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EDEXCEL INTERNATIONAL GCSE MATHS: QUESTIONS BY TOPIC

## Equations & Inequalities (A2)

**International GCSE Mathematics A (4MA1) · Foundation tier**

76 questions · 305 marks · Mark schemes included

Past papers June 2018 - June 2025 · 5 sub-topics

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**HOW TO USE THIS BOOKLET**

Questions are grouped by sub-topic and run from the lowest to the highest mark tariff, then oldest paper first.

Click any row below to jump straight to that sub-topic or question.

On every question page, click ANSWER in the top-right corner to jump to its mark scheme; < QUESTION brings you back.

A gold bar in the left margin marks exactly where the question sits on the original page.

Diagrams, graphs, grids and tables are printed exactly as they appear in the original papers.

Each question is filed under its main topic; longer questions may also test skills from other topics.

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**A2e ITERATION & NUMERICAL METHODS**

No questions on this sub-topic in the available past papers.



# QUESTIONS

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76 questions · 305 marks · 4 sub-topics

SUB-TOPIC A2a

## LINEAR EQUATIONS

Sub-topic A2a · 14 questions · 62 marks · lowest tariff first



11 Show that  $\frac{5}{12} + \frac{3}{8} = \frac{19}{24}$

(Total for Question 11 is 2 marks)

12 (a) Expand  $4(m + 2)$

.....  
(1)

(b) Solve  $2x + 5 = -19$

$x =$  .....  
(2)

(Total for Question 12 is 3 marks)



- 12 The diagram shows a rectangle  $ABCD$  and a semicircle with diameter  $AB$  where  $AB = 12$  cm. The point  $E$  lies on  $DC$  and also on the semicircle.

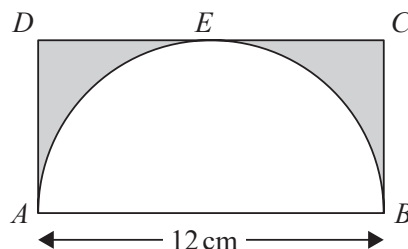


Diagram **NOT** accurately drawn

Work out the area of the shaded region.  
Give your answer correct to 3 significant figures.

..... cm<sup>2</sup>

(Total for Question 12 is 3 marks)

- 13 Solve  $5(2x - 3) = 20$   
Show clear algebraic working.

$x =$  .....

(Total for Question 13 is 3 marks)



19 The table gives the length of the coastline, in kilometres, of each of five oceans.

| Ocean    | Length of coastline (km) |
|----------|--------------------------|
| Arctic   | $4.539 \times 10^4$      |
| Atlantic | $1.119 \times 10^5$      |
| Pacific  | $1.357 \times 10^5$      |
| Indian   | $6.653 \times 10^4$      |
| Southern | $1.797 \times 10^4$      |

(a) Which ocean has the greatest length of coastline?

.....  
(1)

(b) Calculate the difference between the length of the Atlantic Ocean's coastline and the length of the Southern Ocean's coastline.  
Give your answer in standard form.

..... km  
(2)

(Total for Question 19 is 3 marks)

20 Solve  $x^2 - 21x + 20 = 0$   
Show your working clearly.

.....  
(Total for Question 20 is 3 marks)



- 11 (a) Use your calculator to work out the value of

$$\frac{7.45}{4.3^2 - 2.9}$$

Give your answer as a decimal.

Write down all the figures on your calculator display.

.....  
(2)

- (b) Write your answer to part (a) correct to 3 decimal places.

.....  
(1)

(Total for Question 11 is 3 marks)

- 12 Alisa, Jena and Mikael each pick cucumbers.

Alisa picks  $C$  cucumbers.

Jena picks 5 fewer cucumbers than Alisa.

Mikael picks twice as many cucumbers as Alisa.

The total number of cucumbers picked by Alisa, Jena and Mikael is  $T$

Find a formula for  $T$  in terms of  $C$

Give your formula in its simplest form.

.....  
(Total for Question 12 is 3 marks)



- 17 Solve  $3(2 - 4x) = 5 - 8x$   
Show clear algebraic working.

$x = \dots\dots\dots$

(Total for Question 17 is 3 marks)



- 8 Carla wraps some parcels with ribbon.  
She wraps 2 large parcels and 3 small parcels.

For each large parcel, Carla uses 185 centimetres of ribbon.

For each small parcel, she uses  $p$  centimetres of ribbon.

In total, Carla uses exactly 7 metres of ribbon to wrap the parcels.

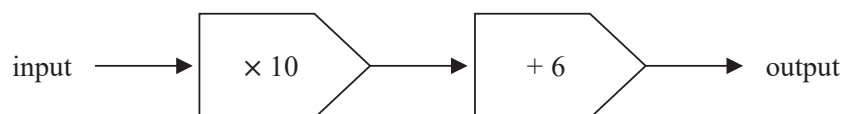
Find the value of  $p$

$p = \dots\dots\dots$

(Total for Question 8 is 3 marks)



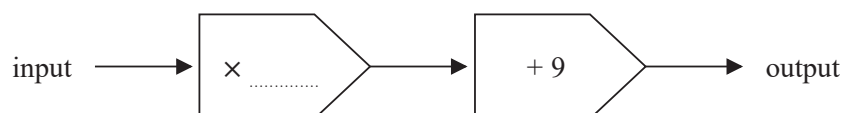
9 Here is a number machine.



(a) Work out the output when the input is 14

.....  
(1)

Here is a different number machine.



When the input is 11 the output is 64

(b) Write a number on the dotted line to complete the number machine.

(2)

(Total for Question 9 is 3 marks)



8 Mairi has 200 flowers.

Of these flowers

37 are white

25 are yellow

42 are pink

The rest of the flowers are red.

Express the number of red flowers as a fraction of the total number of flowers.

Give your fraction in its simplest form.

(Total for Question 8 is 3 marks)

9 3 cups each contain 200 millilitres of water.

4 jugs each contain  $x$  millilitres of water.

Emma pours all the water from the 3 cups and the 4 jugs into a container.

The total amount of water that Emma pours into the container from the 3 cups and 4 jugs is 3.5 litres.

Work out the value of  $x$

$x =$  .....

(Total for Question 9 is 4 marks)



- 6 There are 150 animals on a farm.

Of these animals

19 are sheep

32 are goats

3 are dogs

The rest of the animals are chickens.

Write the number of chickens as a fraction of the total number of animals.  
Give your fraction in its simplest form.

.....  
(Total for Question 6 is 3 marks)

- 7 2 jugs each contain 350 millilitres of milk.  
5 bottles each contain  $y$  millilitres of milk.

Peter tips all the milk from the 2 jugs and the 5 bottles into a container.  
The total amount of milk that Peter tips into the container is 2.8 litres.

Work out the value of  $y$

$y =$  .....

(Total for Question 7 is 4 marks)



15 (a) Solve  $8 - 2p = 15$

$$p = \dots\dots\dots (2)$$

(b) Solve  $\frac{7x - 2}{4} = 3x + 1$

Show clear algebraic working.

$$x = \dots\dots\dots (3)$$

(Total for Question 15 is 5 marks)



- 4 Megan buys 2 muffins and 1 carrot cake.  
The total cost is £4.74

The cost of the carrot cake is £1.80

- (a) Find the cost of each muffin.

£

(3)

Caitlin buys some apples and some oranges.  
She buys twice as many apples as oranges.

Each apple costs £0.25

Each orange costs £0.30

Caitlin has £5 to spend.

- (b) Find the greatest number of apples she can buy.

(3)

(Total for Question 4 is 6 marks)



19 (a) Simplify  $h^7 \times h^2$

.....  
(1)

$$G = c^2 - 4c$$

(b) Find the value of  $G$  when  $c = -5$

$G =$  .....  
(2)

(c) Solve  $\frac{5x - 3}{4} = 2x + 3$

Show clear algebraic working.

$x =$  .....  
(3)

(Total for Question 19 is 6 marks)



**12**  $T = 6p - 4d$

(a) Work out the value of  $T$  when  $p = 8$  and  $d = 3$

$$T = \dots\dots\dots (2)$$

$$T = 6p - 4d$$

(b) Work out the value of  $p$  when  $T = -41$  and  $d = 5$

$$p = \dots\dots\dots (3)$$

(c) Solve  $4(x - 3) = 7x + 15$

Show clear algebraic working.

$$x = \dots\dots\dots (3)$$

**(Total for Question 12 is 8 marks)**



20 (a) Solve  $\frac{2x+5}{6} = 2x-5$

Show clear algebraic working.

$x = \dots\dots\dots$   
(3)

(b) Simplify  $h^{15} \div h^3$

$\dots\dots\dots$   
(1)

(c) Simplify fully  $(2g^3k^5)^4$

$\dots\dots\dots$   
(2)

(d) Given that  $\frac{y^5 \times y^n}{y^7} = y^{12}$   
work out the value of  $n$

$n = \dots\dots\dots$   
(2)

(Total for Question 20 is 8 marks)



SUB-TOPIC A2b

# QUADRATIC EQUATIONS

Sub-topic A2b · 11 questions · 48 marks · lowest tariff first



**19** The weight of a cat is 4.3 kg correct to 2 significant figures.

(a) Write down the upper bound of the weight of the cat.

..... kg  
(1)

(b) Write down the lower bound of the weight of the cat.

..... kg  
(1)

(Total for Question 19 is 2 marks)

**20** Solve  $x^2 - 5x - 36 = 0$   
Show clear algebraic working.

.....  
(Total for Question 20 is 3 marks)



**22** Solve the simultaneous equations

$$5a + 2c = 10$$

$$2a - 4c = 7$$

Show clear algebraic working.

$$a = \dots\dots\dots$$

$$c = \dots\dots\dots$$

**(Total for Question 22 is 3 marks)**

**23** (i) Factorise  $x^2 + 2x - 24$

.....  
(2)

(ii) Hence solve  $x^2 + 2x - 24 = 0$

.....  
(1)

**(Total for Question 23 is 3 marks)**



26 Solve the simultaneous equations

$$7x + 3y = 3$$

$$3x - y = 7$$

Show clear algebraic working.

$$x = \dots\dots\dots$$

$$y = \dots\dots\dots$$

(Total for Question 26 is 3 marks)

27 (i) Factorise  $x^2 + 5x - 24$

.....  
(2)

(ii) Hence, solve  $x^2 + 5x - 24 = 0$

.....  
(1)

(Total for Question 27 is 3 marks)



26 Solve the simultaneous equations

$$\begin{aligned}6x + 4y &= 1 \\ 3x + 5y &= 8\end{aligned}$$

Show clear algebraic working.

$$x = \dots\dots\dots$$

$$y = \dots\dots\dots$$

(Total for Question 26 is 3 marks)

27 (i) Factorise  $x^2 + 9x - 22$

.....  
(2)

(ii) Hence, solve  $x^2 + 9x - 22 = 0$

.....  
(1)

(Total for Question 27 is 3 marks)



24 (a) Simplify  $(3x^2y)^0$

.....  
(1)

(b) (i) Factorise  $x^2 - 5x - 36$

.....  
(2)

(ii) Hence solve  $x^2 - 5x - 36 = 0$

.....  
(1)

(Total for Question 24 is 4 marks)



23 (a) Solve the inequality  $2x + 7 > 4$

.....  
(2)

(b) Solve  $x^2 - 3x - 40 = 0$   
Show clear algebraic working.

.....  
(3)

(Total for Question 23 is 5 marks)



25 (a) Simplify  $(2x^3y^5)^4$

.....  
(2)

(b) (i) Factorise  $x^2 + 5x - 36$

.....  
(2)

(ii) Hence, solve  $x^2 + 5x - 36 = 0$

.....  
(1)

.....  
(Total for Question 25 is 5 marks)



21 (a) Solve the inequality  $5x - 7 \leq 2$

.....  
(2)

(b) (i) Factorise  $y^2 - 2y - 35$

.....  
(2)

(ii) Hence, solve  $y^2 - 2y - 35 = 0$

.....  
(1)

(Total for Question 21 is 5 marks)



21 (a) Expand  $3c^3(c + 4)$

.....  
(2)

(b) (i) Factorise  $x^2 + 8x - 9$

.....  
(2)

(ii) Hence, solve  $x^2 + 8x - 9 = 0$

.....  
(1)

(Total for Question 21 is 5 marks)



25 (a) (i) Factorise  $x^2 + 5x - 24$

.....  
(2)

(ii) Hence, solve  $x^2 + 5x - 24 = 0$

.....  
(1)

(b) Solve the inequality  $3y + 5 > 7y - 10$

Show clear algebraic working.

.....  
(3)

(Total for Question 25 is 6 marks)

23 (a) Solve  $x - 4 = \frac{3 + 2x}{6}$

Show clear algebraic working.

$$x = \dots\dots\dots (3)$$

(b) (i) Factorise  $y^2 - 11y + 30$

$$\dots\dots\dots (2)$$

(ii) Hence solve  $y^2 - 11y + 30 = 0$

$$\dots\dots\dots (1)$$

(Total for Question 23 is 6 marks)



SUB-TOPIC A2c

# SIMULTANEOUS EQUATIONS

Sub-topic A2c · 27 questions · 93 marks · lowest tariff first



25 Solve

$$\begin{aligned}3x + 2y &= 15 \\10x - 4y &= 2\end{aligned}$$

Show clear algebraic working.

$$x = \dots\dots\dots$$

$$y = \dots\dots\dots$$

(Total for Question 25 is 3 marks)

26 Change a speed of 72 kilometres per hour to a speed in metres per second.

..... metres per second

(Total for Question 26 is 3 marks)



**23** Solve the simultaneous equations

$$\begin{aligned}x + y &= 15 \\ 7x - 5y &= 3\end{aligned}$$

Show clear algebraic working.

$$x = \dots\dots\dots$$

$$y = \dots\dots\dots$$

(Total for Question 23 is 3 marks)



- 10 3 kg of carrots cost £1.35  
5 kg of carrots and 2 kg of potatoes cost a total of £4.15

Find the cost of 1 kg of potatoes.

£.....

(Total for Question 10 is 3 marks)

- 11 (a) Find the cube root of 421.875

.....  
(1)

- (b) (i) Work out the value of  $\frac{7.61^2}{5.2 \times 3.5}$

Write down all the figures on your calculator display.

.....  
(2)

- (ii) Write your answer to part (b)(i) correct to 2 significant figures.

.....  
(1)

(Total for Question 11 is 4 marks)



**23** Solve the simultaneous equations

$$4x + 2y = 9$$

$$x - 4y = 9$$

Show clear algebraic working.

$$x =$$

$$y =$$

(Total for Question 23 is 3 marks)



**23** Solve the simultaneous equations

$$4x + 5y = 4$$

$$2x - y = 9$$

Show clear algebraic working.

$$x =$$

$$y =$$

(Total for Question 23 is 3 marks)



**20** Solve the simultaneous equations

$$\begin{aligned}x + 2y &= -0.5 \\ 3x - y &= 16\end{aligned}$$

Show clear algebraic working.

$$x = \dots\dots\dots$$

$$y = \dots\dots\dots$$

**(Total for Question 20 is 3 marks)**



21 Solve the simultaneous equations

$$\begin{aligned}3x + 5y &= 6 \\ 7x - 5y &= -11\end{aligned}$$

Show clear algebraic working.

$$x = \dots\dots\dots$$

$$y = \dots\dots\dots$$

(Total for Question 21 is 3 marks)

22 Hamish buys a new car for \$20 000  
The car depreciates in value by 19% each year.

Work out the value of the car at the end of 3 years.  
Give your answer to the nearest \$.

$$\text{\$} \dots\dots\dots$$

(Total for Question 22 is 3 marks)



**10** In Koko's shop

5 chocolate bars cost \$5.75

2 chocolate bars and 3 packets of sweets cost \$7.85

Work out the cost of one packet of sweets.

\$.....

(Total for Question 10 is 3 marks)

**11** Akiko travelled from London to Tokyo by plane.

The plane left London at 18 40 on Friday.

The plane arrived in Tokyo the next day, at 06 25 London time.

How long did the flight take?

Give your answer in hours and minutes.

..... hours ..... minutes

(Total for Question 11 is 2 marks)



8 (a) Simplify  $a \times a \times a \times a$

.....  
(1)

(b) Simplify  $4b \times 5c$

.....  
(1)

(c) Simplify  $6d + 2e + d - 5e$

.....  
(2)

(Total for Question 8 is 4 marks)

- 9 Sabbir has some boxes of bananas and some sacks of tomatoes.  
The weight of each box of bananas is the same and the weight of each sack of tomatoes is the same.  
The weight of 3 boxes of bananas is 42 kg.  
The weight of 8 sacks of tomatoes is 68 kg.  
Work out the total weight of 9 boxes of bananas and 15 sacks of tomatoes.

..... kg

(Total for Question 9 is 3 marks)



**22** Solve the simultaneous equations

$$5a + 2c = 10$$

$$2a - 4c = 7$$

Show clear algebraic working.

$$a = \dots\dots\dots$$

$$c = \dots\dots\dots$$

**(Total for Question 22 is 3 marks)**

**23** (i) Factorise  $x^2 + 2x - 24$

$$\dots\dots\dots$$

(2)

(ii) Hence solve  $x^2 + 2x - 24 = 0$

$$\dots\dots\dots$$

(1)

**(Total for Question 23 is 3 marks)**



**25** Solve the simultaneous equations

$$3x + 5y = 3.1$$

$$6x + 3y = 3.75$$

Show clear algebraic working.

$$x = \dots\dots\dots$$

$$y = \dots\dots\dots$$

**(Total for Question 25 is 3 marks)**



**10** Thabisa is organising a trip to the theatre.

The cost of a ticket for each adult is £11.75

The total cost of the tickets for 12 adults and 5 children is £181

Work out the cost of a ticket for each child.

£ .....

**(Total for Question 10 is 3 marks)**



26 Solve the simultaneous equations

$$7x + 3y = 3$$

$$3x - y = 7$$

Show clear algebraic working.

$$x = \dots\dots\dots$$

$$y = \dots\dots\dots$$

(Total for Question 26 is 3 marks)

27 (i) Factorise  $x^2 + 5x - 24$

.....  
(2)

(ii) Hence, solve  $x^2 + 5x - 24 = 0$

.....  
(1)

(Total for Question 27 is 3 marks)



- 20**  $C$  grams of chocolate is shared in the ratios  $2:5:8$   
The difference between the largest share and the smallest share is 390 grams.

Work out the value of  $C$

$C = \dots\dots\dots$

(Total for Question 20 is 3 marks)

- 21** Solve the simultaneous equations

$$\begin{aligned}x + 2y &= 15 \\ 4x - 6y &= 4\end{aligned}$$

Show clear algebraic working.

$x = \dots\dots\dots$

$y = \dots\dots\dots$

(Total for Question 21 is 3 marks)



21 The points  $A$  and  $B$  are on a coordinate grid.

The coordinates of  $A$  are  $(6, 4)$

The coordinates of  $B$  are  $(17, j)$  where  $j$  is a constant.

The midpoint of  $AB$  has coordinates  $(k, 15)$  where  $k$  is a constant.

Find the value of  $j$  and the value of  $k$

$$j = \dots\dots\dots$$

$$k = \dots\dots\dots$$

(Total for Question 21 is 3 marks)

22 Solve the simultaneous equations

$$5x + 4y = -2$$

$$2x - y = 4.4$$

Show clear algebraic working.

$$x = \dots\dots\dots$$

$$y = \dots\dots\dots$$

(Total for Question 22 is 3 marks)



24 Solve the simultaneous equations

$$2x + 9y = 14.5$$

$$7x + 3y = 8$$

Show clear algebraic working.

$$x = \dots\dots\dots$$

$$y = \dots\dots\dots$$

(Total for Question 24 is 3 marks)

---

**TOTAL FOR PAPER IS 100 MARKS**



26 Solve the simultaneous equations

$$\begin{aligned}6x + 4y &= 1 \\ 3x + 5y &= 8\end{aligned}$$

Show clear algebraic working.

$$x = \dots\dots\dots$$

$$y = \dots\dots\dots$$

(Total for Question 26 is 3 marks)

27 (i) Factorise  $x^2 + 9x - 22$

.....  
(2)

(ii) Hence, solve  $x^2 + 9x - 22 = 0$

.....  
(1)

(Total for Question 27 is 3 marks)



- 24** Tim buys a bracelet for 4000 Swiss francs.  
The value of the bracelet increases by 7% each year.

Work out the value of the bracelet at the end of 3 years.  
Give your answer correct to the nearest Swiss franc.

..... Swiss francs

(Total for Question 24 is 3 marks)

- 25** Solve the simultaneous equations

$$\begin{aligned}3x + 5y &= 8 \\4x + y &= -3.5\end{aligned}$$

Show clear algebraic working.

$$x = \dots\dots\dots$$

$$y = \dots\dots\dots$$

(Total for Question 25 is 3 marks)



- 18 Write 1400 as a product of powers of its prime factors.  
Show your working clearly.

.....  
(Total for Question 18 is 3 marks)

- 19 Solve the simultaneous equations

$$3x + 2y = 10$$

$$3x - 4y = 16$$

Show clear algebraic working.

$$x = \text{.....}$$

$$y = \text{.....}$$

(Total for Question 19 is 3 marks)



- 6 The two-way table shows some information about where 50 people went for their last holiday.

|        | UK | Africa | USA | Total |
|--------|----|--------|-----|-------|
| Male   |    |        | 2   | 23    |
| Female | 16 | 9      |     |       |
| Total  |    | 16     |     | 50    |

- (a) Complete the table.

(3)

- (b) What percentage of these 50 people were female **and** went on holiday in Africa?

..... %

(2)

(Total for Question 6 is 5 marks)

- 7 3 kg of potatoes and 2 kg of apples cost a total of £7.33  
4 kg of potatoes cost £3.80

Work out the cost of 1 kg of apples.

£.....

(Total for Question 7 is 4 marks)



10 In a shop,

3 bottles of juice cost \$5.25

2 bottles of juice and 5 bars of chocolate cost \$9.75

Work out the cost of 5 bottles of juice and 3 bars of chocolate.

\$.....

(Total for Question 10 is 4 marks)

11 Here are five mathematical signs

|   |   |   |   |   |
|---|---|---|---|---|
| + | > | = | € | < |
|---|---|---|---|---|

(a) Write one of these five signs in each box so that each of these statements is true.

(i)

|      |  |      |
|------|--|------|
| 4 °C |  | 9 °C |
|------|--|------|

(1)

(ii)

|       |  |       |
|-------|--|-------|
| −3 °C |  | −8 °C |
|-------|--|-------|

(1)



- 9 3 kg of carrots and 5 kg of potatoes cost a total of 207 rand.  
2 kg of the carrots cost 48 rand.

Work out the cost of 1 kg of potatoes.

..... rand

(Total for Question 9 is 4 marks)



- 6 Aabir has some boxes and some crates.  
Each box has the same weight.  
Each crate has the same weight.

The total weight of 7 boxes and 2 crates is 27.3 kg

The total weight of 4 boxes and 2 crates is 16.8 kg

Work out the weight of one crate.

..... kg

(Total for Question 6 is 4 marks)

7

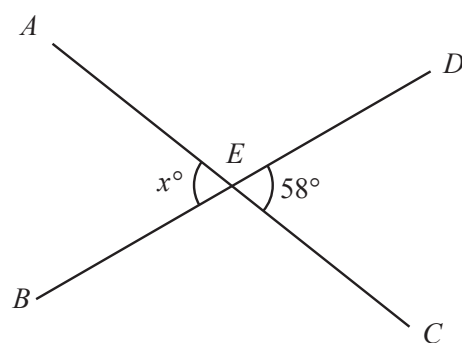


Diagram **NOT**  
accurately drawn

$AEC$  and  $BED$  are straight lines.

Sergio says that the value of  $x$  is 58

- (a) Give a reason why Sergio is correct.

.....

.....

(1)



- 6 (a) Write  $\frac{19}{5}$  as a mixed number.

.....  
(1)

- (b) Circle the two fractions that are equivalent.

$$\frac{19}{20}$$

$$\frac{4}{5}$$

$$\frac{20}{24}$$

$$\frac{28}{35}$$

$$\frac{5}{9}$$

(1)

- (c) Write 0.3 as a fraction.

.....  
(1)

(Total for Question 6 is 3 marks)

- 7 2 cupcakes and 5 doughnuts cost \$4.50  
3 cupcakes cost \$2.25

Work out the cost of 1 doughnut.

\$.....

(Total for Question 7 is 4 marks)



- 17 Yasmin has some identical rectangular tiles.  
Each tile is  $L$  cm by  $W$  cm.

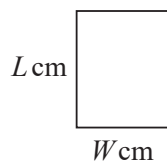


Diagram **NOT**  
accurately drawn

Using 9 of her tiles, Yasmin makes rectangle  $ABCD$  shown in the diagram below.

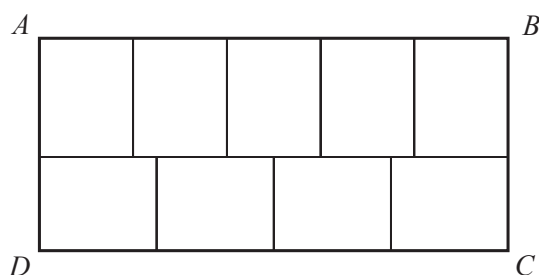


Diagram **NOT**  
accurately drawn

The area of  $ABCD$  is  $1620\text{ cm}^2$

Work out the value of  $L$  and the value of  $W$ .

$$L = \dots\dots\dots W = \dots\dots\dots$$

(Total for Question 17 is 5 marks)



- 18** Alison buys 5 apples and 3 pears for a total cost of \$1.96  
Greg buys 3 apples and 2 pears for a total cost of \$1.22

Michael buys 10 apples and 10 pears.

