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EDEXCEL GCSE (9-1) MATHS: QUESTIONS BY TOPIC

Probability (P1)

GCSE (9-1) Mathematics (1MA1) · Higher tier

69 questions · 271 marks · Mark schemes included

Past papers June 2017 - June 2025 · 4 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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QUESTIONS

69 questions · 271 marks · 4 sub-topics

SUB-TOPIC P1a

BASIC PROBABILITY & EXPECTED OUTCOMES

Sub-topic P1a · 23 questions · 80 marks · lowest tariff first



- 5 A car factory is going to make four different car models **A**, **B**, **C** and **D**.

80 people are asked which of the four models they would be most likely to buy.

The table shows information about the results.

Car model	Number of people
A	23
B	15
C	30
D	12

The factory is going to make 40 000 cars next year.

Work out how many model **B** cars the factory should make next year.

(Total for Question 5 is 2 marks)



22 There are only blue pens and red pens in a box.

The number of blue pens is four times the number of red pens.

Rita takes at random one pen from the box.

She records the colour of the pen and then replaces it in the box.

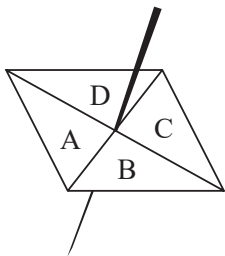
Rita does this n times, where $n \geq 2$

Write down an expression, in terms of n , for the probability that Rita gets a blue pen at least once and a red pen at least once.

.....
(Total for Question 22 is 2 marks)



2 Here is a biased spinner.



The table shows the probabilities that when the spinner is spun it will land on A, on B, on C and on D.

Letter	A	B	C	D
Probability	0.4	0.21	0.32	0.07

Luka will spin the spinner 200 times.
Work out an estimate for the number of times the spinner will land on A.

(Total for Question 2 is 2 marks)

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

- 1** The table shows the probabilities that a biased dice will land on 2, on 3, on 4, on 5 and on 6

Number on dice	1	2	3	4	5	6
Probability		0.17	0.18	0.09	0.15	0.1

Neymar rolls the biased dice 200 times.

Work out an estimate for the total number of times the dice will land on 1 or on 3

.....
(Total for Question 1 is 3 marks)



- 4 There are only blue cubes, yellow cubes and green cubes in a bag.

There are

twice as many blue cubes as yellow cubes
and four times as many green cubes as blue cubes.

Hannah takes at random a cube from the bag.

Work out the probability that Hannah takes a yellow cube.

(Total for Question 4 is 3 marks)



- 8 When a drawing pin is dropped it can land point down or point up.

Lucy, Mel and Tom each dropped the drawing pin a number of times.

The table shows the number of times the drawing pin landed point down and the number of times the drawing pin landed point up for each person.

	Lucy	Mel	Tom
point down	31	53	16
point up	14	27	9

Rachael is going to drop the drawing pin once.

- (a) Whose results will give the best estimate for the probability that the drawing pin will land point up?
Give a reason for your answer.

(1)

Stuart is going to drop the drawing pin twice.

- (b) Use all the results in the table to work out an estimate for the probability that the drawing pin will land point up the first time and point down the second time.

(2)

(Total for Question 8 is 3 marks)



- 10 There are only blue counters, yellow counters, green counters and red counters in a bag. A counter is taken at random from the bag.

The table shows the probabilities of getting a blue counter or a yellow counter or a green counter.

Colour	blue	yellow	green	red
Probability	0.2	0.35	0.4	

- (a) Work out the probability of getting a red counter.

.....
(1)

- (b) What is the least possible number of counters in the bag?
You must give a reason for your answer.

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

(Total for Question 10 is 3 marks)



15 (a) Factorise $a^2 - b^2$

.....
(1)

(b) Hence, or otherwise, simplify fully $(x^2 + 4)^2 - (x^2 - 2)^2$

.....
(3)

(Total for Question 15 is 4 marks)

16 There are only red counters, blue counters and purple counters in a bag.
The ratio of the number of red counters to the number of blue counters is 3 : 17

Sam takes at random a counter from the bag.
The probability that the counter is purple is 0.2

Work out the probability that Sam takes a red counter.

.....
(Total for Question 16 is 3 marks)



- 16 Marek has 9 cards.
There is a number on each card.



Marek takes at random two of the cards.
He works out the product of the numbers on the two cards.
Work out the probability that the product is an even number.

.....
(Total for Question 16 is 3 marks)



23 There are four types of cards in a game.

Each card has a black circle or a white circle or a black triangle or a white triangle.



number of cards with a black shape : number of cards with a white shape = 3 : 5

number of cards with a circle : number of cards with a triangle = 2 : 7

Express the total number of cards with a black shape as a fraction of the total number of cards with a triangle.

(Total for Question 23 is 3 marks)

TOTAL FOR PAPER IS 80 MARKS



- 8 There are some counters in a bag.
The counters are blue or green or red or yellow.

The table shows the probabilities that a counter taken at random from the bag will be blue or will be green.

Colour	blue	green	red	yellow
Probability	0.32	0.20		

The probability that a counter taken at random from the bag will be red is five times the probability that the counter will be yellow.

There are 300 counters in the bag.

Work out the number of yellow counters in the bag.

.....
(Total for Question 8 is 3 marks)



11 Cormac has some sweets in a bag.

The sweets are lime flavoured or strawberry flavoured or orange flavoured.

In the bag

$$\begin{array}{l} \text{number of lime} \\ \text{flavoured sweets} \end{array} : \begin{array}{l} \text{number of strawberry} \\ \text{flavoured sweets} \end{array} : \begin{array}{l} \text{number of orange} \\ \text{flavoured sweets} \end{array} = 9 : 4 : x$$

Cormac is going to take at random a sweet from the bag.

The probability that he takes a lime flavoured sweet is $\frac{3}{7}$

Work out the value of x .

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

(Total for Question 11 is 3 marks)



- 18 Shape A is reflected in the line with equation $x = 2$ to give shape B.
Shape B is reflected in the line with equation $x = 6$ to give shape C.

Describe fully the **single** transformation that maps shape A onto shape C.

(Total for Question 18 is 2 marks)

- 19 There are only blue counters, red counters and green counters in a box.

The probability that a counter taken at random from the box will be blue is 0.4
The ratio of the number of red counters to the number of green counters is 7 : 8

Sameena takes at random a counter from the box.
She records its colour and puts the counter back in the box.
Sameena does this a total of 50 times.

Work out an estimate for the number of times she takes a green counter.

(Total for Question 19 is 3 marks)



Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

- 1** There are only blue cubes, red cubes and yellow cubes in a box.

The table shows the probability of taking at random a blue cube from the box.

Colour	blue	red	yellow
Probability	0.2		

The number of red cubes in the box is the same as the number of yellow cubes in the box.

- (a) Complete the table.

(2)

There are 12 blue cubes in the box.

- (b) Work out the total number of cubes in the box.

(2)

(Total for Question 1 is 4 marks)



- 6 In a bag there are only red counters, blue counters, green counters and pink counters. A counter is going to be taken at random from the bag.

The table shows the probabilities of taking a red counter or a blue counter.

Colour	red	blue	green	pink
Probability	0.05	0.15		

The probability of taking a green counter is 0.2 more than the probability of taking a pink counter.

- (a) Complete the table.

(2)

There are 18 blue counters in the bag.

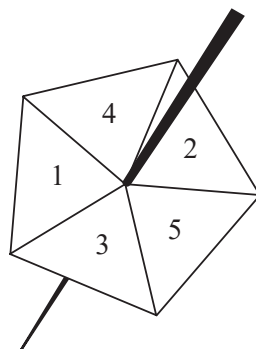
- (b) Work out the total number of counters in the bag.

.....
(2)

(Total for Question 6 is 4 marks)



10 Lina spins a biased 5-sided spinner 40 times.



Here are her results.

Score	1	2	3	4	5
Frequency	6	8	9	7	10

Lina is now going to spin the spinner another two times.

(a) Work out an estimate for the probability that she gets a score of 5 both times.

.....
(2)

Derek is going to spin the spinner a large number of times.

(b) Work out an estimate for the percentage of times Derek can expect to get a score of 1

..... %
(2)

(Total for Question 10 is 4 marks)



10 A biased dice is thrown 60 times.

The table shows information about the number that the dice lands on each time.

Number on dice	1	2	3	4	5	6
Frequency	12	7	8	9	9	15

Gethin throws the dice twice.

(a) Work out an estimate for the probability that the dice will land on 6 both times.

.....

(3)

Sally is going to throw the same dice n times and record the number it lands on each time.

She will use her results to work out a more reliable estimate for the probability in part (a).

(b) What can you say about the value of n ?

.....

.....

.....

(1)

(Total for Question 10 is 4 marks)

- 4 There are only red discs, blue discs and yellow discs in a bag.
There are 24 yellow discs in the bag.

Mel is going to take at random a disc from the bag.

The probability that the disc will be yellow is 0.16

the number of red discs : the number of blue discs = 5 : 4

Work out the number of red discs in the bag.

.....
(Total for Question 4 is 4 marks)



2 The table shows the probabilities that a biased dice will land on 3, on 4, on 5 and on 6

Number on dice	1	2	3	4	5	6
Probability			0.10	0.30	0.05	0.25

Karim assumes that the probabilities that the dice will land on 1 and on 2 are the same.

Karim rolls the biased dice 500 times.

(a) Assuming Karim is right, work out an estimate for the number of times the dice will land on 2

.....
(3)

Karim is wrong.
The probability that the dice will land on 2 is greater than the probability that the dice will land on 1

(b) How does this information affect your answer to part (a)?

.....
.....
.....
(1)

(Total for Question 2 is 4 marks)

6 There are some counters in a bag.
The counters are red or white or blue or yellow.

Bob is going to take at random a counter from the bag.

The table shows each of the probabilities that the counter will be blue or will be yellow.

Colour	red	white	blue	yellow
Probability			0.45	0.25

There are 18 blue counters in the bag.

The probability that the counter Bob takes will be red is twice the probability that the counter will be white.

(a) Work out the number of red counters in the bag.

(4)

A marble is going to be taken at random from a box of marbles.
The probability that the marble will be silver is 0.5

There must be an even number of marbles in the box.

(b) Explain why.

(1)

(Total for Question 6 is 5 marks)



22 There are only r red counters and g green counters in a bag.

A counter is taken at random from the bag.

The probability that the counter is green is $\frac{3}{7}$

The counter is put back in the bag.

2 more red counters and 3 more green counters are put in the bag.

A counter is taken at random from the bag.

The probability that the counter is green is $\frac{6}{13}$

Find the number of red counters and the number of green counters that were in the bag originally.

red counters.....

green counters.....

(Total for Question 22 is 5 marks)

TOTAL FOR PAPER IS 80 MARKS



18 There are only 4 red counters, 3 yellow counters and 1 green counter in a bag.

Tony takes at random three counters from the bag.

Work out the probability that there are now more yellow counters than red counters in the bag.

You must show all your working.

(Total for Question 18 is 5 marks)



2 There are only red counters, white counters, blue counters and green counters in a bag.

Chris is going to take at random a counter from the bag.

The table shows the probability that he will take a red counter and the probability that he will take a white counter.

Colour	red	white	blue	green
Probability	0.3	0.1		

There are twice as many blue counters as there are green counters in the bag.

(a) Work out the probability that Chris will take a blue counter.

.....
(3)

There are 45 red counters in the bag.

(b) Work out the total number of counters in the bag.

.....
(2)

(Total for Question 2 is 5 marks)

SUB-TOPIC P1b

SAMPLE SPACES, TWO-WAY TABLES & LISTING

Sub-topic P1b · 2 questions · 7 marks · lowest tariff first



- 3 200 students chose one language to study.
Each student chose one language from French or Spanish or German.

Of the 200 students,

90 are boys and the rest of the students are girls

70 chose Spanish

60 of the 104 students who chose French are boys

18 girls chose German.

Work out how many boys chose Spanish.

(Total for Question 3 is 3 marks)



8 60 people were asked if they prefer to go on holiday in Britain or in Spain or in Italy.

38 of the people were male.

11 of the 32 people who said Britain were female.

8 males said Italy.

12 people said Spain.

One of the females is chosen at random.

What is the probability that this female said Spain?

(Total for Question 8 is 4 marks)



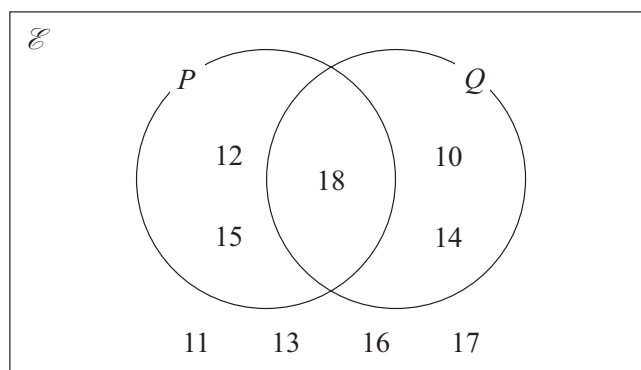
SUB-TOPIC P1c

VENN DIAGRAMS & SET NOTATION

Sub-topic P1c · 9 questions · 45 marks · lowest tariff first



4 Here is a Venn diagram.



(a) Write down the numbers that are in set P'

(1)

A number is chosen at random from the universal set, $\mathcal{E}$

(b) Find the probability that this number is in the set $P \cup Q$

(2)

(Total for Question 4 is 3 marks)



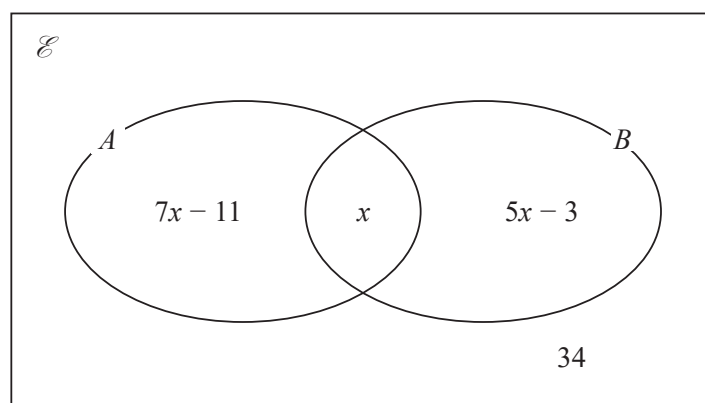
21 Vicky has a collection of medals.

The Venn diagram gives information about the number of medals in her collection where

$$\mathcal{E} = \{\text{all medals}\}$$

$$A = \{\text{English medals}\}$$

$$B = \{\text{gold medals}\}$$



Vicky is going to take at random a medal from her collection.

Given that the medal is gold, the probability that the medal is English is $\frac{2}{11}$

Work out the number of medals in Vicky's collection.

(Total for Question 21 is 4 marks)

TOTAL FOR PAPER IS 80 MARKS



20 50 people were asked if they speak French or German or Spanish.

Of these people,

31 speak French

2 speak French, German and Spanish

4 speak French and Spanish but not German

7 speak German and Spanish

8 do not speak any of the languages

all 10 people who speak German speak at least one other language

Two of the 50 people are chosen at random.

Work out the probability that they both only speak Spanish.

(Total for Question 20 is 5 marks)

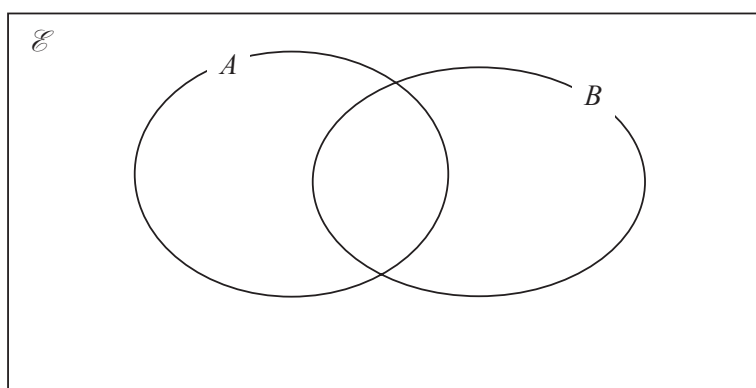


Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

- 1 $\mathcal{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$
 $A = \{1, 5, 6, 8, 9\}$
 $B = \{2, 6, 9\}$



- (a) Complete the Venn diagram to represent this information.

(3)

A number is chosen at random from the universal set $\mathcal{E}$.

- (b) Find the probability that the number is in the set $A \cap B$

(2)

(Total for Question 1 is 5 marks)

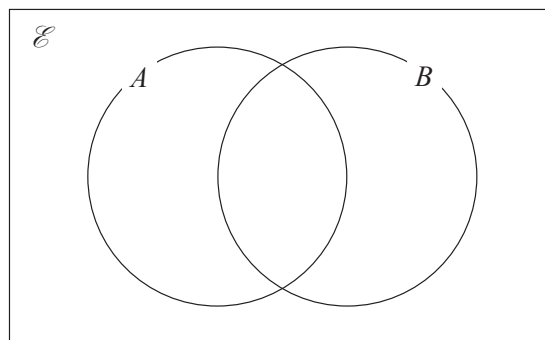


2 $\mathcal{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

$A = \{\text{even numbers}\}$

$B = \{\text{factors of 10}\}$

(a) Complete the Venn diagram for this information.



(3)

A number is chosen at random from the universal set, $\mathcal{E}$

(b) Find the probability that this number is in the set $A \cap B$

.....
(2)

(Total for Question 2 is 5 marks)

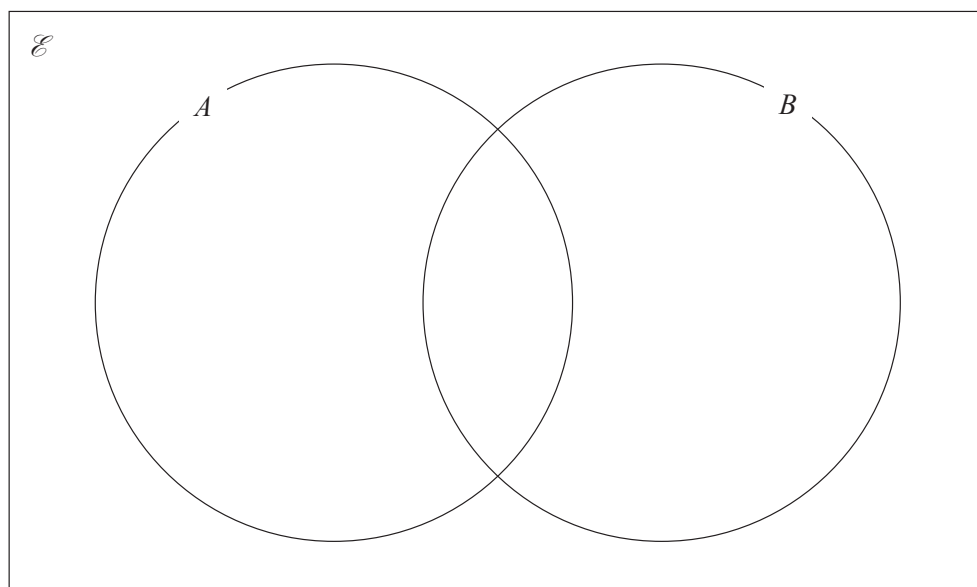


5 $\mathcal{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

$A = \{\text{odd numbers}\}$

$B = \{\text{square numbers}\}$

(a) Complete the Venn diagram for this information.



