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

Pythagoras & Trigonometry (G5)

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

52 questions · 185 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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G5a PYTHAGORAS' THEOREM		8 Qs · 23 marks	3
1. Q8	GCSE Paper 3H June 2019	2	4
2. Q1	GCSE Paper 3H June 2022	2	6
3. Q13	GCSE Paper 2H November 2022	2	7
4. Q1	GCSE Paper 2H June 2024	2	8
5. Q7	GCSE Paper 2H June 2025	2	9
6. Q5	GCSE Paper 2H November 2021	4	10
7. Q10	GCSE Paper 3H November 2021	4	11
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G5b RIGHT-ANGLED TRIGONOMETRY & EXACT VALUES		15 Qs · 46 marks	13
9. Q7	GCSE Paper 3H June 2017	2	14
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23. Q19	GCSE Paper 3H June 2018	5	28
G5c SINE RULE, COSINE RULE & AREA OF A TRIANGLE		20 Qs · 82 marks	29
24. Q18	GCSE Paper 2H November 2022	2	30
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QUESTION	SOURCE	MARKS	PAGE
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40. Q15	GCSE Paper 2H November 2021	5	46
41. Q26	GCSE Paper 3H November 2022	5	47
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G5d 3D PYTHAGORAS & TRIGONOMETRY		9 Qs · 34 marks	50
44. Q22	GCSE Paper 1H June 2023	2	51
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48. Q19	GCSE Paper 2H June 2019	4	55
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52. Q18	GCSE Paper 3H June 2022	5	59



QUESTIONS

52 questions · 185 marks · 4 sub-topics

SUB-TOPIC G5a

PYTHAGORAS' THEOREM

Sub-topic G5a · 8 questions · 23 marks · lowest tariff first

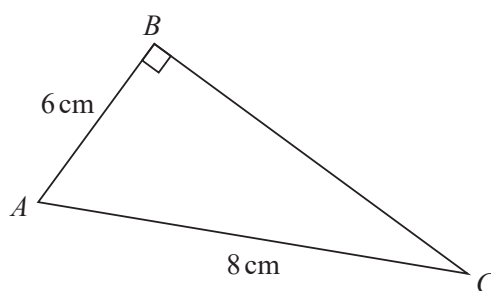


7 Work out

$$\sqrt{\frac{2.5 \times \sin 43^\circ}{8.2^2 - 50.5}}$$

Give your answer correct to 3 significant figures.

(Total for Question 7 is 2 marks)

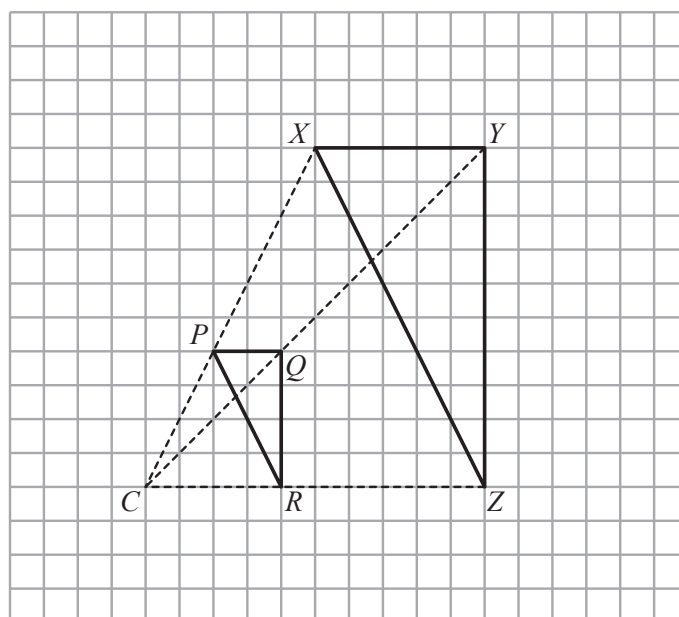
8 ABC is a right-angled triangle.Here is Sarah's method to find the length of BC .

$$\begin{aligned} BC^2 &= AB^2 + AC^2 \\ &= 6^2 + 8^2 \\ &= 100 \\ BC &= 10 \end{aligned}$$

(a) What mistake has Sarah made in her method?

(1)





Roy is going to enlarge triangle PQR with centre C and scale factor $1\frac{1}{2}$

He draws triangle XYZ .

(b) Explain why Roy's diagram is **not** correct.

(1)

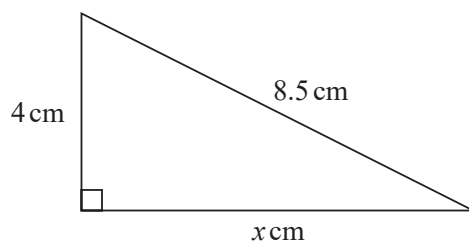
(Total for Question 8 is 2 marks)

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

- 1 Here is a right-angled triangle.



Work out the value of x .

$x =$

(Total for Question 1 is 2 marks)



13 A and B are points on a centimetre grid.

A is the point with coordinates $(-7, 6)$

B is the point with coordinates $(8, -5)$

Work out the length of AB .

Give your answer correct to 1 decimal place.

..... cm

(Total for Question 13 is 2 marks)

14 Using algebra, prove that $1.0\dot{6}\dot{2}$ can be written as $1\frac{14}{225}$

(Total for Question 14 is 3 marks)

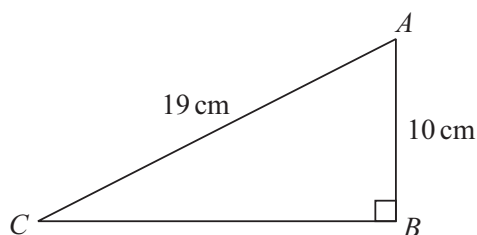


Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

- 1 ABC is a right-angled triangle.



Work out the length of CB .

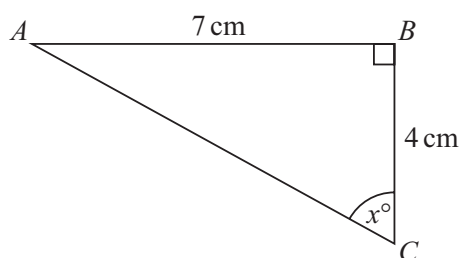
Give your answer correct to 3 significant figures.

..... cm

(Total for Question 1 is 2 marks)



- 7 ABC is a right-angled triangle.



Calculate the value of x .

Give your answer correct to 1 decimal place.

$x = \dots\dots\dots$

(Total for Question 7 is 2 marks)

- 8 Metal rods are made from steel with density 8 g/cm^3
Each metal rod has a volume of 1500 cm^3

The maximum mass of metal rods that can be put on a trolley is 300 kg .

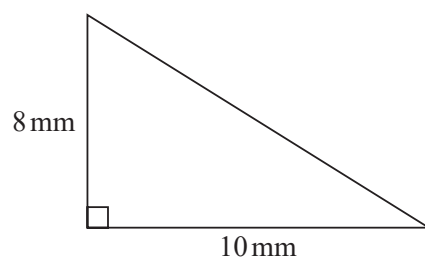
Work out the greatest number of metal rods that can be put on the trolley.

$\dots\dots\dots$

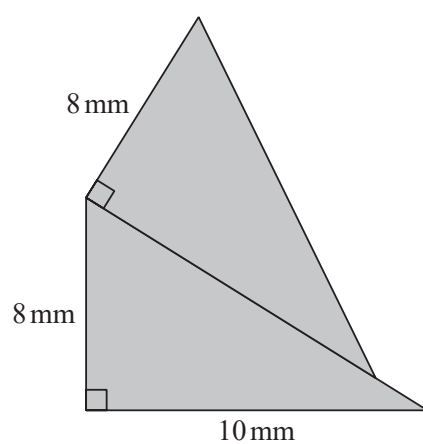
(Total for Question 8 is 3 marks)



5 Here is a right-angled triangle.



The shaded shape below is made from two of these triangles.



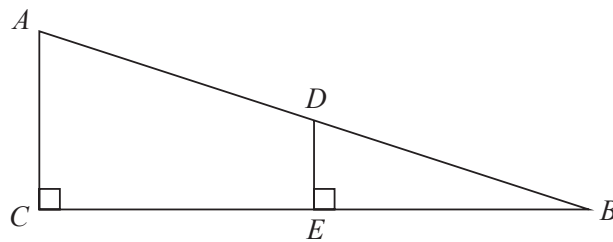
Work out the perimeter of the shaded shape.
Give your answer correct to 3 significant figures.

..... mm

(Total for Question 5 is 4 marks)



10 The diagram shows two right-angled triangles ACB and DEB .



$$AD = 9 \text{ cm}$$

$$DE = 2 \text{ cm}$$

$$DB = 6 \text{ cm}$$

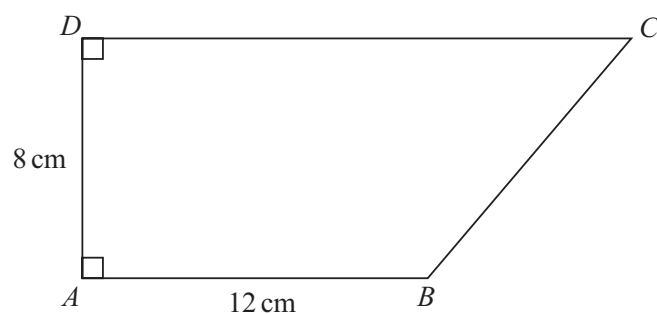
Calculate the length of CB .

Give your answer correct to 2 decimal places.

..... cm

(Total for Question 10 is 4 marks)

- 8 The diagram shows trapezium $ABCD$.



$$AB = 12 \text{ cm}$$

$$AD = 8 \text{ cm}$$

The trapezium has an area of 112 cm^2

Work out the perimeter of the trapezium.

Give your answer correct to 3 significant figures.

..... cm

(Total for Question 8 is 5 marks)



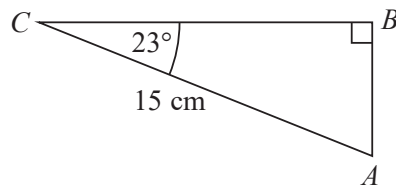
SUB-TOPIC G5b

RIGHT-ANGLED TRIGONOMETRY & EXACT VALUES

Sub-topic G5b · 15 questions · 46 marks · lowest tariff first



7 ABC is a right-angled triangle.



Calculate the length of AB .

Give your answer correct to 3 significant figures.

.....cm

(Total for Question 7 is 2 marks)

13 Given that n can be any integer such that $n > 1$, prove that $n^2 - n$ is never an odd number.

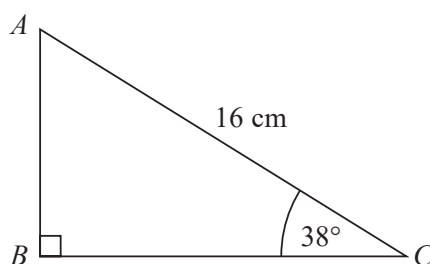
(Total for Question 13 is 2 marks)

14 Find the exact value of $\tan 30^\circ \times \sin 60^\circ$
Give your answer in its simplest form.

(Total for Question 14 is 2 marks)



- 5 ABC is a right-angled triangle.



Calculate the length of AB .
Give your answer correct to 2 decimal places.

.....cm

(Total for Question 5 is 2 marks)

- 6 Sally used her calculator to work out the value of a number y .

The answer on her calculator display began

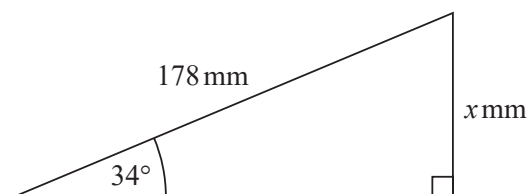
8.3

Complete the error interval for y .

..... $\leq y <$

(Total for Question 6 is 2 marks)

5



Work out the value of x .
Give your answer correct to 1 decimal place.

(Total for Question 5 is 2 marks)

6 $\mathbf{a} = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} 5 \\ -2 \end{pmatrix}$

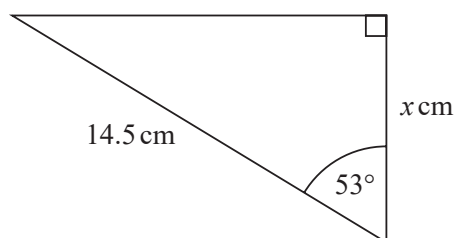
Find $2\mathbf{a} - 3\mathbf{b}$ as a column vector.

$$\begin{pmatrix} \\ \\ \end{pmatrix}$$

(Total for Question 6 is 2 marks)



5



Work out the value of x .
Give your answer correct to 3 significant figures.

 $x = \dots\dots\dots$

(Total for Question 5 is 2 marks)

6 Ella invests £7000 for 2 years in an account paying compound interest.

In the first year, the rate of interest is 3%

In the second year, the rate of interest is 1.5%

Work out the value of Ella's investment at the end of 2 years.