Work out how much Michael pays for his 10 apples and 10 pears.  
Show your working clearly.

\$ .....

(Total for Question 18 is 5 marks)

- 19** Write  $3.6 \times 10^3$  as a product of powers of its prime factors.  
Show your working clearly.

.....

(Total for Question 19 is 3 marks)



21 (a) Simplify  $g^6 \times g^4$

.....  
(1)

(b) Simplify  $(3cd^4)^2$

.....  
(2)

(c) Solve the simultaneous equations

$$\begin{aligned}4x + 3y &= 17 \\ x + 2y &= 5\end{aligned}$$

Show clear algebraic working.

$$x = \text{.....}$$

$$y = \text{.....}$$

(3)

(Total for Question 21 is 6 marks)



SUB-TOPIC A2d

# INEQUALITIES

Sub-topic A2d · 24 questions · 102 marks · lowest tariff first



- 24** Jane bought a new car for \$18 000  
The car depreciates in value by 15% each year.

Work out the value of the car at the end of 4 years.  
Give your answer correct to the nearest \$

\$.....

---

**(Total for Question 24 is 3 marks)**

- 25** Solve the inequality  $3 - 4x \leq 11$

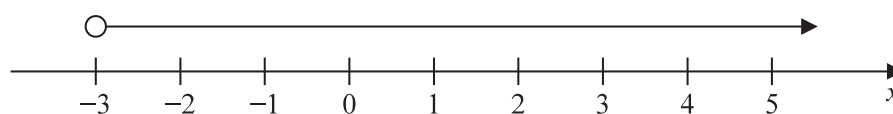
.....

---

**(Total for Question 25 is 2 marks)**



17 (a)



Write down the inequality shown on the number line.

---

(1)

(b) Solve the inequality  $4y - 13 \leq y + 8$ 

---

(2)

---

(Total for Question 17 is 3 marks)

18 Show that  $5\frac{2}{3} - 2\frac{3}{4} = 2\frac{11}{12}$ 

---

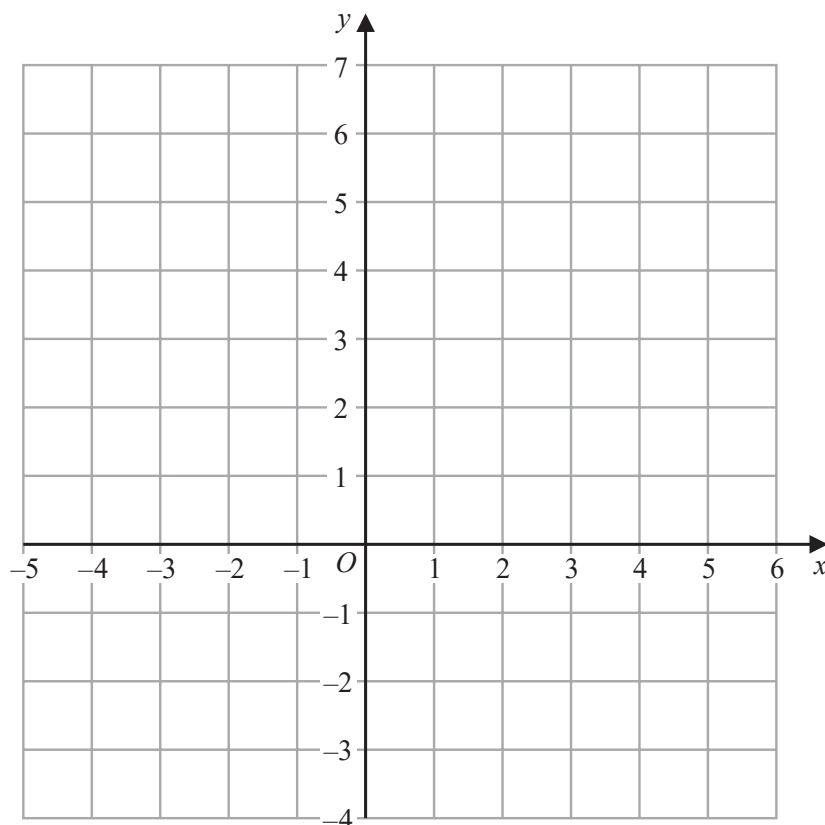
(Total for Question 18 is 3 marks)



24 Show, by shading on the grid, the region that satisfies all three of the inequalities

$$x \leq 4 \quad \text{and} \quad y \geq -2 \quad \text{and} \quad y \leq x$$

Label the region **R**.



(Total for Question 24 is 3 marks)

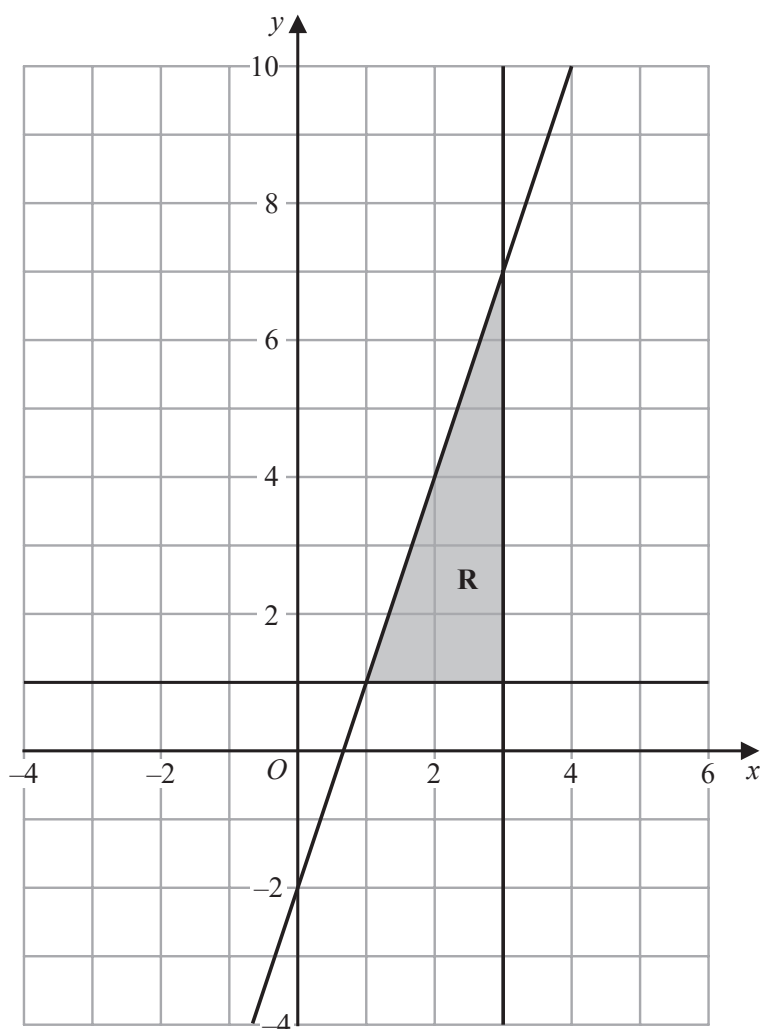
25 Find the gradient of the straight line with equation  $5x + 2y = 7$

(Total for Question 25 is 2 marks)



- 18 The shaded region **R**, shown in the diagram below, is bounded by the straight line with equation  $y = 3x - 2$  and by two other straight lines.

Write down the three inequalities that define region **R**.



.....  
.....  
.....

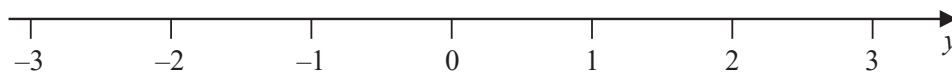
(Total for Question 18 is 3 marks)

15  $n$  is an integer.

(a) Write down all the values of  $n$  such that  $-2 \leq n < 3$

(2)

(b) On the number line, represent the inequality  $y \leq 1$



(1)

(Total for Question 15 is 3 marks)

16 Each time John plays a game, the probability that he wins the game is 0.65

John is going to play the game 300 times.

Work out an estimate for the number of games that John wins.

(Total for Question 16 is 2 marks)



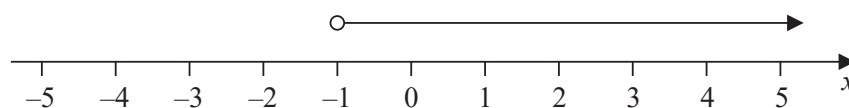
17  $-8 < 2y \leq 2$

$y$  is an integer.

(a) Find all the possible values of  $y$

(2)

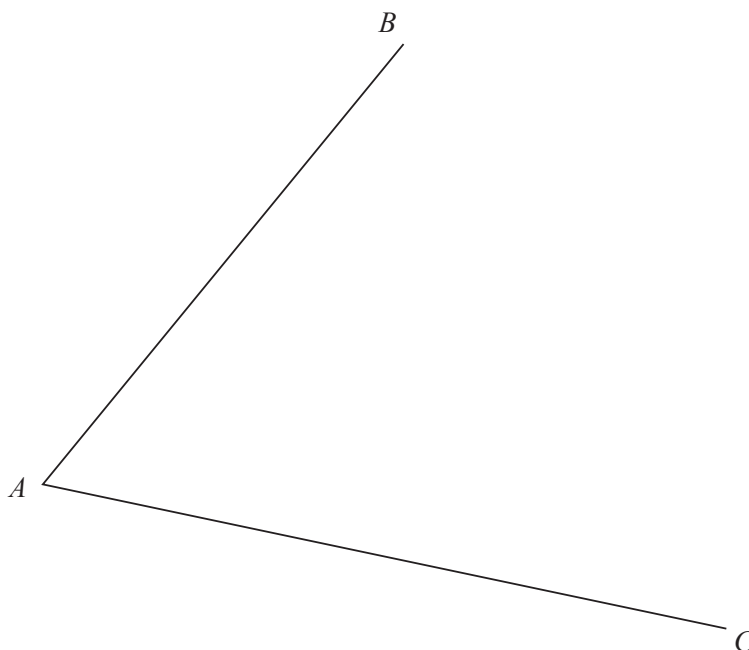
(b) Write down the inequality shown on the number line.



(1)

(Total for Question 17 is 3 marks)

18 Using ruler and compasses only, construct the bisector of angle  $BAC$   
You must show all your construction lines.



(Total for Question 18 is 2 marks)



- 25 (a) Write down the integer values of  $x$  that satisfy the inequality  $-2 < x \leq 4$

.....  
(2)

The region **R**, shown shaded in the diagram, is bounded by three straight lines.

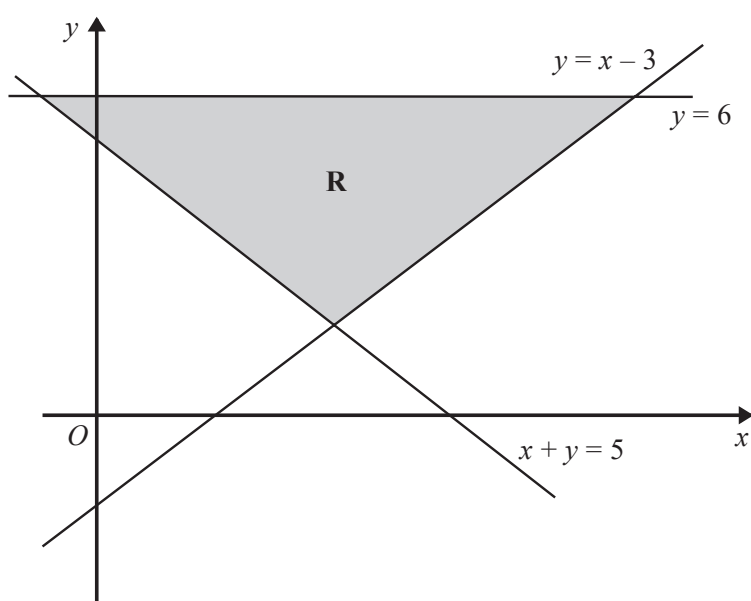


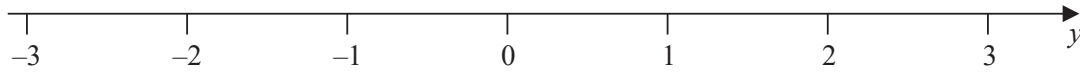
Diagram **NOT**  
accurately drawn

- (b) Write down the three inequalities that define the region **R**.

.....  
.....  
.....  
(2)

(Total for Question 25 is 4 marks)

- 18 (a) On the number line, show the inequality  $-2 \leq y < 1$



(2)

$n$  is an integer.

- (b) Write down all the values of  $n$  that satisfy  $-3.4 < n \leq 2$

.....  
(2)

(Total for Question 18 is 4 marks)

- 19 A train journey from Paris to Amsterdam took 3 hours 24 minutes.  
The total distance the train travelled was 433.5 km.

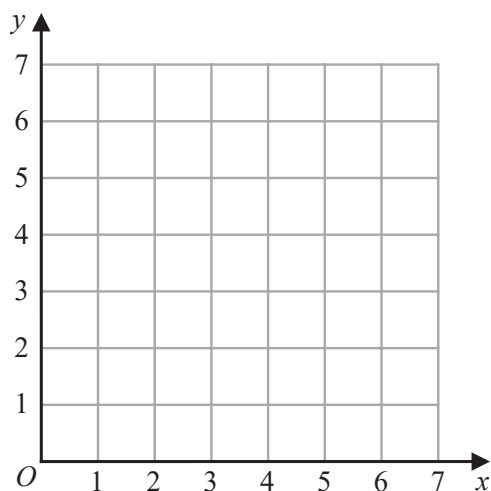
Work out the average speed of the train.  
Give your answer in kilometres per hour.

..... km/h

(Total for Question 19 is 3 marks)



18



(a) On the grid, draw and **label** the straight line with equation

(i)  $x = 1.5$

(ii)  $y = x$

(iii)  $x + y = 6$

(3)

(b) Show, by shading on the grid, the region that satisfies **all three** of the inequalities

$$x \geq 1.5$$

$$y \geq x$$

$$x + y \leq 6$$

Label the region **R**.

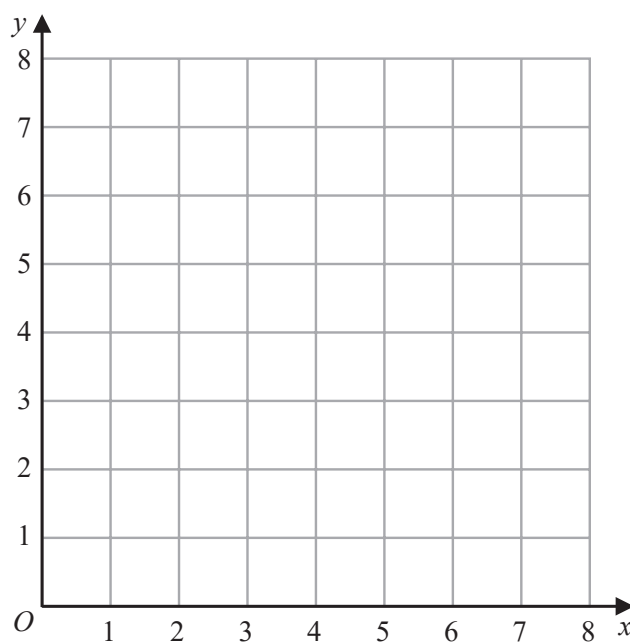
(1)

(Total for Question 18 is 4 marks)



18 (a) On the grid, draw and label with its equation the straight line with equation

(i)  $y = 1$       (ii)  $x = 2$       (iii)  $x + y = 7$



(3)

(b) Show, by shading on the grid, the region that satisfies **all three** of the inequalities

$y \geq 1$        $x \geq 2$        $x + y \leq 7$

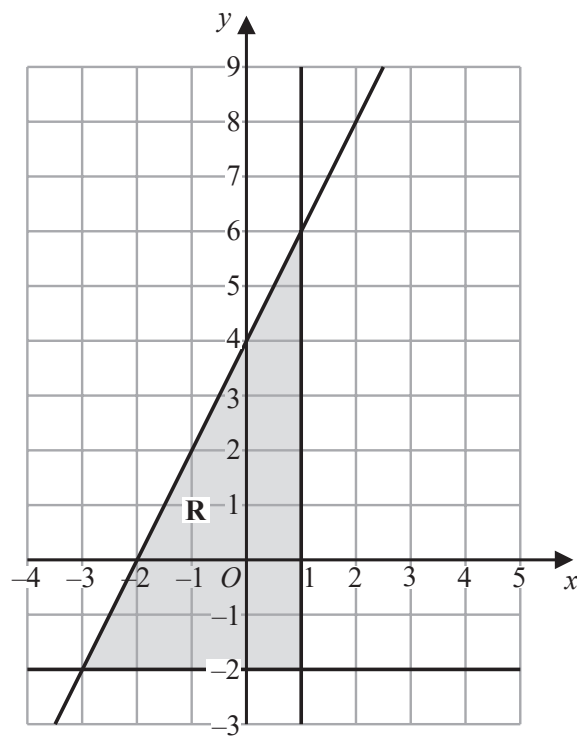
Label the region **R**.

(1)

(Total for Question 18 is 4 marks)



22



The region **R**, shown shaded in the diagram, is bounded by three straight lines.

Find the inequalities that define **R**

.....  
.....  
.....

(Total for Question 22 is 4 marks)



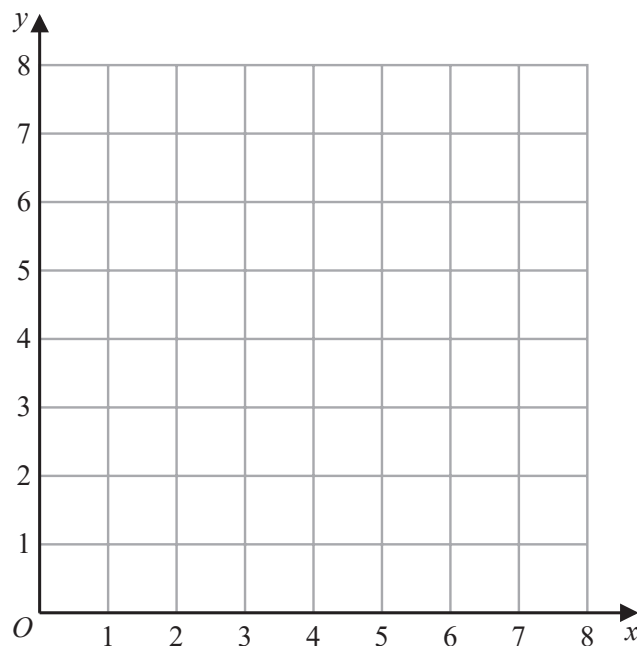
18 (a) On the grid, draw the straight line with equation

(i)  $y = 2$

(ii)  $x = 6$

(iii)  $y = x + 1$

Label each line with its equation.



(3)

(b) Show, by shading on the grid, the region that satisfies all three of the inequalities

$$y \geq 2 \qquad x \leq 6 \qquad y \leq x + 1$$

Label the region **R**

(1)

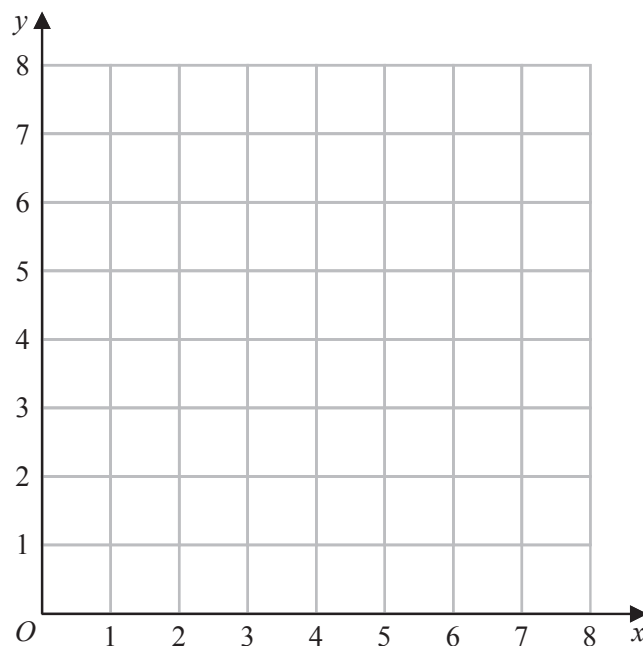
(Total for Question 18 is 4 marks)



23 (a) On the grid, draw the straight line with equation

(i)  $x = 3$       (ii)  $y = 1$       (iii)  $x + y = 7$

Label each line with its equation.



(3)

(b) Show, by shading on the grid, the region that satisfies all three of the inequalities

$$x \geq 3 \quad y \geq 1 \quad x + y \leq 7$$

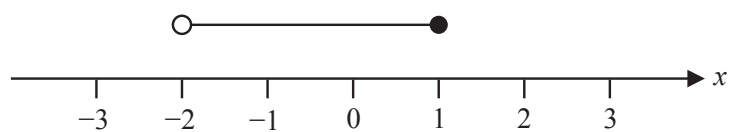
Label the region **R**

(1)

(Total for Question 23 is 4 marks)



21



(a) Write down the inequality shown on the number line.

.....  
(2)

(b) Solve the inequality  $7a - 5 \leq 3a + 28$   
Show clear algebraic working.

.....  
(2)

(Total for Question 21 is 4 marks)

22 (a) Factorise  $x^2 - x - 42$

.....  
(2)

(b) Solve the inequality  $3x + 15 < 8x + 3$

Show clear algebraic working.

.....  
(3)

(Total for Question 22 is 5 marks)

23 Given that  $150^x = 1$

(a) write down the value of  $x$ .

$x =$  .....  
(1)

Given that  $3^{-8} \div 3^{-6} = 3^n$

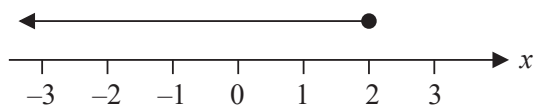
(b) find the value of  $n$ .

$n =$  .....  
(1)

(Total for Question 23 is 2 marks)



22 (a)



Write down the inequality shown on the number line.

.....  
(1)

$$-4 \leq 2y < 6$$

$y$  is an integer.

(b) Write down all the possible values of  $y$ .

.....  
(2)

(c) Solve the inequality  $7t - 3 \leq 2t + 31$

Show your working clearly.

.....  
(2)

(Total for Question 22 is 5 marks)



- 20** In 2018, the population of Sydney was 5.48 million.  
This was 22% of the total population of Australia.

Work out the total population of Australia in 2018  
Give your answer correct to 3 significant figures.

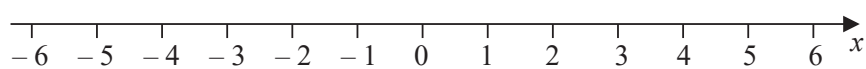
..... million

(Total for Question 20 is 3 marks)

- 21** (i) Solve the inequalities  $-7 \leq 2x - 3 < 5$

.....  
(3)

- (ii) On the number line, represent the solution set to part (i)



(2)

(Total for Question 21 is 5 marks)



20 (a) Solve  $4y + 5 > 12$

(b) Solve  $6x - 5 = \frac{4x - 7}{2}$

Show clear algebraic working.