(3)

A number is chosen at random from the universal set $\mathcal{E}$

(b) Find the probability that this number is in the set B'

(2)

(Total for Question 5 is 5 marks)



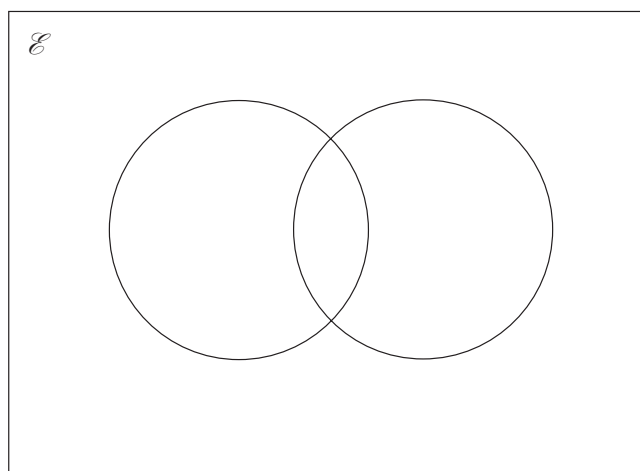
Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

- 1 $\mathcal{E} = \{\text{odd numbers less than } 30\}$
 $A = \{3, 9, 15, 21, 27\}$
 $B = \{5, 15, 25\}$

(a) Complete the Venn diagram to represent this information.



(4)

A number is chosen at random from the universal set, $\mathcal{E}$.

(b) What is the probability that the number is in the set $A \cup B$?

(2)

(Total for Question 1 is 6 marks)



Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

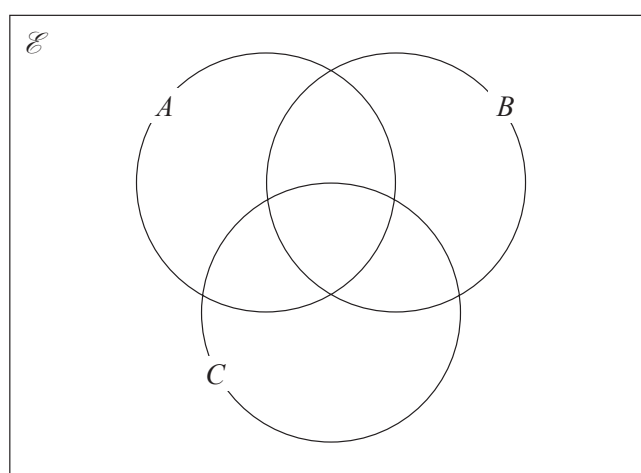
- 1 $\mathcal{E} = \{\text{even numbers between 1 and 25}\}$

$$A = \{2, 8, 10, 14\}$$

$$B = \{6, 8, 20\}$$

$$C = \{8, 18, 20, 22\}$$

- (a) Complete the Venn diagram for this information.



(4)

A number is chosen at random from $\mathcal{E}$.

- (b) Find the probability that the number is a member of $A \cap B$.

(2)

(Total for Question 1 is 6 marks)



18 Magda carried out a survey to find out the drinks that people like.

She asked 100 people if they like coffee (C) or tea (T) or hot chocolate (H).

32 people like all three drinks.

15 people like coffee and hot chocolate but **not** tea.

43 people like coffee and tea.

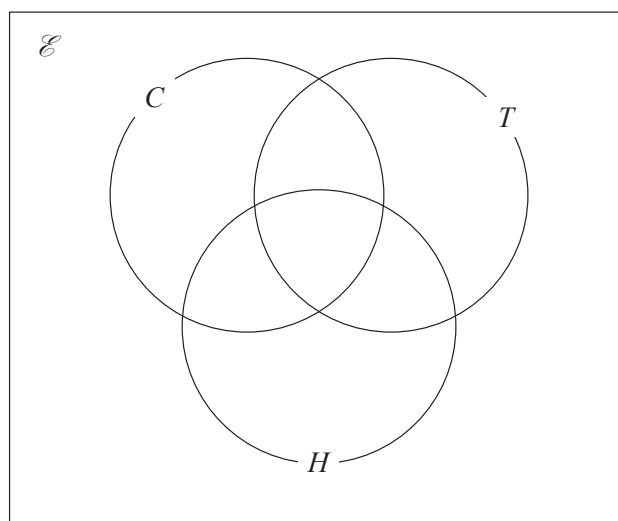
39 people like tea and hot chocolate.

67 people like coffee.

58 people like hot chocolate.

5 people like **only** tea.

(a) Complete the Venn diagram for this information.



(4)

One of the people is chosen at random.

Given that this person likes coffee,

(b) find the probability that this person also likes hot chocolate.

(2)

(Total for Question 18 is 6 marks)



SUB-TOPIC P1d

TREE DIAGRAMS, COMBINED & CONDITIONAL PROBABILITY

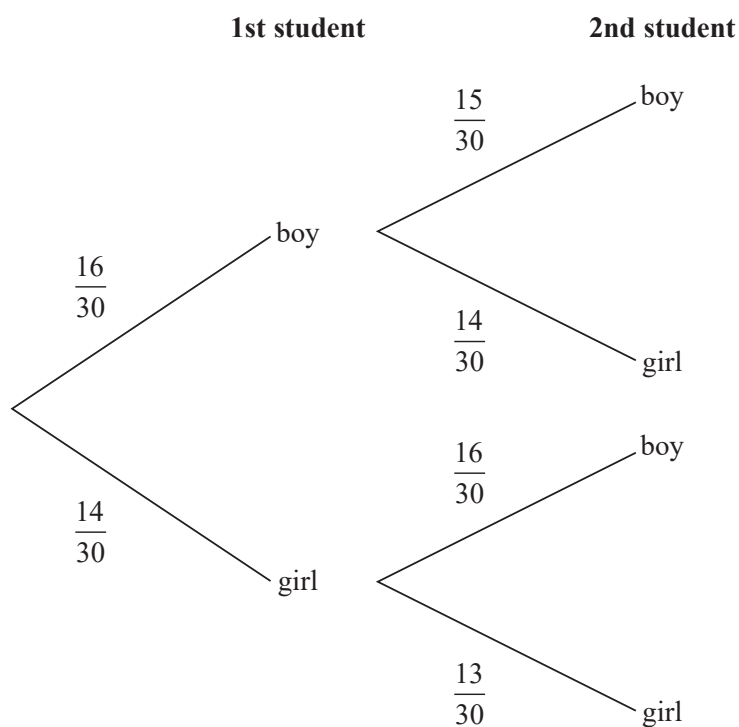
Sub-topic P1d · 35 questions · 139 marks · lowest tariff first



- 12 There are 30 students in Mr Lear's class.
16 of the students are boys.

Two students from the class are chosen at random.

Mr Lear draws this probability tree diagram for this information.



- (a) Write down **one** thing that is wrong with the probabilities in the probability tree diagram.

(1)

Owen and Wasim play for the school football team.

The probability that Owen will score a goal in the next match is 0.4

The probability that Wasim will score a goal in the next match is 0.25

Mr Slater says,

“The probability that both boys will score a goal in the next match is $0.4 + 0.25$ ”

- (b) Is Mr Slater right?

Give a reason for your answer.

(1)

(Total for Question 12 is 2 marks)



20 Here are the first five terms of a sequence.

−1 0 3 8 15

Find an expression, in terms of n , for the n th term of this sequence.

(Total for Question 20 is 2 marks)

21 When a biased coin is thrown 4 times, the probability of getting 4 heads is $\frac{16}{81}$

Work out the probability of getting 4 tails when the coin is thrown 4 times.

(Total for Question 21 is 2 marks)



19 At the start of year n , the number of animals in a population is P_n

At the start of the following year, the number of animals in the population is P_{n+1} where

$$P_{n+1} = kP_n$$

At the start of 2017 the number of animals in the population was 4000

At the start of 2019 the number of animals in the population was 3610

Find the value of the constant k .

(Total for Question 19 is 3 marks)

20 Pat throws a fair coin n times.

Find an expression, in terms of n , for the probability that Pat gets at least 1 head and at least 1 tail.

(Total for Question 20 is 2 marks)



16 There are only n orange sweets and 1 white sweet in a bag.

Saira takes at random a sweet from the bag and eats the sweet.

She then takes at random another sweet from the bag and eats this sweet.

Show that the probability that Saira eats two orange sweets is $\frac{n-1}{n+1}$

(Total for Question 16 is 2 marks)

17 (a) Rationalise the denominator of $\frac{1}{\sqrt{7}}$

.....
(1)

(b) Simplify fully $\sqrt{80} - \sqrt{5}$

.....
(2)

(Total for Question 17 is 3 marks)

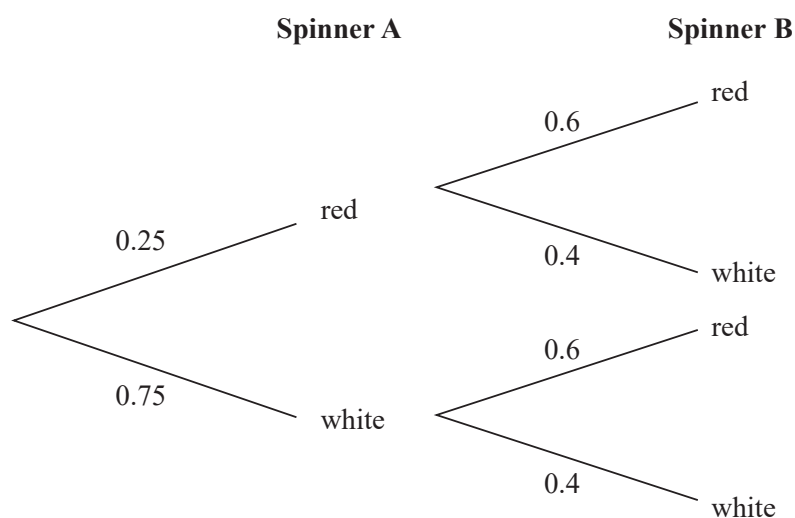


- 12 Alan has two spinners, spinner **A** and spinner **B**.
Each spinner can land on only red or white.

The probability that spinner **A** will land on red is 0.25

The probability that spinner **B** will land on red is 0.6

The probability tree diagram shows this information.



Alan spins spinner **A** once and he spins spinner **B** once.
He does this a number of times.

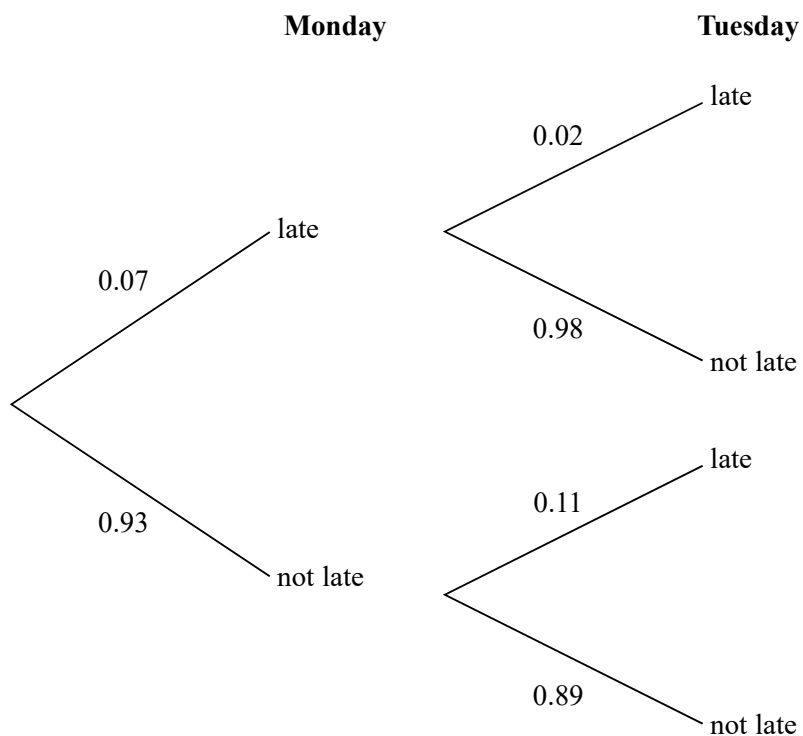
The number of times **both** spinners land on red is 24

Work out an estimate for the number of times **both** spinners land on white.

(Total for Question 12 is 3 marks)



- 11 The probability tree diagram shows the probabilities that Bismah will be late for work on two days next week.



Calculate the probability that Bismah will be late on exactly one of the two days.

(Total for Question 11 is 3 marks)



- 14 Sally plays two games against Martin.
In each game, Sally could win, draw or lose.

In each game they play,
the probability that Sally will win against Martin is 0.3
the probability that Sally will draw against Martin is 0.1

Work out the probability that Sally will win **exactly** one of the two games against Martin.

.....
(Total for Question 14 is 3 marks)

- 15 The straight line L_1 has equation $y = 3x - 4$
The straight line L_2 is perpendicular to L_1 and passes through the point (9, 5)
Find an equation of line L_2

.....
(Total for Question 15 is 3 marks)



20 Alfie has 11 cards.

He has

3 blue cards
7 green cards
and 1 white card.

Alfie takes at random 2 of these cards.

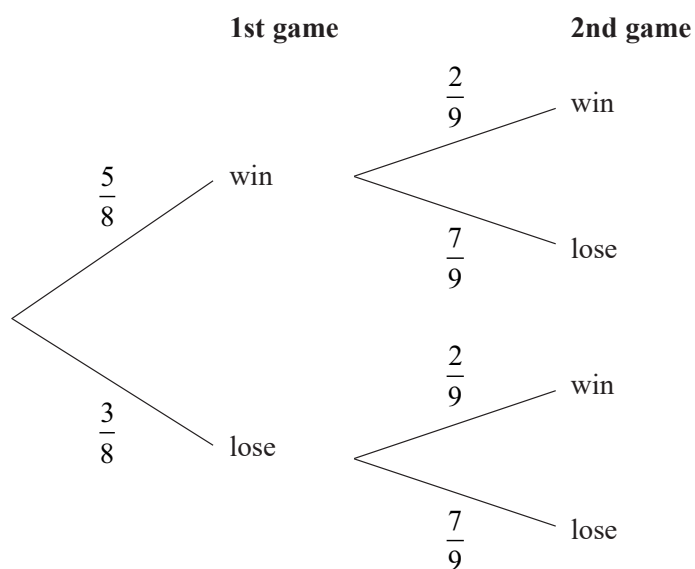
Work out the probability that he takes cards of different colours.

(Total for Question 20 is 3 marks)



12 Martha plays a game twice.

The probability tree diagram shows the probabilities that Martha will win or lose each game.



Find the probability that Martha will lose at least one game.

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



10 There are only red counters and yellow counters in bag **A**.

number of red counters : number of yellow counters = 3 : 5

There are only green counters and blue counters in bag **B**.

The number of counters in bag **B** is half the number of counters in bag **A**.

Given that there are x red counters in bag **A**,

use algebra to show that the total number of counters in bag **A** and bag **B** is $4x$

(Total for Question 10 is 3 marks)



17 There are 9 counters in a bag.

7 of the counters are green.

2 of the counters are blue.

Ria takes at random two counters from the bag.

Work out the probability that Ria takes one counter of each colour.

You must show your working.

(Total for Question 17 is 4 marks)



21 There are 12 counters in a bag.

There is an equal number of red counters, blue counters and yellow counters in the bag.
There are no other counters in the bag.

3 counters are taken at random from the bag.

(a) Work out the probability of taking 3 red counters.

.....
(2)

The 3 counters are put back into the bag.

Some more counters are now put into the bag.

There is still an equal number of red counters, blue counters and yellow counters in the bag.
There are no counters of any other colour in the bag.

3 counters are taken at random from the bag.

(b) Is it now less likely or equally likely or more likely that the 3 counters will be red?
You must show how you get your answer.

(2)

(Total for Question 21 is 4 marks)



15 The equation of a circle is $x^2 + y^2 = 42.25$

Find the radius of the circle.

(Total for Question 15 is 1 mark)

16 There are only red counters and blue counters in a bag.

Joe takes at random a counter from the bag.

The probability that the counter is red is 0.65

Joe puts the counter back into the bag.

Mary takes at random a counter from the bag.

She puts the counter back into the bag.

(a) What is the probability that Joe and Mary take counters of different colours?

(2)

There are 78 red counters in the bag.

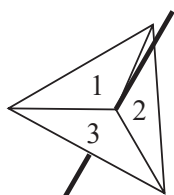
(b) How many blue counters are there in the bag?

(2)

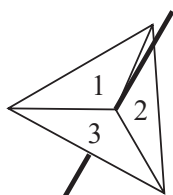
(Total for Question 16 is 4 marks)



- 5** Amanda has two fair 3-sided spinners.



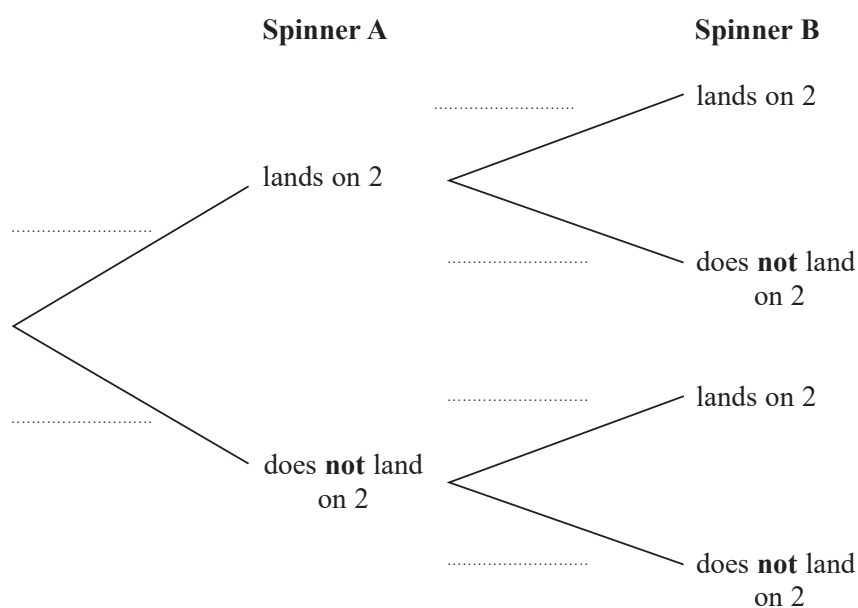
Spinner A



Spinner B

Amanda spins each spinner once.

- (a) Complete the probability tree diagram.



(2)

- (b) Work out the probability that Spinner A lands on 2 and Spinner B does **not** land on 2

(2)

(Total for Question 5 is 4 marks)

16 There are only 3 red counters and 5 yellow counters in a bag.

Jude takes at random 3 counters from the bag.