 $\pounds \dots\dots\dots$

(Total for Question 6 is 3 marks)



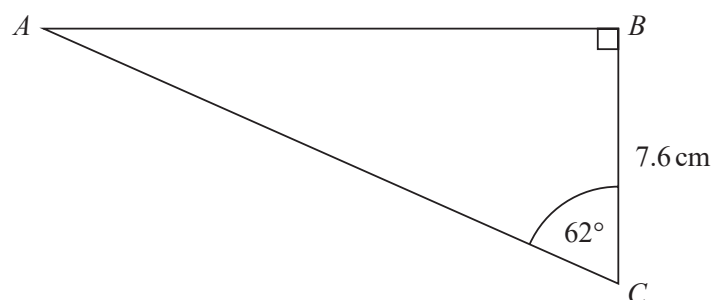
- 7 Jana used her calculator to find the value of a number t .
The answer on her calculator began 10.2

Complete the error interval for t .

..... $\leq t <$

(Total for Question 7 is 2 marks)

- 8 ABC is a right-angled triangle.

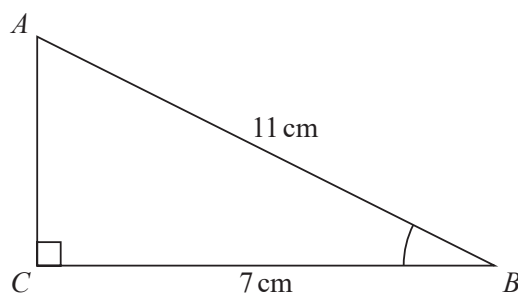


Calculate the length of AB .
Give your answer correct to 1 decimal place.

..... cm

(Total for Question 8 is 2 marks)

5 ABC is a right-angled triangle.



- (a) Work out the size of angle ABC .
Give your answer correct to 1 decimal place.

.....
(2)

The length of the side AB is reduced by 1 cm.

The length of the side BC is still 7 cm.
Angle ACB is still 90°

- (b) Will the value of $\cos ABC$ increase or decrease?
You must give a reason for your answer.

.....
(1)

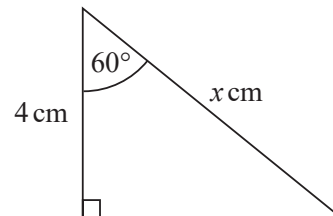
(Total for Question 5 is 3 marks)



- 8 (a) Write down the exact value of $\tan 45^\circ$

.....
(1)

Here is a right-angled triangle.



$$\cos 60^\circ = 0.5$$

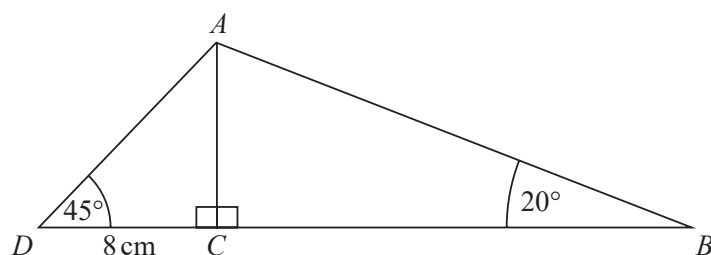
- (b) Work out the value of x .

.....
(2)

(Total for Question 8 is 3 marks)



12 ABC and ACD are right-angled triangles.



$$DC = 8 \text{ cm}$$

$$\text{Angle } ADC = 45^\circ$$

$$\text{Angle } ABC = 20^\circ$$

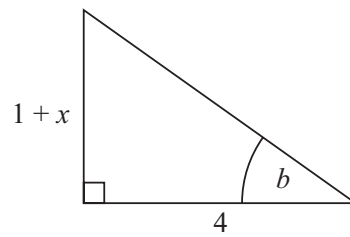
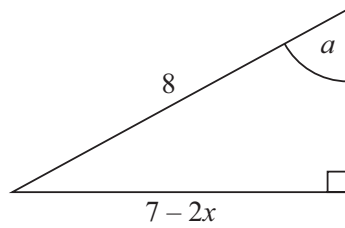
Work out the length of AB .

Give your answer correct to 3 significant figures.

..... cm

(Total for Question 12 is 3 marks)

10 The diagram shows two right-angled triangles.



All lengths are measured in centimetres.

Given that

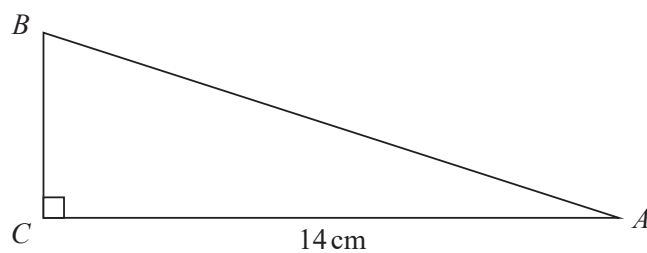
$$\sin a = \tan b$$

work out the value of x .

$x = \dots\dots\dots$

(Total for Question 10 is 3 marks)

6 ABC is a right-angled triangle.



$AC = 14$ cm.

Angle $C = 90^\circ$

size of angle B : size of angle $A = 3 : 2$

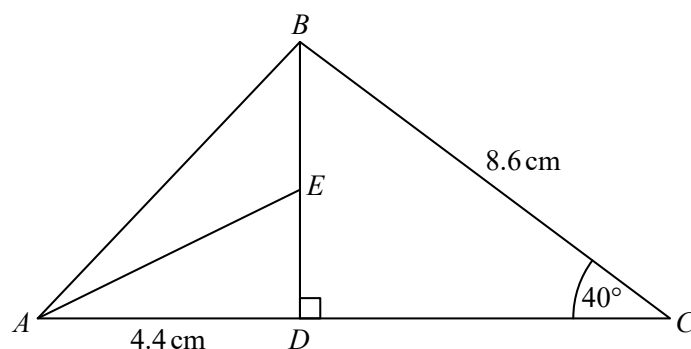
Work out the length of AB .

Give your answer correct to 3 significant figures.

.....cm

(Total for Question 6 is 4 marks)

12 The diagram shows triangle ABC .



ADC and DEB are straight lines.

$$AD = 4.4 \text{ cm}$$

$$BC = 8.6 \text{ cm}$$

E is the midpoint of DB .

$$\text{Angle } CDB = 90^\circ$$

$$\text{Angle } DCB = 40^\circ$$

Work out the size of angle EAD .

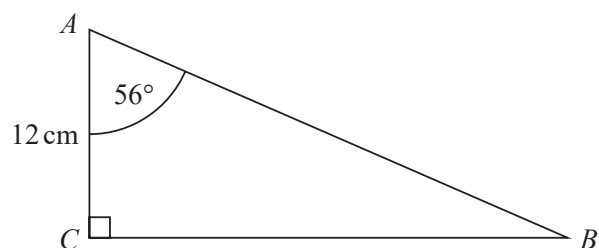
Give your answer correct to 1 decimal place.

You must show all your working.

(Total for Question 12 is 4 marks)



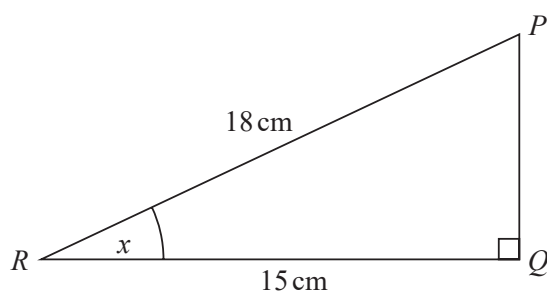
6 ABC is a right-angled triangle.



- (a) Work out the length of BC .
Give your answer correct to 1 decimal place.

..... cm
(2)

PQR is a right-angled triangle.

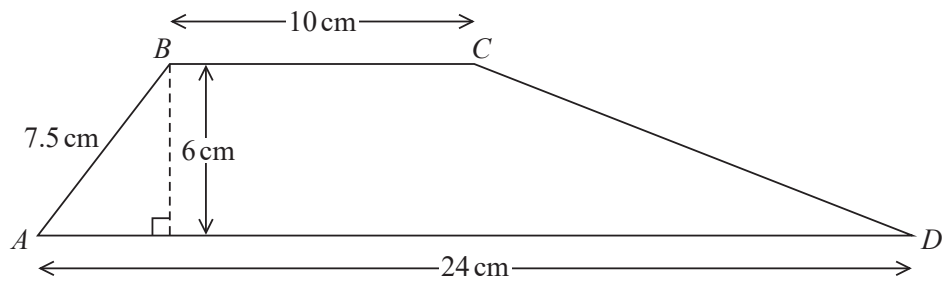


- (b) Work out the size of the angle marked x .
Give your answer correct to 1 decimal place.

.....
(2)

(Total for Question 6 is 4 marks)

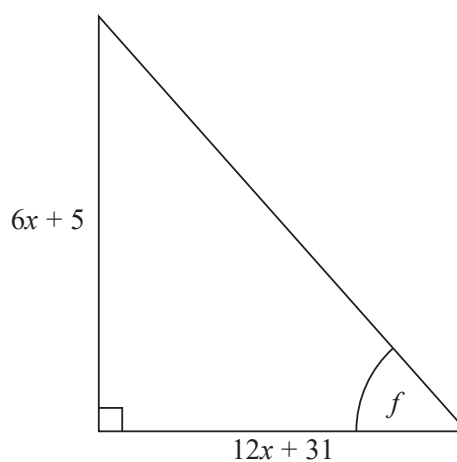
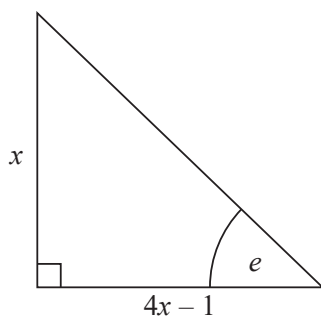
7 $ABCD$ is a trapezium.



Work out the size of angle CDA .
Give your answer correct to 1 decimal place.

(Total for Question 7 is 5 marks)

19 Here are two right-angled triangles.



Given that

$$\tan e = \tan f$$

find the value of x .

You must show all your working.

(Total for Question 19 is 5 marks)

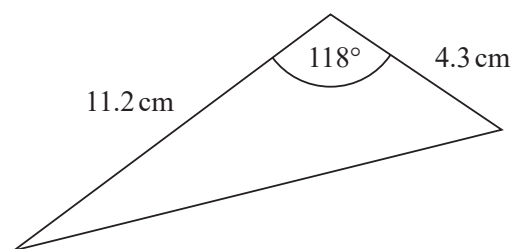
SUB-TOPIC G5c

SINE RULE, COSINE RULE & AREA OF A TRIANGLE

Sub-topic G5c · 20 questions · 82 marks · lowest tariff first



18 Here is a triangle.



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

..... cm²

(Total for Question 18 is 2 marks)

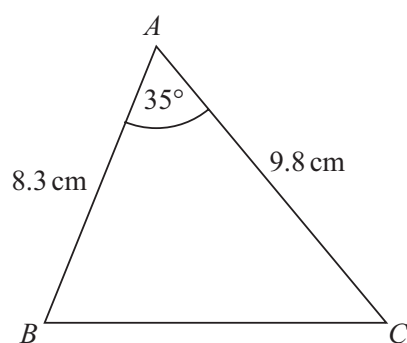
19 Solve $6x^2 + 5x - 6 = 0$

.....

(Total for Question 19 is 3 marks)



14 Here is triangle ABC .



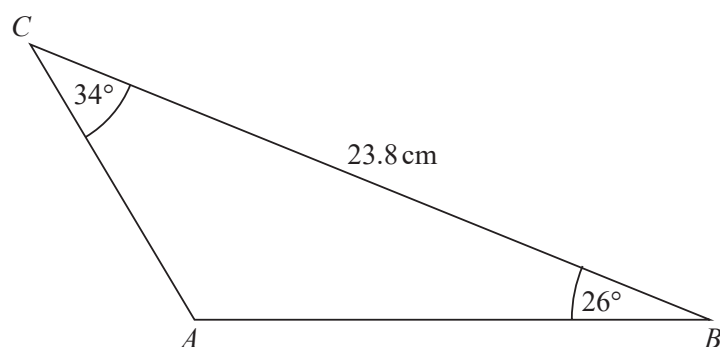
Calculate the area of triangle ABC .
Give your answer correct to 3 significant figures.

..... cm²

(Total for Question 14 is 2 marks)



13 Here is triangle ABC .



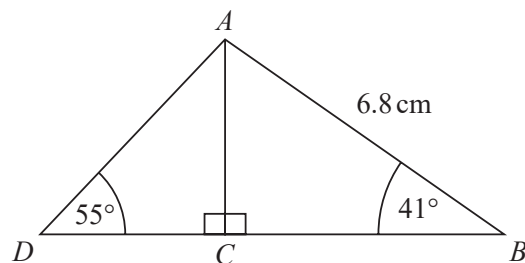
Work out the length of AB .
Give your answer correct to 1 decimal place.