.....  
(2)

$x =$  .....  
(3)

(Total for Question 20 is 5 marks)



- 24 (a) Write down an equation of the straight line with gradient  $-3$  and which passes through the point with coordinates  $(0, 5)$

(2)

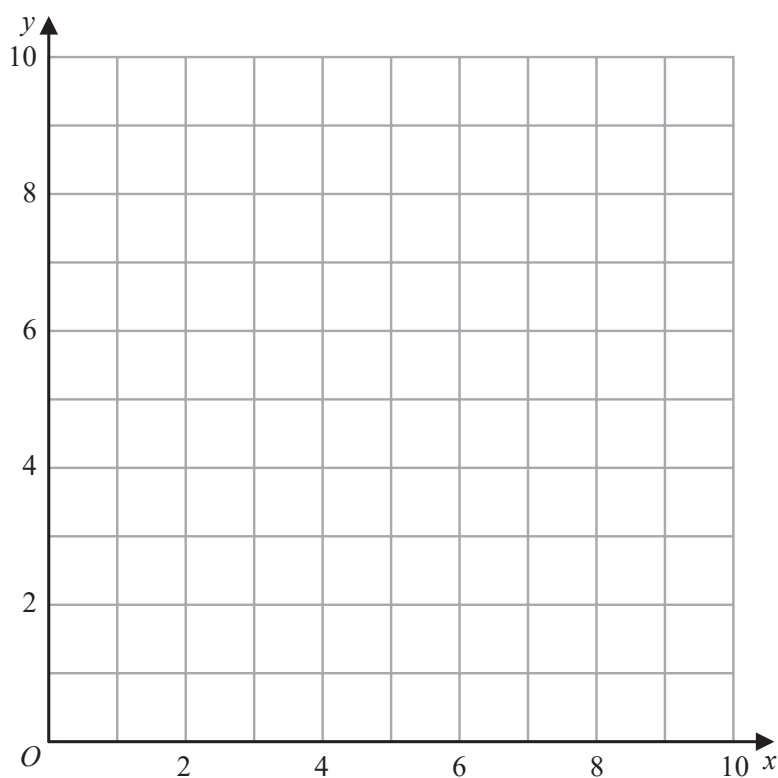
- (b) Show, by shading on the grid, the region defined by **all three** of the inequalities

$$x \leq 6$$

$$y \geq 2$$

$$y \leq x + 1$$

Label the region **R**

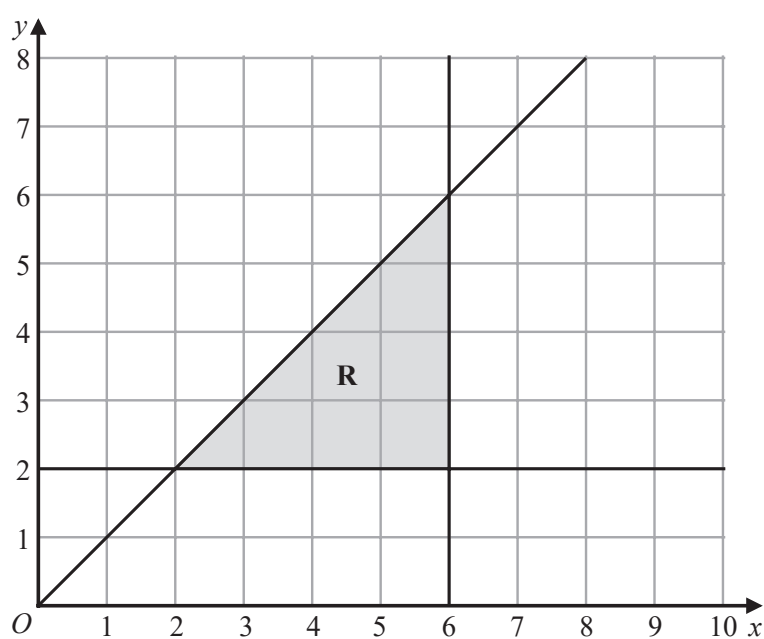


(3)

(Total for Question 24 is 5 marks)

23 (a) Solve  $9 - 4x > 17$

.....  
(2)



(b) Write down the three inequalities that represent the shaded region **R**

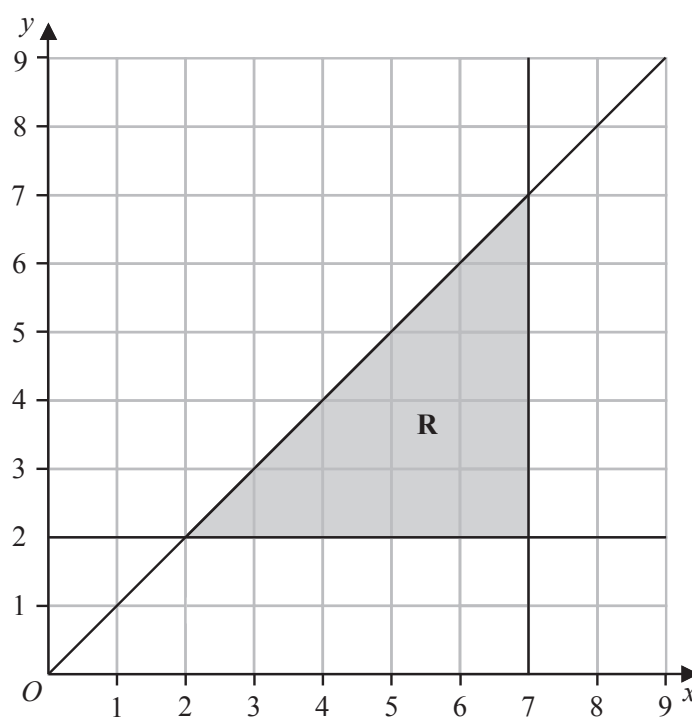
.....  
.....  
.....  
(3)

(Total for Question 23 is 5 marks)

22 (a) Solve the inequality  $8x - 4 \geq 3x - 10$

(2)

The region **R**, shown shaded in the diagram, is bounded by three straight lines.



(b) Write down the three inequalities that define the region **R**

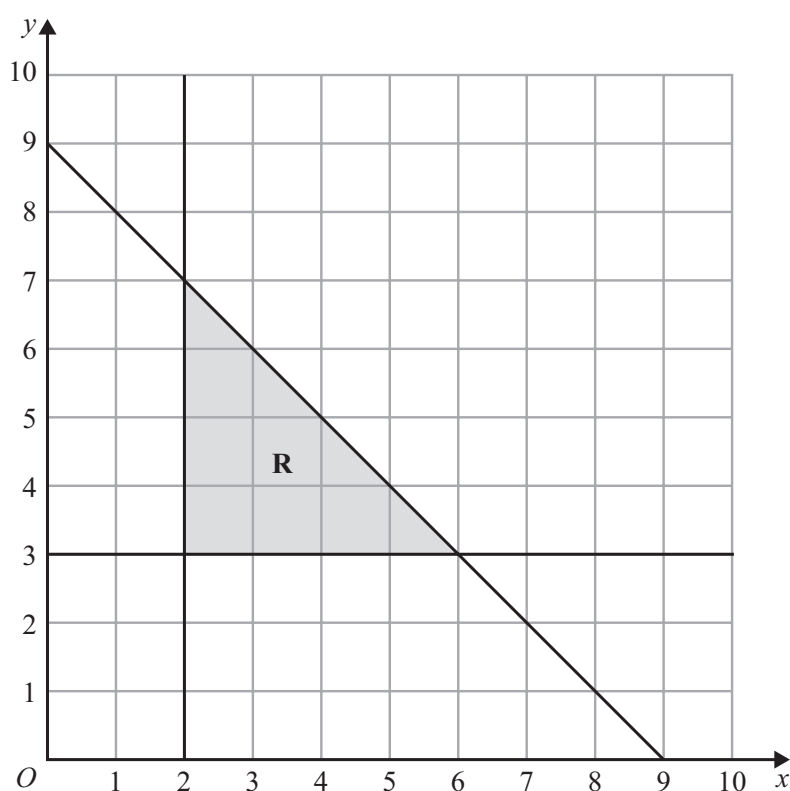
(3)

(Total for Question 22 is 5 marks)

26 (a) Solve the inequality  $7 - 3t < 2t + 15$

.....  
(2)

The region **R**, shown shaded in the diagram, is bounded by three straight lines.



(b) Write down three inequalities that define the region **R**

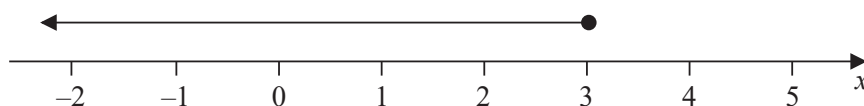
.....  
.....  
.....  
(3)

(Total for Question 26 is 5 marks)

25 (a) Factorise  $y^2 - 2y - 48$

(2)

(b) Write down the inequality shown on the number line



(1)

(c) Solve the inequality  $7w + 6 > 12w + 14$

(3)

(Total for Question 25 is 6 marks)

**TOTAL FOR PAPER IS 100 MARKS**



19 (a) Expand and simplify  $4x(2x + 5) - 3x(2x - 3)$

Given that  $\frac{y^5 \times y^n}{y^6} = y^{13}$

(b) work out the value of  $n$ .

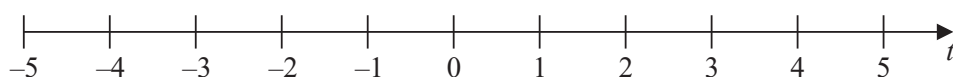
.....  
(2)

$n =$  .....  
(2)

(c) (i) Solve the inequality  $7t - 8 < 2t + 7$

.....  
(2)

(ii) On the number line below, represent the solution set of the inequality solved in part (c)(i)



(1)

(Total for Question 19 is 7 marks)



# MARK SCHEMES

official mark schemes, in the same order as the questions



|               |                                                                                                                                 |                                   |   |                                                                                                                                                        |
|---------------|---------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11            | $\frac{10}{24} + \frac{9}{24}$ or $\frac{10n}{24n} + \frac{9n}{24n}$<br>or eg $\frac{40+36}{96} \left( = \frac{76}{96} \right)$ |                                   | 2 | M1 for writing a sum, and each fraction with a common denominator, eg $\frac{10}{24} + \frac{9}{24}$                                                   |
|               | $\frac{10}{24} + \frac{9}{24} = \frac{19}{24}$<br>or eg $\frac{40+36}{96} = \frac{76}{96} = \frac{19}{24}$                      | clearly shown                     |   | A1 dep on M1 continued to clearly show given result                                                                                                    |
| Total 2 marks |                                                                                                                                 |                                   |   |                                                                                                                                                        |
| 12 (a)        |                                                                                                                                 | $4m + 8$                          | 1 | B1 do not isw further incorrect working                                                                                                                |
| (b)           | $2x = -19 - 5$ or $2x = -24$ or<br>$x = \frac{-19-5}{2}$ or $x = \frac{-24}{2}$                                                 |                                   | 2 | M1                                                                                                                                                     |
|               |                                                                                                                                 | -12                               |   | A1 cao                                                                                                                                                 |
| Total 3 marks |                                                                                                                                 |                                   |   |                                                                                                                                                        |
| 13 (a)        |                                                                                                                                 | Correct mirror line<br>$x = -1.5$ | 1 | B1 Correct line drawn at $x = -1.5$<br>allow freehand with intention to draw at -1.5                                                                   |
| (b)           |                                                                                                                                 | Shape drawn                       | 2 | B2 for correct shape with vertices at (-1,2), (-1, 4), (-3, 2) and (-3, 5)<br>(B1 for a correct orientation or 90° clockwise turn about correct point) |
| Total 3 marks |                                                                                                                                 |                                   |   |                                                                                                                                                        |

|    |     |                                        |              |   |                                                                                                                                      |
|----|-----|----------------------------------------|--------------|---|--------------------------------------------------------------------------------------------------------------------------------------|
| 11 | (a) | $5 \times (-2)^2 - (-2)^3 (= 20 - -8)$ |              | 2 | M1 for correct expression<br>or at least one of 20 or $5 \times 4$ or $--8$ or (+) 8                                                 |
|    |     |                                        | 28           |   | A1                                                                                                                                   |
|    | (b) |                                        | $2p(4p - 1)$ | 2 | B2 B1 for $p(8p - 2)$ or $2(4p^2 - p)$<br>or $2p(4p - 1)$ with two terms inside the bracket with one term correct.                   |
|    | (c) |                                        | $12t^2 - 8t$ | 2 | B2 B1 for $12t^2$ or $-8t$                                                                                                           |
|    | (d) | $5x^2 + 20x - 2x - 8$                  |              | 2 | M1 for 4 correct terms (ignoring signs)<br>or 3 correct terms with correct signs.<br>or $5x^2 + 18x + \dots$<br>or $\dots + 18x - 8$ |
|    |     | $5x^2 + 18x - 8$                       | A1           |   |                                                                                                                                      |
|    |     |                                        |              |   | <b>Total 8 marks</b>                                                                                                                 |

|    |                                                                                                            |      |   |                                 |
|----|------------------------------------------------------------------------------------------------------------|------|---|---------------------------------|
| 12 | $0.5 \times \pi \times 6^2 (= 56.54\dots)$ <b>or</b> $12 \times 6 (= 72)$<br><b>or</b> $\pi \times 6^2$ oe |      | 3 | M1                              |
|    | “72” – “56.54....”                                                                                         |      |   | M1 dep M1 for a complete method |
|    |                                                                                                            | 15.5 |   | A1 15.4 to 15.5                 |
|    |                                                                                                            |      |   |                                 |

|    |                                                                       |        |   |                                                      |
|----|-----------------------------------------------------------------------|--------|---|------------------------------------------------------|
| 13 | $2x - 3 = 20 \div 5$ or $10x - 15 = 20$                               |        | 3 | M1                                                   |
|    | $2x = \text{“4”} + 3$ oe or $10x = 20 + \text{“15”}$<br>$10x = 35$ oe |        |   | M1 For collecting terms, ft their expansion          |
|    |                                                                       | 3.5 oe |   | A1 dep M1<br>accept $\frac{7}{2}$ or $\frac{35}{10}$ |
|    |                                                                       |        |   |                                                      |

|               |     |                                         |                        |   |                                                                                                  |
|---------------|-----|-----------------------------------------|------------------------|---|--------------------------------------------------------------------------------------------------|
| 19            | (a) |                                         | Pacific                | 1 | B1 Accept $1.357 \times 10^5$                                                                    |
|               | (b) | $1.119 \times 10^5 - 1.797 \times 10^4$ |                        | 2 | M1 Accept $111\,900 - 17\,970$ oe<br>or $93\,930$ or $-93\,930$                                  |
|               |     |                                         | $9.393(0) \times 10^4$ |   | A1 Accept $(\pm) 9.393(0) \times 10^4$<br>or $(\pm) 9.39 \times 10^4$ or $(\pm) 9.4 \times 10^4$ |
| Total 3 marks |     |                                         |                        |   |                                                                                                  |

|               |                             |                                                                                                                                                           |       |   |                                                                                                                                                                                                                                                                                                   |
|---------------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-------|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 20            | eg<br>$(x \pm 20)(x \pm 1)$ | $\frac{-(-21) \pm \sqrt{(-21)^2 - 4 \times 1 \times 20}}{2 \times 1}$<br>or $\left(x - \frac{21}{2}\right)^2 - \left(\frac{21}{2}\right)^2 + 20 = 0$      |       | 3 | M1 If factorising, allow brackets which expanded give 2 out of 3 terms correct – if using formula or completing the square allow one sign error and some simplification – allow as far as eg<br>$\frac{21 \pm \sqrt{441 - 80}}{2}$ or eg $\left(x - \frac{21}{2}\right)^2 - \frac{361}{4} = 0$ oe |
|               | $(x - 20)(x - 1)$           | eg $\frac{21 \pm \sqrt{441 - 80}}{2}$ or<br>$\frac{21 \pm \sqrt{361}}{2}$ or $\frac{21 \pm 19}{2}$<br>or $x = \pm \sqrt{\frac{361}{4}} + \frac{21}{2}$ oe |       |   | M1 dep on M1 for correct factorisation, or a correct expression for x if completing the square, or a correct substitution into quadratic formula with some processing.                                                                                                                            |
|               |                             |                                                                                                                                                           | 1, 20 |   | A1 for both correct values, dep on 1st M1 with no incorrect working.                                                                                                                                                                                                                              |
| Total 3 marks |                             |                                                                                                                                                           |       |   |                                                                                                                                                                                                                                                                                                   |

|               |     |                                                                                                            |                   |   |                                                                                                                 |
|---------------|-----|------------------------------------------------------------------------------------------------------------|-------------------|---|-----------------------------------------------------------------------------------------------------------------|
| 11            | (a) | eg 15.59 <b>or</b> 0.477 <b>or</b> 0.478 <b>or</b> 0.4778<br><b>or</b> 0.4779 <b>or</b> $\frac{745}{1559}$ |                   | 2 | M1 for calculating the denominator<br><b>or</b> for answer with 3 or 4 dp<br><b>or</b> for the correct fraction |
|               |     |                                                                                                            | 0.47787(04298...) |   | A1 must have minimum of 5 dp                                                                                    |
|               | (b) |                                                                                                            | 0.478             | 1 | B1ft dep on at least 4 decimal places                                                                           |
| Total 3 marks |     |                                                                                                            |                   |   |                                                                                                                 |

|               |  |                                                                                                                                                                                                                                   |              |   |                                                                                            |
|---------------|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|---|--------------------------------------------------------------------------------------------|
| 12            |  | $C - 5$ <b>oe</b> $2C$ <b>oe</b> $T$ = a linear expression in $C$                                                                                                                                                                 |              | 3 | M1 for one of $C - 5$ <b>oe</b> $2C$ <b>oe</b><br><b>or</b> $T$ = linear expression in $C$ |
|               |  | $C + C - 5 + 2C (= 4C - 5)$ <b>oe</b><br><b>or</b><br>for $T$ = an expression in $C$ with the expression in $C$<br>coming from adding at least 2 of $C$ , $2C$ , $C - 5$ eg $T$<br>$= 2C + C - 5$ <b>or</b> $T = C + C^2 + C - 5$ |              |   | M1                                                                                         |
|               |  |                                                                                                                                                                                                                                   | $T = 4C - 5$ |   | A1 <b>oe</b> but must be simplified<br>eg allow $T = 4 \times C - 5$                       |
| Total 3 marks |  |                                                                                                                                                                                                                                   |              |   |                                                                                            |



|    |                                                                                                                                           |               |   |                                                                                            |
|----|-------------------------------------------------------------------------------------------------------------------------------------------|---------------|---|--------------------------------------------------------------------------------------------|
| 17 | $6-12x$ or<br>$2-4x = \frac{5}{3} - \frac{8}{3}x$                                                                                         |               | 3 | M1 for expansion of bracket on the LHS or dividing the RHS by 3 with two terms             |
|    | $6-5=12x-8x$ or $1=4x$ or<br>$-12x+8x=5-6$ oe or $-4x=-1$ or<br>$\frac{8}{3}x-4x=\frac{5}{3}-2$ oe or $2-\frac{5}{3}=-\frac{8}{3}x+4x$ oe |               |   | M1 ft (dep on 4 terms) for terms in $x$ on one side of equation; number terms on the other |
|    | <i>Working required</i>                                                                                                                   | $\frac{1}{4}$ |   | A1 oe dep on M1 awarded                                                                    |
|    |                                                                                                                                           |               |   | <b>Total 3 marks</b>                                                                       |

|    |                                                                |                                 |   |                                                                                                        |
|----|----------------------------------------------------------------|---------------------------------|---|--------------------------------------------------------------------------------------------------------|
| 18 | Two pairs of intersecting arcs with equal radii centre A and B |                                 | 2 | M1 for arcs that intersect within or on the guidelines or correct perpendicular bisector without arcs. |
|    | <i>Working required</i>                                        | Bisector with construction arcs |   | A1 for a fully correct bisector with two intersecting arcs                                             |
|    |                                                                |                                 |   | <b>Total 2 marks</b>                                                                                   |

|               |                                                                                                                                                                                                                                       |     |   |                                                                                                                                                                                                                                                                                                      |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7             | $10 - 3 (= 7)$ (could be on diagram)<br><b>or</b> $10 + 3 + 10 + 3 (= 26)$ oe<br><b>or</b> $(10 + 3 + 10 + 3) \times 3 (= 78)$ oe<br><b>or</b> $6 \times 10 + 4 \times 3 (= 72)$ oe<br><b>or</b> $4 \times 10 + 4 \times 3 (= 52)$ oe |     | 3 | M1 for $10 - 3 (= 7)$ (could be on diagram)<br><b>or</b> for finding the perimeter of one rectangle<br><b>or</b> for finding the perimeter of 3 rectangles<br><b>or</b> for finding the perimeter including the internal sides<br><b>or</b> for finding the perimeter excluding the two lengths of 7 |
|               | eg $3 + 10 + 3 + 10 + 3 + 10 + 3 + "7" + 10 + "7"$ oe<br><b>or</b> $4 \times 10 + 4 \times 3 + 2 \times "7"$ oe<br><b>or</b> $"78" - (4 \times 3)$ oe<br><b>or</b> $"72" - (2 \times 3)$ oe<br><b>or</b> $"52" + (2 \times "7")$ oe   |     |   | M1 for a fully correct method to find the perimeter of the shape, with at most one error (which could be one length omitted or an extra length added)                                                                                                                                                |
|               | Correct answer scores full marks (unless from obvious incorrect working)                                                                                                                                                              | 66  |   | A1                                                                                                                                                                                                                                                                                                   |
| Total 3 marks |                                                                                                                                                                                                                                       |     |   |                                                                                                                                                                                                                                                                                                      |
| 8             | use of $1 \text{ m} = 100 \text{ cm}$<br>eg $7 \text{ m} = 700 \text{ cm}$ or $185 \text{ cm} = 1.85 \text{ m}$ or $370 \text{ cm} = 3.7 \text{ m}$                                                                                   |     | 3 | B1 for any correct conversion between metres and centimetres                                                                                                                                                                                                                                         |
|               | $"700" - 2 \times 185 (= 330)$<br><b>or</b> $7 - 2 \times "1.85" (= 3.3)$ oe                                                                                                                                                          |     |   | M1 use of their converted value for this method mark ie $"700"$ is their converted 7 m and $"1.85"$ is their converted 185 cm                                                                                                                                                                        |
|               | Correct answer scores full marks (unless from obvious incorrect working)                                                                                                                                                              | 110 |   | A1 allow 1.1 m or 1.1 metres                                                                                                                                                                                                                                                                         |
| Total 3 marks |                                                                                                                                                                                                                                       |     |   |                                                                                                                                                                                                                                                                                                      |



|                      |     |                                                                                 |     |   |                                                                                    |
|----------------------|-----|---------------------------------------------------------------------------------|-----|---|------------------------------------------------------------------------------------|
| <b>9</b>             | (a) |                                                                                 | 146 | 1 | B1                                                                                 |
|                      | (b) | $64 - 9 (= 55)$ <b>or</b> $(64 - 9) \div 11$ <b>or</b> $11x + 9 = 64$           |     | 2 | M1 for working backwards from the output of 64<br><b>or</b> setting up an equation |
|                      |     | <i>Correct answer scores full marks (unless from obvious incorrect working)</i> | 5   |   | A1                                                                                 |
| <b>Total 3 marks</b> |     |                                                                                 |     |   |                                                                                    |

|                      |     |                                                                                    |                 |   |                                                                         |
|----------------------|-----|------------------------------------------------------------------------------------|-----------------|---|-------------------------------------------------------------------------|
| <b>10</b>            | (a) |                                                                                    | $\frac{13}{30}$ | 1 | B1 oe eg 0.43(333...) or 43.(33...)%                                    |
|                      | (b) |                                                                                    | $\frac{6}{30}$  | 1 | B1 oe eg $\frac{1}{5}$ or $\frac{3}{15}$ or 0.2 or 20%                  |
|                      | (c) | eg $\frac{2}{5} = \frac{16}{40}$ <b>or</b> $\frac{2}{5} \times (10 + 30)(= 16)$ oe |                 | 2 | M1 for a method to work out the number of white counters now in the bag |
|                      |     | <i>Correct answer scores full marks (unless from obvious incorrect working)</i>    | 5               |   | A1                                                                      |
| <b>Total 4 marks</b> |     |                                                                                    |                 |   |                                                                         |

|               |                                                                            |   |   |                                                                   |
|---------------|----------------------------------------------------------------------------|---|---|-------------------------------------------------------------------|
| 11            | $94.8(0) - 3 \times 12 (= 58.8(0))$ oe                                     |   | 4 | M1 for a method to find the total cost of the children's tickets  |
|               | eg $0.3 \times 12 (= 3.6(0))$ oe<br>or $(1 - 0.3) \times 12 (= 8.4(0))$ oe |   |   | M1 (indep) for finding 30% or 70% of 12                           |
|               | “58.8(0)” $\div (12 - “3.6(0)”) $ oe<br>or “58.8(0)” $\div “8.4(0)”$ oe    |   |   | M1 for a complete method to find the number of children's tickets |
|               | Correct answer scores full marks (unless from obvious incorrect working)   | 7 |   | A1                                                                |
|               |                                                                            |   |   |                                                                   |
| Total 4 marks |                                                                            |   |   |                                                                   |



|                      |                                                                                                                                      |     |          |                                                                                                         |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------|-----|----------|---------------------------------------------------------------------------------------------------------|
| <b>9</b>             | 200 (ml) written as 0.2 (l) or 3.5 (l) written as 3500 (ml)                                                                          |     | <b>4</b> | <b>B1</b> for a correct conversion                                                                      |
|                      | $3 \times "0.2"$ (= 0.6) oe eg $0.2 + 0.2 + 0.2$<br>or<br>$3 \times 200$ (= 600) oe eg $-200-200-200$<br>or<br>$3500 - 600$ (= 2900) |     |          | <b>M1</b> A correct calculation for the total amount of water in the 3 cups or the 4 jugs               |
|                      | $\frac{3.5 - "0.6"}{4}$ or $\frac{"3500" - "600"}{4}$ oe                                                                             |     |          | <b>M1</b> For a fully correct method or for an answer of 0.725 (this alone gains B1M2)                  |
|                      |                                                                                                                                      | 725 |          | <b>A1</b> (SCB1M1 (no other marks) for $(3.5 - 0.2) \div 4$ (= 0.825) or $(3500 - 200) \div 4$ (= 825)) |
| <b>Total 4 marks</b> |                                                                                                                                      |     |          |                                                                                                         |
| <b>10</b>            | (Area of kite = )12                                                                                                                  |     | <b>3</b> | <b>B1</b> for a correct area of the kite – may be implied by their diagram                              |
|                      |                                                                                                                                      |     |          | <b>M1</b> for any rectangle                                                                             |
|                      |                                                                                                                                      |     |          | <b>A1ft</b> A correct rectangle or ft for a rectangle with their stated area of the kite                |
| <b>Total 3 marks</b> |                                                                                                                                      |     |          |                                                                                                         |

|               |                                                                                                                                           |                 |   |                                                                                                 |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---|-------------------------------------------------------------------------------------------------|
| 6             | 19 + 32 + 3 (= 54)<br>or 150 – 19 – 32 – 3 (= 96)                                                                                         |                 | 3 | M1 or $\frac{54}{150}$                                                                          |
|               | $\frac{150 - '54'}{150} \left( = \frac{'96'}{150} \right)$<br>assumes previous M1                                                         |                 |   | M1 or any correct fraction not in simplest form or for $\frac{9}{25}$                           |
|               | Correct answer scores full marks (unless from obvious incorrect working)                                                                  | $\frac{16}{25}$ |   | A1 (SCB2 for 0.64 or 64% if no other marks scored, B1 for 0.36 or 36% if no other marks scored) |
| Total 3 marks |                                                                                                                                           |                 |   |                                                                                                 |
| 7             | 350 ml written as 0.35 (l) or<br>700 ml written as 0.7 (l) or<br>2.8 l written as 2800 (ml)                                               |                 | 4 | B1 correct conversion (could be implied by further working)                                     |
|               | $2.8 - 2 \times "0.35" (=2.1)$ or $"2800" - 2 \times 350 (=2100)$<br>or<br>$2 \times 350 + 5y = 2800$ oe or $2 \times 0.35 + 5y = 2.8$ oe |                 |   | M1 Also award for<br>$\frac{2.8 - "0.35"}{5}$ or $\frac{2800 - "350"}{5}$                       |
|               | $\frac{"2800" - "700"}{5}$ or $\frac{2.8 - "0.7"}{5}$ or $\frac{"2.1"}{5}$ or $\frac{"2100"}{5}$                                          |                 |   | M1 or for an answer of 0.42(0)                                                                  |
|               | Correct answer scores full marks (unless from obvious incorrect working)                                                                  | 420             |   | A1                                                                                              |
| Total 4 marks |                                                                                                                                           |                 |   |                                                                                                 |