Work out the probability that he takes exactly one red counter.

(Total for Question 16 is 4 marks)



20 In a village,

if it rains on one day, the probability that it will rain on the next day is 0.8

if it does **not** rain on one day, the probability that it will rain on the next day is 0.6

A weather forecaster says,

“There is a 70% chance that it will rain in the village on Monday.”

Work out an estimate for the probability that it will rain in the village on Wednesday.

You must show all your working.

(Total for Question 20 is 4 marks)



16 A first aid test has two parts, a theory test and a practical test.

The probability of passing the theory test is 0.75

The probability of passing only one of the two parts is 0.36

The two events are independent.

Work out the probability of passing the practical test.

(Total for Question 16 is 4 marks)



21 Ray has nine cards numbered 1 to 9



Ray takes at random three of these cards.

He works out the sum of the numbers on the three cards and records the result.

Work out the probability that the result is an even number.

(Total for Question 21 is 4 marks)

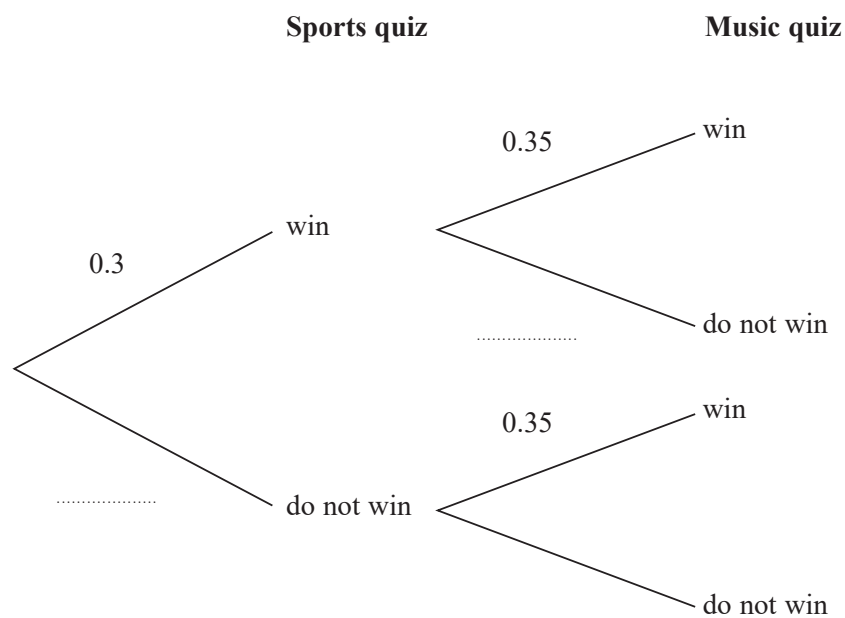


- 6 One weekend the Keddie family is going to do a sports quiz and a music quiz.

The probability that the family will win the sports quiz is 0.3

The probability that the family will win the music quiz is 0.35

- (a) Complete the probability tree diagram.



(2)

- (b) Work out the probability that the Keddie family will win both the sports quiz and the music quiz.

(2)

(Total for Question 6 is 4 marks)



18 Spinner A and spinner B are each spun once.

The probability that spinner A lands on red is $\frac{1}{4}$

The probability that both spinner A and spinner B land on red is $\frac{1}{24}$

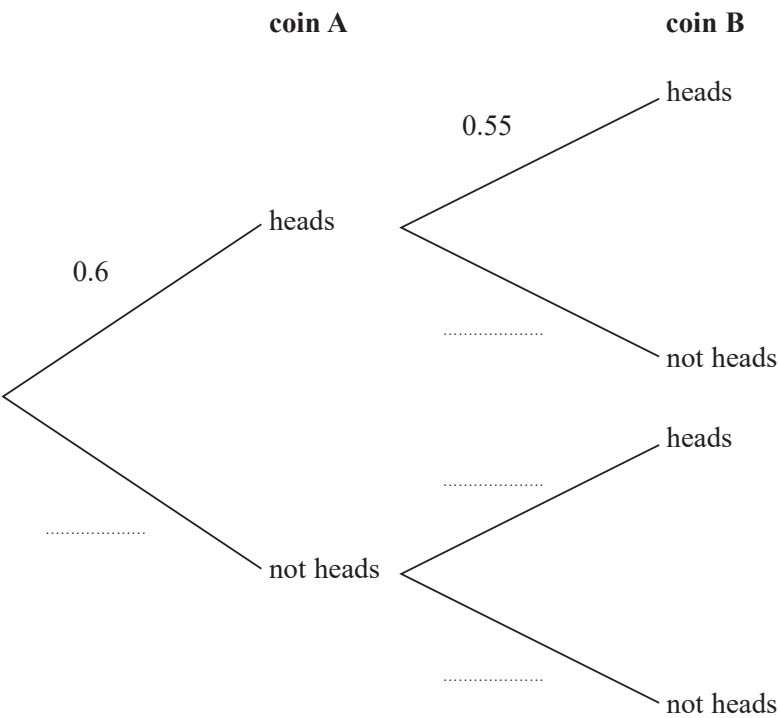
Work out the probability that one spinner lands on red and the other spinner does **not** land on red.

.....
(Total for Question 18 is 4 marks)



- 6 Tim has two biased coins, coin **A** and coin **B**.
He is going to throw both coins.
- The probability that coin **A** will land on heads is 0.6
The probability that coin **B** will land on heads is 0.55

(a) Complete the probability tree diagram.



(2)

Tim throws coin **A** once and he throws coin **B** once.

- (b) Work out the probability that both coins land on heads.

(2)

(Total for Question 6 is 4 marks)



- 19 In the semi-finals of a chess tournament,
player **A** will play player **B**
and player **C** will play player **D**.

The two winners will then play each other in the final.

The probability that player **A** will win against player **B** is 0.6

The probability that player **A** will win against player **C** is 0.5

The probability that player **A** will win against player **D** is 0.3

The probability that player **C** will win against player **D** is 0.2

Work out the probability that player **A** will win the chess tournament.

(Total for Question 19 is 4 marks)

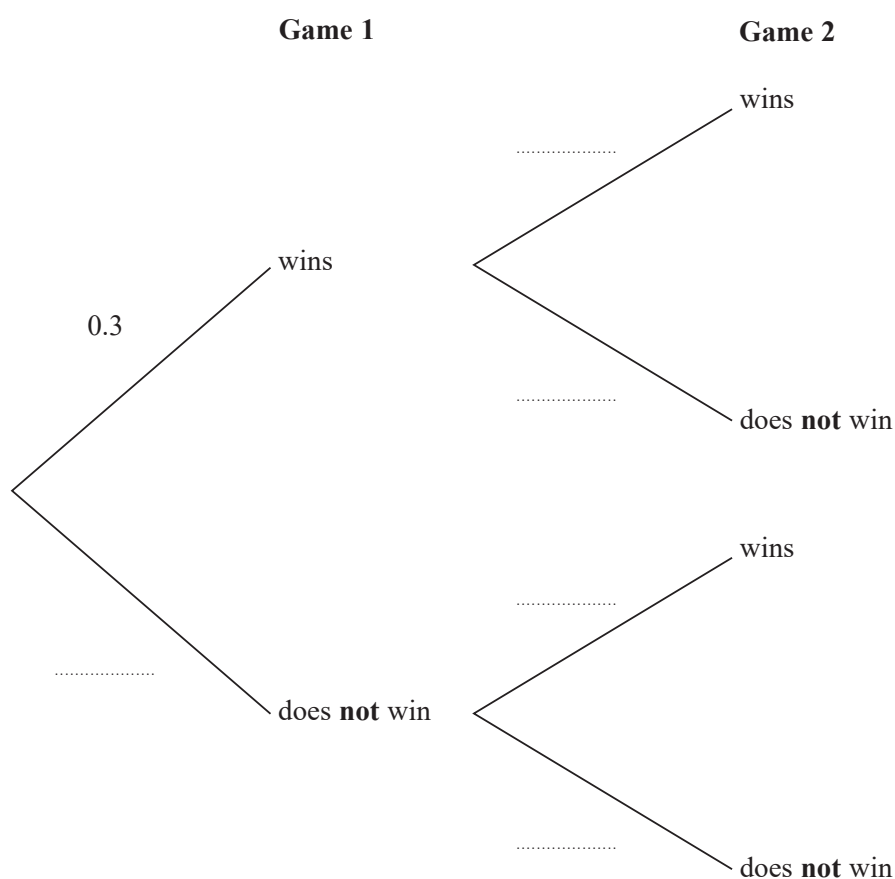


4 Dan is playing cards.

The probability that he will win a game of cards is 0.3

Dan plays two games of cards.

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that Dan does **not** win either game.

(2)

(Total for Question 4 is 4 marks)

15 There are only 7 blue pens and 3 red pens in a box.

Raja takes at random one of the pens.

He notes the colour of the pen and puts the pen back into the box.

Raja does this two more times.

Show that the probability that Raja takes at least two blue pens is $\frac{98}{125}$

(Total for Question 15 is 4 marks)



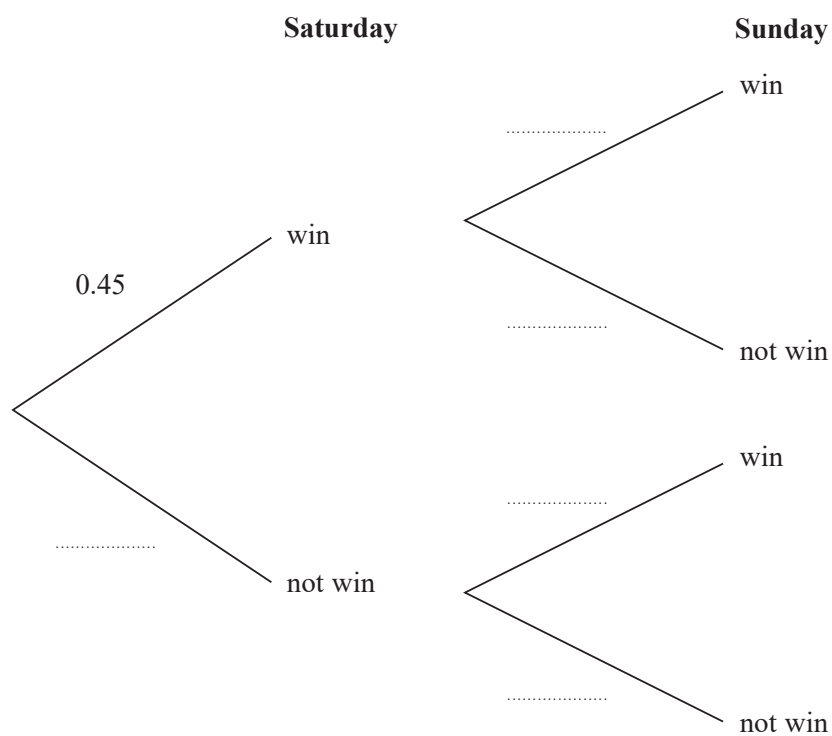
15 A darts team is going to play a match on Saturday and on Sunday.

The probability that the team will win on Saturday is 0.45

If they win on Saturday, the probability that they will win on Sunday is 0.67

If they do **not** win on Saturday, the probability that they will win on Sunday is 0.35

(a) Complete the probability tree diagram.



(2)

(b) Find the probability that the team will win exactly one of the two matches.

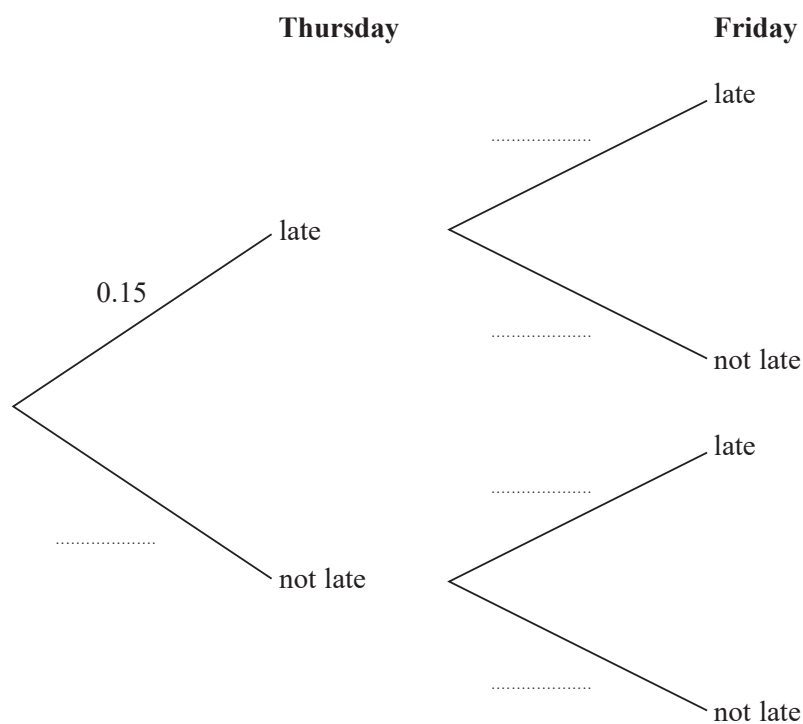
(3)

(Total for Question 15 is 5 marks)



- 10 Mary travels to work by train every day.
The probability that her train will be late on any day is 0.15

(a) Complete the probability tree diagram for Thursday and Friday.



(2)

- (b) Work out the probability that her train will be late on at least one of these two days.

(3)

(Total for Question 10 is 5 marks)



24 There is a total of y counters in a box.

There are x pink counters and 5 blue counters in the box.

The rest of the counters are green.

$$x:y = 1:3$$

Freda takes at random two counters from the box.

Find, in terms of x , an expression for the probability that Freda takes two counters of the same colour.

Give your answer as a fraction in the form $\frac{ax^2 + bx + c}{dx^2 + ex}$ where a , b , c , d and e are integers.

(Total for Question 24 is 5 marks)

TOTAL FOR PAPER IS 80 MARKS



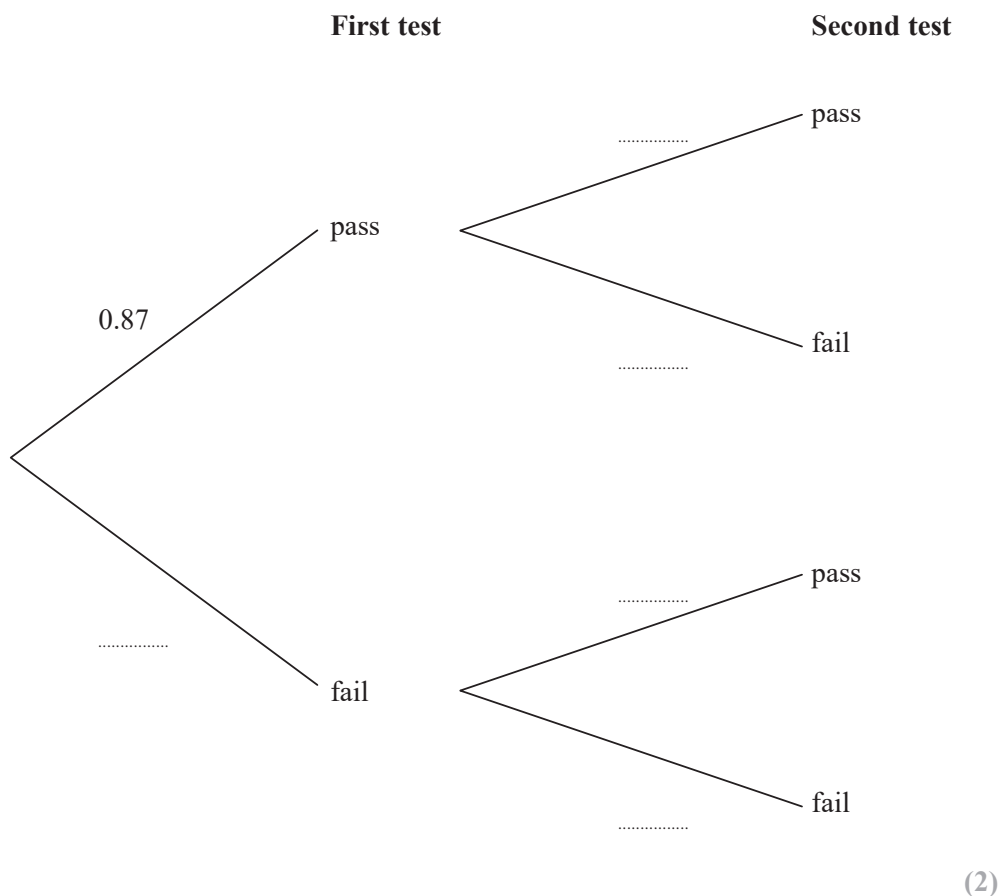
- 10** Shakir has to complete two tests.
He can either pass or fail each test.

The probability that he will pass the first test is 0.87

If he passes the first test the probability he will pass the second test is 0.94

If he fails the first test the probability he will pass the second test is 0.73

- (a) Complete the probability tree diagram for this information.



- (b) Work out the probability that Shakir passes at least one of the tests.

(3)

(Total for Question 10 is 5 marks)



22 There are only red counters and yellow counters in a box.

$\frac{3}{5}$ of the counters are red.

Sophie takes at random two counters from the box.

The probability that the two counters are the same colour is $\frac{41}{80}$

Work out the number of yellow counters in the box.
You must show all your working.

(Total for Question 22 is 5 marks)

TOTAL FOR PAPER IS 80 MARKS



14 There are nine balls labelled 1 to 9 in a box.

Lee will take at random two balls from the box.

Lee says,

“The probability that the sum of the numbers on the two balls will be an even number is greater than the probability that the product of the numbers will be an even number.”

Is Lee correct?

You must show how you get your answer.

(Total for Question 14 is 5 marks)

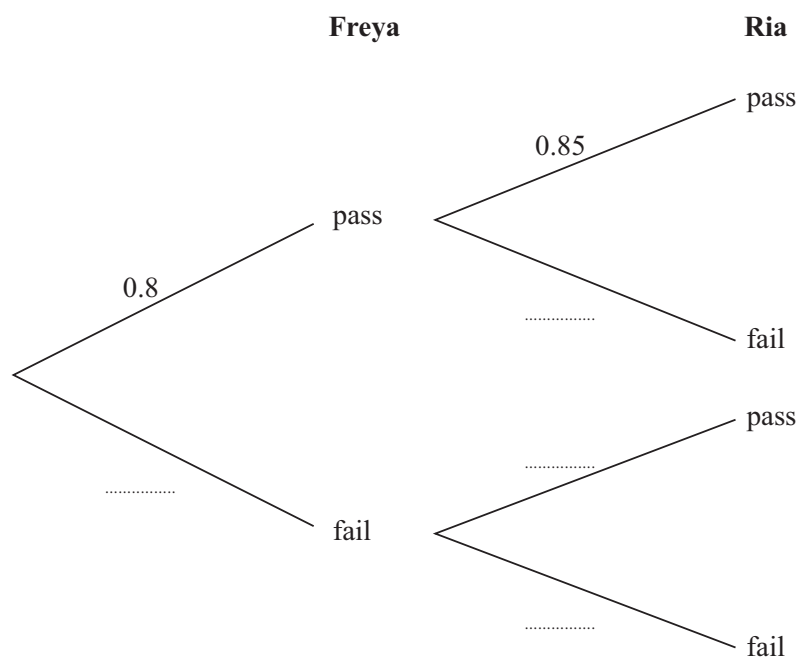


11 Freya and Ria each do an exam.

The probability that Freya will pass the exam is 0.8

The probability that Ria will pass the exam is 0.85

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that only one of Freya or Ria will pass the exam.