..... cm

(Total for Question 13 is 3 marks)



- 10 ABD is a triangle.
 C is a point on BD .



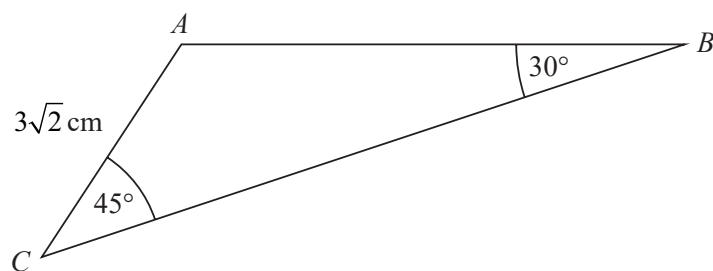
Work out the length of DC .
Give your answer correct to 1 decimal place.

..... cm

(Total for Question 10 is 3 marks)



14 ABC is a triangle.



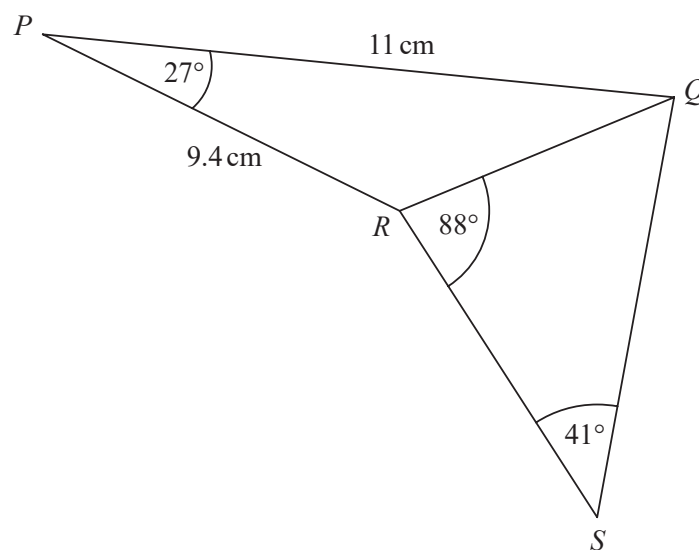
Work out the length of AB .

..... cm

(Total for Question 14 is 3 marks)



18 PQR and QRS are triangles.



Calculate the length of QS .

Give your answer correct to 3 significant figures.

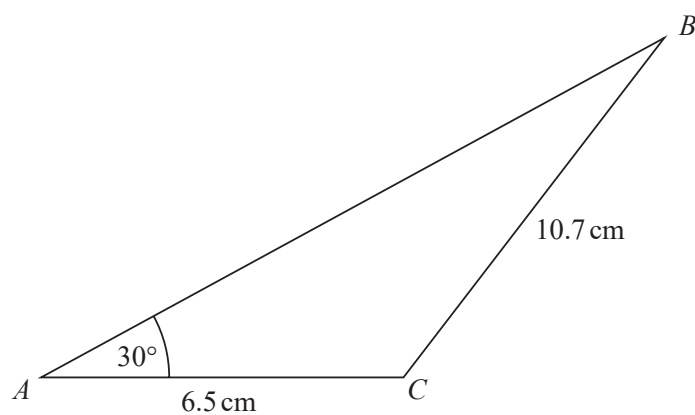
You must show all your working.

..... cm

(Total for Question 18 is 4 marks)



22 Here is a triangle ABC .

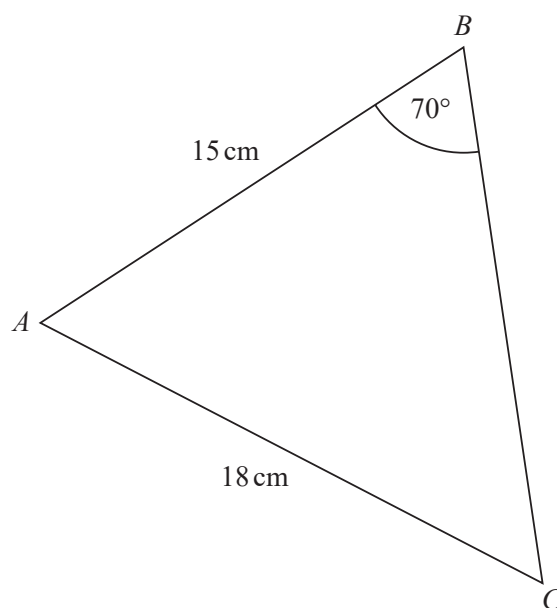


Work out the value of $\sin ABC$

Give your answer in the form $\frac{m}{n}$ where m and n are integers.

(Total for Question 22 is 4 marks)

13 ABC is a triangle.

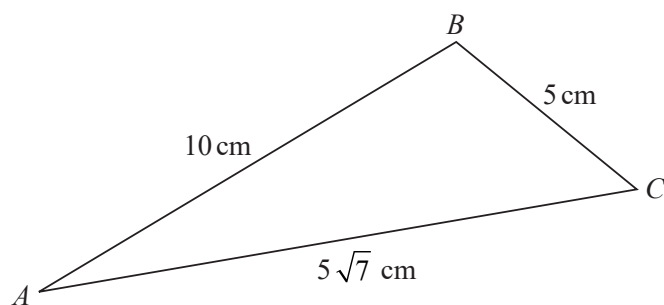


Calculate the size of angle BAC .
Give your answer correct to 1 decimal place.

(Total for Question 13 is 4 marks)



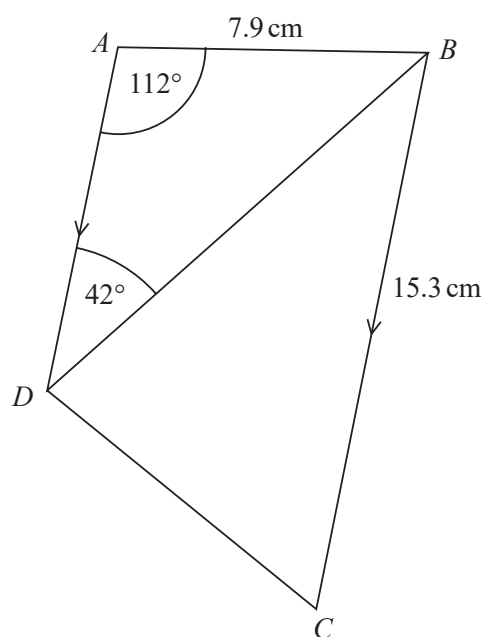
20 Here is triangle ABC .



Find the size of angle ABC .
You must show all your working.

(Total for Question 20 is 4 marks)

16 $ABCD$ is a trapezium.



AD is parallel to BC .

Calculate the area of triangle BCD .

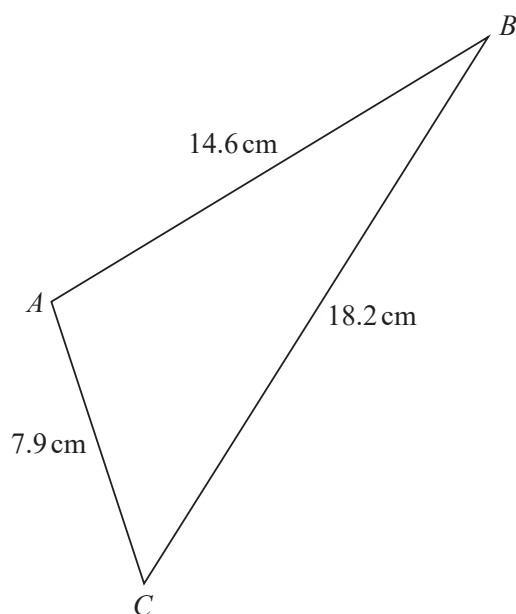
Give your answer correct to 1 decimal place.

..... cm^2

(Total for Question 16 is 4 marks)



17 Here is triangle ABC .



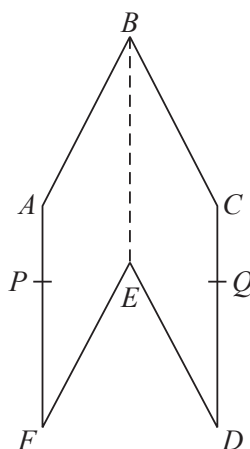
Work out the area of triangle ABC .
Give your answer correct to 3 significant figures.

..... cm^2

(Total for Question 17 is 4 marks)



22 The diagram shows a hexagon $ABCDEF$.



$ABEF$ and $CBED$ are congruent parallelograms where $AB = BC = x$ cm.
 P is the point on AF and Q is the point on CD such that $BP = BQ = 10$ cm.

Given that angle $ABC = 30^\circ$,

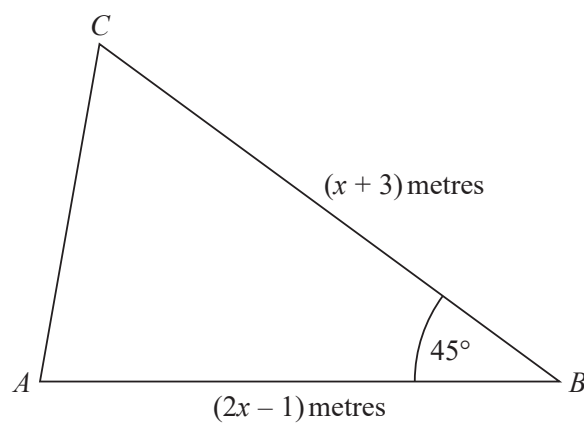
prove that $\cos PBQ = 1 - \frac{(2 - \sqrt{3})}{200}x^2$

(Total for Question 22 is 5 marks)

TOTAL FOR PAPER IS 80 MARKS



15



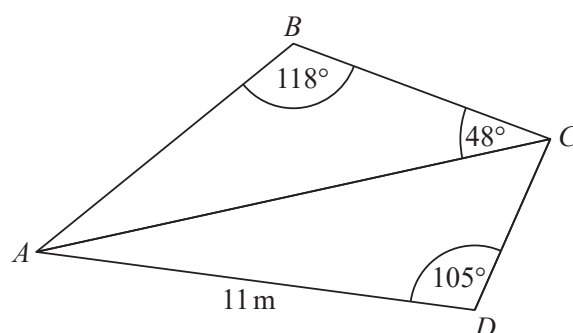
The area of triangle ABC is $6\sqrt{2} \text{ m}^2$.

Calculate the value of x .

Give your answer correct to 3 significant figures.

(Total for Question 15 is 5 marks)

17 ABC and ADC are triangles.



The area of triangle ADC is 56 m^2

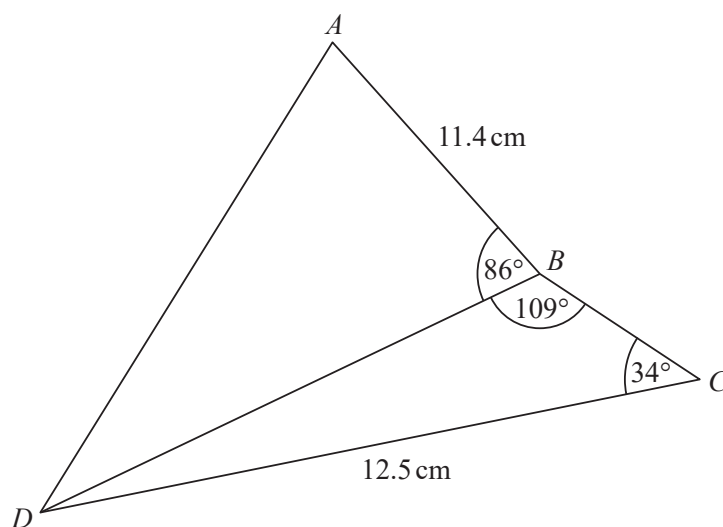
Work out the length of AB .

Give your answer correct to 1 decimal place.

..... m

(Total for Question 17 is 5 marks)

17



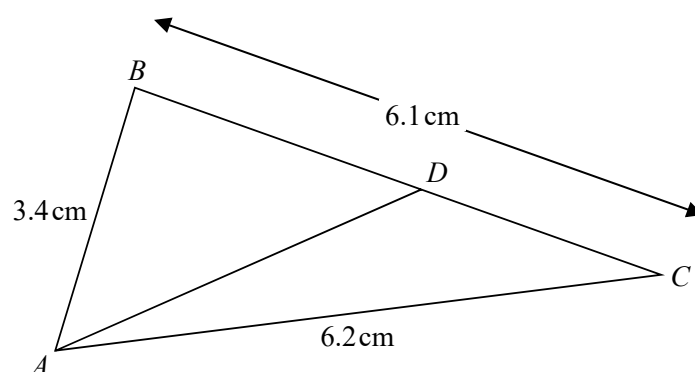
Work out the length of AD .
Give your answer correct to 3 significant figures.