| Question | Working                                                             | Answer          | Mark                                                                                                                                                    | Notes                                                                                                                                                            |
|----------|---------------------------------------------------------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 15 (a)   | $-2p = 15 - 8$ or $8 = 2p + 15$ or $\frac{8}{2} - p = \frac{15}{2}$ | -3.5            | 2                                                                                                                                                       | M1                                                                                                                                                               |
|          | oe                                                                  |                 | A1 oe                                                                                                                                                   |                                                                                                                                                                  |
|          | (b) eg $7x - 2 = 4(3x + 1)$ oe                                      | $-\frac{6}{5}$  | 3                                                                                                                                                       | M1 correct first step                                                                                                                                            |
|          | $7x - 12x = 4 + 2$ oe or $-2 - 4 = 12x - 7x$ oe                     |                 | M1 for rearranging the x terms on one side and the numerical terms on the other. ft rearranging their expansion $ax + b = cx + d$ eg $7x - 2 = 12x + 4$ |                                                                                                                                                                  |
|          |                                                                     |                 | A1 oe, dep on M1                                                                                                                                        |                                                                                                                                                                  |
|          |                                                                     |                 |                                                                                                                                                         | Total 5 marks                                                                                                                                                    |
| 16       | eg $\frac{x+10+y}{3}=11$ oe or $y - x = 7$ oe                       | $x = 8, y = 15$ | 2                                                                                                                                                       | M1 for one correct equation in x and y <b>OR</b> finding the total of x, 10 and y <b>OR</b> two numbers with a sum of 23 <b>OR</b> two numbers with a range of 7 |
|          | $3 \times 11 (=33)$                                                 |                 |                                                                                                                                                         | Note: condone non-integers for the award of M1                                                                                                                   |
|          |                                                                     |                 | A1                                                                                                                                                      | Total 2 marks                                                                                                                                                    |

| Question | Working | Answer                                                                                                                                                                                                           | Mark | Notes                                                                                                                             |
|----------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-----------------------------------------------------------------------------------------------------------------------------------|
| <b>3</b> | (a)(i)  | 14                                                                                                                                                                                                               | 1    | B1                                                                                                                                |
|          | (a)(ii) | Added 4                                                                                                                                                                                                          | 1    | B1 Accept +4, 4 more, jumped forward by 4, difference = 4 or sight of $4n - 2$                                                    |
|          | (b)     | 34                                                                                                                                                                                                               | 1    | B1                                                                                                                                |
|          | (c)     | $(59 + 1) \div 5$ or $59 = 5n - 1$ or<br>4, 9, 14, 19,....., 54, 59 (may start at 34 or 39)                                                                                                                      |      | M1 or for $12 \times 5 - 1$                                                                                                       |
|          |         | 12                                                                                                                                                                                                               | 2    | A1                                                                                                                                |
| <b>4</b> | (a)     | $4.74 - 1.80 (= 2.94)$ or $474 - 180 (= 294)$<br><br>"2.94" $\div 2$ or "294" $\div 2$<br><br>£1.47                                                                                                              | 3    | M1<br>M1 dep<br>A1                                                                                                                |
|          | (b)     | $2 \times 25 + 30$ or 80 (pence) or $2 \times 0.25 + 0.30$ or<br>E.g. $10 \times 25 + 5 \times 30 (= 400)$<br><br>$5 \div "0.8"$ or $500 \div "80"$ or 6.25 or<br>$12 \times 25 + 6 \times 30 (= 480)$ or 4.8(0) | 3    | M1 for method to find total cost of twice as many apples as oranges<br><br>May work in pence or pounds throughout<br><br>M1<br>A1 |

|           |     |                                                                                                                                                                      |       |   |                                                                                                                                                                    |
|-----------|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>19</b> | (a) |                                                                                                                                                                      | $h^9$ | 1 | B1                                                                                                                                                                 |
|           | (b) | $(-5)^2 - 4 \times -5$ oe e.g. $25 + 20$                                                                                                                             |       | 2 | M1 for a correct substitution                                                                                                                                      |
|           |     |                                                                                                                                                                      | 45    |   | A1                                                                                                                                                                 |
|           | (c) | $5x - 3 = 4(2x + 3)$ oe $\frac{5x}{4} - \frac{3}{4} = 2x + 3$ oe                                                                                                     |       | 3 | M1 for correctly removing the denominator, condone missing brackets                                                                                                |
|           |     | e.g. $5x - 8x = 12 + 3$ or $-3x = 12 + 3$<br>or $8x - 5x = -12 - 3$ or $3x = -12 - 3$<br>or $-\frac{3}{4} - 3 = 2x - \frac{5x}{4}$ or $-\frac{15}{4} = \frac{3x}{4}$ |       |   | M1 for a correct rearrangement with terms in $x$ on one side and numbers on the other, allow correct rearrangement of their equation in the form $ax + b = cx + d$ |
|           |     |                                                                                                                                                                      | -5    |   | A1 dep on at least M1                                                                                                                                              |
|           |     |                                                                                                                                                                      |       |   | SCB2 for an answer of<br>$x = -2$ coming from $5x - 3 = 8x + 3$<br>or $x = 5$ coming from $5x - 3 = 2x + 12$                                                       |
|           |     |                                                                                                                                                                      |       |   | <b>Total 6 marks</b>                                                                                                                                               |

|                      |     |                                                                                                                    |                |   |                                                                                                                       |
|----------------------|-----|--------------------------------------------------------------------------------------------------------------------|----------------|---|-----------------------------------------------------------------------------------------------------------------------|
| 12                   | (a) | $6 \times 8 - 4 \times 3$                                                                                          |                | 2 | M1                                                                                                                    |
|                      |     | <i>Correct answer scores full marks (unless from obvious incorrect working)</i>                                    | 36             |   | A1                                                                                                                    |
|                      | (b) | $-41 = 6 \times p - 4 \times 5$ or<br>$6p = T + 4d$ or<br>$6p = -41 + 4 \times 5$                                  |                | 3 | M1 for correct substitution into the correct formula or a correct rearrangement for $6p$                              |
|                      |     | $6p = -41 + 20$ or $6p = -21$<br>$-6p = 41 - 20$ or $-6p = 21$<br>$p = \frac{-41+20}{6}$ or $p = \frac{41-20}{-6}$ |                |   | M1                                                                                                                    |
|                      |     | <i>Correct answer scores full marks (unless from obvious incorrect working)</i>                                    | $-\frac{7}{2}$ |   | A1 Oe<br>If no marks awarded SCB1 for -266                                                                            |
|                      | (c) | $4x - 12$ or $x - 3 = \frac{7x}{4} + \frac{15}{4}$ oe                                                              |                | 3 | M1 for a correct expansion of bracket <b>or</b> division of all terms in a correct equation by 4                      |
|                      |     | $4x - 7x = 15 + 12$ or<br>$-12 - 15 = 7x - 4x$ or<br>$-3x = 27$ or<br>$-27 = 3x$                                   |                |   | M1 for a correct rearrangement within a correct equation with $x$ terms on one side and the numbers on the other side |
|                      |     | <i>Working required</i>                                                                                            | -9             |   | A1 dep on M1<br>(SCB1 for an answer of $x = -6$ with working shown from $4x - 3 = 7x + 15$ )                          |
| <b>Total 8 marks</b> |     |                                                                                                                    |                |   |                                                                                                                       |

| Question      | Working                                                                                                                                                                                                                                                                         | Answer           | Mark | Notes                                                                                                                                                                                                                                         |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 20 (a)        | $2x + 5 = 6(2x - 5)$ or $2x + 5 = 12x - 30$ or<br>$\frac{2}{6}x + \frac{5}{6} = 2x - 5$ oe (allow $0.33x + 0.83 = 2x - 5$ )                                                                                                                                                     |                  | 3    | M1 For multiplying both sides by 6 or separating values in fraction correctly in an equation. (decimals 2 dp or better)                                                                                                                       |
|               | $2x - 12x = -30 - 5$ or $-10x = -35$ or<br>$5 + 30 = 12x - 2x$ or $35 = 10x$ oe or<br>$\frac{5}{6} + 5 = 2x - \frac{1}{3}x$ oe or $1\frac{2}{3}x = 5\frac{5}{6}$ oe                                                                                                             |                  |      | M1 ft For a method to collect the terms in $x$ on one side and the number terms on the other side.<br>ft from incorrect expansion dep on a number term and a term in $x$ on both sides.                                                       |
|               | Working required                                                                                                                                                                                                                                                                | 3.5              |      | A1 dep on M1 oe eg $\frac{7}{2}$ or $3\frac{1}{2}$                                                                                                                                                                                            |
| (b)           |                                                                                                                                                                                                                                                                                 | $h^{12}$         | 1    | B1 Allow $x^{12}$ or another letter to the power 12 but do not allow just 12                                                                                                                                                                  |
| (c)           | Working not required, so correct answer scores full marks (unless from obvious incorrect working)                                                                                                                                                                               | $16g^{12}k^{20}$ | 2    | B2 B1 for 2 terms correct in a product [must be 16 and not $2^4$ ]                                                                                                                                                                            |
| (d)           | eg $\frac{y^n}{y^2} = y^{12}$ or $y^{-2} \times y^n = y^{12}$ or $y^5 \times y^{n-7} = y^{12}$ or<br>$\frac{y^{5+n}}{y^7} = y^{12}$<br>$y^5 \times y^n = y^{19}$ or $y^{5+n-7} = y^{12}$ or $\frac{y^5}{y^{7-n}} = y^{12}$ or<br>$y^{5+n} = y^{12+7}$ or<br>$5 + n - 7 = 12$ oe |                  | 2    | M1 for one correct application of an index rule (must be seen in powers of $y$ )<br>this could be after one initial mistake – working will need to be clearly seen<br><b>or</b><br>for a <b>correct</b> equation in $n$ (no mistakes allowed) |
|               | Working not required, so correct answer scores full marks (unless from obvious incorrect working)                                                                                                                                                                               | 14               |      | A1 Allow $y^{14}$                                                                                                                                                                                                                             |
| Total 8 marks |                                                                                                                                                                                                                                                                                 |                  |      |                                                                                                                                                                                                                                               |

|               |                                                                                    |                         |   |    |                                                                                                  |
|---------------|------------------------------------------------------------------------------------|-------------------------|---|----|--------------------------------------------------------------------------------------------------|
| 18            | $\pi \times 7.2^2 \div 2$ (= 81.4....)                                             |                         |   | M1 | allow 81.3 – 81.5 for area of semi circle                                                        |
|               | “81.4” $\div 6$ (= 13.5...) or $12 \times 6$ (= 72) or “81.4” $\div 12$ (= 6.7...) |                         |   | M1 | (dep) allow 13.5 – 13.6 for the number of boxes needed (NB: $12 \times 6 = 72$ alone is 0 marks) |
|               |                                                                                    | No with correct figures | 3 | A1 |                                                                                                  |
| Total 3 marks |                                                                                    |                         |   |    |                                                                                                  |

|               |   |  |      |   |    |              |
|---------------|---|--|------|---|----|--------------|
| 19            | a |  | 4.35 | 1 | B1 | accept 4.349 |
|               | b |  | 4.25 | 1 | B1 | cao          |
| Total 2 marks |   |  |      |   |    |              |

|               |                      |                                                                                                                |       |   |    |                                                                                                                                                                                                                                      |
|---------------|----------------------|----------------------------------------------------------------------------------------------------------------|-------|---|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 20            | $(x \pm 9)(x \pm 4)$ | $\frac{-(-5) \pm \sqrt{(-5)^2 - 4 \times 1 \times (-36)}}{2 \times 1}$<br>or $\frac{5 \pm \sqrt{25 + 144}}{2}$ |       |   | M1 | or $(x + a)(x + b)$ where $ab = -36$ or $a + b = -5$<br>OR correct substitution into quadratic formula (condone one sign error in $a$ , $b$ or $c$ ) (if + rather than $\pm$ shown then award M1 only unless recovered with answers) |
|               | $(x - 9)(x + 4)$     | $\frac{5 \pm \sqrt{169}}{2}$ or $\frac{5 \pm 13}{2}$                                                           |       |   | M1 | or $\frac{5 \pm \sqrt{169}}{2}$ or $\frac{5 \pm 13}{2}$                                                                                                                                                                              |
|               |                      |                                                                                                                | 9, -4 | 3 | A1 | dep on at least M1                                                                                                                                                                                                                   |
| Total 3 marks |                      |                                                                                                                |       |   |    |                                                                                                                                                                                                                                      |

| Question | Working                                                                                | Answer           | Mark | Notes                                                                                                                                                                                           |
|----------|----------------------------------------------------------------------------------------|------------------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 23 (i)   | $(x \pm 6)(x \pm 4)$                                                                   |                  | 2    | M1 or $(x + a)(x + b)$ where $ab = -24$ or $a + b = 2$                                                                                                                                          |
|          | <i>Working not required, so correct answer scores full marks</i>                       | $(x + 6)(x - 4)$ |      | A1                                                                                                                                                                                              |
| (ii)     | <i>Answer must come from the factors in (i) as the questions says 'Hence solve...'</i> | -6, 4            | 1    | B1 <b>Must</b> follow through from their factors in (i), so even if the answers 8 and -6 are given, the mark can only be awarded if it follows from the factorisation in (i) (dep on 2 factors) |
|          |                                                                                        |                  |      | <b>Total 3 marks</b>                                                                                                                                                                            |
|          |                                                                                        |                  |      | NB: Some students may show the whole of their working in the space for (i) or (ii). Please award the marks for (i) and (ii) so long as there is no ambiguity.                                   |



|    |                                                                                                               |                     |   |                                                                                                                                                                                                                                                                                  |
|----|---------------------------------------------------------------------------------------------------------------|---------------------|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 26 | eg $\begin{matrix} +7x+3y=3 \\ 9x-3y=21 \end{matrix}$ or $\begin{matrix} -21x+9y=9 \\ 21x-7y=49 \end{matrix}$ |                     | 3 | M1 a correct method to eliminate $x$ or $y$ – multiplying one or both equations so that one variable can be eliminated (allow a total of one error in multiplication) <b>and</b> the correct operation to eliminate or for substitution of one variable into the other equation. |
|    | or eg $7x+3(3x-7)=3$ or $7\left(\frac{7+y}{3}\right)+3y=3$                                                    |                     |   | M1 dep on M1 for a correct method to calculate the value of other letter eg substitution or starting again with elimination                                                                                                                                                      |
|    | If first M1 gained then they can substitute an incorrect value if from 'correct' method to gain this mark.    |                     |   | A1 oe dep on M1                                                                                                                                                                                                                                                                  |
|    |                                                                                                               | $x = 1.5, y = -2.5$ |   | <b>Total 3 marks</b>                                                                                                                                                                                                                                                             |

|    |      |                      |              |   |                                                                                                 |
|----|------|----------------------|--------------|---|-------------------------------------------------------------------------------------------------|
| 27 | (i)  | $(x \pm 3)(x \pm 8)$ |              | 2 | M1 or $(x+a)(x+b)$ where $ab = -24$ or $a+b = 5$                                                |
|    |      |                      | $(x-3)(x+8)$ |   | A1                                                                                              |
|    | (ii) |                      | 3, -8        | 1 | B1ft Must fit from their answer to (i) ft from their incorrect factors in the form $(x+a)(x+b)$ |
|    |      |                      |              |   | <b>Total 3 marks</b>                                                                            |



|               |      |                                                                                 |                   |   |                                                        |
|---------------|------|---------------------------------------------------------------------------------|-------------------|---|--------------------------------------------------------|
| 27            | (i)  | $(x \pm 2)(x \pm 11)$                                                           |                   | 2 | M1 or $(x + a)(x + b)$ where $ab = -22$ or $a + b = 9$ |
|               |      | <i>Correct answer scores full marks (unless from obvious incorrect working)</i> | $(x - 2)(x + 11)$ |   | A1                                                     |
|               | (ii) |                                                                                 | 2, -11            | 1 | B1ft <b>Must</b> fit from their factors in (i)         |
| Total 3 marks |      |                                                                                 |                   |   |                                                        |

|               |  |                                                                                 |        |   |                                                               |
|---------------|--|---------------------------------------------------------------------------------|--------|---|---------------------------------------------------------------|
| 28            |  | $4 \times 11\,800 (= 47\,200)$ or $3 \times 13\,207 (= 39\,621)$ or 86821       |        | 3 | M1 for one correct product or for the sum of the products     |
|               |  | $\frac{"47\,200" + "39\,621"}{7} \left( = \frac{86821}{7} \right)$              |        |   | M1 for a fully correct method to find the mean for the 7 days |
|               |  | <i>Correct answer scores full marks (unless from obvious incorrect working)</i> | 12 403 |   | A1                                                            |
| Total 3 marks |  |                                                                                 |        |   |                                                               |



|    |        |                                                                                 |                  |   |                                                                                                                       |
|----|--------|---------------------------------------------------------------------------------|------------------|---|-----------------------------------------------------------------------------------------------------------------------|
| 24 | (a)    |                                                                                 | 1                | 1 | B1                                                                                                                    |
|    | (b)(i) | $(x \pm 4)(x \pm 9) (= 0)$                                                      |                  | 2 | M1 or $(x + a)(x + b)$ where $ab = -36$ or $a + b = -5$                                                               |
|    |        | <i>Correct answer scores full marks (unless from obvious incorrect working)</i> | $(x + 4)(x - 9)$ |   | A1 (isw if they also solve the equation in this part)                                                                 |
|    | (ii)   | <i>Answers must fit from (b)(i)</i>                                             | -4 and 9         | 1 | B1 ft Answer <b>must</b> fit from their $(x + p)(x + q)$ in (b)(i)<br>Award B0 for -4 and 9 if no marks scored in (i) |
|    |        |                                                                                 |                  |   | <b>Total 4 marks</b>                                                                                                  |

|    |  |                                                                                                             |                      |   |                                                                                |
|----|--|-------------------------------------------------------------------------------------------------------------|----------------------|---|--------------------------------------------------------------------------------|
| 25 |  | $1.75 \times 10^6 \div 2.4 \times 10^7$ or<br>$1\,750\,000 \div 24\,000\,000$ oe eg $\frac{1.75}{24}$       |                      | 3 | M1                                                                             |
|    |  | $0.0729(16\dots)$ or $0.072$ or $0.073$ or for $\frac{7}{96}$ or<br>$7.29(16\dots)\%$ or $7.2\%$ or $7.3\%$ |                      |   | A1                                                                             |
|    |  | <i>Correct answer scores full marks (unless from obvious incorrect working)</i>                             | $7.3 \times 10^{-2}$ |   | A1 accept $7.3 \times 10^{-2}$ or better<br>( $7.29(16\dots) \times 10^{-2}$ ) |
|    |  |                                                                                                             |                      |   | <b>Total 3 marks</b>                                                           |



|                      |     |                                                                                                                                     |            |   |                                                                                                                                                                                                                                                                 |
|----------------------|-----|-------------------------------------------------------------------------------------------------------------------------------------|------------|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 23                   | (a) | $2x > 4 - 7$ or $x + 3.5 > 2$                                                                                                       |            | 2 | M1 For a correct first step allow $2x = 4 - 7$ or $x + 3.5 = 2$ or an answer of $x = -1.5$ or $x < -1.5$ or $-1.5$                                                                                                                                              |
|                      |     |                                                                                                                                     | $x > -1.5$ |   | A1 for $x > -1.5$ oe                                                                                                                                                                                                                                            |
|                      | (b) | $(x \pm 8)(x \pm 5)$<br>$\frac{-(-3) \pm \sqrt{(-3)^2 - 4 \times 1 \times (-40)}}{2 \times 1}$<br>or $\frac{3 \pm \sqrt{9+160}}{2}$ |            |   | M1 or $(x+a)(x+b)$ where $ab = -40$ or $a+b = -3$<br><b>OR</b> correct substitution into quadratic formula (condone one sign error in $a$ , $b$ or $c$ and missing brackets)<br>(if + rather than $\pm$ shown then award M1 only unless recovered with answers) |
|                      |     | $(x-8)(x+5)$ $\frac{3 \pm \sqrt{169}}{2}$ or $\frac{3 \pm 13}{2}$                                                                   |            |   | M1 $\frac{3 \pm \sqrt{169}}{2}$ or $\frac{3 \pm 13}{2}$                                                                                                                                                                                                         |
|                      |     |                                                                                                                                     | 8, -5      | 3 | A1 dep on at least M1 for correct values                                                                                                                                                                                                                        |
| <b>Total 5 marks</b> |     |                                                                                                                                     |            |   |                                                                                                                                                                                                                                                                 |

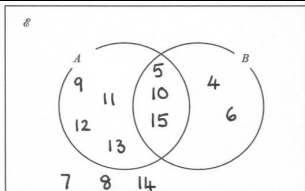
|               |                                                                                                                                                                                                                                                                                        |      |   |                                                                                                           |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---|-----------------------------------------------------------------------------------------------------------|
| 24            | $2 \times \pi \times 7 (= 43.982... \text{ or } 14\pi)$<br><b>or</b> $(2 \times \pi \times 7) \div 2 (= 21.991... \text{ or } 7\pi)$<br><b>or</b> $2 \times \pi \times 9 (= 56.548... \text{ or } 18\pi)$<br><b>or</b> $(2 \times \pi \times 9) \div 2 (= 28.274... \text{ or } 9\pi)$ |      | 3 | M1 for finding the circumference of either the full circle or the length of the arc for either semicircle |
|               | e.g. "21.991" + "28.274" (= 50.26...)<br><b>or</b> "7 $\pi$ " + "9 $\pi$ " (= 16 $\pi$ )<br><b>or</b> "21.991" + "28.274" + 2 (= 52.26...)<br><b>or</b> "7 $\pi$ " + "9 $\pi$ " + 2 (= 52.26...)<br><b>or</b> "21.991" + "28.274" + 2 + 2<br><b>or</b> "7 $\pi$ " + "9 $\pi$ " + 2 + 2 |      |   | M1 for a method to find the length of the two arcs with intention to add                                  |
|               |                                                                                                                                                                                                                                                                                        | 54.3 |   | A1 accept 54.2 – 54.3                                                                                     |
| Total 3 marks |                                                                                                                                                                                                                                                                                        |      |   |                                                                                                           |

|               |        |                      |                  |   |                                                                                                  |
|---------------|--------|----------------------|------------------|---|--------------------------------------------------------------------------------------------------|
| 25            | (a)    |                      | $16x^{12}y^{20}$ | 2 | B2 B1 for an answer in the form $ax^ny^m$ with 2 correct from $a = 16, n = 12, m = 20$           |
|               | (b)(i) | $(x \pm 9)(x \pm 4)$ |                  | 2 | M1 for $(x \pm 9)(x \pm 4)$<br><b>or</b> for $(x + a)(x + b)$<br>where $ab = -36$ or $a + b = 5$ |
|               |        |                      | $(x + 9)(x - 4)$ |   | A1                                                                                               |
|               | (ii)   |                      | -9, 4            | 1 | B1 ft from (b)(i)                                                                                |
| Total 5 marks |        |                      |                  |   |                                                                                                  |



|    |        |                                                                                    |                  |   |                                                                                                                |
|----|--------|------------------------------------------------------------------------------------|------------------|---|----------------------------------------------------------------------------------------------------------------|
| 21 | (a)    | $5x \leq 2 + 7$ or $5x \leq 9$ or $\frac{5x}{5} - \frac{7}{5} \leq \frac{2}{5}$ oe |                  | 2 | M1 allow any sign instead of $\leq$<br>or for an answer of 1.8 oe<br>or $x$ and 1.8 oe with the incorrect sign |
|    |        |                                                                                    | $x \leq 1.8$     |   | A1 oe                                                                                                          |
|    | (b)(i) | $(y \pm 7)(y \pm 5)$                                                               |                  | 2 | M1 for $(y \pm 7)(y \pm 5)$<br>or $(y + a)(y + b)$ where $ab = -35$<br>or $a + b = -2$                         |
|    |        |                                                                                    | $(y - 7)(y + 5)$ |   | A1 isw if student goes on to solve the equation in this part                                                   |
|    | (ii)   |                                                                                    | 7, -5            | 1 | B1ft answer must fit from their $(y + a)(y + b)$ in (b)(i). Award B0 for 7, -5 if no marks scored in (i)       |
|    |        |                                                                                    |                  |   | <b>Total 5 marks</b>                                                                                           |

|    |                                                                                     |  |   |                                                                                                                                                                                                                               |                      |
|----|-------------------------------------------------------------------------------------|--|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| 22 |  |  | 3 | B3 all 4 parts of diagram correct<br><br>(B2 for 2 or 3 parts correct)<br><br>(B1 for 1 part correct)<br><br>SCB1 if no marks scored, award B1 if 4,6 in the section $A \cap B'$ and 9, 11, 12, 13 in the section $A' \cap B$ |                      |
|    |                                                                                     |  |   |                                                                                                                                                                                                                               | <b>Total 3 marks</b> |