(3)

(Total for Question 11 is 5 marks)



22 There are only green pens and blue pens in a box.

There are three more blue pens than green pens in the box.

There are more than 12 pens in the box.

Simon is going to take at random two pens from the box.

The probability that Simon will take two pens of the same colour is $\frac{27}{55}$

Work out the number of green pens in the box.

(Total for Question 22 is 6 marks)

TOTAL FOR PAPER IS 80 MARKS



16 A shop manager wants to advertise special offers on social media platforms.

The manager asks 100 customers which of type A , type B or type C they use.

Of these customers,

4 use all three types

16 do not use any of type A , type B or type C

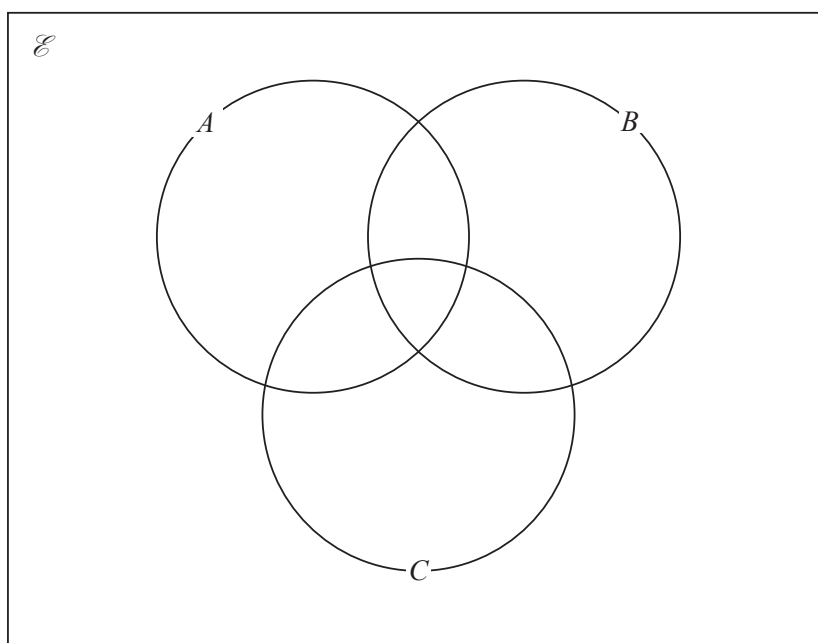
8 use both type A and type B , but not type C

14 use both type B and type C

62 in total use type A

all 20 who use type C also use at least one of type A and type B .

(a) Complete the Venn diagram for this information.



(4)

One of the customers is chosen at random.

Given that this customer uses type A ,

(b) find the probability that this customer also uses type B .

(2)

(Total for Question 16 is 6 marks)

20 There are only red sweets and yellow sweets in a bag.

There are n red sweets in the bag.

There are 8 yellow sweets in the bag.

Sajid is going to take at random a sweet from the bag and eat it.

He says that the probability that the sweet will be red is $\frac{7}{10}$

(a) Show why the probability cannot be $\frac{7}{10}$

(3)

After Sajid has taken the first sweet from the bag and eaten it, he is going to take at random a second sweet from the bag.

Given that the probability that both the sweets he takes will be red is $\frac{3}{5}$

(b) work out the number of red sweets in the bag.
You must show all your working.



(5)

(Total for Question 20 is 8 marks)



MARK SCHEMES

official mark schemes, in the same order as the questions



Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
3	2^6	M1 A1	for the start of a method of simplification, eg $2^{-5+8} (= 2^3)$ or $2^{-5 \times 2} (= 2^{-10})$ or $2^{8 \times 2} (= 2^{16})$ cao SC B1 for answer of 64 or 8^2 or 4^3 if M0 scored.	
4	0.00128	M1 A1	for digits 128 or for correct placement of the decimal point following one arithmetical error, eg $32 \times 4 = 138$ with an answer of 0.00138 for 0.00128 or 1.28×10^{-3}	
5	7500	M1 A1	for method to find expected number of model B, eg $\frac{15}{80} \times 40000$ oe or $\frac{15}{23+15+30+12} \times 40000$ oe cao	

Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
22	$1 - \left(\frac{4}{5}\right)^n - \left(\frac{1}{5}\right)^n$	P1 A1	for start to the process, eg P(at least one blue and at least one red) = $1 - P(\text{all blue}) - P(\text{all red})$ oe or $P(\text{all blue}) = \left(\frac{4}{5}\right)^n$ oe or $P(\text{all red}) = \left(\frac{1}{5}\right)^n$ for $1 - \left(\frac{4}{5}\right)^n - \left(\frac{1}{5}\right)^n$ oe	
23	Shown	M1 M1 C1	for start to process using ratio, eg $1 : 1 + 2 : 1 + 2 + 3 (= 1 : 3 : 6)$ for process to write down ratio of areas of triangles eg $1^2 : 3^2 : 6^2 (= 1 : 9 : 36)$ for correct working leading to answer, eg $1 : 9 - 1 : 36 - 9 = 1 : 8 : 27$	Values may not be seen in a ratio, can still award M marks May be seen combined with algebra

Paper: 1MA1/3H																
Question	Answer	Mark	Mark scheme	Additional guidance												
1 (a)	4.68×10^5	B1	cao													
	0.000 503 7	B1	cao													
2	80	M1	for complete method, eg 200×0.4 or for $\frac{80}{200}$ for the answer													
		A1	cao													
3 (a)	24.6	M1	for finding 5 products within intervals (including end points) with not more than one error, may be seen near table. eg $2 \times 12.5 (= 25)$, $8 \times 17.5 (= 140)$, $13 \times 22.5 (= 292.5)$, $21 \times 27.5 (= 577.5)$, $6 \times 32.5 (= 195)$ or for 1230	<table><tr><td>Min fx</td><td>Max fx</td></tr><tr><td>20</td><td>30</td></tr><tr><td>120</td><td>160</td></tr><tr><td>260</td><td>325</td></tr><tr><td>525</td><td>630</td></tr><tr><td>180</td><td>210</td></tr></table>	Min fx	Max fx	20	30	120	160	260	325	525	630	180	210
				Min fx	Max fx											
		20	30													
		120	160													
260	325															
525	630															
180	210															
M1	for $\Sigma fx \div \Sigma f$ eg $(\text{"25"} + \text{"140"} + \text{"292.5"} + \text{"577.5"} + \text{"195"}) \div \text{"50"}$ or $\text{"1230"} \div \text{"50"}$	Σfx must come from 5 products, fx within intervals (including end points)														
A1	for 24.6 oe															

Paper: 1MA1/2H				
Question	Working	Answer	Mark	Notes
1		98	P1 P1 A1	for process to find $P(1)$, eg. $1 - 0.17 - 0.18 - 0.09 - 0.15 - 0.1 (= 0.31)$ or for a process to find $P(1 \text{ or } 3)$, eg. $1 - 0.17 - 0.09 - 0.15 - 0.1 (= 0.49)$ for process to find the number of 3s eg. $0.18 \times 200 (= 36)$ or process to find the number of 1s, e.g. $P(1) \times 200 (= 62)$, or process to find the number of (1 or 3)s, eg. $[P(1) + 0.18] \times 200$ or for process to find any expected frequency using any probability $\times 200$ eg. 0.17×200 cao
			OR	
			P1 P1 A1	for process to find $P(2 \text{ or } 4 \text{ or } 5 \text{ or } 6)$, eg. $0.17 + 0.09 + 0.15 + 0.1 (= 0.51)$ for process to find the number of (2 or 4 or 5 or 6)s, eg. " 0.51 " $\times 200 (= 102)$ cao



Paper: 1MA1/2H				
Question	Working	Answer	Mark	Notes
3 (a)		31.4	P1	for working with circumference formula, eg $\pi \times 80$ (=251. ...) oe
			A1	for answer in the range 31.4 to 31.5 accept 10π
			C1	Mean distance stays the same with reason, eg total distance remains unchanged or same number of points
4		$\frac{1}{11}$	P1	for starting the process, eg by writing down a correct ratio or using a given number of cubes for one relationship, eg 2B 1Y or B:Y = 2:1 or 4G 1B or G:B = 4:1 or 8G, 1Y or G:Y = 8:1 oe or yellow = 2, blue = 4, or states 2:1:8 oe in any order (can be algebraic)
			P1	for complete process to find possible number of each colour or equivalent ratio, eg 8G 2B 1Y or G:B:Y = 8:2:1 oe or yellow = 2, blue = 4, green = 16 oe (can be algebraic)
			A1	$\frac{1}{11}$ oe
5 (a)		(-2, 1) (-4, 1) (-2, 2) (-5, 2)	B1	Shape labelled A
			B1	Shape labelled B
(b)		(1, -4) (3, -4) (1, -5) (4, -5)		



Paper: 1MA1/3H				
Question	Working	Answer	Mark	Notes
8 (a) (b)		Mel (supported) $\frac{2}{9}$	B1	Mel with reference to greatest number of throws
			M1	selects overall total and multiplies P(point up)×P(point down) eg $\frac{50}{150} \times \frac{100}{150}$ oe (accept $\frac{14}{45} \times \frac{31}{45}$ or $\frac{27}{80} \times \frac{53}{80}$ or $\frac{9}{25} \times \frac{16}{25}$)
			A1	for $\frac{2}{9}$ oe
9 (a) (b)		5	M1	evaluates $(0.85)^n$ or $12\,500 \times (0.85)^n$ for at least one value of n
			A1	cao
		2.4	P1	for a process to find the amount of interest before tax, eg $79.20 \div 0.6 (= 132)$
			P1	for a process to find value of R , eg “132”÷5500×100
10 (a) (b)		0.05 20 Reason	B1	for 0.05 oe
			C1	for stating that at least 20 required
			C1	for reason eg explains that number of each colour must be a whole number or that there must be (at least) 1 red counter or shows that $0.05 = \frac{1}{20}$



Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
16	0.12	P1 P1 A1	for process to start eg $(1 - 0.2) \div (3 + 17)$ (= 0.04) or $(3 + 17) \div (1 - 0.2)$ oe (= 25) or $(100 - 20) \div (3 + 17)$ (= 4) or 3×4 (= 12) and 17×4 (= 68) full process to find the required probability eg $3 \times "0.04"$ or $\frac{3}{20} \times (1 - 0.2)$ oe or $3 \div "25"$ or $3 \times "4" \div 100$ oe	Just $1 - 0.2 = 0.8$ is not sufficient for P1 May be seen in a ratio 0.12 using incorrect probability notation gets P2
17	$\frac{3x+1}{2x}$	M1 A1 A1	for $(3x+1)(x-3)$ or $2x(x-3)$ for $(3x+1)(x-3)$ and $2x(x-3)$ $\frac{3x+1}{2x}$ oe	Accept $(2x+0)$ for the first two marks but not for the final answer
18	Graph drawn	C2 (C1)	for graph translated by -2 in the y direction for a graph translated in the y direction OR for a correct graph through four of the five key points)	Key points: $(-180, -2)$, $(-90, -3)$, $(0, -2)$, $(90, -1)$, $(180, -2)$

Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
16	$\frac{52}{72}$	P1 P1 A1	for $\frac{4}{9} \times \frac{3}{8} \left(\frac{12}{72} \right)$ or $\frac{4}{9} \times \frac{5}{8}$ or $\frac{5}{9} \times \frac{4}{8} \left(\frac{20}{72} \right)$ for $1 - \left(\frac{5}{9} \times \frac{4}{8} \right)$ or $\frac{4}{9} \times \frac{3}{8} + \frac{4}{9} \times \frac{5}{8} + \frac{5}{9} \times \frac{4}{8}$ oe for $\frac{52}{72}$, $\frac{13}{18}$ oe SC B1 for answer of $\frac{56}{81}$ (replacement)	Accept equivalent fractions, decimals (0.72...) or percentages (72.22.....%)
17	61	B1 M1 A1	angle OAD = 90, may be marked on diagram method to work out angle OAB (=29) cao	Angle could be shown by a right-angle symbol Correct method can be implied from angles on the diagram if no ambiguity or contradiction. Reasons need not be given. Award 0 marks for an answer of 61 with no other working.
18	Bar of height 3.2	M1 M1 C1	method to find any frequency eg $1.2 \times 2.5 (=3)$ or $2 \times 2.5 (=5)$ or $2.8 \times 5 (=14)$ or $0.8 \times 12.5 (=10)$ or method to use areas eg $12 \times 5 (=60)$ or $20 \times 5 (=100)$ or $28 \times 10 (=280)$ or $8 \times 25 (=200)$ complete method to find total frequency for the four intervals eg "3" + "5" + "14" + "10" (=32) or "60" + "100" + "280" + "200" (=640) cao	Accept equivalent methods proportional to those shown



Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
23	$\frac{27}{56}$	P1	for $\frac{3}{8}$ and $\frac{7}{9}$ OR uses a total of 72 cards and shows a process to find the number of cards with a black shape or the number of cards with a triangle, eg $72 \div 8 \times 3 (=27)$ or $72 \div 9 \times 7 (=56)$	72 or any multiple of 72 Could be seen in a ratio, eg 27 : 45 or 16 : 56
		P1	for process shown to divide fractions $\frac{3}{8} \div \frac{7}{9}$ or $\frac{3}{8} \times \frac{9}{7}$ OR for $\frac{3}{8} \times \frac{9}{9} (= \frac{27}{72})$ and $\frac{7}{9} \times \frac{8}{8} (= \frac{56}{72})$ OR uses a total of 72 cards and shows a process to find the number of cards with a black shape and the number of cards with a triangle, eg $72 \div 8 \times 3 (=27)$ and $72 \div 9 \times 7 (=56)$	Accept the division shown as $\frac{\frac{3}{8}}{\frac{7}{9}}$ Could be seen in ratios, eg 27 : 45 and 16 : 56
		A1	for $\frac{27}{56}$ or any other equivalent fraction	Answer of 27 : 56 gets P2A0



Paper: IMA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
8	24	P1	for start to process of working out the unknown probabilities, eg $1 - 0.32 - 0.20 (= 0.48)$ or assigning probabilities as $5x$ and x or process to work out the number of blue or green counters, eg $0.32 \times 300 (= 96)$ or $0.20 \times 300 (= 60)$ or $0.52 \times 300 (= 156)$	Award for $P(R) + P(Y) = 0.48$, may be seen in table
		P1	for process to find the probability, eg $5x + x = "0.48"$ or $"0.48" \div 6 (= 0.08)$ or process to find the number of red or yellow counters, eg $300 - "96" - "60"$ or $300 \times "0.48"$	
		A1	cao	

Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
10	(a) 10, 25, 50, 80, 85, 100 (b) Graph drawn	B1	cao	
		M1	for 5 or 6 of their points plotted correctly from a cf table with no more than one error	If histograms drawn, plots must be identified.
		A1	for a fully correct graph SC B1 for 5 or 6 cf values plotted at correct heights not at end but consistently within each interval and joined provided no gradient is negative	Accept a smooth curve or line segments. Ignore to the left of the first point and right of the last point.
	(c) 35 to 39	B1	for answer in the range 35 to 39 or ft their graph (if possible)	
	(d) 85 to 93	M1	for finding the difference between readings taken from the profit axis at points from a cf of 25 and a cf of 75 ft their graph (if possible)	
		A1	for answer in the range 85 to 93 or ft their graph (if possible)	If answer is in the range award the marks unless from obvious incorrect working
11	8	P1	for a start to the process, eg $\frac{9}{9+4+x}$ or $(\frac{3}{7} \Rightarrow) \frac{9}{21}$ or states that the total number of sweets is 21	
		P1	for forming a correct equation without fractions, eg $9 \times 7 = 3(9 + 4 + x)$ or $21 = 9 + 4 + x$ OR for $21 - 9 - 4$ oe or $1 - \frac{9}{21} - \frac{4}{21} (= \frac{8}{21})$	
		A1	cao	



Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
18	Description	C1 C1	for translation for $\begin{pmatrix} 8 \\ 0 \end{pmatrix}$	Award no marks if more than one transformation May be described as, for example “by 8 units in the direction of the x axis”
19	16	P1 A1	for $\text{Prob}(\text{R or G}) = 1 - 0.4 (= 0.6)$ or for (number of red or green counters) = $50 - 0.4 \times 50 (= 30)$ or for use of ratio, eg $[\text{probability}] \times \frac{8}{15} (= 0.32)$ or $[\text{number of counters}] \times \frac{8}{15}$ P1 for a complete process to find number of green counters, eg $(1 - 0.4) \times \frac{8}{15} \times 50$ or for $\frac{16}{50}$ cao	 [probability] may be 0.4 or 0.6 [number of counters] may be 20 or 50
20	Proof	C1 C1 C1	for angle $EAC = \text{angle } EDB$ (Base angles of an <u>isosceles triangle</u> are equal) or for explanation that $AB + BC = BC + CD$ using ratio so $AC = DB$ oe or $AE = DE$ (given) for at least 2 correct pairings with reasons for a complete proof including all reasons given and SAS	Reasons must be linked to their method.