..... cm

(Total for Question 17 is 5 marks)



18 The diagram shows triangle ABC .



$$AB = 3.4 \text{ cm} \quad AC = 6.2 \text{ cm} \quad BC = 6.1 \text{ cm}$$

D is the point on BC such that

$$\text{size of angle } DAC = \frac{2}{5} \times \text{size of angle } BCA$$

Calculate the length DC .

Give your answer correct to 3 significant figures.

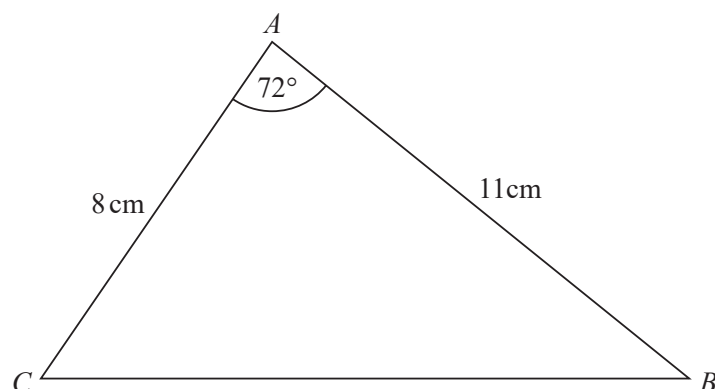
You must show all your working.

..... cm

(Total for Question 18 is 5 marks)



15 Here is triangle ABC .



- (a) Find the length of BC .
Give your answer correct to 3 significant figures.

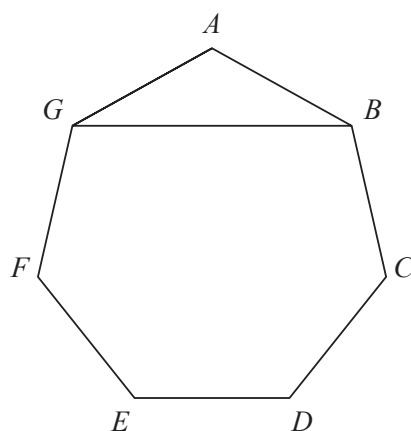
..... cm
(3)

- (b) Find the area of triangle ABC .
Give your answer correct to 3 significant figures.

..... cm²
(2)

(Total for Question 15 is 5 marks)

26 $ABCDEFG$ is a regular heptagon.



The area of triangle ABG is 30 cm^2

Calculate the length of GB .

Give your answer correct to 3 significant figures.

You must show all your working.

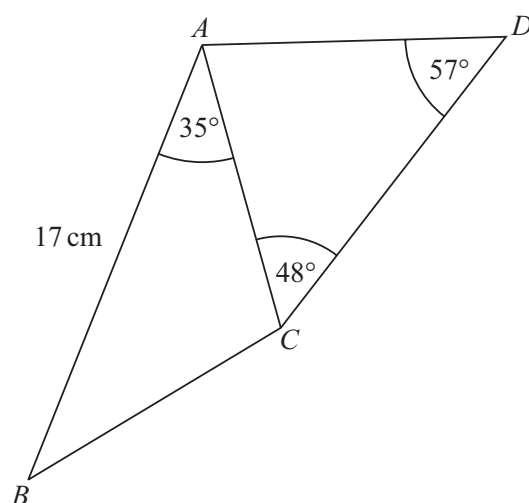
..... cm

(Total for Question 26 is 5 marks)

TOTAL FOR PAPER IS 80 MARKS



18 $ABCD$ is a quadrilateral.



The area of triangle ABC is 54 cm^2

Calculate the area of triangle ACD .

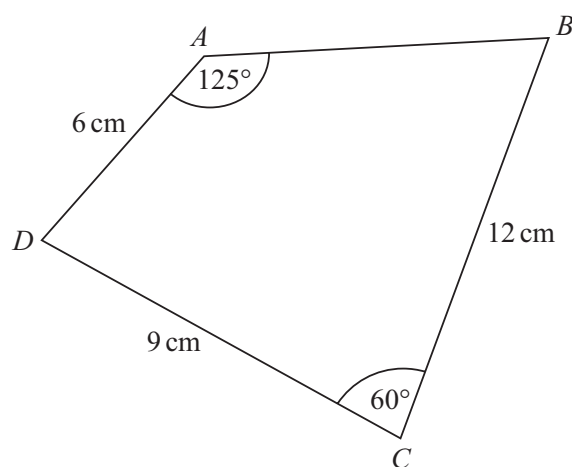
Give your answer correct to 3 significant figures.

..... cm^2

(Total for Question 18 is 5 marks)



23 $ABCD$ is a quadrilateral.



Find the size of angle ABC .
Give your answer correct to the nearest degree.

(Total for Question 23 is 5 marks)

TOTAL FOR PAPER IS 80 MARKS



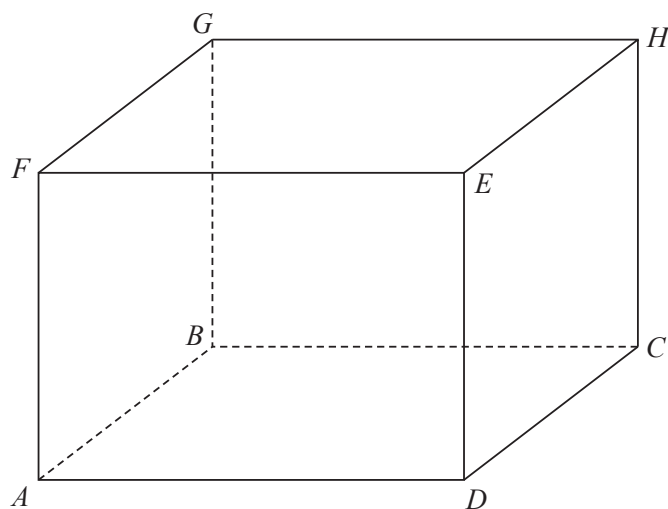
SUB-TOPIC G5d

3D PYTHAGORAS & TRIGONOMETRY

Sub-topic G5d · 9 questions · 34 marks · lowest tariff first



22 $ABCDEFGH$ is a cuboid.



$$AF = 6.8 \text{ cm}$$

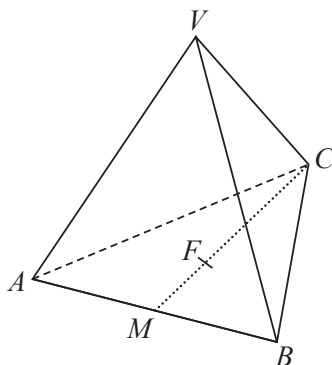
$$FC = 13.6 \text{ cm}$$

Work out the size of the angle between FC and the plane $ABCD$.

(Total for Question 22 is 2 marks)



- 20 $VABC$ is a solid pyramid.
 ABC is an equilateral triangle.



M is the midpoint of AB .

F is the point on MC such that $MF:FC = 1:2$

The vertex V is vertically above F .

$VA = VB = VC$

$VF = 8 \text{ cm}$ Angle $VCM = 52^\circ$

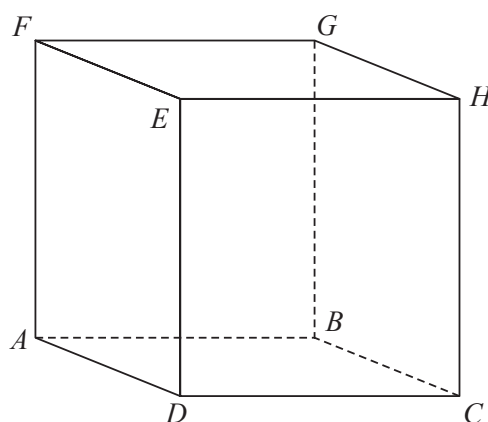
Work out the side length of the equilateral triangle ABC .
 Give your answer correct to 1 decimal place.

..... cm

(Total for Question 20 is 3 marks)



18 $ABCDEFGH$ is a cuboid.



$$AB = 7.3 \text{ cm}$$

$$CH = 8.1 \text{ cm}$$

$$\text{Angle } BCA = 48^\circ$$

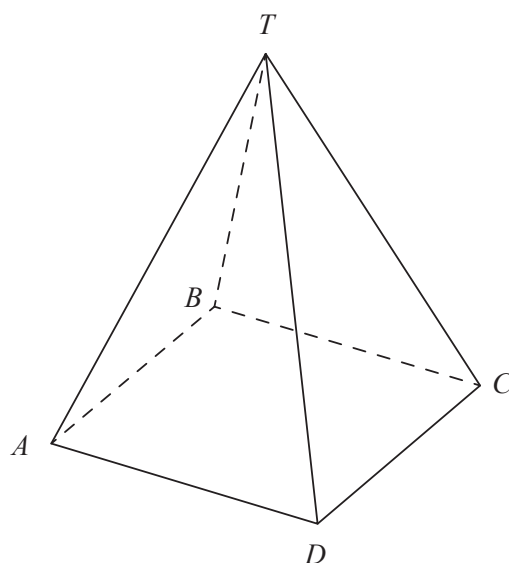
Find the size of the angle between AH and the plane $ABCD$.

Give your answer correct to 1 decimal place.

(Total for Question 18 is 4 marks)



12 Here is a pyramid with a square base $ABCD$.



$$AB = 5 \text{ m}$$

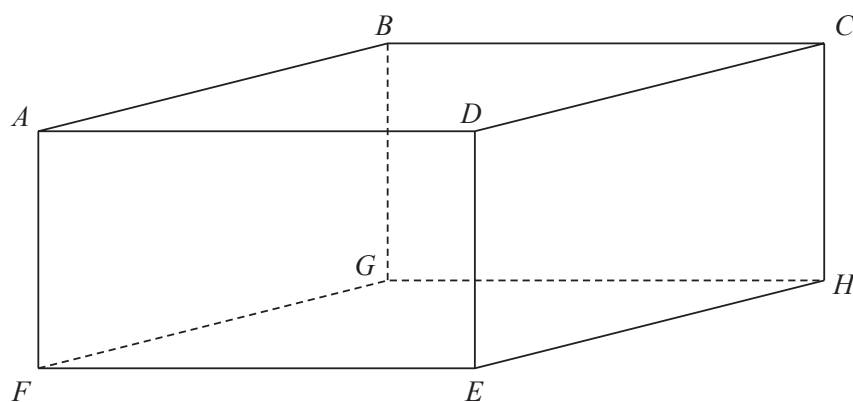
The vertex T is 12 m vertically above the midpoint of AC .

Calculate the size of angle TAC .

(Total for Question 12 is 4 marks)



20 $ABCDEFGH$ is a cuboid.



$$AD = 9 \text{ cm}$$

$$FD = 13 \text{ cm}$$

$$\text{Angle } GHF = 49^\circ$$

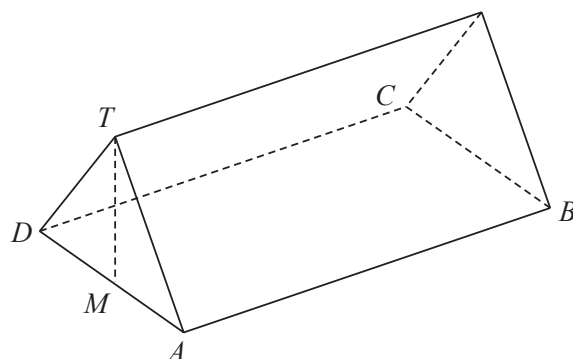
Work out the size of angle FAH .

Give your answer correct to the nearest degree.

(Total for Question 20 is 4 marks)



- 24 The diagram shows a triangular prism with a horizontal rectangular base $ABCD$.



M is the midpoint of AD .

The vertex T of the prism is vertically above M .

$$AB = 14.7 \text{ cm}$$

$$BC = 3.8 \text{ cm}$$

$$MT = 2.3 \text{ cm}$$

P is the point on AB such that

$$AP:PB = 5:2$$

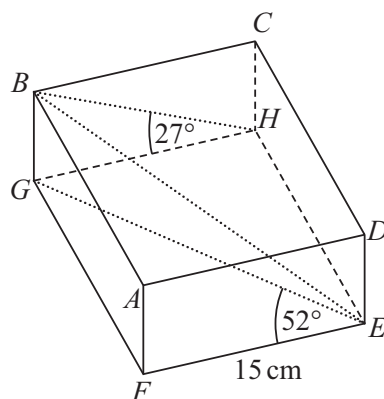
Calculate the size of the angle between TP and the base $ABCD$ of the prism.
Give your answer correct to 1 decimal place.

(Total for Question 24 is 4 marks)

TOTAL FOR PAPER IS 80 MARKS



19 $ABCDEFGH$ is a cuboid.