|               |        |  |                  |   |                                                                                      |
|---------------|--------|--|------------------|---|--------------------------------------------------------------------------------------|
| 21            | (a)    |  | $3c^4 + 12c^3$   | 2 | B2 for $3c^4 + 12c^3$<br>(B1 for $3c^4$ or $12c^3$ )                                 |
|               | (b)(i) |  |                  | 2 | M1 for $(x \pm 9)(x \pm 1)$<br>or for $(x + a)(x + b)$ with $ab = -9$ or $a + b = 8$ |
|               |        |  | $(x + 9)(x - 1)$ |   | A1 for correct factors                                                               |
|               | (ii)   |  | $-9, 1$          | 1 | B1 ft dep on factorising in the form $(x + p)(x + q)$                                |
| Total 5 marks |        |  |                  |   |                                                                                      |

|               |  |                                                                                                                                                                                                          |       |   |                                                                                                                                                              |
|---------------|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 22            |  | $\frac{8}{3}(+) \frac{15}{4}$ or $(2)\frac{8}{12}(+) (3)\frac{9}{12}$ or $(2)\frac{8a}{12a}(+) (3)\frac{9a}{12a}$                                                                                        |       | 3 | M1 for correct improper fractions or fractional part of numbers written correctly over a common denominator                                                  |
|               |  | eg $\frac{8 \times 4 + 15 \times 3}{3 \times 4}$ or $\frac{32}{12} + \frac{45}{12}$ or $\frac{32a}{12a} + \frac{45a}{12a}$<br>or $2\frac{8}{12} + 3\frac{9}{12} = 5\frac{17}{12}$ oe                     |       |   | M1 for correct fractions with a common denominator of 12 or a multiple of 12                                                                                 |
|               |  | $\frac{32}{12} + \frac{45}{12} = 6\frac{5}{12}$ or $5\frac{17}{12} = 6\frac{5}{12}$<br>or if shows $6\frac{5}{12} = \frac{77}{12}$ at the beginning then show that the addition comes to $\frac{77}{12}$ | Shown |   | A1 dep on M2 for a correct answer from fully correct working or shows that<br>RHS = $\frac{77}{12}$ and fully correct working<br>shows LHS = $\frac{77}{12}$ |
| Total 3 marks |  |                                                                                                                                                                                                          |       |   |                                                                                                                                                              |

|    |        |                                                                                 |                    |   |                                                                                                                                                                                                                                |
|----|--------|---------------------------------------------------------------------------------|--------------------|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 25 | (a)(i) | $(x \pm 8)(x \pm 3)$ or<br>$x(x-3)+8(x-3)$ or<br>$x(x+8)-3(x+8)$                |                    | 2 | M1 for $(x \pm 8)(x \pm 3)$ or<br>$(x+a)(x+b)$ where $ab = -24$ or<br>$a + b = 5$ and, $a$ and $b$ are integers                                                                                                                |
|    |        | <i>Correct answer scores full marks (unless from obvious incorrect working)</i> | $(x+8)(x-3)$       |   | A1 for $(x+8)(x-3)$<br>Allow any letter for $x$<br><br>Must be in the form $(x+a)(x+b)$ where $a$ and $b$ are integers                                                                                                         |
|    | (ii)   |                                                                                 | -8 and 3           | 1 | B1 must fit from their answer in (a)(i)<br>ft from their incorrect factors in the form<br>$(x+a)(x+b)$<br>Award B0 for -8 and 3 if no marks scored in (a)(i)                                                                   |
|    | (b)    | $3y - 7y > -10 - 5$ or<br>$5 + 10 > 7y - 3y$                                    |                    | 3 | M1 allow use of = or condone incorrect inequality sign                                                                                                                                                                         |
|    |        | $-4y > -15$ or $15 > 4y$ or $y = \frac{15}{4}$ oe or                            |                    |   | M1 allow use of = or condone incorrect inequality sign                                                                                                                                                                         |
|    |        | <i>Working required</i>                                                         | $y < \frac{15}{4}$ |   | A1 dep on M1<br>oe eg $y < 3.75$ or $\frac{15}{4} > y$ or $3.75 > y$<br>Must have correct sign on answer line<br><br>NB Sight of correct answer in working space and just $(y =) \frac{15}{4}$ oe on answer line gains M2 only |
|    |        |                                                                                 |                    |   | <b>Total 6 marks</b>                                                                                                                                                                                                           |



|               |        |                                                                                                                                                                                                             |                    |   |      |                                                                                                                                                                                                                               |
|---------------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 23            | (a)    | $6x - 24 = 3 + 2x$ <b>or</b> $x - 4 = \frac{3}{6} + \frac{2}{6}x$ oe                                                                                                                                        |                    | 3 | M1   | for correct removal of fraction and expansion of bracket in a correct equation<br><b>or</b><br>separating fraction (RHS) in an equation                                                                                       |
|               |        | $6x - 2x = 3 + 24$ <b>or</b> $4x = 27$<br><b>or</b> $-24 - 3 = 2x - 6x$ <b>or</b> $-27 = -4x$ oe<br><b>or</b> $x - \frac{2}{6}x = \frac{3}{6} + 4$ oe<br><b>or</b> $-4 - \frac{3}{6} = \frac{2}{6}x - x$ oe |                    |   | M1ft | (dep on 4 terms) correctly rearranging their 4 term equation for terms in $x$ on one side of equation and number terms on the other                                                                                           |
|               |        | Working required                                                                                                                                                                                            | $\frac{27}{4}$     |   | A1   | oe eg 6.75 or $6\frac{3}{4}$ , dep on M1                                                                                                                                                                                      |
|               | (b)(i) | $(y \pm 6)(y \pm 5)$ <b>or</b> $(6 \pm y)(5 \pm y)$<br><b>or</b> $y(y - 6) - 5(y - 6)$<br><b>or</b> $y(y - 5) - 6(y - 5)$                                                                                   |                    | 2 | M1   | for $(y \pm 6)(y \pm 5)$ <b>or</b> $(6 \pm y)(5 \pm y)$ <b>or</b> for $(y + a)(y + b)$ where $ab = 30$ or $a + b = -11$<br><b>or</b><br>$y(y + a) + b(y + a)$ or<br>$y(y + b) + a(y + b)$<br>where $ab = 30$ or $a + b = -11$ |
|               |        | Correct answer scores full marks (unless from obvious incorrect working)                                                                                                                                    | $(y - 6)(y - 5)$   |   | A1   | oe, allow any letter for $y$                                                                                                                                                                                                  |
|               | (ii)   |                                                                                                                                                                                                             | $(y =) 6, (y =) 5$ | 1 | B1   | must ft from their answer in (b)(i) ft from their factors in the form $(y + a)(y + b)$                                                                                                                                        |
| Total 6 marks |        |                                                                                                                                                                                                             |                    |   |      |                                                                                                                                                                                                                               |

|    |                                                                        |                    |   |                                                                                                                   |
|----|------------------------------------------------------------------------|--------------------|---|-------------------------------------------------------------------------------------------------------------------|
| 24 | $2.5 - 0.6 = 1.9$                                                      | 2 hours 51 minutes | 4 | M1                                                                                                                |
|    | $3 \times 12 \times "1.9" (= 68.4)$                                    |                    |   | M1 for using length $\times$ width $\times$ height to find a volume                                               |
|    | $"68.4" \times 1000 \div 400$<br>(= 171 minutes)                       |                    |   | M1 for their volume $\times 1000 \div 400$                                                                        |
|    |                                                                        |                    |   | A1                                                                                                                |
|    |                                                                        |                    |   | <b>Total 4 marks</b>                                                                                              |
|    | <b>Alternative scheme</b>                                              |                    |   |                                                                                                                   |
|    | $250 - 60 = 190$                                                       | 2 hours 51 minutes | 4 | M1                                                                                                                |
|    | $300 \times 1200 \times "190" (= 6.84 \times 10^7)$                    |                    |   | M1 for using length $\times$ width $\times$ height to find a volume                                               |
|    | $"6.84 \times 10^7" \div 10^6 \times 1000 \div 400$<br>(= 171 minutes) |                    |   | M1 for their volume $\div 10^6 \times 1000 \div 400$                                                              |
|    |                                                                        |                    |   | A1                                                                                                                |
|    |                                                                        |                    |   | <b>Total 4 marks</b>                                                                                              |
| 25 | $16x = 32$ or $32y = 144$                                              | (2, 4.5)           | 3 | M1 for a correct sequence of operations which leads to 1 equation in one unknown, allowing one arithmetical error |
|    | $3 \times '2' + 2y = 15$ or $3x + 2 \times '4.5' = 15$                 |                    |   | M1 (dep) substitute found value of one variable in one equation                                                   |
|    |                                                                        |                    |   | A1                                                                                                                |
|    |                                                                        |                    |   | <b>Total 3 marks</b>                                                                                              |

| Question             | Working                                                                                                        | Answer             | Mark | Notes                                                                                                                                                                                                                                                                      |
|----------------------|----------------------------------------------------------------------------------------------------------------|--------------------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>22</b> (a)        | $(28+32) \times 72.6 (= 4356)$ <b>or</b> $28 \times 75 (= 2100)$                                               |                    | 4    | M1 Expression for total of both classes together <b>or</b> total of class A                                                                                                                                                                                                |
|                      | $(28+32) \times 72.6 - 28 \times 75 (= 2256)$                                                                  |                    |      | M1 Expression for total of class B.                                                                                                                                                                                                                                        |
|                      | $\frac{(28+32) \times 72.6 - 28 \times 75}{32} (= "2256" \div 32)$                                             |                    |      | M1 Correct calculation for mean of class B                                                                                                                                                                                                                                 |
|                      |                                                                                                                | 70.5               |      | A1                                                                                                                                                                                                                                                                         |
| (b)                  | Highest in A = $39 + 57 (= 96)$<br>Highest in B = $33 + 60 (= 93)$                                             |                    | 3    | M1 for $39 + 57 (=96)$ <b>or</b> $33 + 60 (=93)$                                                                                                                                                                                                                           |
|                      | $(39 + 57) - 33$                                                                                               |                    |      | M1 or for $33 - "96"$ or $33$ to $"96"$ oe                                                                                                                                                                                                                                 |
|                      |                                                                                                                | 63                 |      | A1                                                                                                                                                                                                                                                                         |
| <b>Total 7 marks</b> |                                                                                                                |                    |      |                                                                                                                                                                                                                                                                            |
| <b>23</b>            | eg $7x + 7y = 105$ – $5x + 5y =$<br>75 +<br>$7x - 5y = 3$ $7x - 5y =$<br>3                                     |                    | 3    | M1 Correct method to eliminate x or y: coefficients of x or y the same <b>and</b> correct operation to eliminate selected variable (condone any one arithmetic error in multiplication) <b>or</b> writing x or y in terms of the other variable and correctly substituting |
|                      | $7(15 - y) - 5y = 3$ <b>or</b> $7x - 5(15 - x) = 3$ oe                                                         |                    |      |                                                                                                                                                                                                                                                                            |
|                      | $6.5 + y = 15$ <b>or</b> $x + 8.5 = 15$ <b>or</b><br>$7 \times 6.5 - 5y = 3$ <b>or</b> $7x - 5 \times 8.5 = 3$ |                    |      | M1 dep Correct method to find second variable using their value from a correct method to find first variable or for repeating above method to find second variable                                                                                                         |
|                      |                                                                                                                | $x = 6.5, y = 8.5$ |      | A1oe dep on first M1                                                                                                                                                                                                                                                       |
| <b>Total 3 marks</b> |                                                                                                                |                    |      |                                                                                                                                                                                                                                                                            |

| Question         | Working                                                       | Answer          | Mark | Notes                                                                   |
|------------------|---------------------------------------------------------------|-----------------|------|-------------------------------------------------------------------------|
| <b>10</b>        | $1.35 \div 3 (= 0.45)$<br>$[4.15 - (5 \times "0.45")] \div 2$ | 0.95            | 3    | M1<br>M1<br>A1                                                          |
|                  |                                                               |                 |      | <b>Total 3 marks</b>                                                    |
| <b>11</b> (a)    |                                                               | 7.5             | 1    | B1<br>oe $\frac{15}{2}, 7\frac{1}{2}$                                   |
| (b) (i)          |                                                               | 3.181(983516..) | 2    | M1 For 57.9121 or 18.2 oe<br>A1                                         |
| (ii)             |                                                               | 3.2             | 1    | B1ft ft as long as (i) has at least 3 sf.                               |
|                  |                                                               |                 |      | <b>Total 4 marks</b>                                                    |
| <b>12</b> (a)(i) |                                                               | 2,3,4,6,7,8     | 1    | B1 All numbers and no others, in any order                              |
| (ii)             |                                                               | 3,4             | 1    | B1 Both numbers and no others, in any order                             |
| (iii)            |                                                               | 1,5,9,10        | 1    | B1 All numbers and no others, in any order                              |
| (b)              |                                                               | $\frac{3}{10}$  | 2    | M1 $\frac{3}{n}$ ( $n > 3$ ) or $\frac{m}{10}$ ( $m < 10$ )<br>A1<br>oe |
|                  |                                                               |                 |      | <b>Total 5 marks</b>                                                    |

| Question | Working                                                                                                                                                                                                                           | Answer                          | Mark | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 23       | eg $8x + 4y = 18 +$ <b>or</b> $4x + 2y = 9 -$<br>$x - 4y = 9$ $4x - 16y = 36$<br><br><b>or</b> $4(9 + 4y) + 2y = 9$<br><br>eg $4 \times "3" + 2y = 9$ <b>or</b> $4x + 2 \times "-1.5" = 9$<br><b>or</b> $x = 9 + 4 \times "-1.5"$ | $x = 3,$<br>$y = -1.5$          | 3    | M1 correct method to eliminate $x$ or $y$ : coefficients of $x$ or $y$ the same <b>and</b> correct operation to eliminate the selected variable (condone any one arithmetic error in multiplication) <b>or</b> writing $x$ or $y$ in terms of the other variable and correctly substituting<br><br>M1 (dep) correct method to find second variable using their value from a correct method to find first variable or for repeating above method to find second variable<br><br>A1 oe, dep first M1 |
| 24 (a)   |                                                                                                                                                                                                                                   | $4.8 \times 10^{11}$            | 1    | B1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| (b)      |                                                                                                                                                                                                                                   | $2^{14} \times 3 \times 5^{10}$ | 3    | B3 for the correct answer<br>B2 for an answer in the form $2^m \times 3 \times 5^n$ , where $m$ and $n$ are positive integers<br>B1 for at least 2 correct steps in repeated prime factorisation ( including tree diagram)                                                                                                                                                                                                                                                                         |
| (c)      |                                                                                                                                                                                                                                   | 29 296 875                      | 1    | B1 Accept $3 \times 5^{10}$ , $2.9296875 \times 10^7$                                                                                                                                                                                                                                                                                                                                                                                                                                              |



| Question | Working                                                                                                                                                                                        | Answer                 | Mark | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 23       | e.g. $4x + 5y = 4$<br>$4x - 2y = 18$<br>with the operation of subtraction<br><br>$4x + 5y = 4$<br>$10x - 5y = 45$<br>With the operation of adding<br><br>$y = 2x - 9$ and $4x + 5(2x - 9) = 4$ | $x = 3.5$ oe, $y = -2$ | 3    | M1 for correct method to eliminate one variable – multiplying one or both equations so the coefficient of $x$ or $y$ is the same in both with the intention to add or subtract to eliminate one variable (condone one arithmetic error) or isolating $x$ or $y$ in one equation and substituting into the other equation<br><br>M1 (dep) for substitution of found variable into one equation or correct method to eliminate second variable<br>A1 dep on M1 |

|                      |  |                                                                                                                        |                 |   |                                                                                                      |
|----------------------|--|------------------------------------------------------------------------------------------------------------------------|-----------------|---|------------------------------------------------------------------------------------------------------|
| 19                   |  | $(x) \times 1000$ <b>or</b> $(x) \div 60$ <b>or</b><br>$(x) \div 60 \div 60$ <b>or</b><br>$(x) \times 1000 \div 60$ oe |                 |   | M1 for at least <b>one</b> of $\times 1000$ <b>or</b> $\div 60$ <b>or</b> $\frac{5}{18}$ oe          |
|                      |  | $x \times \frac{1000}{60 \times 60}$ oe                                                                                |                 |   | M1 (dep) for a complete correct method                                                               |
|                      |  |                                                                                                                        | $\frac{5}{18}x$ | 3 | A1 accept $0.2\dot{7}x$ <b>or</b> $0.2\bar{7}x$ <b>or</b> $\frac{x}{3.6}$ <b>or</b> $\frac{1}{3.6}x$ |
| <b>Total 3 marks</b> |  |                                                                                                                        |                 |   |                                                                                                      |

| Using elimination then substitution |  |                                                                                 |                                                                                     |   |                                                                                                                                                           |
|-------------------------------------|--|---------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| 20                                  |  | e.g.<br>$x + 2y = -0.5$<br>$+ 6x - 2y = 32$<br>( $7x = 31.5$ )                  | e.g.<br>$3x + 6y = -1.5$<br>$- 3x - y = 16$<br>( $7y = -17.5$ )                     |   | M1 for a correct method to eliminate x or y: coefficients of x or y the same <b>and</b> correct operation to eliminate selected variable                  |
|                                     |  | e.g.<br>' $4.5$ ' + $2y = -0.5$<br><b>or</b><br>$3 \times$ ' $4.5$ ' - $y = 16$ | e.g.<br>$x + 2 \times$ ' $-2.5$ ' = $-0.5$<br><b>or</b><br>$3x -$ ' $-2.5$ ' = $16$ |   | M1 (dep) for substituting their value found of one variable into one of the equations <b>or</b><br><br>for repeating above method to find second variable |
|                                     |  |                                                                                 | $x = 4.5$<br>$y = -2.5$                                                             | 3 | A1 (dep on first M1) for both solutions                                                                                                                   |
| <b>Total 3 marks</b>                |  |                                                                                 |                                                                                     |   |                                                                                                                                                           |

| Using substitution |                                                                                                          |                                                                                                                     |                         |   |                                                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|-------------------------|---|------------------------------------------------------------------------------------------------------------------------------|
| 20                 | $3(-0.5 - 2y) - y = 16$<br>$(7y = -17.5)$<br><b>or</b><br>$\frac{16+y}{3} + 2y = -0.5$<br>$(7y = -17.5)$ | $3x - \left(\frac{-0.5-x}{2}\right) = 16$<br>$(7x = 31.5)$<br><b>or</b><br>$x + 2(3x - 16) = -0.5$<br>$(7x = 31.5)$ |                         |   | M1 for correctly writing x or y in terms of the other variable and correctly substituting (condone any one arithmetic error) |
|                    | e.g.<br>$x = -0.5 - 2(-2.5)$<br><b>or</b><br>$x = \frac{16 + (-2.5)}{3}$                                 | e.g.<br>$y = \frac{-0.5 - (-4.5)}{2}$<br><b>or</b><br>$y = 3(-4.5) - 16$                                            |                         |   | M1 (dep) for substituting their value found of one variable into one of the equations                                        |
|                    |                                                                                                          |                                                                                                                     | $x = 4.5$<br>$y = -2.5$ | 3 | A1 (dep on first M1) for both solutions                                                                                      |
|                    |                                                                                                          |                                                                                                                     |                         |   | <b>Total 3 marks</b>                                                                                                         |

| Question      | Working                                                                         | Answer                        | Mark | Notes                                                                                                                                                                                                                          |
|---------------|---------------------------------------------------------------------------------|-------------------------------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 17            | $4x$ or $x - 7$                                                                 |                               | 4    | M1 Correct expression for $B$ or $C$                                                                                                                                                                                           |
|               | $x + 4x + x - 7 = 137$ oe                                                       |                               |      | M1 Correct equation                                                                                                                                                                                                            |
|               | $x = 144 \div 6 (=24)$ or $6x = 144$                                            |                               |      | M1 Gathering up the $x$ 's and numbers<br>Dep on previous M1                                                                                                                                                                   |
|               |                                                                                 | 17                            |      | A1                                                                                                                                                                                                                             |
| Total 4 marks |                                                                                 |                               |      |                                                                                                                                                                                                                                |
| 18 (a)        |                                                                                 | $3e^2 - 5e$                   | 1    | B1                                                                                                                                                                                                                             |
| (b)           |                                                                                 | $5(7 + f)$                    | 1    | B1                                                                                                                                                                                                                             |
| (c)           |                                                                                 | $64p^3q^6$                    | 2    | B2 B1 for 2 correct parts of the product                                                                                                                                                                                       |
| Total 4 marks |                                                                                 |                               |      |                                                                                                                                                                                                                                |
| 19            | $8.5^2 + 5.6^2 (=103.61)$                                                       |                               | 3    | M1                                                                                                                                                                                                                             |
|               | $\sqrt{8.5^2 + 5.6^2}$                                                          |                               |      | M1                                                                                                                                                                                                                             |
|               |                                                                                 | 10.2                          |      | A1 awrt 10.2                                                                                                                                                                                                                   |
| Total 3 marks |                                                                                 |                               |      |                                                                                                                                                                                                                                |
| 20            | 3 hours 36 mins = 216 mins or 3.6 hours                                         |                               | 3    | M1                                                                                                                                                                                                                             |
|               | $2470 \div 3.6$ or $2470 \div 216 \times 60$ oe                                 |                               |      | M1 Allow $2470 \div 3.36 (=735$ or better)                                                                                                                                                                                     |
|               |                                                                                 | 686                           |      | A1                                                                                                                                                                                                                             |
| Total 3 marks |                                                                                 |                               |      |                                                                                                                                                                                                                                |
| 21            | (adding) $10x = -5$ or $21x + 35y = 42$<br>$21x - 15y = -33$<br>then $50y = 75$ |                               | 3    | M1 Correct method to eliminate $x$ or $y$ :<br>coefficients of $x$ or $y$ the same <b>and</b><br>correct operator to eliminate<br>selected variable<br>or correct substitution for $x$ or $y$ into<br>2 <sup>nd</sup> equation |
|               |                                                                                 | $x = -0.5$ oe<br>$y = 1.5$ oe |      | A1<br>A1 Both A marks dep on M1                                                                                                                                                                                                |
| Total 3 marks |                                                                                 |                               |      |                                                                                                                                                                                                                                |

|   |                                                                                                                                                                                                           |          |   |                                                                                                                       |
|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|---|-----------------------------------------------------------------------------------------------------------------------|
| 9 | $360 - (59 + 115 + 68) (= 118)$                                                                                                                                                                           |          | 4 | M1 angle values may be seen on diagram throughout                                                                     |
|   |                                                                                                                                                                                                           | $x = 62$ |   | A1 from correct working                                                                                               |
|   | <u>Angles</u> in a <u>quadrilateral</u> add up to 360.<br>Accept "4-sided shape"<br><u>Angles</u> on a straight <u>line</u> add to $180^\circ$<br>Base angles in an <u>isosceles</u> triangle (are equal) |          |   | B2 (dep on M1) for all correct reasons for their method<br><br>(B1 (dep on M1) for 1 correct reason for their method) |
|   |                                                                                                                                                                                                           |          |   | <b>Total 4 marks</b>                                                                                                  |

|    |                                        |      |   |                                                                               |
|----|----------------------------------------|------|---|-------------------------------------------------------------------------------|
| 10 | $5.75 \div 5 (= 1.15)$                 |      | 3 | M1 for finding the cost of one chocolate bar                                  |
|    | e.g. $(7.85 - 2 \times "1.15") \div 3$ |      |   | M1 (dep on M1) for a complete method to find the cost of one packet of sweets |
|    |                                        | 1.85 |   | A1 cao                                                                        |
|    |                                        |      |   | <b>Total 3 marks</b>                                                          |

|    |  |                         |   |                                                                   |
|----|--|-------------------------|---|-------------------------------------------------------------------|
| 11 |  | 11 hours and 45 minutes | 2 | B2 for 11 hours and 45 minutes<br>(B1 for 11 hours or 45 minutes) |
|    |  |                         |   | <b>Total 2 marks</b>                                              |



|                      |   |  |           |   |                                          |
|----------------------|---|--|-----------|---|------------------------------------------|
| <b>8</b>             | a |  | $d^4$     | 1 | B1                                       |
|                      | b |  | $20bc$    | 1 | B1                                       |
|                      | c |  | $7d - 3e$ | 2 | B2 (B1 for $7d$ or $-3e$ or $7d + -3e$ ) |
| <b>Total 4 marks</b> |   |  |           |   |                                          |

|                      |                                                                                                                  |       |   |    |                          |
|----------------------|------------------------------------------------------------------------------------------------------------------|-------|---|----|--------------------------|
| <b>9</b>             | E.g. $42 \div 3 (= 14)$ or $68 \div 8 (= 8.5)$ or<br>$42 \times 3 (= 126)$ or $\frac{15}{8} \times 68 (= 127.5)$ |       |   | M1 | for a correct first step |
|                      | E.g. $9 \times '14' + 15 \times '8.5'$ oe<br>or $'126' + '127.5'$                                                |       |   | M1 | for a complete method    |
|                      |                                                                                                                  | 253.5 | 3 | A1 |                          |
| <b>Total 3 marks</b> |                                                                                                                  |       |   |    |                          |

|                      |                             |     |   |    |                        |
|----------------------|-----------------------------|-----|---|----|------------------------|
| <b>10</b>            | $(180 - 44) \div 2 (= 68)$  |     |   | M1 | May be seen on diagram |
|                      | $180 - '68'$ or $44 + '68'$ |     |   | M1 |                        |
|                      |                             | 112 | 3 | A1 |                        |
| <b>Total 3 marks</b> |                             |     |   |    |                        |