Paper: IMA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
1 (a)	0.4, 0.4	P1	for process to find sum of unknown probabilities, eg $1 - 0.2 (= 0.8)$	Award mark for any two probabilities given that sum to 0.8, eg given in the table Accept any equivalent fraction or 40%
		A1	oe	
		P1	for complete process to find total number of cubes, eg $12 \div 0.2$ or 12×5 or $(“0.4” \div 0.2) \times 12 + (“0.4” \div 0.2) \times 12 + 12$	
		A1	OR states $0.1 = 6$ or $0.4 = 24$ cao	
2 (a)	600	P1	for starting process to calculate amount of flour eg $60 \div 15 (= 4)$ or $3 \times 50 (= 150)$	4 implied by 200g of sugar
		P1	for complete process eg $\frac{60}{15} \times “150”$	
		A1	cao	
		P1	for process to calculate amount of butter eg $\frac{60}{15} \times 2 \times 50 (= 400)$	
(b)	2		OR for process to calculate the number of packs of butter needed eg [butter] $\div 250$	[butter] must be clearly stated or calculated, may be seen in part (a) 2 must not come from incorrect working
		A1	cao	

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
5	12	P1	for a process to find the fifth term, eg $3a + 5a (= 8a)$	[8a] allow use of what is clearly indicated as the missing term $\frac{228}{19}$ or $\frac{228}{1+2+3+5+8}$ scores P1 P1 $\frac{228}{1+2+3+5+[8]}$ scores P0P1
		P1	for setting up the equation eg $a + 2a + 3a + 5a + [8a] = 228$	
		A1	cao	
6	(a)	P1	for $1 - 0.05 - 0.15 (= 0.8)$	Award this mark for any two probabilities that sum to 0.8
		A1	oe	
	(b)	M1	$18 \div 0.15$ oe or $6 + 18 + a + b$ where $a + b = 96$	
		A1	cao	
7	18.3	P1	for finding the area of the triangle eg $0.5 \times 8 \times 8 (= 32)$	Accept rounded or truncated figures If the answer is given within the range but then rounded incorrectly award full marks.
		P1	for finding the area of the circle $\pi \times 8 \times 8 (= 201.06..)$	
		P1	for finding the area of the sector eg $\frac{1}{4} \times \pi \times 8^2$ or "201.06.." $\div 4 (= 50.26...)$	
		A1	for an answer in the range 18.2 to 18.3	
8	(a)	C1	Sketch	Accept freehand provided intention is clear
	(b)	C1	Sketch	



Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
10 (a)	$\frac{1}{16}$	M1	for method to find probability of getting a score of 5, eg $\frac{10}{6+8+9+7+10} (= \frac{10}{40})$ oe	Accept any equivalent fraction, decimal form 0.06(25) or 0.063, percentage form 6(.25)% or 6.3% Ignore subsequent incorrect attempts to write the correct answer in a different form.
		A1	for $\frac{1}{16}$ oe	
	15	M1	for method to find the proportion of 1s, eg $\frac{6}{40}$ oe	
		A1	cao	
11	Enlargement scale factor $\frac{1}{3}$ centre (0, 2)	B2 (B1)	for enlargement scale factor $\frac{1}{3}$ centre (0, 2) for any 2 aspects)	No marks if more than one transformation is given
12	$x = 3, y = -2$	M1 A1 M1 A1	for a correct method to eliminate either variable or rearrangement of one equation leading to substitution (condone one arithmetic error) for either correct value of x or correct value of y (dep M1) for a correct substitution of found value into one of the equations or a correct method leading to the second value (condone one arithmetic error) $x = 3, y = -2$	Trial and improvement methods score 0 marks unless both x and y are correct



Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
9 (a)	Graph drawn through (30, 20), (40, 48), (50, 64), (60, 75), (70, 80)	M1	for 4 or 5 points plotted correctly from the cumulative frequency table	Ignore to the left of the first point and right of the last point If histograms drawn, points must be identified
		A1	for a fully correct graph SCB1 if 4 or 5 points plotted not at end but consistent within each interval and joined by a curve or line segments providing no gradient is negative	Accept a smooth curve or line segments
		B1	for answer in range 36 to 38 or ft their cf graph	
10 (a)	$\frac{225}{3600}$	P1	for process to use relative frequency for landing on a 6, eg $\frac{15}{60}$ oe	Accept any equivalent fraction, decimal form 0.06(25) or 0.062 or 0.063, percentage form 6(.25)% or 6.2% or 6.3% Ignore subsequent attempts to write the correct answer in a different form.
		P1	for $\frac{15}{60} \times \frac{15}{60}$ oe, eg $\frac{1}{4} \times \frac{1}{4}$	
		A1	for $\frac{225}{3600}$ oe, eg $\frac{1}{16}$	
(b)	Explanation	C1	for a correct explanation Acceptable examples n must be greater than 60 She must do it more times than in (a) n must be bigger, eg 100 Not acceptable examples If you increase the number of results, you increase the accuracy n must be bigger n is an integer n is 100	



Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
4	70	P1	for process to find number of discs in the bag, eg $24 \div 0.16$ (=150) or for process to find the total probability of red or blue, eg $1 - 0.16$ (= 0.84 or $\frac{21}{25}$ oe)	May be implied by 126
		P1	for process to work with the ratio eg $([total] - 24) \div (5 + 4)$ (=14) or for a process to find the probability of red, eg $[probability] \div (5 + 4) \times 5$ (= 0.46... or $\frac{7}{15}$)	0.46 or better or 0.47 may imply P2 [total] can be any integer [probability] can be any value less than 1
		P1	for a complete correct process to find the number of red discs eg "14"×5 or "0.46..."×24÷0.16 or an answer of $\frac{70}{150}$	If correct processes seen to find the total for both red and blue or 70 : 56 award P3 Must come from correct use of probability and ratio in either order
		A1	for 70	If the values for red and blue are found, the value for red must be clearly identified as the answer to gain A1



Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
2 (a)	75	P1	for process to find sum of unknown probabilities eg $1 - (0.10 + 0.30 + 0.05 + 0.25) (= 0.3)$ oe or for process to find number of times dice lands on 3, 4, 5 or 6 eg $(0.10 + 0.30 + 0.05 + 0.25) \times 500 (= 350)$ oe	Award mark for any two probabilities that sum to 0.3 eg in the table or probability of 2 = 0.15
		P1	for a complete process, eg $(“0.3” \div 2) \times 500$ oe or $(500 - “350”) \div 2$ oe	P1P1A0 for answer of 75:500 or $\frac{75}{500}$
		A1	cao	
(b)	Answer to part (a) will be greater	C1	for an explanation that the answer will be greater Acceptable examples It makes the answer an underestimate The number will be higher The answer will increase / will go up The number of 2s will increase It would be more than [75] Not acceptable examples My answer will change My answer is incorrect The calculation will change The probability will change It would make the probability of 2 go up My answer won't change	Where [75] is their answer to (a)

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
6 (a)	8	P1	for process to find sum of unknown probabilities, eg $1 - 0.45 - 0.25 (= 0.3)$ OR to find the total number of counters in the bag, eg $\frac{18}{0.45} (= 40)$ OR to find the number of yellow counters, eg $\frac{0.25}{0.45} \times 18 (= 10)$	Award mark for any two probabilities given that sum to 0.3 eg given in the table.
		P1	for process to find $P(\text{red}) = 0.2$ oe or $P(\text{white}) = 0.1$ oe OR for process to find the total number of red and white counters, eg “40” – 18 – “10” (=12) OR for process to derive an equation in x , eg $2x + x = 1 - 0.45 - 0.25$ or $2x + x = “0.3”$ or $x = 0.1$	Award P2 for $P(\text{red})$ or $P(\text{white})$ (could be shown in table) Equations could be given as written statements or working but must be fully equivalent.
		P1	for a complete process to find the number of red counters, eg $\frac{2 \times 0.1}{0.45} \times 18$ or $\frac{2}{3} \times “12”$ or $0.2 \times “40”$ or $\frac{0.2}{0.025}$	
		A1	cao	
(b)	Explanation	C1	for explanation eg 0.5 multiplied by an odd number will never be a whole number, for half of a number to be an integer that number must be even, you can't have half a marble	



Paper: IMA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
22	12 red, 9 green	P1	for process to find a relationship between r and g eg $\frac{g}{r+g} = \frac{3}{7}$ or $\frac{g}{r} = \frac{3}{4}$	
		P1	for process to find a second relationship between r and g eg $\frac{g+3}{r+2+g+3} = \frac{6}{13}$ or $\frac{g+3}{r+2} = \frac{6}{7}$	
		P1	(dep P2) for start to process of solving pair of equations, eg eliminates one variable from the equations or removes fractions from both equations	
		P1	(dep P3) for complete process to solve equations to find g or r	
		A1	cao	
			OR	
		P1	for two of $3x+3$, $4x+2$ and $7x+5$	
		P1	for $\frac{3x+3}{7x+5} = \frac{6}{13}$	
		P1	(dep P2) for removing fractions from the equation, eg $13(3x+3) = 6(7x+5)$ or $39x+39 = 42x+30$	
		P1	(dep P3) for complete process to solve $13(3x+3) = 6(7x+5)$	
		A1	cao	



Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
18	$\frac{5}{28}$	P1	for a correct probability for 2 nd or 3 rd counter, eg $\frac{3}{7}$ or $\frac{4}{7}$ or $\frac{1}{7}$ or $\frac{1}{6}$ or $\frac{2}{6}$ or $\frac{3}{6}$	
		p1	for a correct product for 2 red and 1 green eg, $(P(RRG) = \frac{4}{8} \times \frac{3}{7} \times \frac{1}{6} = \frac{12}{336}$ or $\frac{1}{28}$) or $(P(RGR) = \frac{4}{8} \times \frac{1}{7} \times \frac{3}{6} = \frac{12}{336}$ or $\frac{1}{28}$) or $(P(GRR) = \frac{1}{8} \times \frac{4}{7} \times \frac{3}{6} = \frac{12}{336}$ or $\frac{1}{28}$)	
		P1	for a correct product for 3 red, eg $(P(RRR) = \frac{4}{8} \times \frac{3}{7} \times \frac{2}{6} = \frac{24}{336}$ or $\frac{2}{28}$)	
		P1	for a complete process, eg $\left(\frac{4}{8} \times \frac{3}{7} \times \frac{1}{6}\right) + \left(\frac{4}{8} \times \frac{1}{7} \times \frac{3}{6}\right) + \left(\frac{1}{8} \times \frac{4}{7} \times \frac{3}{6}\right) + \left(\frac{4}{8} \times \frac{3}{7} \times \frac{2}{6}\right)$	
		A1	for $\frac{60}{336}$ oe eg $\frac{5}{28}$ SCB2 if P0 scored for answer of $\frac{112}{512}$ oe (replacement)	Accept equivalent fractions, decimals (0.17... or 0.18) or percentages (17% or 18%)

Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
1	6	M1 A1	for a complete factor tree for 54 or 120 with no more than one arithmetic error or for listing at least 4 correct factors (with no more than 1 incorrect) of 54 or 120, could be in factor pairs or for the prime factors of 54 (2, 3, 3, 3) or 120 (2, 2, 2, 3, 5) cao SCB1 for an answer of 2 or 3 or 2×3 if M0 scored	Condone the inclusion of 1 for this mark Factors of 54: 1, 2, 3, 6, 9, 18, 27, 54 Factors of 120: 1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 20, 24, 30, 40, 60, 120 Prime factors may be seen in a diagram eg a Venn diagram
2 (a)	0.4	P1 P1 A1	for $1 - 0.3 - 0.1 (= 0.6)$ or $0.3 + 0.1 + 2x + x = 1$ for " 0.6 " $\div 3 (= 0.2)$ or $3x = "0.6"$ or for " 0.6 " $\div 3 \times 2$ for 0.4 oe	Award this mark for any two probabilities that sum to 0.6 Allow P1P1A0 for $P(\text{green}) = 0.4$ Award P1P1A0 for 0.4 with incorrect subsequent working eg $\frac{0.4}{0.6}$ If no answer on answer line then check table A0 for $\frac{0.4}{1}$
(b)	150	M1 A1	for complete method to find the total number of counters eg $45 \div 0.3$ or $45 \div 3 \times 10$ oe or $45 + 45 \div 3 + 45 \div 3 \times 4 + 45 \div 3 \times 2 (= 45 + 15 + 60 + 30)$ cao	fit their table



Paper: 1MA1/3H																								
Question	Answer	Mark	Mark scheme	Additional guidance																				
1	$a = \frac{p+9}{3}$	M1 A1	for correct first step to rearrange, eg $p + 9 = 3a - 9 + 9$ or $\frac{p}{3} = \frac{3a-9}{3}$ oe or answer ambiguously shown eg $a = p + 9 \div 3$ or answer given as $\frac{p+9}{3}$ oe oe	May be seen in different equivalent forms but must be carried out, not just intention seen.																				
2	Description	C1	Identifies a mistake in the working Acceptable examples Rob should divide by 8 He should have added the 3 and 5 first He divided 120 by 3 and 5 instead of 8 He did not do it as $120 \times \frac{3}{8}$ and $120 \times \frac{5}{8}$ He did not add the two ratios first Not acceptable examples He has done it in two parts but he should do it in one The answer should be 45 : 75 They do not add up to 120 He is supposed to add his numbers 40 + 24 does not equal 120																					
3	22	P1 P1 A1	for process to find total German eg $200 - 104 - 70 (= 26)$ for complete process to find boys choosing Spanish eg $90 - (60 + ("26" - 18))$ cao	for process to find girls choosing French, eg $104 - 60 (= 44)$ or girls total, eg $200 - 90 (= 110)$ for complete process to find boys choosing Spanish eg $70 - ("110" - "44" - 18)$ <table border="1"><tr><td></td><td>F</td><td>S</td><td>G</td><td>total</td></tr><tr><td>girls</td><td>44</td><td>48</td><td>18</td><td>110</td></tr><tr><td>boys</td><td>60</td><td>22</td><td>8</td><td>90</td></tr><tr><td>total</td><td>104</td><td>70</td><td>26</td><td>200</td></tr></table>		F	S	G	total	girls	44	48	18	110	boys	60	22	8	90	total	104	70	26	200
	F	S	G	total																				
girls	44	48	18	110																				
boys	60	22	8	90																				
total	104	70	26	200																				

Paper: 1MA1/2H								
Question	Answer	Mark	Mark scheme	Additional guidance				
8	$\frac{3}{22}$	P1	for a process to find a first value eg male/Britain = $32 - 11$ (=21) or Italy/total = $60 - (32+12)$ (=16) or female/total = $60 - 38$ (=22)		Br	Sp	It	Tot
			M	21	9	8	38	
			F	11	3	8	22	
			Tot	32	12	16	60	
		P1	for process to find a secondary value, eg male/Spain = $38 - ("21" + 8)$ (=9) or female/Italy = $"16" - 8$ (=8)	May be seen in a frequency tree Values attributed to a category or from method seen				
		P1	complete process to find female/Spain, eg $12 - "9"$ or $"22" - (11 + "8")$ (=3)					
		A1	oe accept 0.136 to 0.14 SC B3 for $\frac{3}{60}$					
9	12 508.7(0)	P1	for start of process to find interest rate for year 1 eg $12336 \div 12000$ (=1.028) or $(12336 - 12000) \div 12000$ (=0.028) OR forms a suitable equation, eg $12000 \times (1 + \frac{x}{100}) = 12336$					
		P1	for complete process to find the interest rate for year 1 eg $("1.028" - 1) \times 100$ (=2.8) or $"0.028" \times 100$ (=2.8) OR correct process to solve correct equation eg $(12336 - 12000) \div 120$ (=2.8)	Rate of interest = 2.8, or x = 2.8 implies P2				
		P1	for complete process to find the value at the end of 2 years eg $("2.8" \div 2 + 100) \div 100 \times 12336$					
		A1	accept 12508.7 to 12508.71 or 12509	12509 must come from correct working				



Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
4 (a)	10, 11, 13, 14, 16, 17	B1	cao	
(b)	$\frac{5}{9}$	M1	for identification of 10, 12, 14, 15, 18 or for $\frac{a}{9}$ where $1 \leq a \leq 8$, a an integer, or $\frac{5}{b}$ where $b > 5$, b an integer or for incorrect form, eg 5 : 9	
		A1	oe	Accept any equivalent fraction, decimal form, 0.55(5...) or 0.56 or percentage form, 55.(5...) % or 56%

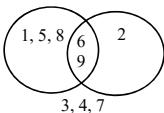


Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
20	$\frac{6x+37}{6x-42}$	P1	for factorising to get the numerator, eg $(x+4)(2x-14)$ or $2(x+4)(x-7)$ or $(2x+8)(x-7)$	P marks can be awarded in any order
		P1	For process to work with the division by $\frac{2x^2-6x-56}{2x+3}$ eg multiplies by $\frac{2x+3}{2x^2-6x-56}$	
		P1	for two correct fractions with a common denominator, eg $\frac{28}{6(x-7)}$ and $\frac{6x+9}{6(x-7)}$ oe or $\frac{28+6x+9}{6(x-7)}$ oe	
		A1	oe or $a=6, b=37, c=6, d=-42$	
21	98	P1	for (total number of gold =) $6x-3$	
		P1	for forming an equation, eg $\frac{x}{6x-3} = \frac{2}{11}$	
		P1	(dep on P2) for correct substitution of their value into all expressions, eg $7 \times "6" - 11 + "6" + 5 \times "6" - 3 (= 64)$	
		A1	98	

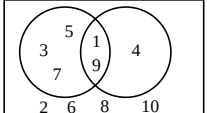


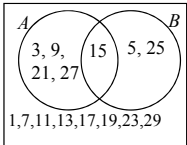
Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
20	$\frac{6}{490}$	P1	for start to process information, eg draws Venn diagram and shows at least 1 unknown amount, eg 5 speak German and Spanish but not French	See Venn Diagram at end of mark scheme – rectangle not needed
		P1	for process to find at least 3 unknown amounts from, eg 5 speak German and Spanish but not French 3 speak French and German but not Spanish 22 speak French but not German or Spanish 0 speak German but not French or Spanish	
		P1	for complete process to find number of people who speak only Spanish (= 6)	
		P1	for $\frac{[\text{number speaking Spanish only}]}{50} \times \frac{[\text{number speaking Spanish only}] - 1}{49}$, eg $\frac{6}{50} \times \frac{5}{49}$	
		A1	for $\frac{6}{490}$ oe	
				Award first 3 marks to students who show this on the Venn diagram or in a statement. Award this mark for use of their number of students who speak Spanish. Must be a clear link, eg from Venn diagram
				See note 8 in general marking guidance but 0.01 or 1% must be from seen correct working.