Angle $GEF = 52^\circ$

Angle $BHG = 27^\circ$

$EF = 15 \text{ cm}$

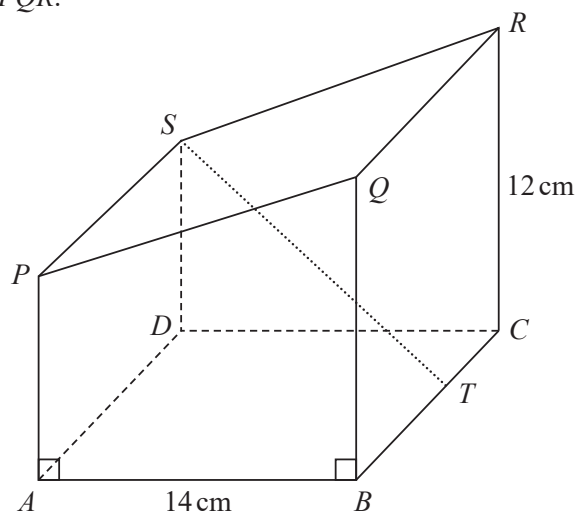
Work out the size of angle GEB .

Give your answer to the nearest degree.

(Total for Question 19 is 4 marks)



18 Here is a prism $ABCDSPQR$.



The base $ABCD$ of the prism is a square of side 14 cm

T is the point on BC such that $BT : TC = 4 : 3$

The cross section of the prism is in the shape of a trapezium of area 147 cm^2

$CR = 12 \text{ cm}$

Find the size of the angle between the line ST and the base $ABCD$.

Give your answer correct to 1 decimal place.

(Total for Question 18 is 5 marks)

MARK SCHEMES

official mark schemes, in the same order as the questions



Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
7	0.319	M1 A1	for partial method eg $1.70(499\dots)$ or 16.74 or $\frac{837}{50}$ or $0.101(8516\dots)$ or 0.102 or 0.32 for $0.319(1419\dots)$	Accept 0.319 or better. Condone incorrect digits after the 0.319; isw incorrect rounding if $0.319(1419\dots)$ is shown in working.
8 (a)	Mistake described	C1	for statement describing a mistake Acceptable eg should be $AC^2 - AB^2$ she should do $8^2 - 6^2$ she should be subtracting not adding the numbers she thought that BC was the hypoteneuse when it was actually AC should be $BC^2 + AB^2 = AC^2$ should be $8^2 = 6^2 + BC^2$ Not acceptable eg she has not used Pythagoras correctly $6^2 + 8^2$ is 120 the answer should be $\sqrt{28}$ or 5 or 5.3 or 5.2915 $BC + AB = AC$	
(b)	Explanation	C1	for explanation Acceptable examples the scale factor used is 2.5 $5 \div 2$ is not 1.5 $10 \div 4$ is more than 1.5 the scale factor is not 1.5 he has not used the correct scale factor has enlarged it by too much ZY should be 6 Not acceptable examples the grid is not large enough	Note that a diagram alone is insufficient.



Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
1	7.5	M1 A1	for correct use of Pythagoras, eg. $8.5^2 - 4^2 (= 56.25)$ or $4^2 + x^2 = 8.5^2$ for 7.5 or $7\frac{1}{2}$ or $\frac{15}{2}$	Must have values substituted Trigonometry may be used but M1 only awarded when complete method shown.
2 (a)	25	M1 A1	for $(T =) 4 \times (-3)^2 - 11$ or $4 \times (-3)^2 = 36$ cao	Can accept missing brackets.
(b)	$p = \frac{d-4}{3}$ oe	M1 A1	for a correct first step, eg. $d - 4 = 3p$ or $\frac{d}{3} = p + \frac{4}{3}$ or for $\frac{d-4}{3}$ as answer for $p = \frac{d-4}{3}$ oe	May be in unsimplified form, eg $d - 4 = 3p + 4 - 4$
3	1.5	P1 P1 P1 P1 A1	for process to develop 3 algebraic expressions, eg. (R =) n , (S =) $2n$, (T =) $2n - 6$, oe, at least two must be correct. or for selecting 3 values satisfying the given criteria, eg. (R =) 10, (S =) 20, (T =) 14 for process to sum 3 algebraic expressions and equating to 54, eg. $n + "2n" + "2n - 6" = 54$ or for finding the correct sum of their values eg. $"10" + "20" + "14" = 44$ for start of process to solve the correct linear equation, eg. $5n = 54 + 6$ ($n = 12$) or for 12, 24, 18 for $"12" : 2 \times "12" - 6$ oe eg 12 : 18 oe or 18 : 12 linked to T, R for 1.5 or $\frac{3}{2}$ or $1\frac{1}{2}$	Accept 1 : 1.5 etc as answer



Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
13	18.6	M1 A1	for use of Pythagoras eg, $(-5 - 6)^2 + (8 - -7)^2$ or $121 + 225$ or 346 or $\sqrt{346}$ answer in the range 18.6 to 18.61	If a correct answer within the range is shown in working but incorrectly rounded award full marks
14	Shown	M1 M1 A1	for $(x =) 1.0622\dots$ or $(10x =) 10.622\dots$ or $(100x =) 106.22\dots$ or $(1000x =) 1062.2\dots$ OR for $(x =) 0.0622\dots$ or $(10x =) 0.622\dots$ or $(100x =) 6.22\dots$ or $(1000x =) 62.2\dots$ (dep M1) for a method using two recurring decimals that leads to a terminating decimal difference, using correct multiples of x eg $(1000x - 100x =) 1062.2\dots - 106.22\dots (= 956)$ or $\frac{956}{900}$ OR (dep M1) for a method using two recurring decimals that leads to a terminating decimal difference, using correct multiples of x eg $(1000x - 100x =) 62.2\dots - 6.22\dots (= 56)$ or $\frac{56}{900}$ for completing algebra to $1\frac{14}{225}$	Use of recurring notation acceptable throughout.



Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
1	16.2	M1 A1	for a correct first step to find BC , eg $19^2 = 10^2 + BC^2$ or $19^2 - 10^2$ ($= 261$) or $\sqrt{19^2 - 10^2}$ or $\sqrt{261}$ or $3\sqrt{29}$ for answer in the range 16.1 to 16.2	Can use alternative letter for BC provided intention is clear If using an alternative method using trigonometry must have BC as the only unknown ISW incorrect rounding if answer given in range
2 (a)	$2 \times 3 \times 3 \times 5$	M1 A1	for a complete method to find prime factors; could be shown on a complete factor tree with no more than one error or by division by prime factors with no more than one error or for 2, 3, 3, 5 for $2 \times 3 \times 3 \times 5$ oe	Condone the inclusion of 1 for this mark Accept $2 \times 3^2 \times 5$
(b)	36	B1	for 36	Accept $2^2 \times 3^2$ or $2 \times 2 \times 3 \times 3$
3	4	M1 A1	for method to use formula, eg $72 \div 6$ ($= 12$) or $72 \div 9$ ($= 8$) cao	Can be implied by $\frac{72}{6}$ or $\frac{72}{9}$

Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
7	60.3	M1	for a correct trig statement, eg $\tan x = \frac{7}{4}$	Other methods are possible but only award this mark at the point of an equation with x as the only unknown
		A1	60.2 to 60.42	
8	25	P1	for working with density eg $8 \times 1500 (= 12\,000)$ or [density] $\times 1500$	P marks can be awarded in either order [density] is 8×10^4 Condone $8 \times 1500 \times 300$ for this mark only P marks can be awarded in either order [mass] must be what they believe to be mass following a calculation that uses 8 and 1500 but not 300
		P1	for a conversion, eg “12 000” $\div 1000 (= 12)$ or $\frac{8}{1000} (= 0.008)$ or $300 \times 1000 (= 300\,000)$ or [mass] $\div 1000$	
		A1	cao	
9	12, – 3, 2	B2	all correct	12 – 3 x^2 seen in working space gets B2 unless contradicted May be seen in an expression of the correct form, eg $a + bx^n$
		(B1	for one or two correct)	



Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
5	41.6	P1 P1 P1 A1	for start of process to find the length of the hypotenuse, eg $(\text{hyp}^2 =) 8^2 + 10^2 (= 164)$ for complete process to find hypotenuse, eg $\sqrt{8^2 + 10^2}$ or $\sqrt{64 + 100}$ or $\sqrt{164}$ ($= 12.8\dots$) (dep P2) for complete process to find the required perimeter, eg $8 + 8 + 10 + "12.8" + "12.8 - 10"$ or $16 + 4\sqrt{41}$ for answer in the range 41 to 42	Note lengths may be seen on the diagram 8 + 8 + "12.8" + "12.8" oe is acceptable for this mark If an answer in the range 41 to 42 is given in the working space then incorrectly rounded, award full marks.
6 (a)	17.8	M1 A1	for $\tan 56 = \frac{x}{12}$ or $(BC) = 12 \times \tan 56$ oe or alternative method to find BC for an answer in the range 17.7 to 17.8	For any alternative method candidates must arrive at an equation with BC as the only unknown If an answer in the range 17.7 to 17.8 is given in the working space then incorrectly rounded, award full marks.
(b)	33.6	M1 A1	for $\cos x = \frac{15}{18}$ or $\cos x = 0.83\dots$ or $x = \cos^{-1} \frac{15}{18}$ or alternative method to find x for an answer in the range 33.5 to 33.91	For any alternative method candidates must arrive at an equation with x as the only unknown If an answer in the range 33.5 to 33.91 is given in the working space then incorrectly rounded, award full marks.



Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
9 (a)	4	P1 A1	$12 \times 5 \div 15$ cao	
(b)	Statement	C1	Acceptable examples it could take more time it could take less time it could take more or less time it would take longer if they worked at a slower rate Not acceptable examples the time will be less as there are more people if the rate at which the 15 people work changes it would have taken longer it would take less time	
10	14.14	P1 P1 P1 A1	works out scale factor eg $(9 + 6) \div 6 (= 2.5)$ OR for start of process to find angle DBE eg $\sin B = \frac{2}{6}$ oe uses Pythagoras eg $6^2 - 2^2 (= 32)$ or $\sqrt{32} (= 5.6...)$ OR calculates AC eg $2 \times "2.5" (= 5)$ OR for complete process to find angle DBE eg $\sin^{-1}\left(\frac{2}{6}\right) (= 19.4...)$ complete process to find CB eg $"2.5" \times "\sqrt{32}" (= 10\sqrt{2})$ or $\sqrt{(9+6)^2 - "5^2"} (= 10\sqrt{2})$ OR uses trigonometry, eg $15 \times \cos "19.4..."$ 14.1 to 14.15	Note method can be carried out in either order May be seen on diagram If the answer is given within the range but then rounded incorrectly award full marks



Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
8	44.9	P1	for process to find an expression for the area of the trapezium, eg $\frac{1}{2}(12 + CD)8$ or $8 \times 12 + \frac{1}{2} \times 8 \times x$ or for process to find the area of the triangle, eg $112 - 8 \times 12 (= 16)$	x is the length of the line from C to where perpendicular from B meets CD Allow use of other letters in place of CD and x (do not have to be defined unless otherwise stated) Award P1 for $112 - 8 \times 12 (= 16)$ even if not used
		P1	for forming an equation and isolating terms in the unknown length, eg $4CD = 112 - 48$ or $\frac{1}{2} \times 8 \times x = 112 - 8 \times 12$ or $\frac{1}{2} \times 8 \times x = "16"$ or $CD = 16$ or $x = 4$	Award P2 for $CD = 16$ or $x = 4$ even if not used unless clearly from incorrect working eg $12 - 8 (= 4)$ Only award P2 for 16 if it is clearly identified as CD
		P1	for start of process to find length of BC , eg $8^2 + "4"'^2 (= 80)$ or $8^2 + [\text{their } x]^2$ or $\tan^{-1}\left(\frac{"4"}{8}\right) (= 26.5\dots)$ oe or $\tan^{-1}\left(\frac{8}{"4"}\right) (= 63.4\dots)$ where "4" can be [their x]	[their x] can be any value less than 12 or clearly identified as the length of the line from C to where perpendicular from B meets CD (may be seen on the diagram)
		P1	for $\sqrt{8^2 + "4"'^2}$ or $\sqrt{64 + "16"}$ or $\sqrt{80}$ or $4\sqrt{5} (= 8.9\dots)$ oe or $\sqrt{8^2 + [\text{their } x]^2}$ or $\frac{"4"}{\sin "26.5\dots"}$ or $\frac{8}{\cos "26.5\dots"}$ or $\frac{8}{\sin "63.4\dots"}$ or $\frac{"4"}{\cos "63.4\dots"}$ where "4" can be [their x]	Award P4 for $(BC =) \sqrt{80}$ or $4\sqrt{5}$ or 8.9... unless $x = 4$ is clearly from incorrect working
		A1	for answer in the range 44.9 to 44.95	If an answer is shown in the range in working and then incorrectly rounded award full marks