| Question | Working                                                                                                                                           |                                                                                                                                                     | Answer                     | Mark | Notes                                                                                                                                                                                                                                                                                                          |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 22       | eg $10a + 4c = 20$<br>$+ 2a - 4c = 7$<br><br>eg<br>$\left[ c = \frac{10 - 5a}{2} \right]$ oe<br><br>$2a - 4\left(\frac{10 - 5a}{2}\right) = 7$ oe | eg $10a + 4c = 20$<br>$- 10a - 20c = 35$<br><br>eg<br>$\left[ a = \frac{7 + 4c}{2} \right]$ oe<br><br>$5\left(\frac{7 + 4c}{2}\right) + 2c = 10$ oe |                            | 3    | M1 multiplication of one or both equation(s) with correct operation selected (allow one arithmetic error) (if + or – is not shown then assume it is the operation that at least 2 of the 3 terms have been calculated for)<br><b>or</b><br>correct rearrangement of one equation with substitution into second |
|          | eg $5 \times "2.25" + 2c = 10$ <b>or</b> $2 \times "2.25" - 4c = 7$                                                                               | eg $5a + 2 \times "-0.625" = 10$<br><b>or</b> $2a - 4 \times "-0.625" = 7$                                                                          |                            |      | M1 (dep on previous M1 but not on a correct first value) correct method to find second unknown – this could be a correct substitution into one of the equations given or calculated or starting again with the same style of working as for the first method mark                                              |
|          | Working required                                                                                                                                  |                                                                                                                                                     | $a = 2.25$<br>$c = -0.625$ |      | A1<br>oe eg $a = \frac{9}{4}$ , $c = -\frac{5}{8}$ for both solutions<br>dependent on first M1                                                                                                                                                                                                                 |
|          |                                                                                                                                                   |                                                                                                                                                     |                            |      | <b>Total 3 marks</b>                                                                                                                                                                                                                                                                                           |



|    |                                                                                                                                                                                                                       |                                |   |                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 25 | eg $6x + 10y = 6.2$ _<br>$\underline{6x + 3y = 3.75}$<br>$7y = 2.45$<br><br>eg $30x + 15y = 18.75$ _<br>$\underline{9x + 15y = 9.3}$<br>$21x = 9.45$<br><br><b>or</b> eg $6\left(\frac{3.1-5y}{3}\right) + 3y = 3.75$ |                                | 3 | M1 for correct method to eliminate one variable – multiplying one or both equations so the coefficient of $x$ or $y$ is the same in both (condone one arithmetic error), with the intention to subtract all 3 terms to eliminate one variable (intention to subtract is clearly showing a minus sign or subtracting 2 or 3 out of 3 terms)<br><br><b>or</b> isolating $x$ or $y$ in one equation and substituting into the other |
|    | eg, $6 \times "0.45" + 3y = 3.75$<br>or $3 \times "0.45" + 5y = 3.1$<br><br><b>or</b> $3x + 5 \times "0.35" = 3.1$<br>or $6x + 3 \times "0.35" = 3.75$                                                                |                                |   | M1 dep. Substitute found value into one equation <b>or</b> correct method to eliminate second unknown.                                                                                                                                                                                                                                                                                                                           |
|    |                                                                                                                                                                                                                       | $x = 0.45$ oe<br>$y = 0.35$ oe |   | A1 dep M1                                                                                                                                                                                                                                                                                                                                                                                                                        |
|    |                                                                                                                                                                                                                       |                                |   | <b>Total 3 marks</b>                                                                                                                                                                                                                                                                                                                                                                                                             |

|                      |                           |        |   |    |
|----------------------|---------------------------|--------|---|----|
| <b>10</b>            | $12 \times 11.75 (= 141)$ |        | 3 | M1 |
|                      | $(181 - '141') \div 5$    |        |   | M1 |
|                      |                           | 8(.00) |   | A1 |
| <b>Total 3 marks</b> |                           |        |   |    |

|                      |  |                                          |   |                                                                                                                                                                                 |
|----------------------|--|------------------------------------------|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>11</b>            |  | TV, TB, TT,<br>NV, NB, NT,<br>HV, HB, HT | 2 | B2 for all combinations with no repeats or incorrect combinations<br><br>If not B2 then award B1 for at least 4 correct combinations (ignore repeats or incorrect combinations) |
| <b>Total 2 marks</b> |  |                                          |   |                                                                                                                                                                                 |

|                      |                                                                                  |      |   |                                   |
|----------------------|----------------------------------------------------------------------------------|------|---|-----------------------------------|
| <b>12</b>            | $175 + 175 + 175 + 330 (= 855)$ or $\frac{330}{'855'}$                           |      | 3 | M1                                |
|                      | $\frac{330}{175 + 175 + 175 + 330} \times 100$ or $\frac{330}{'855'} \times 100$ |      |   | M1                                |
|                      |                                                                                  | 38.6 |   | A1 Answers in range 38.59 to 38.6 |
| <b>Total 3 marks</b> |                                                                                  |      |   |                                   |

|    |                                                                                                    |                       |   |    |                                                                                                                                                                                                                                                                                                |
|----|----------------------------------------------------------------------------------------------------|-----------------------|---|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 21 | eg $4x + 8y = 60$ or $3x + 6y = 45$<br>$- 4x - 6y = 4$ $+ 4x - 6y = 4$<br>$(14y = 56)$ $(7x = 49)$ |                       | 3 | M1 | Correct method to eliminate $x$ or $y$ : coefficients of $x$ or $y$ the same <b>and</b> correct operator to eliminate selected variable (condone any one arithmetic error in multiplication) <b>or</b> correctly writing $x$ or $y$ in terms of the other variable and correctly substituting. |
|    | eg $4x - 6\left(\frac{15-x}{2}\right) = 4$ or $4(15-2y) - 6y = 4$ oe                               |                       |   | M1 | dep correct method to find second variable using their value from a correct method to find first variable or for repeating above method to find second variable.                                                                                                                               |
|    | eg $x + 2 \times 4 = 15$ or $7 + 2 \times y = 15$                                                  |                       |   | A1 | dep on M1                                                                                                                                                                                                                                                                                      |
|    | <i>Working required</i>                                                                            | $x = 7, y = 4$        |   |    | <b>Total 3 marks</b>                                                                                                                                                                                                                                                                           |
| 22 | (a)                                                                                                | 0.000 0932            | 1 | B1 |                                                                                                                                                                                                                                                                                                |
|    | (b)                                                                                                | $2.4 \times 10^5$     | 2 | B2 | If not B2, then B1 for 240 000 or $24 \times 10^4$ oe or $2.4 \times 10^a$ $a \neq 5$                                                                                                                                                                                                          |
|    | (c)                                                                                                | $1.8 \times 10^{121}$ | 2 | B2 | If not B2, then B1 for $18 \times 10^{120}$ or $1.8 \times 10^b$ $b \neq 121$                                                                                                                                                                                                                  |
|    |                                                                                                    |                       |   |    | <b>Total 5 marks</b>                                                                                                                                                                                                                                                                           |

| Question | Working                                                                                                                                                     |                                                                                                                               | Answer                | Mark | Notes                                                                                                                                                                                                                                                                                                          |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 22       | eg $5x + 4y = -2$<br>$+ 8x - 4y = 17.6$<br>$(13x = 15.6)$<br><br>eg<br>$[ x = \frac{4.4 + y}{2} ]$ oe<br><br>$5\left(\frac{4.4 + y}{2}\right) + 4y = -2$ oe | eg $10x + 8y = -4$<br>$- 10x - 5y = 22$<br>$(13y = -26)$<br><br>eg<br>$[ y = 2x - 4.4 ]$ oe<br><br>$5x + 4(2x - 4.4) = -2$ oe |                       | 3    | M1 multiplication of one or both equation(s) with correct operation selected (allow one arithmetic error) (if + or – is not shown then assume it is the operation that at least 2 of the 3 terms have been calculated for)<br><b>or</b><br>correct rearrangement of one equation with substitution into second |
|          | eg $5 \times "1.2" + 4y = -2$ <b>or</b><br>$2 \times "1.2" - y = 4.4$                                                                                       | eg $5x + 4 \times "-2" = 4.4$ <b>or</b><br>$2x - "-2" = 4.4$                                                                  |                       |      | M1 (dep on previous M1 but not on a correct first value) correct method to find second unknown – this could be a correct substitution into one of the equations given or calculated or starting again with the same style of working as for the first method mark                                              |
|          | Working required                                                                                                                                            |                                                                                                                               | $x = 1.2$<br>$y = -2$ |      | A1<br>oe eg $x = \frac{6}{5}$<br>for both solutions dependent on first M1                                                                                                                                                                                                                                      |
|          |                                                                                                                                                             |                                                                                                                               |                       |      | <b>Total 3 marks</b>                                                                                                                                                                                                                                                                                           |



|    |                                                                                                                                                                       |                                |   |                                                                                                                                                                                                                                                                                                                                                                 |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 24 | eg $21x + 9y = 24$ _<br>$2x + 9y = 14.5$<br>or<br>$14x + 63y = 101.5$ _<br>$14x + 6y = 16$<br><br><b>or</b> eg $7 \times \left( \frac{14.5 - 9y}{2} \right) + 3y = 8$ |                                | 3 | M1 for a correct method to eliminate x or y:<br><br>multiplication of one or both equation(s) with correct operation selected (allow one arithmetic error) (if + or – is not shown then assume it is the operation that at least 2 of the 3 terms have been calculated for)<br><b>or</b><br>correct rearrangement of one equation with substitution into second |
|    |                                                                                                                                                                       |                                |   | M1 (dep on previous M1 but not on a correct first value) correct method to find second unknown – this could be a correct substitution into one of the equations given or calculated or starting again with the same style of working as for the first method mark                                                                                               |
|    | Working required                                                                                                                                                      | $x = 0.5$ <b>and</b> $y = 1.5$ |   | A1 oe, dep on M1                                                                                                                                                                                                                                                                                                                                                |
|    |                                                                                                                                                                       |                                |   | <b>Total 3 marks</b>                                                                                                                                                                                                                                                                                                                                            |

|    |                                                                                                                                                                                                                                                                                 |                          |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 26 | $\begin{array}{r} 6x + 4y = 1 \\ \text{eg } 6x + 10y = 16 \text{ or } (6y = 15) \end{array}$ $\begin{array}{r} 30x + 20y = 5 \\ 12x + 20y = 32 \text{ oe } (18x = -27) \end{array}$<br>or eg $6x + 4\left(\frac{8-3x}{5}\right) = 1$ or $3\left(\frac{1-4y}{6}\right) + 5y = 8$ |                          | 3 | M1 A correct method to eliminate $x$ or $y$ – multiplying one or both equations so that one value can be eliminated <b>and</b> the correct operation to eliminate which can be shown by 2 out of 3 terms correct for subtraction or addition<br>(allow one arithmetic error in multiplying)<br><b>or</b><br>for a correct substitution of one variable into the other equation.<br><br>NB: the mark is for the method and not for the result of the method – although if the correct result is seen, this means the mark is awarded |
|    |                                                                                                                                                                                                                                                                                 |                          |   | M1dep A correct method to calculate the value of the other letter (dep on M1) eg substitution of found variable into an equation (equation does not need to be solved) or starting again with elimination or substitution                                                                                                                                                                                                                                                                                                           |
|    | working required                                                                                                                                                                                                                                                                | $x = -1.5,$<br>$y = 2.5$ |   | A1oe dep on M1<br>Must be a vulgar fraction or mixed number or a decimal<br>(eg do not allow $y = \frac{12.5}{5}$ )                                                                                                                                                                                                                                                                                                                                                                                                                 |
|    |                                                                                                                                                                                                                                                                                 |                          |   | <b>Total 3 marks</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

| Question | Working                                                                                                                                                                                               | Answer                                                                                                                                                                                                                                  | Mark | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 25*      | eg $3x + 5y = 8$<br>$20x + 5y = -17.5$<br><b>Subtracting</b><br>$(3x - 20x = 8 - -17.5 \text{ or } -17x = 25.5)$<br><b>or</b><br>$3x + 5(-3.5 - 4x) = 8$<br><b>or</b><br>$4x + \frac{8-3x}{5} = -3.5$ | eg $12x + 20y = 32$<br>$12x + 3y = -10.5$<br><b>Subtracting</b><br>$(20y - 3y = 32 - -10.5 \text{ or } 17y = 42.5)$<br><b>or</b><br>$3\left(\frac{-3.5-y}{4}\right) + 5y = 8$<br><b>or</b><br>$4\left(\frac{8-5y}{3}\right) + y = -3.5$ | 3    | M1 for a correct method to eliminate $x$ or $y$ :<br>coefficients of $x$ or $y$ the same <b>and</b> correct operator to eliminate selected variable (condone any one arithmetic error in multiplication)<br><b>or</b><br>writing $x$ or $y$ in terms of the other variable and correctly substituting (condone missing brackets)<br><br>NB The mark is for the method and not for the result of the method. However, if the correct result of the method is seen, the mark can be awarded. |
|          | $3 \times "-1.5" + 5y = 8$<br><b>or</b><br>$4 \times "-1.5" + y = -3.5$<br><b>or</b><br>$y = -3.5 - 4 \times "-1.5"$<br><b>or</b><br>$y = \frac{8-3 \times "-1.5"}{5}$                                | $3x + 5 \times "2.5" = 8$<br><b>or</b><br>$4x + "2.5" = -3.5$<br><b>or</b><br>$x = \frac{-3.5 - "2.5"}{4}$<br><b>or</b><br>$x = \frac{8-5 \times "2.5"}{3}$                                                                             |      | M1 dep on first M1 for a correct method to find other variable by substitution of found variable into one equation<br><b>or</b><br>for repeating the above method to find the second variable.                                                                                                                                                                                                                                                                                             |
|          | Working required                                                                                                                                                                                      | $x = -1.5$<br>$y = 2.5$                                                                                                                                                                                                                 |      | A1 oe dep on M1                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|          |                                                                                                                                                                                                       |                                                                                                                                                                                                                                         |      | <b>Total 3 marks</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

|    |                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                    |  |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 19 | eg<br>$3x + 2y = 10$<br>$- 3x - 4y = 16$<br><br>$(6y = -6)$<br><br><b>or</b><br>eg<br>$3\left(\frac{10 - 2y}{3}\right) - 4y = 16$<br><br><b>or</b><br>$3\left(\frac{16 + 4y}{3}\right) + 2y = 10$<br><br><b>or</b><br>$6y = -6$ oe | Eg<br>$6x + 4y = 20$<br>$+ 3x - 4y = 16$<br><br>$(9x = 36)$<br><br><b>or</b><br>eg<br>$3x - 4\left(\frac{10 - 3x}{2}\right) = 16$<br><br><b>or</b><br>$3x + 2\left(\frac{3x - 16}{4}\right) = 10$<br><br><b>or</b><br>$9x = 36$ oe |  | 3                   | M1<br>a correct method to eliminate x or y: coefficients of x or y are the same <b>and</b> the correct operation to eliminate is selected; if operator not written, the correct operation can be implied by 2 out of 3 terms correct<br>Allow one arithmetic error if multiplying to equate coefficients<br><b>or</b><br>for a correct substitution of one variable into the other equation<br><br>NB: the mark is for the method and not for the result of the method. However, if the correct result of this method is seen, the mark can be awarded |
|    | $3x + 2 \times "-1" = 10$<br><b>or</b><br>$3x - 4 \times "-1" = 16$<br><b>or</b><br>$x = \frac{10 - 2 \times "-1"}{3}$<br><b>or</b><br>$x = \frac{16 + 4 \times "-1"}{3}$                                                          | $3 \times "4" + 2y = 10$<br><b>or</b><br>$3 \times "4" - 4y = 16$<br><b>or</b><br>$y = \frac{10 - 3 \times "4"}{2}$<br><b>or</b><br>$y = \frac{3 \times "4" - 16}{4}$                                                              |  |                     | M1<br>dep on M1<br>a correct substitution to find the value of the second variable using their value <b>or</b> for starting again with elimination or substitution (as above)                                                                                                                                                                                                                                                                                                                                                                          |
|    | Working required                                                                                                                                                                                                                   |                                                                                                                                                                                                                                    |  | $x = 4$<br>$y = -1$ | A1<br>dep on M1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|    |                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                    |  |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

| Question | Working                                                                                                                                             | Answer                                                                                                                                                                                                                                                                                             | Mark | Notes                                                                                 |        |     |       |      |    |   |   |    |        |    |   |   |    |       |    |    |   |    |   |                                                                                                               |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---------------------------------------------------------------------------------------|--------|-----|-------|------|----|---|---|----|--------|----|---|---|----|-------|----|----|---|----|---|---------------------------------------------------------------------------------------------------------------|
| 6 a      |                                                                                                                                                     | <table> <tr> <td></td><td>UK</td><td>Africa</td><td>USA</td><td>Total</td></tr> <tr> <td>Male</td><td>14</td><td>7</td><td>2</td><td>23</td></tr> <tr> <td>Female</td><td>16</td><td>9</td><td>2</td><td>27</td></tr> <tr> <td>Total</td><td>30</td><td>16</td><td>4</td><td>50</td></tr> </table> |      | UK                                                                                    | Africa | USA | Total | Male | 14 | 7 | 2 | 23 | Female | 16 | 9 | 2 | 27 | Total | 30 | 16 | 4 | 50 | 3 | B3 If not B3 then<br>B2 for at least 4 correct entries<br>If not B2 then<br>B1 for at least 2 correct entries |
|          | UK                                                                                                                                                  | Africa                                                                                                                                                                                                                                                                                             | USA  | Total                                                                                 |        |     |       |      |    |   |   |    |        |    |   |   |    |       |    |    |   |    |   |                                                                                                               |
| Male     | 14                                                                                                                                                  | 7                                                                                                                                                                                                                                                                                                  | 2    | 23                                                                                    |        |     |       |      |    |   |   |    |        |    |   |   |    |       |    |    |   |    |   |                                                                                                               |
| Female   | 16                                                                                                                                                  | 9                                                                                                                                                                                                                                                                                                  | 2    | 27                                                                                    |        |     |       |      |    |   |   |    |        |    |   |   |    |       |    |    |   |    |   |                                                                                                               |
| Total    | 30                                                                                                                                                  | 16                                                                                                                                                                                                                                                                                                 | 4    | 50                                                                                    |        |     |       |      |    |   |   |    |        |    |   |   |    |       |    |    |   |    |   |                                                                                                               |
| b        | $\frac{9}{50}$ or 0.18                                                                                                                              | 18                                                                                                                                                                                                                                                                                                 | 2    | M1 for selecting 9 (may be seen in a calculation)<br>A1                               |        |     |       |      |    |   |   |    |        |    |   |   |    |       |    |    |   |    |   |                                                                                                               |
| 7        | $3.80 \div 4 (=0.95)$ or<br>$0.75 \times 3.80 (=2.85)$<br><br>$7.33 - 3 \times "0.95" (=4.48)$ or<br>$7.33 - "2.85" (=4.48)$<br><br>$"4.48" \div 2$ | 2.24                                                                                                                                                                                                                                                                                               | 4    | M1<br><br><br>M1<br><br><br>M1<br><br>A1 SC: Award B2 for an answer of £2.08 or £2.09 |        |     |       |      |    |   |   |    |        |    |   |   |    |       |    |    |   |    |   |                                                                                                               |

|          |        |                                                                                                                |                 |   |                                                                                           |
|----------|--------|----------------------------------------------------------------------------------------------------------------|-----------------|---|-------------------------------------------------------------------------------------------|
| <b>9</b> | (a)(i) |                                                                                                                | $\frac{10}{25}$ | 1 | B1 for 0.4 oe                                                                             |
|          | (ii)   |                                                                                                                | $\frac{8}{25}$  | 1 | B1 for 0.32 oe<br>(penalise incorrect notation once only in (a))                          |
|          | (b)    |                                                                                                                | 2               | 1 | B1 for 2                                                                                  |
|          | (c)    | $(1 \times 14) + (2 \times 17) + (3 \times 15) + (4 \times 12) + (5 \times 9)$<br>$(= 14 + 34 + 45 + 48 + 45)$ |                 | 2 | M1 For correct products seen –<br>condone one incorrect product or<br>one missing product |
|          |        |                                                                                                                | 186             |   | A1 for 186                                                                                |
|          |        |                                                                                                                |                 |   | <b>Total 5 marks</b>                                                                      |

|           |                                                              |         |   |                      |
|-----------|--------------------------------------------------------------|---------|---|----------------------|
| <b>10</b> | $5.25 \div 3 (= 1.75)$                                       |         | 4 | M1                   |
|           | $[9.75 - (2 \times '1.75')] \div 5 (= 1.25)$                 |         |   | M1                   |
|           | $(5 \times '1.75') + (3 \times '1.25')$<br>$(= 8.75 + 3.75)$ |         |   | M1                   |
|           |                                                              | 12.5(0) |   | A1                   |
|           |                                                              |         |   | <b>Total 4 marks</b> |



| Question      | Working                                                                                                  | Answer | Mark | Notes                                                                                                        |
|---------------|----------------------------------------------------------------------------------------------------------|--------|------|--------------------------------------------------------------------------------------------------------------|
| 9             | $48 \div 2 (= 24)$ or $\frac{3}{2} \times 48 (= 72)$                                                     |        | 4    | M1 Method to find the cost of 1 kg of carrots or 3 kg of carrots                                             |
|               | $207 - 3 \times "24" (= 135)$ or<br>$207 - "72" (= 135)$ oe or<br>$"72" + 5p = 207$                      |        |      | M1 dep on M1<br>Method to find the cost of the 5 kg of potatoes or a correct equation for potatoes (eg $p$ ) |
|               | $"135" \div 5$                                                                                           |        |      | M1 dep on M2<br>Method to find the cost of 1 kg of potatoes                                                  |
|               | <i>Working not required, so correct answer scores full marks (unless from obvious incorrect working)</i> | 27     |      | A1<br>cao<br><br>If no method marks awarded<br>SCB2 for an answer 31.8                                       |
| Total 4 marks |                                                                                                          |        |      |                                                                                                              |

|   |                                                                                                                                   |     |   |                                                           |
|---|-----------------------------------------------------------------------------------------------------------------------------------|-----|---|-----------------------------------------------------------|
| 6 | 27.3 – 16.8 (= 10.5) <b>or</b><br>$7b + 2c = 27.3$<br>$4b + 2c = 16.8$<br>$3b = 10.5$                                             |     | 4 | M1 for a correct first step to find the weight of 3 boxes |
|   | “10.5” ÷ (7 – 4) (= 3.5) <b>or</b><br>$b = 3.5$                                                                                   |     |   | M1 for a method to find the weight of one box             |
|   | eg $27.3 - 7 \times "3.5" (= 2.8)$ <b>or</b><br>$16.8 - 4 \times "3.5" (= 2.8)$ <b>or</b><br>$2c = 16.8 - 4 \times "3.5" (= 2.8)$ |     |   | M1 for a method to find the weight of 2 crates            |
|   | Correct answer scores full marks (unless from obvious incorrect working)                                                          | 1.4 |   | A1<br>oe eg $\frac{7}{5}$                                 |
|   |                                                                                                                                   |     |   | <b>Total 4 marks</b>                                      |

| Question | Working                                                                                                                                                                                                                      | Answer | Mark | Notes                                                                                                                                                                                                                                                                                                             |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7        | $2.25 \div 3 (= 0.75)$ or<br>$225 \div 3 (= 75)$ or<br>$\frac{2}{3} \times 2.25 (= 1.5(0))$ or<br>$\frac{2}{3} \times 225 (= 150)$ or<br>$6c + 15d = 13.5(0)$ and $6c = 4.5(0)$ oe or<br>$6c + 15d = 1350$ and $6c = 450$ oe |        | 4    | M1 for a correct method to find the cost of 1 cupcake<br>Allow $\frac{1}{3} = 0.33...$ or $\frac{2}{3} = 0.66...$ truncated or rounded or<br>for setting up two equations where the coefficients of $c$ are equal<br>$c =$ cupcakes and $d =$ doughnuts or<br>the use of 2 different letters (may not be defined) |
|          | $4.50 - 2 \times "0.75" (= 3)$ or<br>$450 - 2 \times "75" (= 300)$ or<br>$15d = 9$ oe or<br>$15d = 900$ oe                                                                                                                   |        |      | M1 for a correct method to find the cost of the 5 doughnuts<br>or<br>for finding an equation for $d$                                                                                                                                                                                                              |
|          | $"3" \div 5$ or<br>$"300" \div 5 (= 60)$ or<br>$9 \div 15$ or<br>$900 \div 15 (= 60)$                                                                                                                                        |        |      | M1 for a correct method to find the cost of 1 doughnut                                                                                                                                                                                                                                                            |
|          | Working not required, so correct answer scores full marks (unless from obvious incorrect working)                                                                                                                            | 0.6(0) |      | A1 or \$ crossed out and 60 cents<br>SCB2 for $4.50 - 2(3 \div 2.25) (= 1.83...)$ and $"1.83..." \div 5 (= 0.36...)$<br>OR<br>$450 - 2(3 \div 225) (= 449.9...)$ and $"449.9..." \div 5 (= 89.9...)$<br>SCB1 for $4.50 - 2(3 \div 2.25) (= 1.83...)$<br>OR<br>$450 - 2(3 \div 225) (= 449.9...)$                  |
|          |                                                                                                                                                                                                                              |        |      | <b>Total 4 marks</b>                                                                                                                                                                                                                                                                                              |