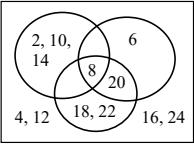
Paper: IMA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
1 (a)	6, 9	M1	for 6, 9 in the intersection only	Ignore all entries except the region you are marking for each method mark 
	1, 5, 8	M1	for 1, 5, 8 in set A only or 2 in set B only or 3, 4, 7 in set $(A \cup B)'$ only	
	2			
	3, 4, 7	C1	for all numbers correctly placed in the Venn Diagram	
(b)	$\frac{2}{9}$	M1	ft for identification of 2 or 9 or ft diagram	Need not be written in correct form at this stage eg could be a ratio 2 : 9 Repeated digits in the diagram should be counted as 2 elements Accept any equivalent fraction, decimal form 0.22(22...) or percentage form 22(22...) %
		A1	$\frac{2}{9}$ oe or ft diagram	
2	12272.70 12272.71 or 12272.72	M1	for evidence of using a correct first step eg 200000×0.015 (= 3000) or 200000×1.015 (= 203000)	values may be rounded or truncated to 2 dp
		M1	for evidence of a compound interest method eg 203000×0.015 (= 3045) or 203000×1.015 (= 206045) or 206045×0.015 (= 3090.675) or 206045×1.015 (= 209135.675) or 209135.675×0.015 (= 3137.035...) or 209135.675×1.015 (212272.710...) or 200000×1.015^t , $t \geq 2$	
		A1	for 12272.7(0) or 12272.71 or 12272.72	
			SC B2 for 212272.7(0) or 212272.71 or 212272.72	

Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
1 (a)	$2 \times 2 \times 3 \times 7$	M1	for a complete method to find prime factors, could be shown on a factor tree, with no more than one arithmetic error or for 2, 2, 3, 7	Condone the use of 1
		A1	for $2 \times 2 \times 3 \times 7$ oe	Accept $2^2 \times 3 \times 7$
	420	M1	for at least 3 multiples of both 60 and 84 (can include 60 and 84) or finds the prime factors of both 84 (may be seen in (a)) and 60, may be seen in factor trees	60, 120, 180, 240, 300, 360, 420 84, 168, 252, 336, 420 $60 = 2 \times 2 \times 3 \times 5$ or $2^2 \times 3 \times 5$ If factor tree in (a) is incorrect ft this factor tree in part3 (b) for M1 only
		A1	420 or $2 \times 2 \times 3 \times 5 \times 7$ oe	
2 (a)	Venn diagram	M1	for correct numbers in at least one region	Ignore all entries except the region you are marking for each method mark
		M1	for correct numbers in at least two regions	
		A1	for all regions correct	
	$\frac{2}{10}$	M1	for $\frac{a}{10}$ where $0 < a < 10$ and a is an integer or $\frac{2}{b}$ where $b > 2$ and b is an integer or ft diagram	Need not be written in correct form at this stage eg could be a ratio 2 : 10 Repeated digits in the diagram should be counted as 2 elements
		A1	$\frac{2}{10}$ oe or ft diagram	Accept any equivalent fraction, decimal form 0.2 or percentage form 20%

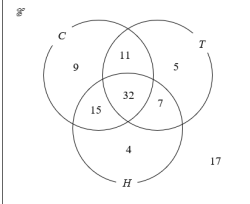
Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
5 (a)	Venn diagram	B3	for a fully correct Venn diagram	Ignore all entries except the region you are marking for each method mark 
		(B2)	for two or three of the four regions correct)	
		(B1)	for just one of the four regions correct)	
	$\frac{7}{10}$	M1	(ft diagram) for $\frac{a}{10}$ where $0 < a < 10$ and a is an integer or $\frac{7}{b}$ where $b > 7$ and b is an integer or $1 - \frac{3}{10}$ or $7 : 10$	Repeated digits in the diagram should be counted as 2 elements Accept any equivalent fraction, or 0.7 or 70%
		A1	(ft diagram) for $\frac{7}{10}$ oe	

Paper 1MA1: 3H				
Question	Working	Answer	Mark	Notes
1 (a)		Venn Diagram	B1 M1 M1 C1	for labels on diagram for just 15 in the intersection for just 5 and 25 in only set B or just 3, 9, 21 and 27 in only set A or just 1, 7, 11, 13, 17, 19, 23, 29 in $(A \cup B)'$ for all numbers correctly placed in the Venn Diagram Ignore all entries except the region you are marking for each method mark
(b)		$\frac{7}{15}$	P1 A1	fit for $\frac{7}{a}$ where $a \geq 7$ or $\frac{b}{15}$ where $b \leq 15$ fit $\frac{7}{15}$ oe
2		$x = -\frac{2}{3}$ $y = -2$	M1 M1 A1	for a method to eliminate one variable (condone one arithmetic error) (dep) for substituting found value in one of the equations or appropriate method after starting again (condone one arithmetic error) $x = -\frac{2}{3}$ oe and $y = -2$
3 (a)		12	B1	cao
(b)		Explanation	C1	No with statement about not being mutually exclusive events eg a person could be in both categories



Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
1 (a)	Venn diagram	C4	fully correct Venn diagram	 Need not be written as a fraction or probability at this stage. eg could be a ratio 1:12 Acceptable equivalents are (eg, could fit) any fraction equivalent to $\frac{1}{12}$, 0.08(33..) or 8(.33..)%
		(C3	7 of the 8 regions correct or for a diagram with only one number incorrectly placed)	
		(C2	5 or 6 of the 8 regions correct)	
		(C1	3 or 4 of the 8 regions correct)	
(b)	$\frac{1}{12}$	M1	fit for identification of 1 or 12 eg from the diagram	Need not be written as a fraction or probability at this stage. eg could be a ratio 1:12 Acceptable equivalents are (eg, could fit) any fraction equivalent to $\frac{1}{12}$, 0.08(33..) or 8(.33..)%
		A1	fit oe	



Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
18 (a)	Venn diagram	C4	fully correct Venn diagram	Ignore all entries except the region you are marking for each C mark Repeated digits in the diagram should be counted as 2 elements 
		(C3)	6 or 7 of the 8 regions correct	
		(C2)	4 or 5 of the 8 regions correct	
		(C1)	2 or 3 of the 8 regions correct	
(b)	$\frac{47}{67}$	M1	for $\frac{47}{b}$ where $b > 47$ or ft $\frac{"47"}{b}$ where $b > "47"$ or $\frac{a}{67}$ where $0 < a < 67$ or ft $\frac{a}{"67"}$ where $0 < a < "67"$	Need not be written in correct form at this stage eg could be a ratio 47 : 67 "47" = "15" + "32" "67" = "9" + "11" + "32" + "15"
		A1	for $\frac{47}{67}$ oe or ft $\frac{"47"}{"67"}$ oe	



Paper: 1MA1/2H				
Question	Working	Answer	Mark	Notes
12 (a)		comment	C1	for comment e.g. incorrect denominator for the 2nd student or probabilities for 2 nd student do not add up to 1
(b)		No (supported)	C1	for "no" with supporting evidence, e.g. probabilities should be multiplied together or 0.4×0.25
13		7	P1 P1 A1	for correct process to find any frequency, eg. $"1.1" \times 10 (= 11)$ or $"2.8" \times 10 (= 28)$ or $"2.3" \times 20 (= 46)$ or $"1.4" \times 20 (= 28)$ or $"1.4" \times 10 (= 14)$ or $"0.7" \times 30 (= 21)$ or for a correct process to find the total area and an area of any block, eg. using $1 \text{ cm}^2 = 1$ unit of area to get 53.6 and one of 4.4, 11.2, 18.4, 11.2, 5.6, 8.4 (dep P1) for complete process to find 20% of $(\text{"1.4"} \times 10 + \text{"0.7"} \times 30)$, eg. $\frac{20}{100} \times "35"$ or $\frac{"5.6" + "8.4"}{53.6} \times 134 \times \frac{20}{100}$ cao
14		C, F, A, H	B3 [B2 [B1	for a fully correct table for 2 or 3 correct] for 1 correct]



Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
4	Probabilities should sum to 1 0.35 and 0.65 reversed	C1 C1	for stating that the probabilities should total 1 eg 0.25 should be 0.35 for recognising that the 0.35 and 0.65 in the first branches for the 2nd throw should be reversed eg, “for the second throw, the probability it lands on 4 should be 0.65”	Can be shown on the diagram
5 (a)	50.5	M1 A1	for $\cos ABC = \frac{7}{11}$ (0.63...) oe for answer in the range 50.4 to 50.51	Must be a complete statement for cos, sin or tan with all three elements present. If an answer is in the range 50.4 to 50.51 is given in the working space then incorrectly rounded, award full marks.
(b)	Increase (supported)	C1	States increase with supporting reason eg “ $\frac{7}{10}$ is greater than $\frac{7}{11}$ ” “0.636 is less than 0.7” ...“cos increases as angle decreases” “decreasing the denominator increases the value of the fraction” “angle is now 45.6” (accept 45.5 – 45.6)	If figures are given they must be correct (truncated or rounded).



Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
19	3.4	M1	for drawing a suitable tangent at $t = 6$	Use of change in y over change in x Answers of $\frac{10}{6}$ oe scores no marks
		M1	for a full method to find the gradient of the tangent at $t=6$, eg $20 \div 5.8$	
		A1	answer in the range 3.05 to 3.7	
20	$n^2 - 2n$	M1	for correct deduction from differences, eg 2nd difference of 2 implies $1n^2$ or gives a quadratic expression which includes the term $1n^2$ or states 1,4,9,16,25 and deduces 2,4,6,8,10	
		A1	oe	
21	$\frac{1}{81}$	M1	for finding the probability of heads eg $\sqrt[4]{\frac{16}{81}}$ ($= \frac{2}{3}$)	Seeing a probability of $\frac{2}{3}$ or $\frac{1}{3}$ is enough for this mark
		A1	or for finding the probability of tails $1 - \sqrt[4]{\frac{16}{81}}$ ($= \frac{1}{3}$) oe	



Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
20	$1 - \left(\frac{1}{2}\right)^n - \left(\frac{1}{2}\right)^n$	M1 A1	for $\left(\frac{1}{2}\right)^n$ oe oe eg $1 - \left(\frac{1}{2}\right)^{n-1}$	
21 (a)	19.1	M1 M1 A1	for a method to find an estimate for the area of at least 1 trapezium under the curve eg $0.5 \times 1 \times (4 + 6)$ or $0.5 \times 1 \times (6 + 7.2)$ or $0.5 \times 1 \times (7.2 + 7.8)$ for a complete method eg $0.5 \times 1 \times (4 + 6) + 0.5 \times 1 \times (6 + 7.2) + 0.5 \times 1 \times (7.2 + 7.8)$ or $0.5 \{(4 + 7.8) + 2(6 + 7.2)\}$ cao	Allow a maximum of 2 errors in y values used Ignore any reference to units
(b)	Statement	C1	eg distance (travelled)	If units are given they must be correct
22	$\frac{1}{x(x+4)}$	M1 M1 A1	inverting the fraction and multiplying eg $\frac{6x^3}{(9x^2-144)} \times \frac{3(x-4)}{2x^4}$ for factorising $9x^2 - 144$, eg $(3x - 12)(3x + 12)$ cao	

Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
15	15π	P2 P1 P1 A1	for process to find size of the angle eg $\frac{5\pi \times 360}{2 \times \pi \times 6}$ oe (= 150) or for working with proportion eg $\frac{5\pi}{12\pi} (= \frac{5}{12})$ or $\frac{12\pi}{5\pi} (= \frac{12}{5})$ (P1 for a first step eg $\frac{x}{360} \times 2 \times \pi \times 6 = 5\pi$) (dep on P2) for process to find the area eg $\frac{150}{360} \times \pi \times 6^2$ or $\frac{5\pi}{12\pi} \times \pi \times 6^2$ cao	
16	Shown	M1 A1	for $\frac{n}{n+1}$ or $\frac{n-1}{n}$ (dep) for $\frac{n}{n+1} \times \frac{n-1}{n}$ oe = $\frac{n-1}{n+1}$	Do not award A1 if errors seen
17 (a)	$\frac{\sqrt{7}}{7}$	B1	for $\frac{\sqrt{7}}{7}$ or $\frac{k\sqrt{7}}{7k}$ or $\frac{\sqrt{7k^2}}{7k}$ where k is an integer not equal to 0	
(b)	$3\sqrt{5}$	M1 A1	for writing $\sqrt{80}$ as $\sqrt{16 \times 5}$ or $\sqrt{16} \times \sqrt{5}$ or $4\sqrt{5}$ for $3\sqrt{5}$ or $\sqrt{45}$	



Paper: 1MA1/3H				
Question	Working	Answer	Mark	Notes
11 (a)		57	B1	cao
(b)		Decision and reason	C1	Jamil might not be correct and reason, eg the maximum weight could be less than 80 or the minimum weight could be less than 40
(c)		Shown	C1	for evidence of reading from the graph at weight 65 (= 48 to 49) or at cf 45 (= 63)
			C1	eg 25% of 60 is 15 but only 11 potatoes have a weight greater than 65g or 25% of potatoes have a weight greater than 63g
12		48	M1	for $0.25 \times 0.6 (= 0.15)$ or $0.75 \times 0.4 (= 0.3)$
			M1	for $0.25 \times 0.6 (= 0.15)$ and $0.75 \times 0.4 (= 0.3)$ or for $24 \div "0.15" (= 160)$
			A1	cao
13		$(x + 3)^2 - 16$	M1	for $(x + 3)^2$ or $(x^2 + 6x - 7) x^2 + 2ax + a^2 + b$
			A1	cao
14		Shown	M1	for $\sqrt[3]{\frac{8}{27}} (= \frac{2}{3})$ or $\sqrt[3]{\frac{27}{8}} (= \frac{3}{2})$ or $2 : 3$ or $3 : 2$
			M1	for $\left(\sqrt[3]{\frac{8}{27}}\right)^2 (= \frac{4}{9})$ or $\left(\sqrt[3]{\frac{27}{8}}\right)^2 (= \frac{9}{4})$ or $4 : 9$ or $9 : 4$
			A1	132 from correct arithmetic



Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
11	0.1709	M1 M1 A1	for one product, $0.07 \times 0.98 (=0.0686)$ or $0.93 \times 0.11 (=0.1023)$ or $0.07 \times 0.02 (=0.0014)$ or $0.93 \times 0.89 (=0.8277)$ for a fully correct method, eg $0.07 \times 0.98 + 0.93 \times 0.11$ or $1 - (0.07 \times 0.02) - (0.93 \times 0.89)$ oe	If all products shown, award this mark
12	Box plot	M1 M1 A1	for correctly identifying one of the LQ (188), median (197) or UQ (209) from the stem leaf for showing a box and at least 3 correctly plotted values from 173, 188, 197, 209, 219 for a fully correct box plot	May be implied by one of these values being correctly plotted.
13	739	P1 P1 P1 A1	process to find the volume of C, eg $\pi \times 3^2 \times 25 (=706.8583471 \text{ or } 225\pi)$ process to find the volume of A or the volume of B, eg “706.8...” $\times \frac{2}{2+13} (=94.24777961 \text{ or } 30\pi)$ or “706.8...” $\times \frac{13}{2+13} (=612.6105675 \text{ or } 195\pi)$ or process to work with density and ratio, eg $(2 \times 1.21 + 13 \times 1.02) (=15.68)$ process to find the mass of C, eg “ 30π ” $\times 1.21 (=114.0398133) +$ “ 195π ” $\times 1.02 (=624.8627788)$ or “ 225π ” $\times$ “15.68” $\div (2+13)$ for an answer in the range 738.5 to 739	For use of 3.14 Volume of C is 706.5 Volume of A is 94.2 Volume of B is 612.3 Mass of A is 113.982 Mass of B is 624.546 Do not award accuracy mark if the figure is from obvious incorrect working

Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
12 (a)	5,15,35,55,70,80	B1	cao	
(b)	Graph drawn	M1	for 5 or 6 of their points plotted correctly from a cf table	Ignore to the left of the first point and right of the last point If histograms drawn, points must be identified Accept a smooth curve or line segments
		A1	for a fully correct graph SC B1 if 5 or 6 of their points plotted not at end but consistent within each interval and joined by a curve or line segments providing no gradient is negative	
(c)	Correct decision and correct figures	M1	for $60 \div 100 \times 80 (=48)$ oe	
			reading value from graph at wage = 360 (=40) or for $35 + \frac{1}{5} \times 20 (=39)$	ft from a cum freq graph
		M1	reading value from graph at cf = 48 (=380)	
			for "40" $\div 80 \times 100 (=50(\%))$ or for $60 \div 100 \times 80 (=48)$	
		C1	ft for correct decision and correct figures, eg No with 48 and "380" or with "40" and "50"($\%$) or with "40" and 48	
13	196	P1	for vol A = $1400 \div 70 (=20)$ or for mass B = $280 \times 30 (=8400)$	An answer of 350 from $70 + 280$ gets no marks
		P1	for density $C = \frac{1400 + "8400"}{"20" + 30} (= \frac{9800}{50})$ or answer with digits 196	
		A1	cao	
14	0.42	P1	for appropriate multiplication eg $0.3 \times 0.7 (=0.21)$ or $0.3 \times 0.1 (=0.03)$ or $0.3 \times 0.6 (=0.18)$	Probabilities could also be given in fraction or percentage form Acceptable equivalents are 42% or $\frac{42}{100}$ oe
		P1	(dep) for complete process eg $0.3 \times 0.7 + 0.7 \times 0.3$ or $0.3 \times 0.1 + 0.3 \times 0.6 + 0.6 \times 0.3 + 0.1 \times 0.3$	
		A1	oe	

Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
20	$\frac{62}{110}$	P1	for process to find a probability of 2 cards of different colours, eg $\frac{3}{11} \times \frac{7}{10}$ or $\frac{3}{11} \times \frac{1}{10}$ or $\frac{7}{11} \times \frac{3}{10}$ or $\frac{7}{11} \times \frac{1}{10}$ or $\frac{1}{11} \times \frac{3}{10}$ or $\frac{1}{11} \times \frac{7}{10}$ oe or $\frac{3}{11} \times \frac{8}{10}$ oe or $\frac{7}{11} \times \frac{4}{10}$ oe or $\frac{1}{11} \times \frac{10}{10}$ oe	May see fraction with denominator 110
		P1	for a complete process, eg $\frac{3}{11} \times \frac{7}{10} + \frac{3}{11} \times \frac{1}{10} + \frac{7}{11} \times \frac{3}{10} + \frac{7}{11} \times \frac{1}{10} + \frac{1}{11} \times \frac{3}{10} + \frac{1}{11} \times \frac{7}{10}$ oe or $\frac{3}{11} \times \frac{8}{10} + \frac{7}{11} \times \frac{4}{10} + \frac{1}{11} \times \frac{10}{10}$ oe	
		A1	for $\frac{62}{110}$ oe OR	Accept equivalent fraction, decimal form 0.56(36...) or percentage form 56(.36...)%
		P1	for process to find a probability of 2 cards of the same colour, eg $\frac{3}{11} \times \frac{2}{10}$ or $\frac{7}{11} \times \frac{6}{10}$ or $\frac{1}{11} \times \frac{0}{10}$ oe	
		P1	for a complete process, eg $1 - \frac{3}{11} \times \frac{2}{10} - \frac{7}{11} \times \frac{6}{10} - \frac{1}{11} \times \frac{0}{10}$ oe	
		A1	for $\frac{62}{110}$ oe	Accept equivalent fraction, decimal form 0.56(36...) or percentage form 56(.36...)%
			SC B1 for answer of $\frac{62}{121}$ (replacement)	

Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
12	$\frac{62}{72}$	M1	for one correct product, eg $\frac{5}{8} \times \frac{7}{9} (= \frac{35}{72})$ oe or $\frac{3}{8} \times \frac{2}{9} (= \frac{6}{72})$ oe or $\frac{3}{8} \times \frac{7}{9} (= \frac{21}{72})$ oe or $\frac{5}{8} \times \frac{2}{9} (= \frac{10}{72})$ oe	
		M1	for a full method, eg $\frac{5}{8} \times \frac{7}{9} + \frac{3}{8} \times \frac{2}{9} + \frac{3}{8} \times \frac{7}{9}$ oe or $1 - \frac{5}{8} \times \frac{2}{9}$ oe	
		A1	for $\frac{62}{72}$ oe eg $\frac{31}{36}$	
13	80	M1	for setting up an equation with a constant term, eg $y = kx$ oe or $24 = k \times 1.5$ oe or $k = 16$ or for starting to work with direct proportion, eg $24 \div 1.5 (= 16)$ or $5 \div 1.5 (= 3.33\dots)$	Condone the use of “ α ” instead of “ $=$ ” for the M marks
		M1	for substituting in $y = kx$, eg $y = “16” \times 5$ or for a complete method, eg $24 \div 1.5 \times 5$ or $5 \div 1.5 \times 24$	
		A1	cao	



Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
10	Result shown	M1	for method to find the number of yellow counters in bag A , eg $x \div 3 \times 5 (= \frac{5x}{3})$ or for method to find the total number of counters in bag A eg $x \div 3 \times 8 (= \frac{8x}{3})$ or for starting to work with ratio using algebra eg $3y, 5y$	Could use any letter other than y apart from x
		M1	(dep) for method to find the total number of counters in bag B , eg $(x + \frac{5x}{3}) \div 2 (= \frac{4x}{3})$ or $\frac{8x}{3} \div 2 (= \frac{4x}{3})$ or $(3y + 5y) \div 2 (= 4y)$	For the method marks condone decimals that are rounded or truncated to 1dp
		C1	for complete method showing that total number of counters in bag A and bag B is $4x$, eg $\frac{8x}{3} + \frac{4x}{3} = 4x$ or $3y + 5y + 4y = 12y$ and $12y \div 3y \times x = 4x$	For the C mark only accept values that are shown to be recurring and allow $3.\dot{9}x = 4x$



Paper: 1MA1/1H				
Question	Working	Answer	Mark	Notes
17		$\frac{28}{72}$	P1 for $\frac{6}{8} \times \frac{2}{8} \times \frac{7}{8} \times \frac{1}{8}$ oe seen on diagram or in a calculation P1 for $\frac{7}{9} \times \frac{2}{8} \times \frac{2}{9} \times \frac{7}{8} \times \frac{14}{72}$ oe P1 for $\frac{7}{9} \times \frac{2}{8} + \frac{2}{9} \times \frac{7}{8}$ or "$\frac{14}{72}$" + "$\frac{14}{72}$" oe A1 oe SC B1 for $\frac{14}{81}$ B2 for $\frac{28}{81}$	for $\frac{7}{9} \times \frac{6}{8} \times \frac{2}{9} \times \frac{1}{8} \times \frac{42}{72}$ or $\frac{2}{72}$ or $\frac{44}{72}$ oe for $1 - (\frac{7}{9} \times \frac{6}{8} + \frac{2}{9} \times \frac{1}{8})$ or $1 - (\frac{42}{72} + \frac{2}{72})$ or $1 - \frac{44}{72}$ oe
18		$y = -2x + 21$	P1 shows evidence of understanding that AC is perpendicular to DB, or states the gradient of DB as 0.5 oe P1 shows a process to find the gradient of a perp. line e.g. use of $-\frac{1}{m}$ or states $y = -2x + c$ or states the gradient of AC as -2 P1 (dep on P2) for sub. of $x = 5, y = 11$ into $y = mx + c$ where m is their found gradient for AC. A1 oe	



Paper: 1MA1/2H				
Question	Working	Answer	Mark	Notes
21 (a)		$\frac{1}{55}$	M1	for $\frac{4}{12} \times \frac{3}{11} \times \frac{2}{10}$
			A1	for $\frac{1}{55}$ oe
(b)		Conclusion (supported)	C1	starts correct argument, eg by calculating a relevant probability, eg $\frac{5}{15} \times \frac{4}{14} \times \frac{3}{13}$
			C1	statement of “more likely” from eg comparison of probabilities, ft answer to (a) eg $\frac{1}{55}$ (= 0.018...) and $\frac{2}{91}$ (= 0.021...or 0.022)
22		7, -1	P1	for strategy to use $g(3) = 20$, e.g. $3a + b = 20$
			P1	for $g(1) = a + b$
			P1	for a process to find inverse of f. e.g. $f^{-1}(x) = \frac{x-3}{5}$ or $f^{-1}(33) = 6$
			P1	for using $f^{-1}(33) = g(1)$ to find an equation e.g. $\frac{33-3}{5} = a + b$
			A1	for $a = 7, b = -1$

Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
16 (a)	0.455	M1	for $0.65 \times (1 - 0.65)$ or 0.65×0.35 ($=0.2275$ or $\frac{91}{400}$) or 2×0.2275 oe	Could be shown on a tree diagram but must show an intention to multiply
		A1	oe	Acceptable equivalents are 45.5% or $\frac{91}{200}$ oe
		M1	for a start of the process eg $78 \div 0.65$ ($= 120$) or 78×0.35 ($=27.3$)	$\frac{78 \times 0.35}{0.65}$, $\frac{78}{0.65} - 78$
		A1	cao	
17	4 : 1	P1	for associating algebraic expressions with the correct ratio eg $p - 5 : q - 5$ ($= 5 : 1$) or $p + 20 : q + 20$ ($= 5 : 2$)	
		P1	for $\frac{p+20}{q+20} = \frac{5}{2}$ or $\frac{p-5}{q-5} = \frac{5}{1}$ oe or $p - 5 = 5(q - 5)$ or $2(p + 20) = 5(q + 20)$ oe	Award for one of the two simultaneous equations eg $5q - p = 20$, $5q - 2p = -60$ oe
		M1	for a complete method shown to find p or q	Award for a simultaneous equation method to eliminate one variable leading to either $p = 80$ or $q = 20$
		M1	for a complete method shown to find p and q or two values for p and q that are in the ratio 4 : 1 or an unsimplified ratio 4 : 1 (eg 80 : 20) or an answer of 1 : 4	Award for a simultaneous equation method to eliminate both variables leading to either $p = 80$ and $q = 20$
		A1	cao	



Paper: IMA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
5	(a)			
	(b)			
6	(a)			
	(b)			
7				

Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
15	$\frac{26x+15}{10x}$	M1 M1 A1	for method to write at least one of the fractions with a suitable denominator, eg $\frac{4x+3}{2x} \times \frac{5}{5} (= \frac{20x+15}{10x})$ or $\frac{3}{5} \times \frac{2x}{2x} (= \frac{6x}{10x})$ for method to combine the fractions, eg $\frac{5(4x+3)}{5 \times 2x} + \frac{3 \times 2x}{5 \times 2x}$ or $\frac{5(4x+3)+3 \times 2x}{5 \times 2x}$ or $\frac{20x+15}{10x} + \frac{6x}{10x}$ for correct algebra leading to $\frac{26x+15}{10x}$ oe in form $\frac{ax+b}{cx}$	
16	$\frac{180}{336}$	P1 P1 P1 A1	for $\frac{3}{7}$ or $\frac{4}{7}$ or $\frac{5}{7}$ as probability for second counter for one correct product eg $\frac{3}{8} \times \frac{5}{7} \times \frac{4}{6} (= \frac{60}{336})$ or $\frac{5}{8} \times \frac{3}{7} \times \frac{4}{6} (= \frac{60}{336})$ or $\frac{5}{8} \times \frac{4}{7} \times \frac{3}{6} (= \frac{60}{336})$ for a complete process eg $\frac{3}{8} \times \frac{5}{7} \times \frac{4}{6} + \frac{5}{8} \times \frac{3}{7} \times \frac{4}{6} + \frac{5}{8} \times \frac{4}{7} \times \frac{3}{6}$ oe, eg $\frac{15}{28}$ SC B1 for answer of $\frac{225}{512}$ (replacement)	May be seen in a calculation or on a diagram Accept equivalent fractions, decimals (0.53... or 0.54) or percentages (53% or 54%)



Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
19	25 : 36	P1 P1 A1	for $\sqrt[3]{125}$ (= 5) and $\sqrt[3]{27}$ (= 3) oe OR for correct process to find the radius of A and radius of B (3.10... and 1.86...) for method to find values in ratio of length between A and C eg 5 and 2×3 (= 6) oe or "3.10..." and "1.86..." $\times 2$ (=3.72...) OR 25 and 36 OR for correct process to find SA of A and SA of C (120.(8...)) and (174.(0...)) for 25 : 36 oe eg 1 : 1.44	Accept scale factors expressed as fractions or decimals eg 1.66, 1.67, 0.6 or better Ignore units throughout For both P marks the lengths need not be written as a ratio
20	0.748	P1 P1 P1 A1	for a process to find a correct probability product for 2 consecutive days, eg. 0.7×0.8 (rain M + T) or 0.7×0.2 (rain M + no rain T) or 0.3×0.6 (no rain M + rain on T) or 0.3×0.4 (no rain M + T) for process to find a correct triple probability product for it raining on Wednesday, eg. $0.7 \times 0.8 \times 0.8$ (rain M + T + W) (= 0.448 or $\frac{56}{125}$ oe) or $0.7 \times 0.2 \times 0.6$ (rain M + no rain T + rain W) (= 0.084 or $\frac{21}{250}$ oe) or $0.3 \times 0.6 \times 0.8$ (no rain M + rain T + rain W) (= 0.144 or $\frac{18}{125}$ oe) or $0.3 \times 0.4 \times 0.6$ (no rain M + no rain T + rain W) (= 0.072 or $\frac{9}{125}$ oe) for complete process, eg. "0.448" + "0.084" + "0.144" + "0.072" oe eg. $\frac{187}{250}$	Throughout accept probabilities given as fractions or percentages Could be for Tuesday and Wednesday also NB: correct answer without supportive working gets 0 marks

Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
16	0.78	P1	for using 0.75 or 0.25 in a relevant product, eg $0.75 \times x$ or $0.25 \times y$	Allow different letters Could work with fractions
		P1	for using two products to form an equation, eg $0.75x + 0.25y = 0.36$	
		P1	for a correct equation in one variable, eg $0.75(1 - p) + 0.25p = 0.36$ or $0.75f + 0.25(1 - f) = 0.36$	Could set up an equation for pass $\times$ pass + fail $\times$ fail = 0.64
		A1	oe	Accept 78% or any equivalent fraction, eg $\frac{39}{50}, \frac{156}{200}$
17	$y = \frac{40}{\sqrt{x^3}}$	P1	for setting up an equation with a constant term, eg $y = k\sqrt{t}$ or $t = \frac{K}{x^3}$	Condone the use of 'α' instead of '≡' for the first two P marks Equation can be implied by correct substitution
		P1	for a process to substitute values in one equation, eg $15 = k\sqrt{9}$ or $k = 5$ or $8 = \frac{K}{2^3}$ or $K = 64$	
		P1	(dep P2) for combining the two equations ft their values of k and K , eg $y = 5\sqrt{\frac{64}{x^3}}$ OR for $y = 5\sqrt{t}$ and $t = \frac{64}{x^3}$	
		A1	oe	Formula must include 40 Accept other forms for the power of x but must be a single term in x

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
21	$\frac{11}{21}$	P1	for any product of 3 probabilities of the form $\frac{a}{9} \times \frac{b}{8} \times \frac{c}{7}$ where $a < 9$, $b < 8$, $c < 7$	May see fraction with denominator 504
		P1	for a product of 3 probabilities giving an even sum, eg. $E,E,E = \frac{4}{9} \times \frac{3}{8} \times \frac{2}{7}$ or $E,O,O = \frac{4}{9} \times \frac{5}{8} \times \frac{4}{7}$	Students who indicate they are using the approach $P(\text{even}) = 1 - P(\text{odd})$ should be given credit as appropriate
		P1	for summing the product of at least three correct triples, eg $(E,E,E + E,O,O + O,O,E =)$ $\frac{4}{9} \times \frac{3}{8} \times \frac{2}{7} + \frac{4}{9} \times \frac{5}{8} \times \frac{4}{7} + \frac{5}{9} \times \frac{4}{8} \times \frac{4}{7}$ OR $3(\frac{4}{9} \times \frac{5}{8} \times \frac{4}{7})$	
		A1	for $\frac{11}{21}$ oe SCB1 for answer of $\frac{364}{729}$ (replacement)	Accept any equivalent fraction, decimal form 0.52(38...) or percentage form 52(.38...)%

Paper: 1MA1/3H					
Question	Answer	Mark	Mark scheme	Additional guidance	
6	(a)	0.7	B1	for 0.7 on the first branch	Accept equivalent fractions or percentages for probabilities
		0.65, 0.65	B1	for 0.65, 0.65 on the second branches	
	(b)	0.105	M1	for 0.3×0.35	
			A1	oe	
7	(a)	0.008	B1	for 0.008 or 8×10^{-3}	May be awarded at any stage
	(b)	50	M1	for conversion from km to m eg 180×1000 (= 180 000) or for conversion from hours to seconds eg $180 \div (60 \times 60)$ (= 0.05) or for conversion from km per hour to metres per second, eg $1000 \div (60 \times 60)$ (= 0.277...) (Accept $(60 \times 60) \div 1000$ (= 3.6))	
			M1	for a complete process eg $180 \times 1000 \div 3600$	
			A1	cao	
8		158	P1	for a first step in the process eg 50×167.6 (= 8380) or 20×182 (= 3640)	
			P1	for a complete process eg $(50 \times 167.6 - 20 \times 182) \div 30$ or $\frac{8380 - 3640}{30}$ or $4740 \div 30$	
			A1	cao	

Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
18	$\frac{1}{3}$	P1 P1 P1 A1	for start of process to find the probability of spinner B landing on red eg $\frac{1}{4}x = \frac{1}{24}$ oe or $\frac{1}{24} \div \frac{1}{4}$ or $x = \frac{1}{6}$ for process to find probability of one red and one not red eg $\frac{1}{4} \times (1 - \frac{1}{6}) (= \frac{5}{24})$ or $(1 - \frac{1}{4}) \times \frac{1}{6} (= \frac{3}{24})$ or process to find probability of both not red, eg $(1 - \frac{1}{4}) \times (1 - \frac{1}{6}) (= \frac{15}{24})$ for a complete process to find the required probability eg "$\frac{5}{24}$" + "$\frac{3}{24}$" or $1 - \frac{1}{24} - \frac{15}{24}$ oe	
19 (a)	18 and 162	M1	for a correct method, eg line drawn at 0.3 to sine curve or point(s) marked on sine curve	
		A1	or for one correct value	
(b)	-20 or 160	B1	for answers in the range 15 to 18 and 162 to 165 and no incorrect values	
			cao	



Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
6 (a)	0.4	B1	for 0.4 in correct position	Accept equivalent fractions or percentages for probabilities An answer of $\frac{0.33}{1}$ scores M1A0
	0.45, 0.55, 0.45	B1	for the correct probabilities for coin B in the correct place on the branches	
	0.33	M1	for a correct method, eg 0.6×0.55 only	
		A1	for 0.33 oe	
7	63	P1	for process to find volume, eg $\pi \times 100^2 \times 30$ ($= 300\,000\pi$ or $942\,477(.796\dots)$)	(volume $\Rightarrow$) 942 478 implies P1
		P1	for process to find time in seconds, eg " $942\,477(.796\dots)$ " $\div$ 250 ($= 1200\pi$ or $3769(.911\dots)$) or [volume] $\div$ 250 or for converting rate to minutes, eg 250×60 ($= 15\,000$)	(time $\Rightarrow$) 3770 implies P2 [volume] $\neq$ 30, 60, 100, 250
		P1	for complete process eg " $3769(.911\dots)$ " $\div$ 60 ($= 20\pi$) or " $942\,477(.796\dots)$ " $\div$ " $15\,000$ " ($= 20\pi$)	A correct answer with no supportive working gets 0 marks If an answer is shown in the range in working and then incorrectly rounded award full marks
		A1	for answer in the range 62 to 63	

Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
19	0.204	P1	for a process to find a correct product, eg $P(\text{A plays C in the final}) = 0.6 \times 0.2 (= 0.12)$ or $P(\text{A plays D in the final}) = 0.6 \times 0.8 (= 0.48)$ or $P(\text{A wins against B and C}) = 0.6 \times 0.5 (= 0.3)$ or $P(\text{A wins against B and D}) = 0.6 \times 0.3 (= 0.18)$	Could work with fractions Could be seen as part of a correct triple product
		P1	for a process to find the probability of A winning against C or winning against D in the final, eg $P(\text{A wins against C in the final}) = "0.12" \times 0.5 (= 0.06)$ or $P(\text{A wins against D in the final}) = "0.48" \times 0.3 (= 0.144)$ or $P(\text{A wins against C in the final}) = "0.3" \times 0.2 (= 0.06)$ or $P(\text{A wins against D in the final}) = "0.18" \times 0.8 (= 0.144)$	
		P1	for a complete process, eg $P(\text{A wins the tournament}) = "0.06" + "0.144"$	
		A1	for 0.204 oe	

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
1	Points plotted at (130, 12) (150, 28) (170, 30) (190, 22) (210, 8) and joined with line segments	B2 (B1)	for correct plotting of 5 points and joining with line segments for points plotted correctly at midpoints or for a frequency polygon with one point incorrect or for a frequency polygon with first and last point joined directly or for joining the points with line segments at the correct heights consistent within intervals (including end points))	Ignore any histogram drawn Ignore any part of the frequency polygon outside of the range of the first and last point plotted. for example, at 120, 140, 160, 180, 200 or at 140, 160, 180, 200, 220
2 (a)	340 200	B1	cao	
(b)	8.026×10^{-1}	B1	cao	
3	Drawn	B2 (B1)	for a correct construction with all relevant arcs drawn for all relevant arcs drawn or for a bisector within guidelines but with no or insufficient arcs)	
4 (a)	(0.3) 0.7 0.3 0.7 0.3 0.7	B2 (B1)	all probabilities correctly placed for 0.7 correctly placed for Game 1)	Accept equivalent fractions or percentages for probabilities
(b)	0.49	M1 A1	for a correct method, ft their tree diagram eg 0.7×0.7 only oe, ft their tree diagram	ft their diagram provided probabilities are less than 1 An answer of $\frac{0.49}{1}$ scores M1A0 unless 0.49 seen



Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
15	Shown	M1	for one correct product eg $\frac{7}{10} \times \frac{7}{10} \times \frac{7}{10} (= \frac{343}{1000})$ oe or $\frac{7}{10} \times \frac{7}{10} \times \frac{3}{10} (= \frac{147}{1000})$ oe or $\frac{3}{10} \times \frac{3}{10} \times \frac{3}{10} (= \frac{27}{1000})$ oe or $\frac{3}{10} \times \frac{3}{10} \times \frac{7}{10} (= \frac{63}{1000})$ oe or $\frac{7}{10} \times \frac{7}{10} (= \frac{49}{100})$ oe or $\frac{3}{10} \times \frac{3}{10} (= \frac{9}{100})$ oe	Throughout accept probabilities given as decimals or percentages Condone sampling without replacement for the first method mark only provided it is in the form $\frac{a}{10} \times \frac{b}{9} \times \frac{c}{8}$ where a, b, c are integers and $a < 10$ and $b < 9$ and $c < 8$
		M1	for $\frac{7}{10} \times \frac{7}{10} \times \frac{7}{10} (= \frac{343}{1000})$ oe and $\frac{7}{10} \times \frac{7}{10} \times \frac{3}{10} (= \frac{147}{1000})$ oe or $\frac{3}{10} \times \frac{3}{10} \times \frac{3}{10} (= \frac{27}{1000})$ oe and $\frac{3}{10} \times \frac{3}{10} \times \frac{7}{10} (= \frac{63}{1000})$ oe or $\frac{7}{10} \times \frac{7}{10} (= \frac{49}{100})$ oe and $\frac{7}{10} \times \frac{7}{10} \times \frac{3}{10} (= \frac{147}{1000})$ oe or $\frac{3}{10} \times \frac{3}{10} (= \frac{9}{100})$ oe and $\frac{3}{10} \times \frac{3}{10} \times \frac{7}{10} (= \frac{63}{1000})$ oe	Condone any labelling, even if incorrect for the method marks ÷
		M1	for $\frac{7}{10} \times \frac{7}{10} \times \frac{7}{10}$ oe and $3 \times \frac{7}{10} \times \frac{7}{10} \times \frac{3}{10}$ oe or $\frac{3}{10} \times \frac{3}{10} \times \frac{3}{10}$ oe and $3 \times \frac{3}{10} \times \frac{3}{10} \times \frac{7}{10}$ oe or $\frac{7}{10} \times \frac{7}{10}$ oe and $2 \times \frac{7}{10} \times \frac{7}{10} \times \frac{3}{10}$ oe or $\frac{3}{10} \times \frac{3}{10}$ oe and $2 \times \frac{3}{10} \times \frac{3}{10} \times \frac{7}{10}$ oe	



Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
		C1	for a complete method and chain of reasoning leading to $\frac{98}{125}$ eg $\frac{7}{10} \times \frac{7}{10} \times \frac{7}{10} + 3 \times \frac{7}{10} \times \frac{7}{10} \times \frac{3}{10} = \frac{98}{125}$ or $1 - \frac{3}{10} \times \frac{3}{10} \times \frac{3}{10} - 3 \times \frac{3}{10} \times \frac{3}{10} \times \frac{7}{10} = \frac{98}{125}$ or $\frac{7}{10} \times \frac{7}{10} + 2 \times \frac{7}{10} \times \frac{7}{10} \times \frac{3}{10} = \frac{98}{125}$ or $1 - \frac{3}{10} \times \frac{3}{10} - 2 \times \frac{3}{10} \times \frac{3}{10} \times \frac{7}{10} = \frac{98}{125}$	

Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
15 (a)	0.55, 0.67, 0.33, 0.35, 0.65	B1	for 0.55 in correct position	Can be seen as fractions or percentages
		B1	for the branches for the second game correct	
		M1	for one correct product, eg $0.45 \times "0.33"$ (=0.1485) or $"0.55" \times "0.35"$ (=0.1925) or $0.45 \times "0.67"$ (=0.3015) or $"0.55" \times "0.65"$ (=0.3575)	Follow through acceptable for method marks from their tree in part (a) providing probabilities are less than 1. Accept fractional equivalents
		M1	for correct method eg $(0.45 \times "0.33") + ("0.55" \times "0.35")$ or $1 - (0.45 \times "0.67") - ("0.55" \times "0.65")$	
		A1	answer in range 0.34 – 0.341 oe	
16 (a)	Correct graph	B2	for a circle radius 3.5, centre (0, 0)	Circle could be drawn freehand as long as it approximates to a circle
		(B1	for a circle centre (0, 0) of a different radius, or for a circle drawn of radius 3.5 centre not (0, 0) or incomplete correct circle)	
		M1	for $2x + y = 1$ drawn, or for correctly eliminating one variable, eg $x^2 + 1 - 4x + 4x^2 = 12.25$ or $x^2 + (1 - 2x)^2 = 12.25$	
		A1	for the pair of x values, or the correct pair of y values, or one correct pair of x/y values fit from (a) (dep on B1)	$2x + y = 1$ does not have to be shown Use professional judgment
		A1	for both correct pair of x/y values, unambiguously matched fit from (a) (dep on B1)	Accept values given as coordinates. Check graph for answers
(b)	$x = 2.0, y = -2.9$ $x = -1.2, y = 3.3$			



Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
9 (a)	100 : 81	M1	for a scale factor of 0.9 oe used; OR for 10 : 9 oe OR 81 : 100 oe OR 81%	eg. 1 : 0.81, accept 1.23(4...) : 1
		A1	for 100 : 81 oe	
	6 : 5	P1	for 1.44 oe used as the scale factor or 1.2 oe OR for 144 : 100 oe or $\sqrt{144} : \sqrt{100}$ oe OR 5 : 6 oe	
		A1	for 6 : 5 oe	
10 (a)	Diagram completed 0.85 0.15, 0.85, 0.15, 0.85	M1	for $1 - 0.15 (=0.85)$	fit their diagram provided probabilities are less than 1
		A1	fully correct diagram	
	0.2775	M1	for one correct product eg $0.15 \times 0.15 (= 0.0225)$ or $0.15 \times 0.85 (= 0.1275)$ or $0.85 \times 0.85 (= 0.7225)$	
		M1	for a complete method eg "0.0225" + $2 \times$ "0.1275" OR $1 - "0.7225"$ oe	
10 (b)	0.2775	A1	oe, eg $\frac{111}{400}$	fit their diagram provided probabilities are less than 1

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
24	$\frac{5x^2-23x+50}{9x^2-3x}$	P1	for using $y = 3x$ or $x = \frac{1}{3}y$ to obtain an expression for a probability in one variable	This may be awarded at any time
		P1	for a correct second probability eg $\frac{x-1}{y-1}$ or $\frac{x-1}{3x-1}$ or $\frac{4}{y-1}$ or $\frac{4}{3x-1}$ or $\frac{y-x-6}{y-1}$ or $\frac{2x-6}{3x-1}$	
		P1	for forming a correct product eg $\frac{x}{y} \times \frac{x-1}{y-1}$ or $\frac{x}{3x} \times \frac{x-1}{3x-1}$ or $\frac{5}{y} \times \frac{4}{y-1}$ or $\frac{5}{3x} \times \frac{4}{3x-1}$ or $\frac{y-x-5}{y} \times \frac{y-x-6}{y-1}$ or $\frac{2x-5}{3x} \times \frac{2x-6}{3x-1}$	
		P1	for adding the 3 correct probabilities eg $\frac{x}{y} \times \frac{x-1}{y-1} + \frac{5}{y} \times \frac{4}{y-1} + \frac{y-x-5}{y} \times \frac{y-x-6}{y-1}$ or $\frac{x}{3x} \times \frac{x-1}{3x-1} + \frac{5}{3x} \times \frac{4}{3x-1} + \frac{2x-5}{3x} \times \frac{2x-6}{3x-1}$	Can be seen after processing of algebra
		A1	$\frac{5x^2-23x+50}{9x^2-3x}$	



Paper: IMA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
10 (a)	0.13, 0.94, 0.06, 0.73, 0.27	B2	for all values correctly placed	Allow values that are truncated or rounded as long as the intention is clear.
		(B1	for at least 2 correct values placed)	
		M1	(fit their diagram) for one correct product, eg $0.87 \times 0.94 (= 0.8178)$ or $0.87 \times 0.06 (= 0.0522)$ or $0.13 \times 0.73 (= 0.0949)$ or $0.13 \times 0.27 (= 0.0351)$	
		M1	for a full method, eg “0.8178” + “0.0522” + “0.0949” or 1 – “0.0351”	
(b)	0.9649	A1	for 0.9649, 96.49% or $\frac{9649}{10000}$	
11	D A B C	B2	for all correct	
		(B1	for at least 2 correct)	
12	6.4	P1	for a suitable start to the process, eg, $M = \left(\frac{7-3}{2}, \frac{13+21}{2} \right) (= (2, 17))$ or $N = \left(\frac{15-3}{2}, \frac{23+21}{2} \right) (= (6, 22))$	Condone missing brackets on coordinates Ignore units throughout
		P1	(dep on P1) for a correct first step using of Pythagoras, eg $(x_N - x_M)^2 + (y_N - y_M)^2$ eg $(“6” - “2”)^2 + (“22” - “17”)^2 (= 41)$	
		A1	for answer in the range 6.4 to 6.41	

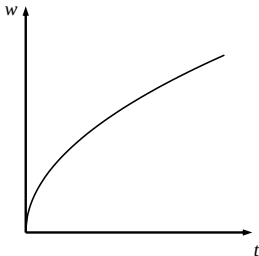
Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
22	26	P1	for a correct 2nd probability, eg $\frac{2x-1}{5x-1}$ or $\frac{3x-1}{5x-1}$ or $\frac{2x}{5x-1}$ or $\frac{3x}{5x-1}$ or $\frac{\frac{3}{5}n-1}{n-1}$ or $\frac{\frac{2}{5}n-1}{n-1}$	
		P1	for a correct product, eg $\frac{3x}{5x} \times \frac{3x-1}{5x-1}$ or $\frac{2x}{5x} \times \frac{2x-1}{5x-1}$ or $\frac{3}{5} \times \frac{2x}{5x-1}$ or $\frac{2}{5} \times \frac{3x}{5x-1}$ or $\frac{3}{5} \times \frac{\frac{3}{5}n-1}{n-1}$ or $\frac{2}{5} \times \frac{\frac{2}{5}n-1}{n-1}$ oe	Award of this mark implies P2
		P1	for process to form equation, eg $\frac{3x}{5x} \times \frac{3x-1}{5x-1} + \frac{2x}{5x} \times \frac{2x-1}{5x-1} = \frac{41}{80}$ or $2 \times \frac{3}{5} \times \frac{2x}{5x-1} = \frac{39}{80}$ or $\frac{3}{5} \times \frac{\frac{3}{5}n-1}{n-1} + \frac{2}{5} \times \frac{\frac{2}{5}n-1}{n-1}$ oe	Award of this mark implies P3
		P1	for process to eliminate fractions and reduce equation to linear or quadratic form, eg $1040x - 400 = 1025x^2 - 205$ or $960x = 975x^2 - 195$ or $1040x^2 - 400x = 1025x^2 - 205x$ or $960x^2 = 975x^2 - 195x$ or $\frac{208}{5}n - 80 = 41n - 41$ or $x = 13$ or $n = 65$	
		A1	cao	



Question 3

	London	Zurich
100g	$3.5 \div 2 = \text{£}1.75$ $1.75 \times 1.25 = \text{£}2.1875 \text{ F}$	$7.2 \div 360 = \text{£}2.00 \text{ F}$ $2.00 \div 1.25 = \text{£}1.60$
200g	$\text{£}3.50$ $3.5 \times 1.25 = \text{£}4.375 \text{ F}$	$7.2 \div 360 \times 200 = \text{£}4.0 \text{ F}$ $4.0 \div 1.25 = \text{£}3.20$
360g	$3.5 \div 200 \times 360 = \text{£}6.30$ $6.30 \times 1.25 = \text{£}7.875 \text{ F}$	$\text{£}7.20 \text{ F}$ $7.20 \div 1.25 = \text{£}5.76$
1g	$\text{£}3.50 \div 200 = \text{£}0.0175$ $\times 1.25 = \text{£}0.021875 \text{ F}$	$7.20 \div 360 = \text{£}0.02 \text{ F}$ $\div 1.25 = \text{£}0.016$
40g	$\text{£}3.50 \div 5 = \text{£}0.70$ $0.7 \times 1.25 = \text{£}0.875 \text{ F}$	$7.20 \div 9 = \text{£}0.8 \text{ F}$ $0.8 \div 1.25 = \text{£}0.64$
By weight	$350 \div 200 = 1.75 \text{ p/g}$ $350 \times 1.25 = 4.375$ $4.375 \div 200 = \text{£}0.021875 \text{ F/g}$	$720 \div 360 = \text{£}0.02 \text{ F/g}$ $720 \div 1.25 = 576$ $576 \div 360 = \text{£}1.6 \text{ p/g}$

Question 13(b) (ii)

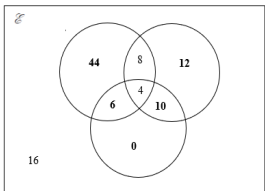


Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
14	No (supported)	P1	for $P(OO) = \frac{5}{9} \times \frac{4}{8} (= \frac{20}{72})$ or $P(OE) = \frac{5}{9} \times \frac{4}{8} (= \frac{20}{72})$ or $P(EO) = \frac{4}{9} \times \frac{5}{8} (= \frac{20}{72})$ or $P(EE) = \frac{4}{9} \times \frac{3}{8} (= \frac{12}{72})$	Accept equivalent probabilities throughout Sample space diagram or listing: Award P3 for $P(\text{sum even}) = \frac{32}{72}$ or $P(\text{product even}) = \frac{52}{72}$, P4 for both
		P1	for $P(OO) = \frac{5}{9} \times \frac{4}{8} (= \frac{20}{72})$ and $P(EE) = \frac{4}{9} \times \frac{3}{8} (= \frac{12}{72})$ OR for $P(OE) = \frac{5}{9} \times \frac{4}{8} (= \frac{20}{72})$ and $P(EO) = \frac{4}{9} \times \frac{5}{8} (= \frac{20}{72})$ and $P(EE) = \frac{4}{9} \times \frac{3}{8} (= \frac{12}{72})$	
		P1	for a process to find probability of sum being even, eg $P(OO) + P(EE) = \frac{5}{9} \times \frac{4}{8} + \frac{4}{9} \times \frac{3}{8} (= \frac{32}{72})$	
		P1	for a process to work with probability of product being even, eg $P(EO) + P(OE) + P(EE) = \frac{4}{9} \times \frac{5}{8} + \frac{5}{9} \times \frac{4}{8} + \frac{4}{9} \times \frac{3}{8} (= \frac{52}{72})$ or $1 - P(OO) = 1 - \frac{5}{9} \times \frac{4}{8} (= \frac{52}{72})$	
		C1	for No supported by correct probabilities, eg $\frac{32}{72}$ and $\frac{52}{72}$ SC B2 for $\frac{41}{81}$ and $\frac{56}{81}$ and No SC B1 for $\frac{41}{81}$ and $\frac{56}{81}$ with no decision or incorrect decision	

Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
10	1.4	M1 A1	for a correct first step eg $\frac{14-x}{3} \times 3 = 3x \times 3$ or $\frac{14}{3} - \frac{1}{3}x + \frac{1}{3}x = 3x + \frac{1}{3}x$ oe oe, eg $\frac{14}{10}$	For M mark, step must be carried out not just intention shown. For example if you see $\frac{14-x}{3} = 3x$ $\times 3 \qquad \times 3$ Only award M1 when you see $14-x = kx$ where $k > 3$
11 (a)	0.2, 0.15, 0.85, 0.15	B2 (B1)	all placed correctly for 2 or 3 placed correctly)	
(b)	0.29	M1 M1 A1	for one correct product, ft their tree diagram eg $0.8 \times 0.85 (= 0.68)$ or $0.8 \times "0.15" (= 0.12)$ or $"0.2" \times "0.85" (= 0.17)$ or $"0.2" \times "0.15" (= 0.03)$ for a complete method, ft their tree diagram eg $"0.2" \times "0.85" + 0.8 \times "0.15"$ or $1 - (0.8 \times 0.85 + "0.2" \times "0.15")$ for 0.29 oe or ft their tree diagram	Working for part (b) may be seen in part (a) To apply ft values must be <1 Cannot award A1ft if answer > 1



Paper: IMA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
22	21	P1	for a relevant probability, eg $P(\text{green}) = \frac{x}{2x+3}$ or $P(\text{blue}) = \frac{x+3}{2x+3}$	the number of green and blue pens could be $x - 3$ and x or equivalent probabilities must be in an algebraic form in a single variable This is an exception using replacements. No further credit is available
		P1	for a relevant product, eg. " $\frac{x}{2x+3}$ " $\times$ " $\frac{x-1}{2x+2}$ " or " $\frac{x+3}{2x+3}$ " $\times$ " $\frac{x+2}{2x+2}$ " OR $\left(\frac{x}{x+3}\right)^2 + \left(\frac{x+3}{2x+3}\right)^2 = \frac{27}{75}$	
		P1	forms an appropriate equation, eg. " $\frac{x}{2x+3} \times \frac{x-1}{2x+2}$ " + " $\frac{x+3}{2x+3} \times \frac{x+2}{2x+2}$ " = $\frac{27}{55}$	
		P1	(dep P3) process to reduce equation to $ax^2 + bx + c = 0$ eg. $x^2 - 25x + 84 = 0$	
		P1	process to solve quadratic equation eg. $(x - 21)(x - 4) = 0$	
		A1	cao	

Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
16 (a)	Venn diagram	C4	fully correct Venn diagram	 If all other regions correct, accept blank region for 0 Additional digits in the diagram should be counted as 2 elements
		(C3)	6 or 7 of the 8 regions correct	
(b)	$\frac{12}{62}$	(C2)	4 or 5 of the 8 regions correct	Need not be written in correct form at this stage eg could be a ratio 12 : 62 Accept any equivalent fraction, decimal form 0.19(35...) or percentage form 19(.35...)%
		(C1)	2 or 3 of the 8 regions correct	
		M1	(ft their Venn diagram) for $\frac{8+4}{b}$ where $b > 8+4$	
		A1	or $\frac{a}{44+8+4+6}$ where $a < 44+8+4+6$ oe ft oe	

Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
19	788.4	P1 P1 P1 A1	for substituting values, eg $1040 = K \times 1200 + 20$ for process to find K , eg $(1040 - 20) \div 1200$ oe ($= 0.85$) for complete process, eg 09 17: " 0.85 " $\times 1040 + 20$ ($= 904$); 09 18: " 0.85 " $\times$ " 904 " $+ 20$ for 788.4 or 788 or 789	
20 (a)	Shown	M1 M1 C1	for $\frac{n}{n+8}$ or starts to work with ratios, eg 3:7 forms equation and clears fractions, eg $10n = 7n + 56$ or $10n + 3(n+8) = 10(n+8)$ or equates $\frac{3}{10} = \frac{8}{x}$ or $\frac{3}{10} = \frac{8}{n+8}$ or continues to work with ratios, eg 3:7 = 24:56 gives the total sweets eg $\frac{80}{3}$ oe or number of red sweets $n = \frac{56}{3}$ oe or gives number of red as $\frac{56}{3}$ OR award 3 marks for a complete written argument, eg, $P(y) = \frac{3}{10}$ and there are 8 yellows. This cannot work as 3 is not a factor of 8 (and $\frac{3}{10}$ is in its simplest form)	Does not have to restate the $\frac{7}{10}$; giving a different probability will suffice



Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
20 (b)	28	P1	for $\frac{n}{n+8}$ and $\frac{n-1}{n+7}$ oe	Note we do not need to see “= 0”; just the LHS is sufficient.
		P1	forms an appropriate equation, eg $\frac{n}{n+8} \times \frac{n-1}{n+7} = \frac{3}{5}$	
		P1	for correctly forming a quadratic ready for solving, eg $an^2 + bn + c (=0)$, $2n^2 - 50n - 168 (=0)$, $n^2 - 25n - 84 (=0)$ oe	
		P1	process to solve quadratic equation, ft a 3 term quadratic factorising eg $(n+3)(n-28) (=0)$ oe or completing the square or correct use of formula eg $\frac{- -25 \pm \sqrt{25^2 - 4 \times -84}}{2}$, $\frac{- -50 \pm \sqrt{50^2 - 4 \times 2 \times -168}}{2 \times 2}$	
		A1	cao	Award 0 marks for a correct answer with no supportive working.