Paper 1MA1: 3H				
Question	Working	Answer	Mark	Notes
6		1.01	P1 P1 P1 A1	fruit syrup $15 \times 1.4 (= 21)$ or water $280 \times 0.99 (= 277.2)$ or apple juice $25 \times 1.05 (= 26.25)$ (dep P1) for complete process to find the total mass e.g. “277.2” + “26.25” + “21” (= 324.45) or a weighted density eg $15 \times 1.4 \div 320 (= 0.065625)$ or $280 \times 0.99 \div 320 (= 0.86625)$ or $25 \times 1.05 \div 320 (= 0.08203125)$ (dep P2) for complete process to find the density eg “324.45” $\div 320 (= 1.01\dots)$ or “0.065625” + “0.86625” + “0.08203125” (= 1.0139..) 1.01 to 1.014
7		5.86	M1 A1	for $\sin 23 = \frac{AB}{15}$ NB Allow any alternative equivalent method to form an equation in AB 5.8 to 5.9
8		5.59	M1 M1 M1 A1	For use of $\pi r^2 = 49$, where r is the radius or $r = 3.9(49\dots)$ or diameter = 7.8(9865...) For use of Pythagoras to set up an equation in x^2 e.g. $x^2 + x^2 = (d)^2$ or $x^2 = r^2 + r^2$ For use of trigonometry to set up an equation in x eg $\sin 45 = x \div d$ (dep on M2) Rearrange to $(x^2 =) 2 \times “3.949\dots”^2$ Rearrange to $(x =) “7.898\dots” \times \sin 45$ oe 5.5 to 5.6
9	(a) (b) 60,180,300,350,650 (c) Medians 250 and 300	180 Statement	M1 A1 B2 (B1) C1	for evidence of using the LQ (150) and UQ (330) eg $330 - 150$ cao for fully correct box plot for showing a box and at least 3 correctly plotted values for a correct comparative statement relevant to the question e.g. Yes because the female students have a greater median than the male students

Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
14	$\frac{1}{2}$	M1 A1	for $\frac{1}{\sqrt{3}} \times \frac{\sqrt{3}}{2}$ or $\frac{\sqrt{3}}{3} \times \frac{\sqrt{3}}{2}$ or $(\frac{1}{2} \div \frac{\sqrt{3}}{2}) \times \frac{\sqrt{3}}{2}$ OR $\tan 30 = \frac{1}{\sqrt{3}}$ oe or $\sin 60 = \frac{\sqrt{3}}{2}$ for $\frac{1}{2}$ or 0.5	
15	48	M1 M1 M1 A1	for method to use a volume formula with correct substitution for the cone, sphere or hemisphere eg $\frac{1}{3} \times \pi \times 3^2 \times 10$ or $\frac{4}{3} \times \pi \times 3^3$ or $\frac{2}{3} \times \pi \times 3^3$ oe for complete method to find total volume eg $\frac{1}{3} \times \pi \times 3^2 \times 10 + \frac{2}{3} \times \pi \times 3^3$ (dep first M1) for correct partial simplification, eg 30π or 18π cao SC B2 for answer of 264 or 264π	May work without π or with an approximation of π ; must use the correct radius of 3 (and 10) in substitution Must be cone or hemisphere Accept 48π



Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
5	9.85	M1 A1	for $\sin(38) = \frac{AB}{16}$ oe or alternative method to find AB for an answer in the range 9.76 to 9.92	
6	8.3 and 8.4	B1 B1	for 8.3 in the correct position for 8.4 in the correct position	Accept 8.39 or 8.399...
7	168	P1 P1 P1 A1	for working with ratio to find the amount for C or D eg $1.5 \times 2 (=3)$ or (A, B, C, D =) 2, 7, 3, 3 oe OR for suitable expressions linking A with C or D, eg. $A = x$, $C = 1.5x$ for “2 + 3 + 3 + 7” (=15) OR adds 4 suitable expressions, eg. “ $x + 3.5x + 1.5x + 1.5x$ ” (= 7.5x) for a complete process to find the amount of money eg $360 \div “15” \times 7$ OR $360 \div “7.5” \times 3.5$ cao	
8 (a)	5.62×10^{-3}	B1	cao	
(b)	1452	B1	cao	

Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
5	99.5	M1	for $\sin(34) = \frac{x}{178}$ oe or alternative method to find x	If an answer in the range 99.5 to 99.7 is given in the working space then incorrectly rounded, award full marks
		A1	for answer in range 99.5 to 99.7	
6	$\begin{pmatrix} -9 \\ 14 \end{pmatrix}$	M1	for $2\begin{pmatrix} 3 \\ 4 \end{pmatrix} - 3\begin{pmatrix} 5 \\ -2 \end{pmatrix}$ or $\begin{pmatrix} 6 \\ 8 \end{pmatrix}$ and $\begin{pmatrix} 15 \\ -6 \end{pmatrix}$ or $\begin{pmatrix} -9 \\ y \end{pmatrix}$ or $\begin{pmatrix} x \\ 14 \end{pmatrix}$	May be seen in two separate calculations eg $2 \times 3 + -3 \times 5$ and $2 \times 4 + -3 \times -2$ Condone incorrect notation if method is clear for this mark only
		A1	cao	
7	35.3	P1	for starting the process to find length of third side of triangle, eg $9^2 - 6^2 (= 45)$ or $6^2 + x^2 = 9^2$	[radius] is any value If an answer in the range 35.2 to 35.4 is given in the working space then incorrectly rounded, award full marks No working, answer only, no marks
		P1	for $\sqrt{9^2 - 6^2}$ or $\sqrt{81 - 36}$ or $\sqrt{45}$ or $3\sqrt{5}$ ($= 6.7..$) or $r^2 = 45$	
		P1	for stating or using $\pi \times [\text{radius}]^2 \div 4$	
		A1	for answer in range 35.2 to 35.4	

Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
4	186.15	P1	for correctly finding the area of at least three sections, eg 3 of $11 \times 7 (= 77)$, or $9 \times 7 (= 63)$, or $\frac{1}{2} \times 11 \times 9 (= 49.5)$, or $\frac{1}{4} \times \pi \times 7^2 (= 38.4845\dots)$	Note a trapezium for the rectangle and triangle should be classed as two areas. Accept figures rounded or truncated to 1 dp or better throughout.
		P1	for a method to find the number of bags required for one area or a combination of areas eg $"77" \div 14 (= 5.5)$ or $"227.9845\dots" \div 14 (= 16.2846\dots)$	
		P1	for method to work out the total area for all four sections eg $"77" + "63" + "49.5" + "38.4845\dots" (= 227.9845\dots)$ or adding the exact number of bags per section for all four sections eg $"5.5" + "4.5" + "3.53\dots" + "2.74\dots" (= 16.28\dots)$	This mark is dependent upon correct processes seen for all four sections.
		P1	for method to find the cost, eg integer number of bags $\times 10.95$	integer number of bags must come from area $\div 14$ rounded up
		A1	cao	
5	8.73	M1	for a correct trig statement, eg $14.5 \times \cos 53$ or $\cos 53 = x \div 14.5$	Can use a combination of skills but must have only one unknown in x to score this mark
		A1	answer in the range 8.726 to 8.73	If an answer is given in the range in working and then rounded incorrectly award full marks.
6	7318.15	M1	for a correct first step eg working out increase for one year $7000 \times (100 + 3) \div 100 (= 7210)$ oe or $7000 \times 3 \div 100 (= 210)$ oe or find the multiplier for both years eg $(100 + 3) \div 100 \times (100 + 1.5) \div 100 (= 1.04545)$	7315 or 315 implies M1
		M1	for a compound method, eg $7000 \times (100 + 3) \div 100 \times (100 + 1.5) \div 100$ oe or $"7210" \times 1.5 \div 100$ or $(= 108.15)$ oe	318.15 implies M1M1A0
		A1	cao	



Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
6	Comparison	B1	for correctly identifying the median of (School) A as 57	If median for school B is stated in the comparison it must be correct If range for school B is stated in the comparison it must be correct
		C1	(ft, dep on value for the median being stated) for making a correct comparison of <u>median</u> eg 'the median of (School) A is higher than the median of (School) B'	
		B1	for correctly identifying the range of (School) A as 49	
		C1	(ft, dep on value for the range being stated) for making a correct comparison of <u>range</u> eg 'the range of (School) A is higher than the range of (School) B'	
7	10.2 and 10.3	B1	for 10.2 in the correct place	Accept 10.29 or 10.299(99...)
		B1	for 10.3 in the correct place	
8	14.3	M1	for a correct statement for AB using trigonometry, eg $\tan 62 = \frac{AB}{7.6}$ or $(AB =) 7.6 \times \tan 62$	If an answer is given in the range in working and then rounded incorrectly award full marks
		A1	answer in the range 14.28 to 14.3	
9	(a) $14x^5y^6$	B2	cao	Where a , x^b , y^c can be made up of two products Condone inclusion of multiplication signs for B1
	(b) m^{-6}	(B1)	for correct simplification of two terms ax^5y^6 or $14x^b y^6$ or $14x^5 y^c$ where $a \neq 14$, $b \neq 5$, $c \neq 6$	
		B1	for m^{-6} or $\frac{1}{m^6}$	

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
4	Probabilities should sum to 1	C1	for stating that the probabilities should total 1 eg 0.25 should be 0.35	Can be shown on the diagram
	0.35 and 0.65 reversed	C1	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”	
5 (a)	50.5	M1	for $\cos ABC = \frac{7}{11}$ (0.63...) oe	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. If figures are given they must be correct (truncated or rounded).
		A1	for answer in the range 50.4 to 50.51	
	(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)	



Paper: IMA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
6	$x = 4.5, y = -1.5$	M1	correct process to eliminate one variable (condone one arithmetic error)	Fractions do not need to be in simplest form
		M1	(dep) for substituting found value in one of the equations OR correct process after starting again (condone one arithmetic error)	
		A1	for $x = 4.5, y = -1.5$ oe	
7	shown	C1	for method to find area of semicircle, eg $\pi \times 10^2 \div 2 (= 50\pi)$	Can award first 3 marks if a value for π is used Working out to find the area of the shaded region must be shown
		C1	for method to find area of quarter circle, for $\pi \times 20^2 \div 4 (= 100\pi)$	
		C1	for a complete method to find area shaded and area of square, eg $\pi \times 20^2 \div 4 - \pi \times 10^2 \div 2$ and 20×20	
		C1	fully correct working leading to $\frac{\pi}{8}$	
8	(a)	1	B1	All three elements of cos, 4, x must be present in an equation. eg $\cos = 4/x$ is acceptable but $\cos(4/x)$ is insufficient
	(b)	8	M1 A1	
			starts process, eg $\cos(60) = \frac{4}{x}$ or $0.5 = \frac{4}{x}$ oe or $\sin 30 = \frac{4}{x}$ or $\frac{\sin 30}{4} = \frac{\sin 90}{x}$ oe cao	

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
10	24000	P1 P1 A1	for use of either 0.9 or 0.875 or for 18900 (after 2 years) for using $0.9^2 \times 0.875 (= 0.70875)$ oe or for 21000 (after 1 year) cao	
11	240	M1 A1	for $16 \times 5 \times 3$ cao	
12	23.4	M1 M1 A1 M1 M1 A1	for stating that $AC = 8$ or for a relationship that may be used to find AC eg $(AC =) 8 \times \tan 45$ or $\tan 45 = \frac{AC}{8}$ for relationship that may be used to find AB, eg $\sin(20) = \frac{8}{AB}$ or $(AB =) \frac{8}{\sin 20}$ for answer in the range 23.3 to 23.4 Alternative for a relationship that may be used to find AD eg $\cos(45) = \frac{8}{AD}$ oe or $(AD =) 11.3(13\dots)$ for a relationship that may be used to find AB, eg $\frac{AB}{\sin 45} = \frac{11.3}{\sin 20}$ for answer in the range 23.3 to 23.4	May be seen on diagram May use the sine rule If an answer is given in the range in working and then rounded incorrectly award full marks. May be seen on diagram If an answer is given in the range in working and then rounded incorrectly award full marks.

Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
10	1.25	B1	for $(\sin a =) \frac{7-2x}{8}$ or $(\tan b =) \frac{1+x}{4}$	Must come from a correct equation
		P1	for start of a process to solve $\frac{7-2x}{8} = \frac{1+x}{4}$, eg $4(7-2x) = 8(1+x)$ or $28-8x = 8+8x$ or $7-2x = 2(1+x)$ or $7-2x = 2+2x$ or $\frac{7-2x}{8} = \frac{2(1+x)}{8}$ or $\frac{7-2x}{8} = \frac{2x+2}{8}$	
		A1	for 1.25 oe	

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
6	17.3	P1	for full process to find either angle eg $(180 - 90) \div (2+3) \times 2 (=36)$ or for 36 or 54 seen as an angle	May be seen on diagram Condone correct values if incorrectly placed.
		P1	for a correct equation using trigonometry eg $\cos [A] = 14 \div AB$	This must be shown as an equation with all four elements (eg $\cos$, $[A]$, 14 , AB) present. $[A]$ could be 36 or any angle clearly and unambiguously identified as A . This also applies to $[B]$ with Sine.
		P1	(dep previous P mark) for rearranging their trigonometry equation to make AB the subject eg $(AB \Rightarrow) "14 \div \cos 36"$	
		A1	for an answer in the range 17.3 to 17.4	If an answer is shown in the range in working and then incorrectly rounded award full marks.



Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
10	$k = 2m - y^2$	M1 A1	correct first step of showing an intention to square both sides with no algebraic ambiguity in any resulting statements, eg $y^2 = 2m - k$ for $k = 2m - y^2$	
11	(a) Explanation (b) Comparison	C1 C1	eg 'No' the median is 57 (ft) a correct comparison of medians eg the median weight for Megan was greater than the median weight for Amy a correct comparison of a measure of spread eg the interquartile range of weights for Megan was greater than the interquartile range of weights for Amy For the award of both marks at least one of the comparisons must be in the context of the question	Simply quoting values for median, range and IQR is insufficient, they must be compared Median Range IQR Megan 57 49 26 Amy 42 47 16 Figures given must be correct. Comparisons can relate to the range or the IQR
12	32.1	P1 P1 P1 A1	starts process, eg $\sin 40 = \frac{DB}{8.6}$ oe or for $8.6 \times \sin 40 (=5.52797\dots)$ complete process to find ED , eg $(8.6 \times \sin 40) \div 2 (=2.76\dots)$ process to find angle EAD , eg $\tan^{-1}\left(\frac{2.76\dots}{4.4}\right)$ or $\tan^{-1}("0.628\dots")$ answer in range 32.09 to 32.2	Accept values rounded or truncated to 2 dp. If an answer in the range is seen in working and then incorrectly rounded award full marks



Paper: 1MA1/2H				
Question	Working	Answer	Mark	Notes
7		32.3	P1	for using Pythagoras to find length of third side of triangle, eg $7.5^2 - 6^2$ or $6^2 + x^2 = 7.5^2$ or uses trigonometry to find angle in triangle, eg $\sin A = \frac{6}{7.5}$ or $\cos B = \frac{6}{7.5}$
			P1	(dep P1) for complete process to find length of third side of triangle eg $\sqrt{7.5^2 - 6^2}$ or $\sqrt{56.25 - 36}$ or $\sqrt{20.25}$ (= 4.5) or uses trigonometry to find base length of triangle, eg $7.5 \times \cos "A"$ or $7.5 \times \sin "B"$ or $\frac{6}{\tan "A"}$
			P1	(dep P2) for $24 - 10 - "4.5"$ (= 9.5)
			P1	(indep) for process to find angle CDA , eg $\tan CDA = \frac{6}{\text{base}}$ from right- angled triangle
			A1	for answer in the range 32.2 to 32.3
8 (a)		2.7560...	M1	for 1.0654(059...), 0.1402(633...), 7.5957(541...), 2.756 truncated or rounded to no less than 2dp
			A1	for 2.7560(...)
(b)		2.76	B1	for 2.76 ft from (a)



Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
19	$\frac{5}{3}$	P1	for process to derive an equation in x , eg $\frac{x}{4x-1} = \frac{6x+5}{12x+31}$	
		P1	for complete process to remove fractions, eg $x(12x+31) = (6x+5)(4x-1)$	Must be correct use of brackets
		P1	for process to reduce to a quadratic equation, eg $12x^2 - 17x - 5 = 0$	Award for correct LHS only.
		P1	for process to solve the quadratic equation by factorisation or use of quadratic formula, eg $(4x+1)(3x-5) = 0$	Award for correct LHS only. Accept substitution into the formula; $\frac{-17 \pm \sqrt{(-17)^2 - 4 \times 12 \times -5}}{2 \times 12}$
		A1	for $\frac{5}{3}$ oe	Accept answers in the range 1.66 to 1.67 as equivalent



Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
17	3.6	P1	process to find the volume scale factor, eg $1587.762 \div 58.806 (= 27)$ or $58.806 \div 1587.762 (= 0.037\dots)$	
		P1	process to find the height of B , eg $2 \times 43.74 \div 8.1 (= 10.8)$ or process to find the area of A , eg $43.74 \div (\sqrt[3]{27})^2 (= 4.86)$ or $43.74 \times (\sqrt[3]{0.037\dots})^2 (= 4.86)$	
		P1	complete process to find height of A , eg “ $10.8 \div \sqrt[3]{27}$ ” or “ $4.86 \times 2 \div (8.1 \div \sqrt[3]{27})$ ”	
		A1	cao	
18	21.3	P1	for $\frac{1}{2} \times 11.2 \times 4.3 \times \sin(118)$	If a correct answer within the range is shown in working but incorrectly rounded award full marks
		A1	answer in the range 21.26 to 21.3	
19	$-\frac{3}{2}$ and $\frac{2}{3}$	M1	for $(2x \pm 3)(3x \pm 2)$ or $(6x \pm 4)(x \pm \frac{9}{6})$ or $(6x \pm 4)(x \pm \frac{3}{2})$ or correct substitution into the quadratic formula, eg $\frac{-5 \pm \sqrt{5^2 - 4 \times 6 \times (-6)}}{2 \times 6}$	
		M1	$(2x + 3)(3x - 2)$ $(6x - 4)(x + \frac{9}{6})$ or $(6x - 4)(x + \frac{3}{2})$ or $\frac{-5 \pm \sqrt{169}}{12}$ or one correct answer	
		A1	oe accept answers of -1.5 and in the range 0.66 to 0.67	

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
(b)	160	P1 P1 A1	for process to find the number sold in November, eg $180 \div 150 \times 100$ or $180 \div 1.5 (= 120)$ oe or for $0.75 \times 1.5 (= 1.125)$ oe or for $75 \times 1.5 (= 112.5)$ oe for a process to find the number sold in October, eg " $120 \div 75 \times 100$ " oe eg " $120 \div 0.75$ " or $180 \div "1.125"$ oe eg $180 \div "112.5" \times 100$ or [value] $\div 0.75$ oe cao	[value] can be any value they believe to be the number of bikes sold in November or 180
13	E C B H	B3 (B2) (B1)	for a fully correct table for 3 correct) for 2 correct)	
14	23.3	M1 A1	for a complete method eg $\frac{1}{2} \times 8.3 \times 9.8 \times \sin 35$ for answer in range 23.3 to 23.33	If an answer is shown in the range in working and then incorrectly rounded award full marks



Paper: 1MA1/2H					
Question	Answer	Mark	Mark scheme		Additional guidance
13	15.4	M1 M1 A1	for $\frac{AB}{\sin 34} = \frac{23.8}{\sin "120"}$ or $\frac{\sin 34}{AB} = \frac{\sin "120"}{23.8}$ for $(AB =) \frac{23.8}{\sin "120"} \times \sin 34$ for answer in range 15.36 to 15.4		“120” comes from $180 - 26 - 34$ If an answer in the range 15.36 to 15.4 is given in the working space then incorrectly rounded, award full marks
14	116	P1 P1 A1 B1	for setting up an equation, eg $(x + 4)^2 = x^2 + 70$ for process to reduce equation down to a linear equation ready to solve eg $8x = 54$ oe for 6.75 oe ft (dep P2) for finding the area of B or for answer in range 115 to 116	for setting up an equation, eg $x^2 - (x - 4)^2 = 70$ for process to reduce equation down to a linear equation ready to solve eg $8x = 86$ oe for 10.75 oe	Equation must be in a single variable. If a candidate uses a trial and improvement method, it is either full marks or no marks. Candidates must get as far as $ax = b$
15	Enlargement sf –1.5 centre (1, 1)	B2 (B1)	for enlargement scale factor –1.5 and centre (1, 1) for enlargement scale factor –1.5 or enlargement centre (1, 1)		Award no marks if more than one transformation is given



Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
9	56	P1 A1	for $70 \times 80 \div 100$ oe or for the use of $0.7 \times 0.8 (= 0.56)$ oe cao	
10	3.1	P1 P1 A1	for using sin to find length of AC, eg $6.8 \times \sin 41$ or a full process to find AC or $(AC =) 4.46...$ or a full process to find AD or $(AD =) 5.44...$ for a complete process to find a relationship involving DC eg $\tan 55 = \frac{4.46...}{DC}$ or $(DC =) \frac{4.46...}{\tan 55}$ or $\cos 55 = \frac{DC}{5.44...}$	Accept rounded or truncated figures. If a correct answer within the range is shown in working but is incorrectly rounded, award full marks.
11 (a)	Box plot	B3 (B2 (B1	for fully correct box plot for box plot showing a box and whiskers and at least 3 correctly plotted values from 169, 174, 177, 180, 186) for at least 2 correctly plotted values including a box or whiskers)	Box can be of any height. Accept ends that are marked (eg line, cross, dot) or defined by the end of the whiskers if clear
(b)	Comparisons	C1 C1	(ft) for a correct comparison of medians, eg the median for Adults is greater than the median for Teenagers or the Teenagers heights are lower in general as the median is lower (ft) for a correct comparison of a measure of spread, eg the interquartile (range) of the Adults is the same as (similar to) the IQR of the Teenagers, the range of the Teenagers is greater than the range of the Adults Comparisons for this mark can relate to the range or the IQR.	For 2 marks, at least one comparison must be in context (eg refers to heights or cm). Simply quoting values for median and range and IQR is insufficient, they must be compared Median Range IQR Adults 177 17 6 Teenagers 169 20.5 6 Figures need not be seen but if given they must be correct.

Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
14	6	M1 M1 A1	for either $\sin 30 = 0.5$ oe $\sin 45 = \frac{1}{\sqrt{2}}$ or $\frac{\sqrt{2}}{2}$ for $\frac{AB}{\sin 45} = \frac{3\sqrt{2}}{\sin 30}$ oe cao	
15	4 : 1	P1 P1 P1 A1	for $\overrightarrow{OM} = \frac{1}{4}\mathbf{a}$ or $\overrightarrow{MO} = -\frac{1}{4}\mathbf{a}$ or $\overrightarrow{ON} = \frac{1}{3}\mathbf{b}$ or $\overrightarrow{NO} = -\frac{1}{3}\mathbf{b}$ $\overrightarrow{OX} = \mathbf{a} - \mathbf{b}$ or $\overrightarrow{XO} = -\mathbf{a} + \mathbf{b}$ or $\overrightarrow{ZY} = \mathbf{a} - \mathbf{b}$ or $\overrightarrow{YZ} = -\mathbf{a} + \mathbf{b}$ for $\overrightarrow{XN} = \mathbf{b} - \mathbf{a} + \frac{1}{3}\mathbf{b}$ ($= \frac{4}{3}\mathbf{b} - \mathbf{a}$) oe or $\overrightarrow{MN} = \frac{1}{3}\mathbf{b} - \frac{1}{4}\mathbf{a}$ oe or $\overrightarrow{XM} = \mathbf{b} - \mathbf{a} + \frac{1}{4}\mathbf{a}$ ($= \mathbf{b} - \frac{3}{4}\mathbf{a}$) oe for $\overrightarrow{XN} = \mathbf{b} - \mathbf{a} + \frac{1}{3}\mathbf{b}$ oe and $\overrightarrow{MN} = \frac{1}{3}\mathbf{b} - \frac{1}{4}\mathbf{a}$ or $\frac{4}{3}\mathbf{b} - \mathbf{a} - \mathbf{b} + \frac{3}{4}\mathbf{a}$ oe for 4 : 1 oe	Implies 1 st P1 A correct answer with no supportive working gets 0 marks



Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
21	(180, -1)	B1	for 180 ^(o)	
		B1	for -1	
			SC B1 if B0 scored for answer of (-1, 180)	
22	$\frac{65}{214}$	B1	for $\sin 30 = 0.5$	Answer of $\frac{3.25}{10.7}$ or $\frac{6.5}{21.4}$ gets 3 marks Where [0.5] is their value of $\sin 30$ Answer must be in the form $\frac{m}{n}$ where m and n are integers
		P1	for use of the sine rule with values substituted, eg $\frac{6.5}{\sin ABC} = \frac{10.7}{\sin 30}$ oe	
		P1	for $(\sin ABC =) \frac{6.5 \times \sin 30}{10.7}$ oe or for a complete process to find $\sin ABC$, eg $(\sin ABC =) \frac{6.5 \times [0.5]}{10.7}$ oe	
		A1	for $\frac{65}{214}$ oe eg $\frac{325}{1070}$	



Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
20	120	P1	for using the cosine rule for any angle, eg $(5\sqrt{7})^2 = 10^2 + 5^2 - 2 \times 10 \times 5 \times \cos B$	May be any angle; check diagram for working.
		P1	for a complete process to find $\cos B$ eg $(\cos B =) \frac{10^2 + 5^2 - (5\sqrt{7})^2}{2 \times 10 \times 5}$ oe	
		P1	for $\cos^{-1}(\frac{1}{2}) = 60$ or $\cos B = -0.5$	
		A1	cao	A correct answer with no supportive working gets 0 marks
21 (a)	Circle drawn	B2	for drawing a circle centre (0,0) and radius 13	Circle could be drawn freehand as long as it closely approximates to a circle
		(B1	for drawing a circle centre (0,0) with radius $\neq 13$ or a circle of radius 13 with a centre not (0,0) or an incomplete correct circle drawn)	
(b)	$x = 7.2$, $y = 10.8$ and $x = -7.2$, $y = -10.8$	M1	for drawing the line $2y = 3x$	
		A1	for both x values correct or both y values correct or one pair of x and y values correct ft from (a) dep on B1	For both A marks accept answers in the ranges $x = 7.0$ to 7.4 , $y = 10.6$ to 11.0 $x = -7.0$ to -7.4 , $y = -10.6$ to -11.0
		A1	for both correct pairs of values correctly matched ft from (a) dep on B1	Accept values given as coordinates Check graph for answers



Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
15 (a)	3	B1	for 3 correctly placed in the first row	
(b)	Correct bars	B2	for both bars correct, heights of 4.5 and 1.4	
		(B1	for one bar correct out of a maximum of 2 bars)	
(c)	18.5	M1	for finding the area of at least 2 bars eg, $2 \times 2 (= 4)$ or $4 \times 2 (= 8)$ or $4 \times 4 (= 16)$ or $2 \times 6.5 (= 13)$ or $4 \times 0.5 (= 2)$	Condone 1 error in reading fd values or measurements.
		M1	for $(“43” + 1) \div 2 (= 22)$ and $10 \div 16 \times 4 (= 2.5)$ or $“43” \div 2 (= 21.5)$ and $9.5 \div 16 \times 4 (= 2.375)$	
		A1	For 18.5 or 18.375	
16	56.0	P1	for $\frac{BD}{\sin(112)} = \frac{7.9}{\sin(42)}$	
		P1	for complete process to find BD , eg $(BD =) \frac{7.9}{\sin(42)} \times \sin(112) (= 10.9\dots)$	Values may be rounded or truncated.
		P1	for area = $\frac{1}{2} \times [BD] \times 15.3 \times \sin(42)$	$[BD]$ must be clearly identified
		A1	for answer in the range 56.0 to 56.1 SCB2 for $BD = 10.9\dots$ if no marks are awarded.	If an answer is given in the range in working and then rounded incorrectly award full marks.