|               |                                                                                                                                                                                                                                                                                                                                                                                                                  |                             |   |                                                                                                                                                                                                                                                                                            |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 17            | $LW = 180$ oe ( $9LW = 1620$ ) or<br>$4L \times (L + W) = 1620$ oe or<br>$5W \times (L + W) = 1620$ oe or<br>$4L = 5W$ oe ( $L = \frac{5}{4}W$ oe or $W = \frac{4}{5}L$ oe)                                                                                                                                                                                                                                      |                             | 5 | M2 for any two correct equations from<br>(i) $LW = 180$ oe ( $9LW = 1620$ )<br>(ii) $4L \times (L + W) = 1620$ oe<br>(iii) $5W \times (L + W) = 1620$ oe<br>(iv) $4L = 5W$ oe ( $L = \frac{5}{4}W$ oe or $W = \frac{4}{5}L$ oe)<br>(M1 for one correct equation or $1620 \div 9 (= 180)$ ) |
|               | $L \times \frac{4}{5}L = "180"$ oe or $W \times \frac{5}{4}W = "180"$ oe or<br>$4L \times \left(L + \frac{4}{5}L\right) = 1620$ oe or<br>$5W \times \left(\frac{5}{4}W + W\right) = 1620$ oe or<br>$9L \left(\frac{4}{5}L\right) = 1620$ oe or $9 \left(\frac{5}{4}W\right) W = 1620$ oe or<br>$4 \left(\frac{180}{W}\right)^2 + 4("180") = 1620$ oe or<br>$5("180") + 5 \left(\frac{180}{L}\right)^2 = 1620$ oe |                             |   | M1 for a correct equation in terms of one variable only                                                                                                                                                                                                                                    |
|               | Correct answer scores full marks (unless from obvious incorrect working)                                                                                                                                                                                                                                                                                                                                         | $L = 15$<br>and<br>$W = 12$ |   | A2 for both correct<br>(A1 for one correct)<br>Award 4 marks for $L = 12$ and $W = 15$ dep on M3                                                                                                                                                                                           |
| Total 5 marks |                                                                                                                                                                                                                                                                                                                                                                                                                  |                             |   |                                                                                                                                                                                                                                                                                            |

| Elimination |                                                                                                                                                  |                                                                              |                                                                                                                                                                                                                                                              |   |                                                                                                                                                                                                                                                                                                              |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 18          | $5a + 3p = 1.96$ and $3a + 2p = 1.22$ oe<br><b>or</b><br>$5a + 3p = 196$ and $3a + 2p = 122$ oe                                                  |                                                                              | M2 for an arithmetical method (must see the calculation to find 0.22 or 0.26 or 0.74 and 0.48 oe)<br>E.g.<br>$6.1(0) - 5.88 (= 0.22)$ oe<br><b>or</b><br>$3.92 - 3.66 (= 0.26)$ oe<br><b>or</b><br>$1.96 - 1.22 (= 0.74)$ oe<br>and $1.22 - "0.74" (= 0.48)$ | 5 | M1 for setting up both equations oe<br>Allow the use of apples and pears oe throughout, e.g.<br>$5 \text{ apples} + 3 \text{ pears} = 1.96$ and<br>$3 \text{ apples} + 2 \text{ pears} = 1.22$                                                                                                               |
|             | E.g.<br>$15a + 9p = 5.88$<br>$15a + 10p = 6.10$<br>Subtracting<br>$(-p = -0.22)$<br>E.g. $5a + 3p = 1.96$ and $6a + 4p = 2.44$ oe<br>Subtracting | E.g.<br>$10a + 6p = 3.92$<br>$9a + 6p = 3.66$<br>Subtracting<br>$(a = 0.26)$ |                                                                                                                                                                                                                                                              |   | M1 for a correct method to eliminate $a$ or $p$ : coefficients of $a$ or $p$ the same <b>and</b> correct operation to eliminate selected variable (condone any one arithmetic error) <b>or</b> to find the cost of 1 apple and 1 pear                                                                        |
|             | E.g.<br>$5a + 3("0.22") = 1.96$<br><b>or</b><br>$3a + 2("0.22") = 1.22$<br>E.g.<br>$a + p = 0.48$ oe                                             | E.g.<br>$5("0.26") + 3p = 196$<br><b>or</b><br>$3("0.26") + 2p = 1.22$       | E.g.<br>$3 \times 0.22 (= 0.66)$<br>$1.96 - "0.66" (= 1.3(0))$<br>$"1.3(0)" \div 5 (= 0.26)$<br><b>or</b><br>$5 \times 0.26 (= 1.3(0))$<br>$1.96 - "1.3(0)" (= 0.66)$<br>$"0.66" \div 3 (= 0.22)$<br><b>or</b><br>Apple and pear is 0.48 oe                  |   | M1 (dep on M2) for substituting their value found (must be $> 0$ ) of one variable into one of the equations <b>or</b> for repeating above method to find second variable <b>or</b> for third working column allow $k(a + p) = k(0.48)$ <b>or</b> for a complete arithmetical method to find the other value |
|             | $10 \times "0.26" + 10 \times "0.22"$ or $(a + p) = 0.48 \times 10$ oe or $k(a + p) = k(0.48) \times \frac{10}{k}$                               |                                                                              |                                                                                                                                                                                                                                                              |   | M1 (dep on M3) can be implied by $10(a + p)$ provided $a$ and $p$ must be $> 0$                                                                                                                                                                                                                              |
|             | Working required                                                                                                                                 |                                                                              | 4.8(0)                                                                                                                                                                                                                                                       |   | A1 dep M2                                                                                                                                                                                                                                                                                                    |
|             |                                                                                                                                                  |                                                                              |                                                                                                                                                                                                                                                              |   | <b>Total 5 marks</b>                                                                                                                                                                                                                                                                                         |



| Substitution  |                                                                                                                                                                                                                                                          |        |   |                                                                                                                                                                                           |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 18            | $5a + 3p = 1.96$ and $3a + 2p = 1.22$ oe<br><b>or</b><br>$5a + 3p = 196$ and $3a + 2p = 122$ oe                                                                                                                                                          |        | 5 | M1 for setting up both equations oe<br>Allow the use of apples and pears oe<br>throughout, e.g.<br>5 apples + 3 pears = 1.96 and<br>3 apples + 2 pears = 1.22                             |
|               | E.g.<br>$3\left(\frac{1.96 - 3p}{5}\right) + 2p = 1.22$ or<br>$5\left(\frac{1.22 - 2p}{3}\right) + 3p = 1.96$ or<br>$3a + 2\left(\frac{1.96 - 5a}{3}\right) = 1.22$ or<br>$5a + 3\left(\frac{1.22 - 3a}{2}\right) = 1.96$ or<br>$p = 0.22$ or $a = 0.26$ |        |   | M1 for correctly writing $a$ or $p$ in terms<br>of the other variable <b>and</b> correctly<br>substituting (condone any one arithmetic<br>error)                                          |
|               | E.g.<br>$(a =) \frac{1.96 - 3(0.22)}{5}$ or $(a =) \frac{1.22 - 2(0.22)}{3}$ or<br>$(p =) \frac{1.96 - 5(0.26)}{3}$ or $(p =) \frac{1.22 - 3(0.26)}{2}$                                                                                                  |        |   | M1 (dep on M2) for substituting their<br>value found (must be $> 0$ ) of one variable<br>into one of the equations <b>or</b><br><br>for repeating above method to find<br>second variable |
|               | $10 \times "0.26" + 10 \times "0.22"$                                                                                                                                                                                                                    |        |   | M1 (dep on M3) can be implied by<br>$10(a + p)$ provided $a$ and $p$ must be $> 0$                                                                                                        |
|               | <i>Working required</i>                                                                                                                                                                                                                                  | 4.8(0) |   | A1 dep M2                                                                                                                                                                                 |
| Total 5 marks |                                                                                                                                                                                                                                                          |        |   |                                                                                                                                                                                           |

|    |   |                                                                                |                                                                                                  |   |                                                                                                                                                                                                                                                                            |
|----|---|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 21 | a |                                                                                | $g^{10}$                                                                                         | 1 | B1                                                                                                                                                                                                                                                                         |
|    | b |                                                                                | $9c^2d^8$                                                                                        | 2 | B2 B1 for 2 out of 3 terms correct as part of a product                                                                                                                                                                                                                    |
|    | c | eg $4x + 3y = 17$<br>– $4x + 8y = 20$<br><b>or</b><br>eg $4(5 - 2y) + 3y = 17$ | eg $8x + 6y = 34$<br>– $3x + 6y = 15$<br><b>or</b><br>eg $4x + 3 \times \frac{1}{2}(5 - x) = 17$ | 3 | M1 Correct method to eliminate x or y: coefficients of x or y the same <b>and</b> correct operation to eliminate selected variable (condone any one arithmetic error in multiplication) <b>or</b> writing x or y in terms of the other variable and correctly substituting |
|    |   | eg $4x + 3 \times 0.6 = 17$<br><b>or</b> $x + 2 \times 0.6 = 5$                | eg $4 \times 3.8 + 3y = 17$<br><b>or</b> $3.8 + 2y = 5$                                          |   | M1 (dep) correct method to find second variable – could start process again or use substitution                                                                                                                                                                            |
|    |   |                                                                                | $x = 3.8$<br>$y = 0.6$                                                                           |   | A1 oe for both solutions dep on first M1                                                                                                                                                                                                                                   |
|    |   |                                                                                |                                                                                                  |   | <b>Total 6 marks</b>                                                                                                                                                                                                                                                       |

|    |  |                                                                                                                    |      |   |                                                                                 |
|----|--|--------------------------------------------------------------------------------------------------------------------|------|---|---------------------------------------------------------------------------------|
| 22 |  | $\tan x = \frac{3.4}{4.7}$ oe eg $\cos x = \frac{4.7}{\sqrt{3.4^2 + 4.7^2}}$                                       |      |   | M1 or $\sin x = \frac{3.4 \sin 90}{\sqrt{3.4^2 + 4.7^2}}$ oe                    |
|    |  | $(x =) \tan^{-1}\left(\frac{3.4}{4.7}\right)$ oe eg $(x =) \cos^{-1}\left(\frac{4.7}{\sqrt{3.4^2 + 4.7^2}}\right)$ |      |   | M1 or $(x =) \sin^{-1}\left(\frac{3.4 \sin 90}{\sqrt{3.4^2 + 4.7^2}}\right)$ oe |
|    |  |                                                                                                                    | 35.9 | 3 | A1 accept 35.7 - 36.1                                                           |
|    |  |                                                                                                                    |      |   | <b>Total 3 marks</b>                                                            |



|    |                                                                                      |             |   |                                                                                                            |
|----|--------------------------------------------------------------------------------------|-------------|---|------------------------------------------------------------------------------------------------------------|
| 25 | $-4x \leq 11 - 3$ or $-4x \leq 8$ or $-x \leq 2$ or $3 - 11 \leq 4x$ or $-8 \leq 4x$ |             | 2 | M1 allow equals sign or condone incorrect inequality sign for M1 only                                      |
|    |                                                                                      | $x \geq -2$ |   | A1 allow $-2 \leq x$<br><br>SCB1 for $x$ and $-2$ with an incorrect sign between them or $-2$ as an answer |
|    |                                                                                      |             |   | Total 2 marks                                                                                              |

|    |                                                                                                  |                        |   |    |                                                                                                                                                                                                                                             |
|----|--------------------------------------------------------------------------------------------------|------------------------|---|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 26 | $3 \div 2 (=1.5 \text{ or } \frac{3}{2})$ <b>or</b> eg $\frac{5-1}{4(-0)}$<br><b>or</b> $c = -1$ |                        | 3 | M1 | for correct method to find gradient or the correct value of $c$<br><br>for gradient, may see a correct calculation <b>or</b> $\frac{3}{2}$ oe<br><b>or</b> $1.5x (+c)$ oe<br><br>for value of $c$ , allow $c = -1, y = -1, (L =) mx - 1$ oe |
|    | $y = "1.5"x (+c)$ <b>or</b> $y = mx - 1$<br><b>or</b> eg $y - 5 = m(x - 4)$                      |                        |   | M1 | for use of $y = mx + c$ with either $m$ or $c$ correct (NB: $m \neq 0$ )<br><b>or</b> for $(L =) 1.5x - 1$ oe                                                                                                                               |
|    |                                                                                                  | $y = \frac{3}{2}x - 1$ |   | A1 | oe eg $y = 1.5x - 1$                                                                                                                                                                                                                        |
|    |                                                                                                  |                        |   |    | <b>Total 3 marks</b>                                                                                                                                                                                                                        |



| Question |     | Working              | Answer     | Mark | Notes    |                                                                                                                                                                                                         |
|----------|-----|----------------------|------------|------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 17       | (a) |                      | $x > -3$   | 1    | B1       | Accept $-3 < x$                                                                                                                                                                                         |
|          | (b) | $4y - y \leq 8 + 13$ | $y \leq 7$ | 2    | M1<br>A1 | Arranging y's on one side and the numbers on the other side.<br>(allow $4y - y = 8 + 13$ oe<br>or $4y - y < 8 + 13$ oe<br>or $4y - y > 8 + 13$ oe<br>or $4y - y \geq 8 + 13$ oe)<br>Allow $y \leq 21/3$ |
|          |     |                      |            |      |          | <b>Total 3 marks</b>                                                                                                                                                                                    |

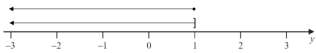
|    |  |                                                                                                                                          |  |   |                |                                                                                   |
|----|--|------------------------------------------------------------------------------------------------------------------------------------------|--|---|----------------|-----------------------------------------------------------------------------------|
| 18 |  | $\frac{17}{3}(-)\frac{11}{4}$ oe or $5\frac{8}{12}(-)2\frac{9}{12}$                                                                      |  | 3 | M1             | Sight of $\frac{17}{3}$ and $\frac{11}{4}$ or $5\frac{8}{12}$ and $2\frac{9}{12}$ |
|    |  | $\frac{68}{12} - \frac{33}{12}$ or $4\frac{20}{12} - 2\frac{9}{12}$                                                                      |  |   | M1             | or $\frac{68n}{12n} - \frac{33n}{12n}$                                            |
|    |  | $\frac{35}{12} = 2\frac{11}{12}$                                                                                                         |  |   | A1             | Dep on M2                                                                         |
|    |  | Alt:<br>$3(+)(\frac{2}{3} - \frac{3}{4})$<br>$3(+)(\frac{8}{12} - \frac{9}{12})$<br>$3 - \frac{1}{12} = 2\frac{11}{12}$                  |  |   | M1<br>M1       |                                                                                   |
|    |  | Alt:<br>$4\frac{5}{3} - 2\frac{3}{4}$<br>$2(+)(\frac{5}{3} - \frac{3}{4})$<br>$2(+)(\frac{20}{12} - \frac{9}{12})$<br>$= 2\frac{11}{12}$ |  |   | A1<br>M1<br>A1 | Dep on M2<br><br>Dep on M2                                                        |

|               |                |                                          |   |    |                                                                                                                                                              |
|---------------|----------------|------------------------------------------|---|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 22            | (a)            |                                          | 2 | M1 | for $(x \pm 6)(x \pm 7)$                                                                                                                                     |
|               |                | $(x + 6)(x - 7)$                         |   | A1 | for $(x + 6)(x - 7)$ or $(x - 7)(x + 6)$<br>isw roots given if candidate solves the quadratic = 0                                                            |
|               | (b)            | $3x - 8x < 3 - 15$ or $15 - 3 < 8x - 3x$ | 3 | M1 | accept as equation or with the wrong inequality sign.                                                                                                        |
|               |                | $-5x < -12$ or $12 < 5x$                 |   | M1 | accept as equation or with the wrong inequality sign.                                                                                                        |
|               |                | $x > 2.4$                                |   | A1 | Accept $2.4 < x$ or $x > \frac{12}{5}$ oe<br>allow $(-\infty, 2.4)$<br><br>award M1 M1 A0 for 2.4 with = sign or no inequality or incorrect inequality sign. |
| Total 5 marks |                |                                          |   |    |                                                                                                                                                              |
| 23            | (a)            | 0                                        | 1 | B1 | condone $150^0$                                                                                                                                              |
|               | (b)            | -2                                       | 1 | B1 | condone $3^{-2}$                                                                                                                                             |
| Total 2 marks |                |                                          |   |    |                                                                                                                                                              |
| 24            | See appendix 1 |                                          | 3 | M1 | for $y = x$ correctly drawn                                                                                                                                  |
|               |                |                                          |   | M1 | for $x = 4$ and $y = -2$ correctly drawn                                                                                                                     |
|               |                | Correct region identified                |   | A1 | for correct region identified<br>region may be shaded or left unshaded<br>Condone missing label if region is clear and no contradictory labels               |
| Total 3 marks |                |                                          |   |    |                                                                                                                                                              |

|    |                                                                |                               |                                                   |   |                |                                                                                                                                                                                                                                                                  |
|----|----------------------------------------------------------------|-------------------------------|---------------------------------------------------|---|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 17 | $x \times 1.05 = 1.26$ oe<br>eg $(x =) 1.26 \div 1.05 (= 1.2)$ | or $30 \times 1.26 (= 37.80)$ | or $30 \div 1.05 (= 28.57)$                       |   | 3              | M1                                                                                                                                                                                                                                                               |
|    | $30 \times "1.2"$                                              | "37.80" $\div 1.05$           | "28.57..." $\times 1.26$                          |   |                | M1                                                                                                                                                                                                                                                               |
|    |                                                                |                               |                                                   |   | 36             | A1<br>cao<br>If no marks awarded,<br>SC B1 for one operation<br>used correctly, even with<br>another incorrect<br>operation.<br>eg $1.26 \times 0.95 \times 30$ oe<br>or $1.26 \times 1.05 \times 30$ oe<br>or $1.26 \div 0.95 \times 30$ oe                     |
|    |                                                                |                               |                                                   |   |                | <b>Total 3 marks</b>                                                                                                                                                                                                                                             |
| 18 |                                                                |                               | $y \geq 1$ oe<br>$x \leq 3$ oe<br>$y \leq 3x - 2$ | 3 | B1<br>B1<br>B1 | Condone < and > in place of $\leq$ and $\geq$<br>throughout.<br><br>SC B1 if no marks awarded,<br>recognition of lines $x = 3$ and $y = 1$ .<br>Allow incorrect inequality and<br>condone use of equals signs<br>eg $y < 1$ , $x = 3$<br>may be seen on diagram. |
|    |                                                                |                               |                                                   |   |                | <b>Total 3 marks</b>                                                                                                                                                                                                                                             |



|               |  |              |   |                                                      |
|---------------|--|--------------|---|------------------------------------------------------|
| 14            |  |              | 2 | M1 for 2.72(02...) or 26.01 or 8.67 or 11.4 or 11.39 |
|               |  | 11.390(2941) |   | A1                                                   |
| Total 2 marks |  |              |   |                                                      |

| Q             | Working                                                                             | Answer                                                        | Mark | Notes                                                                                                                                                                                                                                             |
|---------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 15 (a)        |                                                                                     | -2, -1, 0, 1, 2                                               | 2    | B2 for -2, -1, 0, 1, 2 with no additions or repeats<br>(B1 for 4 of -2, -1, 0, 1, 2 with no additions or repeats<br>or<br>for 6 values with no more than one incorrect value e.g. all of -2, -1, 0, 1, 2, 3<br>or<br>for 5 values with one error) |
| (b)           |  | Closed circle at $x = 1$ and a line with an arrow to the left | 1    | B1 for a closed circle at $x = 1$ and a line with an arrow of any length to the left<br><br>Allow ] for a closed circle<br><br>Allow a line without an arrow if it reaches to at least -3                                                         |
| Total 3 marks |                                                                                     |                                                               |      |                                                                                                                                                                                                                                                   |

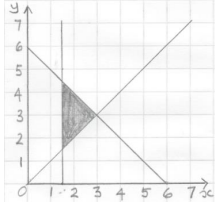
|    |     |  |                                                   |   |                                                                                                                                                                                                                                          |
|----|-----|--|---------------------------------------------------|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 16 | (a) |  | Triangle drawn at<br>$(-1, -3) (-1, -4) (-3, -3)$ | 2 | B2 for a correct triangle with correct<br>orientation and position<br><br>If not B2 then award B1 for a<br>correct triangle drawn with correct<br>orientation in wrong position or<br>triangle drawn with 2 out of 3<br>correct vertices |
|    | (b) |  | Triangle drawn at<br>$(-4, 4) (-4, 5) (-2, 4)$    | 1 | B1 cao                                                                                                                                                                                                                                   |
|    |     |  |                                                   |   | <b>Total 3 marks</b>                                                                                                                                                                                                                     |
| 17 | (a) |  | $-3, -2, -1, 0, 1$                                | 2 | B2 for $-3, -2, -1, 0, 1$<br><br>If not B2 then award B1 for 4 correct values and<br>no incorrect values (eg $-3, -2, -1, 0$ )<br><b>or</b> for 6 values with no more than one incorrect<br>value (eg $-4, -3, -2, -1, 0, 1$ )           |
|    | (b) |  | $x > -1$                                          | 1 | B1 accept $-1 < x$                                                                                                                                                                                                                       |
|    |     |  |                                                   |   | <b>Total 3 marks</b>                                                                                                                                                                                                                     |

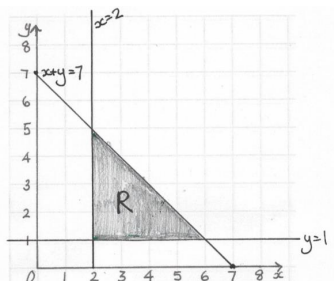
| Question             | Working                 | Answer                                         | Mark | Notes                                                                                                                          |
|----------------------|-------------------------|------------------------------------------------|------|--------------------------------------------------------------------------------------------------------------------------------|
| 22                   | $20\,000 \times 0.81^3$ |                                                |      | M2 M1 for $20\,000 \times 0.81$ (= 16 200)<br>or $20\,000 \times 1.19$ (= 23 800)<br>or $20\,000 \times 1.19^3$ (= 33 703.18)) |
|                      |                         | 10 629                                         |      | A1 Accept 10 628 → 10.629                                                                                                      |
| <b>Total 3 marks</b> |                         |                                                |      |                                                                                                                                |
| 23                   | $30 = \frac{27}{1.2x}$  |                                                | 3    | M2 M1 for $\frac{27}{1.2x}$                                                                                                    |
|                      |                         | 0.75                                           |      | A1 oe                                                                                                                          |
| <b>Total 3 marks</b> |                         |                                                |      |                                                                                                                                |
| 24 (a)               |                         | 156 000 000                                    | 1    | B1                                                                                                                             |
| (b)                  |                         | Arctic                                         | 1    | B1                                                                                                                             |
| (c)                  |                         | $3.74 \times 10^7$                             | 2    | B2 B1 for 37 400 000 (oe but not in standard form)                                                                             |
| <b>Total 4 marks</b> |                         |                                                |      |                                                                                                                                |
| 25 (a)               |                         | -1, 0, 1, 2, 3, 4                              | 2    | B2 B1 for -2, -1, 0, 1, 2, 3, 4<br>or -1, 0, 1, 2, 3                                                                           |
| (b)                  |                         | $y \leq 6$<br>$x + y \geq 5$<br>$y \geq x - 3$ | 2    | B2 for 3 correct inequalities<br>B1 for 2 correct inequalities<br>(In both cases allow < in place of ≤, and > in place of ≥)   |
| <b>Total 4 marks</b> |                         |                                                |      |                                                                                                                                |



|    |                                                                                                                                                           |           |   |                                                                                                                     |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|---|---------------------------------------------------------------------------------------------------------------------|
| 17 | $a = 7$                                                                                                                                                   |           | 4 | B1                                                                                                                  |
|    | $\frac{b + \text{their } a}{2} = 8.5$ oe <b>or</b> $b = 10$                                                                                               |           |   | M1 ft their value of $a$ <b>or</b> for setting up an equation for $b$ <b>or</b> $b = 10$                            |
|    | $\frac{\text{their } a + \text{their } a + \text{their } b + c}{4} = 9$ oe or<br>( $c =$ ) $9 \times 4 - (2 \times \text{their } a + \text{their } b)$ oe |           |   | M1 for a calculation involving $c$ using their values <b>or</b> for a calculation leading to $c$ using their values |
|    |                                                                                                                                                           | 7, 10, 12 |   | A1                                                                                                                  |
|    |                                                                                                                                                           |           |   | <b>Total 4 marks</b>                                                                                                |

|    |   |  |                       |   |                                                                                                                                                                                                                                                                             |
|----|---|--|-----------------------|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 18 | a |  | Correct number line   | 2 | B2 for a fully correct number line e.g. shaded circle at $-2$ , unshaded circle at $1$ and a line drawn between them<br><br>B1 for a shaded circle at $-2$ <b>or</b> an unshaded circle at $1$ <b>or</b> circles at $-2$ and $1$ with line in between but shading incorrect |
|    | b |  | $-3, -2, -1, 0, 1, 2$ | 2 | B2 fully correct values with no extras<br><br>B1 for 5 correct values and none incorrect <b>or</b> all 6 correct values with no more than one additional incorrect value                                                                                                    |
|    |   |  |                       |   | <b>Total 4 marks</b>                                                                                                                                                                                                                                                        |

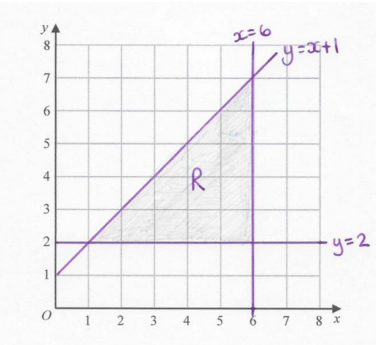
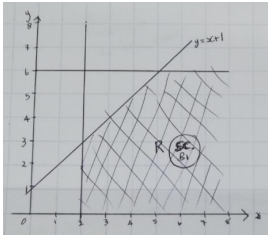
|               |        |                                                                                   |                |   |                                                                                                                                    |
|---------------|--------|-----------------------------------------------------------------------------------|----------------|---|------------------------------------------------------------------------------------------------------------------------------------|
| 18            | (a)(i) |  | Correct line   | 1 | B1 For $x = 1.5$ drawn                                                                                                             |
|               | (ii)   |                                                                                   | Correct line   | 1 | B1 For $y = x$ drawn                                                                                                               |
|               | (iii)  |                                                                                   | Correct line   | 1 | B1 For $x + y = 6$ drawn                                                                                                           |
|               | (b)    |                                                                                   | Correct region | 1 | B1 dep on B3 for correctly shading the region <b>R</b><br>accept unlabelled or unshaded if clear.<br>Shading can be 'in' or 'out'. |
| Total 4 marks |        |                                                                                   |                |   |                                                                                                                                    |

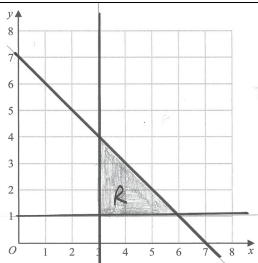
|               |        |                                                                                                                                                                  |  |  |   |                                                                                                                                                                                                            |
|---------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 18            | (a)(i) |  <p>Line length 2cm + but shaded area must be enclosed for the mark in (b)</p> |  |  | 3 | B1 $y = 1$ drawn<br>B1 $x = 2$ drawn<br>B1 $x + y = 7$ drawn<br><br>Allow dashed lines or solid lines for graphs<br><b>condone lack of labels if unambiguous</b>                                           |
|               | (b)    |                                                                                                                                                                  |  |  |   | B1 correct region shaded – shaded in or out – labelled <b>R</b> or clear intention to be the required region<br>(ft only for one vertical line, one horizontal line and one line with a negative gradient) |
| Total 4 marks |        |                                                                                                                                                                  |  |  |   |                                                                                                                                                                                                            |

|    |        |                                                                          |                    |   |                                                                                                                                                       |
|----|--------|--------------------------------------------------------------------------|--------------------|---|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| 21 | (a)    |                                                                          | $8c^{12}d^{21}$    | 2 | B2 (B1 for 2 correct terms as part of a product)                                                                                                      |
|    | (b)    |                                                                          | 5                  | 1 | B1                                                                                                                                                    |
|    | (c)    |                                                                          | $4a^2b(4b^2 + 5a)$ | 2 | B2 B1 for any correct partial factorisation with at least 2 factors, <b>or</b> the correct common factor with no more than 1 error inside the bracket |
|    | (d)(i) | $(x \pm 11)(x \pm 2)$                                                    |                    | 2 | M1 for $(x \pm 11)(x \pm 2)$<br><b>or</b> for $(x + a)(x + b)$ with $ab = -22$<br>or $a + b = 9$                                                      |
|    |        | Correct answer scores full marks (unless from obvious incorrect working) | $(x + 11)(x - 2)$  |   | A1 for correct factors                                                                                                                                |
|    | (ii)   |                                                                          | -11, 2             | 1 | B1ft ft dep on factorising in the form $(x + p)(x + q)$                                                                                               |
|    |        |                                                                          |                    |   | <b>Total 8 marks</b>                                                                                                                                  |

|    |                                                                          |                 |   |                                                                                 |
|----|--------------------------------------------------------------------------|-----------------|---|---------------------------------------------------------------------------------|
| 22 |                                                                          | $x \leq 1$      | 4 | B1 accept $x < 1$                                                               |
|    |                                                                          | $y \geq -2$     |   | B1 accept $y > -2$                                                              |
|    | $y = 2x + c$ or $y = mx + 4$                                             |                 |   | M1 allow = or < or ≤ or > or ≥                                                  |
|    | Correct answer scores full marks (unless from obvious incorrect working) | $y \leq 2x + 4$ |   | A1 oe, allow $y < 2x + 4$ oe                                                    |
|    |                                                                          |                 |   | SCB2 for the correct inequalities with all inequality signs the wrong way round |
|    |                                                                          |                 |   | <b>Total 4 marks</b>                                                            |



|               |        |                                                                                    |                            |   |      |                                                                                                                                                                                                                                                                                                                            |
|---------------|--------|------------------------------------------------------------------------------------|----------------------------|---|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 18            | (a)(i) |                                                                                    | <div>y = 2 drawn</div>     | 3 | B1   | Lines (can be solid, dotted or dashed) must be at least 2 cm long and need not be labelled                                                                                                                                                                                                                                 |
|               | (ii)   |                                                                                    | <div>x = 6 drawn</div>     |   | B1   |                                                                                                                                                                                                                                                                                                                            |
|               | (iii)  |                                                                                    | <div>y = x + 1 drawn</div> |   | B1   |                                                                                                                                                                                                                                                                                                                            |
|               | (b)    |  |                            | 1 | B1ft | Correct region indicated<br>ft dep on at least B2 scored and a vertical line, a horizontal line and a diagonal line with a positive gradient<br><br>SCB1 for $y = x + 1$ , $y = 6$ and $x = 2$ and area shaded as shown below<br><br> |
| Total 4 marks |        |                                                                                    |                            |   |      |                                                                                                                                                                                                                                                                                                                            |

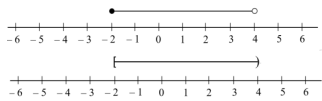
|               |                                                                                                                                                                                                                                        |                                                                                                                                                                   |  |   |                                                                                                                                                                                                                                                                             |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 23            | (a)(i)<br>(ii)<br>(iii)                                                                                                                                                                                                                |  <p>Line length 2 cm + but shaded area must be enclosed for the mark in (b)</p> |  | 3 | B1 $x = 3$ drawn<br>B1 $y = 1$ drawn<br>B1 $x + y = 7$ drawn<br><br>Allow dashed lines or solid lines for graphs of minimum length 2 squares condone lack of labels if unambiguous                                                                                          |
|               | (b)<br><b>If unlabelled, award:</b><br>$x = 3$ and $y = 3$ B1 B0<br>$y = 1$ and $x = 1$ B0 B1<br>$x = 3$ and $x = 1$ and $y = 1$ B0 B1<br>$x = 3$ and $y = 1$ and $y = 3$ B1 B0<br><br>$x = 3$ and $x = 1$ , $y = 1$ and $y = 3$ B0 B0 |                                                                                                                                                                   |  | 1 | B1 correct region shaded – shaded in or out – labelled <b>R</b> or clear intention to be the required region (ft only for one vertical line (not $x = 0$ ), one horizontal line (not $y = 0$ ) and one line with a negative gradient eg $x = 1$ , $y = 3$ and $x + y = 7$ ) |
| Total 4 marks |                                                                                                                                                                                                                                        |                                                                                                                                                                   |  |   |                                                                                                                                                                                                                                                                             |

|                      |        |  |                          |   |    |
|----------------------|--------|--|--------------------------|---|----|
| <b>20</b>            | (a)(i) |  | 2, 3, 4, 6, 8, 9, 10, 12 | 1 | B1 |
|                      | (ii)   |  | 1, 2, 4, 5, 7, 8, 10, 11 | 1 | B1 |
|                      | (b)(i) |  | $\emptyset$              | 1 | B1 |
|                      | (ii)   |  | $\epsilon$               | 1 | B1 |
| <b>Total 4 marks</b> |        |  |                          |   |    |

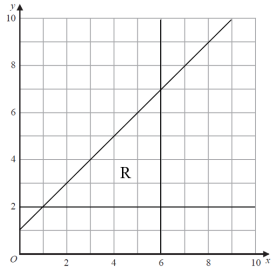
|                      |     |                                                                                                           |                 |   |                                                                                                                                                                                                                                                      |
|----------------------|-----|-----------------------------------------------------------------------------------------------------------|-----------------|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>21</b>            | (a) |                                                                                                           | $-2 < x \leq 1$ | 2 | B2 accept $1 \geq x > -2$ <b>or</b> $x > -2, x \leq 1$<br>if not B2 then B1 for $-2 < x$ <b>or</b> $x \leq 1$ <b>or</b><br>$-2 \leq x < 1$ <b>or</b> $-2 \leq x \leq 1$ <b>or</b> $-2 < x < 1$<br>Condone use of a variable other than $x$ but not 0 |
|                      | (b) | $7a - 3a \leq 28 + 5$ <b>or</b> $4a \leq 33$ <b>or</b> $-5 - 28 \leq 3a - 7a$<br><b>or</b> $-33 \leq -4a$ |                 | 2 | M1 for $a$ terms on one side and numbers on the other.<br>Condone = rather than $\leq$ or any other sign for this mark.                                                                                                                              |
|                      |     | Working required                                                                                          | $a \leq 8.25$   |   | A1 (dep on M1) oe eg $a \leq \frac{33}{4}$ <b>or</b> $a \leq 8\frac{1}{4}$ <b>or</b> $8.25 \geq a$<br>must have correct sign on answer line<br>(sight of correct answer in working space and just 8.25 on answer line gains M1 only).                |
| <b>Total 4 marks</b> |     |                                                                                                           |                 |   |                                                                                                                                                                                                                                                      |



|               |     |                                                                                               |                   |   |                                                                                                                                                                                                                              |
|---------------|-----|-----------------------------------------------------------------------------------------------|-------------------|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 22            | (a) |                                                                                               | $x \leq 2$        | 1 | B1 Allow $2 \geq x$                                                                                                                                                                                                          |
|               | (b) |                                                                                               | $-2, -1, 0, 1, 2$ | 2 | B2 (B1 for 4 correct values and no incorrect values (eg $-1, 0, 1, 2$ ) <b>or</b> for 6 values with no more than one incorrect value (eg $-2, -1, 0, 1, 2, 3$ ))                                                             |
|               | (c) | $7t - 2t \leq 31 + 3$ or<br>$5t \leq 34$ or<br>$-3 - 31 \leq 2t - 7t$ or<br>$-34 \leq -5t$ oe |                   | 2 | M1 $t$ terms on one side and numbers on the other. Condone = rather than $\leq$ or any other sign for this mark.                                                                                                             |
|               |     | Working required                                                                              | $t \leq 6.8$      |   | A1<br>oe eg $t \leq \frac{34}{5}$ <b>or</b> $t \leq 6\frac{4}{5}$ or $6.8 \geq t$<br>Must have correct sign on answer line dep on M1<br>(sight of correct answer in working space and just 6.8 on answer line gains M1 only) |
| Total 5 marks |     |                                                                                               |                   |   |                                                                                                                                                                                                                              |

|               |                                                                                                                                                                                                          |                 |   |                                                                                                                                                                                           |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 21 (i)        | $-7+3 \leq 2x < 5+3$ oe or<br>$\frac{-7}{2} \leq x - \frac{3}{2} < \frac{5}{2}$ oe or<br>$-7+3 \leq 2x$ oe and $2x < 5+3$ oe<br>or $(x \geq) -2$ or $(x <) 4$                                            |                 | 3 | M1 or one side of the inequality correct, i.e.. $x \geq -2$ oe or $x < 4$<br>Condone = rather than $\leq$ or $<$ or any other sign for the M marks.                                       |
|               | $\frac{-7+3}{2} \leq x < \frac{5+3}{2}$ or<br>$\frac{-7}{2} + \frac{3}{2} \leq x < \frac{5}{2} + \frac{3}{2}$<br>or $\frac{-7+3}{2} \leq x$ oe and $x < \frac{5+3}{2}$<br>or $(x \geq) -2$ and $(x <) 4$ |                 |   | M1                                                                                                                                                                                        |
|               | Correct answer scores full marks (unless from obvious incorrect working)                                                                                                                                 | $-2 \leq x < 4$ |   | A1 allow $x \geq -2$ and $x < 4$<br>Allow $[-2, 4)$                                                                                                                                       |
| (ii)          |                                                                                                                       |                 | 2 | M1 ft for drawing a line from -2 to 4 or (indep) for a closed circle or [ at -2 or (indep) for an open circle or ) or [ at 4<br>Only allow a follow through for a double ended inequality |
|               |                                                                                                                                                                                                          | Correct diagram |   | A1 ft for correct diagram<br>Only allow a follow through for a double ended inequality                                                                                                    |
| Total 4 marks |                                                                                                                                                                                                          |                 |   |                                                                                                                                                                                           |

|    |     |                                                                                         |                   |   |                                                                                                                                                   |
|----|-----|-----------------------------------------------------------------------------------------|-------------------|---|---------------------------------------------------------------------------------------------------------------------------------------------------|
| 20 | (a) | $4y > 12 - 5$                                                                           |                   | 2 | M1 Allow $y = \frac{7}{4}$ oe or $y < \frac{7}{4}$                                                                                                |
|    |     |                                                                                         | $y > \frac{7}{4}$ |   | A1 oe                                                                                                                                             |
|    | (b) | $12x - 10$<br>or $2(6x - 5) = 4x - 7$<br>or<br>$6x - 5 = \frac{4}{2}x - \frac{7}{2}$ oe |                   | 3 | M1 for removal of fraction <b>and</b> multiplying out LHS<br>or rearranging to remove the fraction<br>or separating fraction (RHS) in an equation |
|    |     | $12x - 4x = -7 + 10$ oe<br>or<br>$6x - \frac{4}{2}x = -\frac{7}{2} + 5$ oe              |                   |   | M1 ft (dep on 4 terms) for terms in $x$ on one side of equation and number terms on the other                                                     |
|    |     |                                                                                         | $\frac{3}{8}$     |   | A1 (dep M1) oe                                                                                                                                    |
|    |     |                                                                                         |                   |   | <b>Total 5 marks</b>                                                                                                                              |

|               |                                                                                     |                              |   |                                                                                                                                                                                                       |
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| 24 (a)        |                                                                                     | $y = -3x + 5$<br>oe          | 2 | B2 fully correct equation eg $y = -3x + 5$<br>or $y - 5 = -3(x - 0)$<br><br>If not B2 then B1 for<br>$y = -3x + a$ with $a \neq 5$<br>or<br>$y = bx + 5$ ( $b \neq 0, -3$ ) or<br>( $L =$ ) $-3x + 5$ |
| (b)           | Lines (solid or dashed) $x = 6$ and $y = 2$ drawn                                   |                              | 3 | B1 The lines $x = 6$ and $y = 2$ should<br>extend far enough to intersect with each<br>other.                                                                                                         |
|               | Line (solid or dashed) $y = x + 1$ drawn                                            |                              |   | B1 The line should extend from at least<br>$x = 1$ to $x = 6$ or far enough to intersect<br>with their horizontal and vertical lines.                                                                 |
|               | Region R shown (shaded or not shaded)                                               | Correct region<br>identified |   | B1 dep on B2                                                                                                                                                                                          |
|               |  |                              |   |                                                                                                                                                                                                       |
| Total 5 marks |                                                                                     |                              |   |                                                                                                                                                                                                       |

|    |     |  |    |   |                          |
|----|-----|--|----|---|--------------------------|
| 22 | (a) |  | 1  | 1 | B1 cao                   |
|    | (b) |  | -6 | 1 | B1 Allow 3 <sup>-6</sup> |
|    |     |  |    |   | <b>Total 2 marks</b>     |

|    |     |                                                                                                                                                 |                                        |   |                                                                                                                                                                                                                      |
|----|-----|-------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 23 | (a) | $-4x > 17 - 9$ or $-4x > 8$ or<br>$9 - 17 > 4x$ or $-8 > 4x$ or<br>$\frac{9}{4} - x > \frac{17}{4}$ oe or $-\frac{9}{4} + x < -\frac{17}{4}$ oe |                                        | 2 | M1 for a correct first step<br>Condone = rather than > or any other sign for this mark.                                                                                                                              |
|    |     | <i>Correct answer scores full marks (unless from obvious incorrect working)</i>                                                                 | $x < -2$                               |   | A1 oe eg $-2 > x$<br>(sight of correct answer in working space and just $(x =) -2$ on answer line gains M1 only)                                                                                                     |
|    | (b) |                                                                                                                                                 | $y \geq 2$<br>$x \leq 6$<br>$y \leq x$ | 3 | B3 for all 3 correct<br>Allow $2 \leq y, 6 \geq x$ and $x \geq y$<br>B2 for 2 correct<br>B1 for 1 correct<br>Allow < and > signs<br><br>SCB2: $y \leq 2, y \geq x$ and $x \geq 6$ (for all 3)<br>Allow < and > signs |
|    |     | <i>Correct answer scores full marks (unless from obvious incorrect working)</i>                                                                 |                                        |   | <b>Total 5 marks</b>                                                                                                                                                                                                 |

|    |     |                                                                                                          |                     |   |                                                                                                                                                                             |
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| 22 | (a) | $8x - 3x \geq -10 + 4$ or<br>$5x \geq -6$ or<br>$10 - 4 \geq -8x + 3x$ or<br>$6 \geq -5x$                |                     | 2 | M1 for $x$ terms on one side and numbers on the other. Condone = rather than $\leq$ or any other sign for this mark.                                                        |
|    |     | <i>Working not required, so correct answer scores full marks (unless from obvious incorrect working)</i> | $x^3 - \frac{6}{5}$ |   | A1 oe eg $-\frac{6}{5} \leq x$<br>Must have correct sign on answer line (sight of correct answer in working space and just -1.2 on answer line gains M1 only)               |
|    | (b) |                                                                                                          | $y \geq 2$          | 3 | B1 oe eg $y - 2 \geq 0$ allow $>$ in place of $\geq$                                                                                                                        |
|    |     |                                                                                                          | $x \leq 7$          |   | B1 oe eg $x - 7 \leq 0$ allow $<$ in place of $\leq$                                                                                                                        |
|    |     |                                                                                                          | $y \leq x$          |   | B1 oe eg $y - x \leq 0$ allow $<$ in place of $\leq$                                                                                                                        |
|    |     |                                                                                                          |                     |   | SCB1 for $y = 2$ , $x = 7$ and $y = x$<br>SCB2 for $y \leq 2$ , $x \geq 7$ and $y \geq x$<br>or $y < 2$ , $x > 7$ and $y > x$<br>Allow $<$ in place of $\leq$ or vice versa |
|    |     |                                                                                                          |                     |   | <b>Total 5 marks</b>                                                                                                                                                        |

| Question | Working                                                                                                        | Answer         | Mark | Notes                                                                                                                                                                                                                                |
|----------|----------------------------------------------------------------------------------------------------------------|----------------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 26* (a)  | $-3t - 2t < 15 - 7$ or $-5t < 8$ oe or<br>$7 - 15 < 2t + 3t$ or $-8 < 5t$ oe or<br>$t = -1.6$ or<br>$t < -1.6$ |                | 2    | M1 for correctly isolating terms in $t$ on one side and number terms on the other side (use of = or any inequality symbol or variable is permitted)                                                                                  |
|          | <i>Working not required, so correct answer scores full marks (unless from obvious incorrect working)</i>       | $t > -1.6$     |      | A1<br>oe eg $-1.6 < t$ or $t > -\frac{8}{5}$ or $-\frac{8}{5} < t$ oe<br>Must have correct inequality symbol on answer line<br><br>NB Sight of correct answer in working space and just $(t =) -1.6$ oe on answer line gains M1 only |
| (b)      |                                                                                                                | $x \geq 2$     | 3    | B1 oe allow $x > 2$ or $2 < x$                                                                                                                                                                                                       |
|          |                                                                                                                | $y \geq 3$     |      | B1 oe allow $y > 3$ or $3 < y$                                                                                                                                                                                                       |
|          |                                                                                                                | $x + y \leq 9$ |      | B1<br>oe allow $x + y < 9$ or $y < 9 - x$ or $9 > x + y$<br><br>SC B2 for all of $x \leq 2, y \leq 3, x + y \geq 9$ oe or<br>$x < 2, y < 3, x + y > 9$<br><br>SC B1 for all of $x = 2, y = 3, x + y = 9$ oe                          |
|          |                                                                                                                |                |      | <b>Total 5 marks</b>                                                                                                                                                                                                                 |

|    |                                                                                                                                       |                   |   |    |                                                                                                  |
|----|---------------------------------------------------------------------------------------------------------------------------------------|-------------------|---|----|--------------------------------------------------------------------------------------------------|
| 23 | $\cos 50 = \frac{18}{(AB)}$ or $\sin 40 = \frac{18}{(AB)}$ or<br>$\frac{(AB)}{\sin 90} = \frac{18}{\sin 40}$                          |                   | 5 | M1 | M2 for<br>$(AB =) \sqrt{18^2 + (18 \tan 50)^2}$ oe<br>(= 28.0030...) or 28                       |
|    | $(AB =) \frac{18}{\cos 50}$ (= 28.0030...) oe or 28 or<br>$(AB =) \frac{18}{\sin 40}$ (= 28.0030...) oe or 28                         |                   |   | M1 |                                                                                                  |
|    | $\frac{1}{2} \times \pi \times "28.0030..." (= 43.9...) \text{ oe or } 44$<br>$\pi \times "28.0030..." (= 87.9...) \text{ oe or } 88$ |                   |   |    | M1 for use of $\pi d$ or $\frac{1}{2} \pi d$ oe<br>Allow any value of $AB > 18$ if M2 not scored |
|    | "28..." + "43.9..." (= 71.9900...) or<br>"28" + "44"                                                                                  |                   |   |    | M1ft from previous M1<br>Allow <i>their d</i> + <i>their</i> $\frac{1}{2} \pi d$                 |
|    | Correct answer scores full marks (unless from obvious incorrect working)                                                              | 72                |   |    | A1 awrt 72                                                                                       |
|    |                                                                                                                                       |                   |   |    | <b>Total 5 marks</b>                                                                             |
| 24 | (a)                                                                                                                                   | 0.000 625         | 1 | B1 |                                                                                                  |
|    | (b)<br>25 000 000 oe e.g. $25 \times 10^6$ or $0.25 \times 10^8$<br>or<br>$2.5 \times 10^n$ $n \neq 7$                                |                   | 2 | M1 |                                                                                                  |
|    | Correct answer scores full marks (unless from obvious incorrect working)                                                              | $2.5 \times 10^7$ |   | A1 |                                                                                                  |
|    |                                                                                                                                       |                   |   |    | <b>Total 3 marks</b>                                                                             |

|    |     |                                                                                             |                    |   |                                                                                                                                                                                                |
|----|-----|---------------------------------------------------------------------------------------------|--------------------|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 25 | (a) | $(y \pm 6)(y \pm 8)$ or $y(y+6) - 8(y+6)$ or $y(y-8) + 6(y-8)$                              |                    | 2 | M1 or for $(y \pm a)(y \pm b)$ where $ab = -48$ or $a + b = -2$                                                                                                                                |
|    |     |                                                                                             | $(y+6)(y-8)$       |   | A1 oe Allow any letter for y                                                                                                                                                                   |
|    | (b) |                                                                                             | $x \leq 3$         | 1 | B1 allow $3 \geq x$<br>Allow any letter for x                                                                                                                                                  |
|    | (c) | $6-14 > 12w-7w$ oe or $7w-12w > 14-6$ oe                                                    |                    | 3 | M1 Condone = rather than $>$ or any other sign for this mark.                                                                                                                                  |
|    |     | $-8 > 5w$ or $-5w > 8$ or $-w > \frac{8}{5}$ or $w > -\frac{8}{5}$ or $w = -\frac{8}{5}$ oe |                    |   | M1 Condone = rather than $>$ or any other sign for this mark.                                                                                                                                  |
|    |     | Correct answer scores full marks (unless from obvious incorrect working)                    | $w < -\frac{8}{5}$ |   | A1 oe accept $-\frac{8}{5} > w$<br>Must have correct sign on answer line dep on M1<br>(sight of correct answer in working space and just $(w =) -\frac{8}{5}$ oe on answer line gains M2 only) |
|    |     |                                                                                             |                    |   | <b>Total 6 marks</b>                                                                                                                                                                           |



|               |        |                                                                               |                                                                   |   |                                                                                                                                                                           |
|---------------|--------|-------------------------------------------------------------------------------|-------------------------------------------------------------------|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 19            | (a)    | $8x^2 + 20x - 6x^2 + 9x$                                                      | $2x^2 + 29x$                                                      | 2 | M1 3 correct terms or all 4 terms<br>condoning incorrect signs                                                                                                            |
|               |        |                                                                               |                                                                   |   | A1                                                                                                                                                                        |
|               | (b)    | $y^5 \times y^n = y^{19}$ or $y^{-1} \times y^n = y^{13}$ or $5 + n - 6 = 13$ | 14                                                                | 2 | M1 Use of 1 rule of indices or a<br>correct equation in $n$                                                                                                               |
|               |        |                                                                               |                                                                   |   | A1 Accept $y^{14}$                                                                                                                                                        |
|               | (c)(i) | $7t - 2t < 7 + 8$ oe eg $5t < 15$ oe                                          | $t < 3$                                                           | 2 | M1 Terms in $t$ on one side and number<br>terms the other side – may be in<br>an equation or the incorrect<br>inequality sign or an answer of<br>$t = 3$ or eg $t \geq 3$ |
|               |        |                                                                               |                                                                   |   | A1 Must be a correct inequality given<br>as answer                                                                                                                        |
|               | (ii)   |                                                                               | open circle at $t = 3$<br>and a line with an<br>arrow to the left | 1 | B1ft Allow a line without an arrow if it<br>reaches to at least $-5$ , with an<br>arrow it can be any length                                                              |
| Total 7 marks |        |                                                                               |                                                                   |   |                                                                                                                                                                           |