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
17	56.0	P1	for a start to the process by correctly substituting into the cosine rule to find an angle eg, $18.2^2 = 14.6^2 + 7.9^2 - 2 \times 14.6 \times 7.9 \times \cos A$	
		P1	for rearranging to find $\cos A$, eg $\cos A = \frac{14.6^2 + 7.9^2 - 18.2^2}{2 \times 14.6 \times 7.9} \quad (= -0.2413\dots)$ or $A = 103.965\dots$	$\cos B = 0.9069\dots$ $B = 24.912\dots$ $\cos C = 0.6276\dots$ $C = 51.1222\dots$
		P1	for process to find the area of triangle ABC eg $\text{Area} = \frac{1}{2} \times 7.9 \times 14.6 \times \sin ("103.965\dots")$ or $\text{Area} = \frac{1}{2} \times 7.9 \times 14.6 \times \sin [A]$ $\text{Area} = \frac{1}{2} \times 14.6 \times 18.2 \times \sin ("24.912\dots")$ or $\text{Area} = \frac{1}{2} \times 14.6 \times 18.2 \times \sin [B]$ $\text{Area} = \frac{1}{2} \times 7.9 \times 18.2 \times \sin ("51.1222\dots")$ or $\text{Area} = \frac{1}{2} \times 7.9 \times 18.2 \times \sin [C]$	[A], [B], [C] must be a numerical value and clearly identified by labelling or on the diagram with no contradiction
		A1	for answer in the range 55.96 to 56.0	If an answer is given in the range in working and then rounded incorrectly award full marks



Paper: 1MA1/1H				
Question	Working	Answer	Mark	Notes
21			C1	states (angle) $ABC = (\text{angle}) BCD$
			C1	states 2 nd link $AB = CD$
			C1	states 3 rd link with reason: $BC = BC$ (common)
			C1	concludes proof by stating (triangle) $ABC \equiv (\text{triangle}) DCB$ with reason SAS and $AC = BD$
22		Proof	B1	(indep) for stating $\cos 30 = \frac{\sqrt{3}}{2}$
			M1	for $PQ^2 = 10^2 + 10^2 - 2 \times 10 \times 10 \times \cos PBQ$ or $AC^2 = x^2 + x^2 - 2 \times x \times x \times \cos 30 (=x^2(2-\sqrt{3}))$ oe
			M1	for $\cos PBQ = \frac{10^2 + 10^2 - PQ^2}{2 \times 10 \times 10}$ (implies previous M1)
			M1	for $\cos PBQ = \frac{10^2 + 10^2 - (x^2 + x^2 - 2 \times x \times x \times \cos 30)}{2 \times 10 \times 10}$
	$\cos PBQ = \frac{10^2 + 10^2 - x^2(2-\sqrt{3})}{200}$ $= \frac{200 - x^2(2-\sqrt{3})}{200}$		A1	conclusion of proof with all working seen



Paper 1MA1: 3H				
Question	Working	Answer	Mark	Notes
15		2.63	P1 P1 P1 P1 A1	for setting up the expression $\frac{1}{2}(x+3)(2x-1)\sin 45$ (may be seen in an equation) (dep) for expanding the brackets in the expression or for the equation $\frac{1}{2}(x+3)(2x-1)\sin 45 = 6\sqrt{2}$ oe (dep) for the process to set up the equation and rearrange to the form $ax^2 + bx + c = d$ e.g. to $2x^2 + 5x - 27 = 0$ or $24 = 2x^2 + 5x - 3$ (dep) for substitution into the quadratic formula e.g. $\frac{-5 \pm \sqrt{5^2 - 4 \times 2 \times -27}}{4}$ for 2.63(10436...)
16 (a)		$x_1 = -2.64$ $x_2 = -2.57392$ $x_3 = -2.603767255$	M1 M1 A1	for substitution of -2.5 into the equation (to get $x_1 = -2.64$) for substitution of " $x_1 = -2.64$ " and " $x_2 = -2.57392$ " to give x_2 and x_3 for $x_1 = -2.64$ oe, $x_2 = -2.57(392)$ and $x_3 = -2.6(03767255)$ Condone $x_3 = -2.61$ if $x_2 = -2.57$ is used in the substitution
(b)		Statements	C1 C1	Connection between equation and iterative form in (a) e.g. rearrangement Statement e.g. iteration is an estimation of a solution
17 (a)		No (supported)	P1 P1 P1 C1	for 265 or 275 or 274.999... or 107.5 or 112.5 or 112.4999... process to find $\frac{d}{t}$ where $270 < d \leq 275$ and $107.5 \leq t < 110$ oe for process to work in consistent units of time eg $\frac{d}{t} \times 60$ or $t \div 60$ where $265 \leq d \leq 275$ and $107.5 \leq t < 110$ oe or $160 \div 60 (= 2.666...)$ Conclusion supported with correct figure(s) given eg No and 153(.488...) or No and 2.66 to 2.7 and 2.5(581...) from correct working
(b)		Statement	C1	e.g. Less distance in the same time so (max) speed would drop



Paper: 1MA1/3H				
Question	Working	Answer	Mark	Notes
15 (a)		Shown	M1 C1	for method to establish at least one root between $x = 0$ and $x = 1$, eg $f(0) = -5$ and $f(1) = 3$ for correct values and a deduction about the roots eg as there is a sign change there must be at least one root between $x = 0$ and $x = 1$ (as f is continuous)
(b)		Shown	C1 C1	for a correct first step in rearrangement, eg $x(x^2 + 7) - 5 = 0$ or $x^3 + 7x = 5$ for clear and correct steps showing complete rearrangement
(c)	$x_1 = 0.625$ $x_2 = 0.6765327696$ $x_3 = 0.6704483001$	0.6704(483001)	M1 M1 A1	for substitution of 1 into the formula (to get 0.625) for substitution of " $x_1 = 0.625$ " and " $x_2 = 0.6765327696$ " to give x_2 and x_3 0.6704(483001)
(d)		Comment	M1 C1	substitutes answer to (c) into expression (to get $-0.00549\dots$) appropriate comment, eg accurate as answer is close to 0
16		Yes and correct working	B1 P1 A1	for 147.5 or 148.5 or 148.4999... or 11.75 or 11.85 or 11.84999... substitutes $11.8 < UB \leq 11.85$ and $147.5 \leq LB < 148$ in the formula to work out petrol consumption for 'Yes' and 8.03(3898305...) from correct working
17		14.4	P1 P1 P1 P1 A1	for start of process, eg $0.5 \times 11 \times CD \times \sin 105 = 56$ for complete process to find CD , eg $(CD =) \frac{56}{0.5 \times 11 \times \sin 105}$ oe (= 10.54) for process to find AC , eg $(AC^2 =) 11^2 + [CD]^2 - 2 \times 11 \times [CD] \times \cos 105$ ($AC = 17.09$) for process to find AB , eg $\frac{AB}{\sin 48} = \frac{[AC]}{\sin 118}$ answer in range 14.3 to 14.4



Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
17	13.1	P1	for start of process to find the length of BD , eg $\frac{BD}{\sin 34^\circ} = \frac{12.5}{\sin 109^\circ}$	Accept 7.4 for the award of the first two P marks
		P1	for complete process to find the length of BD , eg $BD = \frac{12.5}{\sin 109^\circ} \times \sin 34^\circ (= 7.39\dots)$	
		P1	for process to find the length of AD , eg $AD^2 = 11.4^2 + "7.39^2" - 2 \times 11.4 \times "7.39" \times \cos 86^\circ$	
		P1	for process to use correct order of operations, eg $129.96 + 54.6(5\dots) - 11.7(5\dots) (= 172.85\dots)$	
		A1	for answer in the range 13.1 to 13.2	If an answer is given within the range and then incorrectly rounded to 3 sig figs award full marks.



Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
17	2.7 and -0.7	M1	for $x^2-3 = 2x-1$ or $x^2-3 -2x + 1 (=0)$ or completing the square eg $(y-1)(x-1)^2-1-2$	Line segments required For 1.7 allow from 1.6 to 1.8 For -1.7 allow from -1.8 to -1.6 Points indicated or attempt to read off x-axis at the appropriate points – maybe indicated by dashes No marks will be awarded for correct answers only
		M1	(dep M1) draws graph of $y = 2x-1$ or drawing the translated graph or describing the translation in words or $-1.7 + 1 (= -0.7)$ or $1.7 + 1 (=2.7)$	
		M1	shows the points of intersection clearly for the given quadratic graph and linear graph or for one correct solution from appropriate supportive working	
		A1	for x in the range 2.6 to 2.8 and -0.6 to -0.8 SCB2 for plotting $y = 2x + 1$ and values for x in the range -1.1 to -1.3 and 3.1 to 3.3	
18	1.95	P1	for correct substitution into the cosine rule, eg $3.4^2 = 6.1^2 + 6.2^2 - 2 \times 6.1 \times 6.2 \times \cos BCA$	Can be any angle within triangle ABC P2 can be awarded for $BCA = 32(.08046913\dots)$ Must not come from incorrect processing
		P1	for a full process to find BCA eg $(\cos BCA \Rightarrow \frac{6.1^2 + 6.2^2 - 3.4^2}{2 \times 6.1 \times 6.2})$ or $(BCA \Rightarrow) 32(.08046913\dots)$	
		P1	correct substitution into the sine rule, eg $\frac{DC}{\sin(32.08\dots \times \frac{2}{3})} = \frac{6.2}{\sin(180 - 32.08\dots - ("32.08\dots \times \frac{2}{3})})$	
		P1	for complete process to find DC eg $(DC \Rightarrow) \frac{6.2 \times \sin "12.832"}{\sin "135.088"}$	
		A1	Answer in the range 1.94 to 1.951	



Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
15 (a)	11.4	M1	for start to method to find the length of BC eg. $8^2 + 11^2 - 2 \times 8 \times 11 \times \cos 72$	If an answer within the given range is seen in working and rounded incorrectly award full marks. Any alternative method must be complete
		M1	(dep on M1) for method to use correct order of operations, eg. $64 + 121 - 54.38 \dots (= 130.61 \dots)$	
		A1	for answer in the range 11.4 to 11.5	
	41.8	M1	for $0.5 \times 8 \times 11 \times \sin 72 (= 41.8 \dots)$	
		A1	for answer in the range 41.5 to 41.9	
16 (a)	$x_1 = 1.817$ $x_2 = 1.853$ $x_3 = 1.846$	M1	for a correct method to find x_1 eg $\sqrt[3]{10-2 \times 2} (= 1.8171 \dots)$	Accept an accuracy of 2dp or more rounded or truncated
		M1	(dep on M1) for substitution of x_1 to give x_2 and x_2 to give x_3	
		A1	for $x_1 = 1.81(71 \dots)$, $x_2 = 1.85(33 \dots)$ and $x_3 = 1.84(62 \dots)$	
	$a = 2$, $b = -10$	C1	cao	

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
26	15.8	P1	starts process by finding an angle, eg exterior angle = $360 \div 7$ (= 51.42...) or interior angle = $\frac{900}{7}$ or $180 - (360 \div 7)$ (= 128.57...) oe	Accept values to 3 figures rounded or truncated
		P1	start of process to find length of side by using area, eg $\frac{1}{2} \times AB \times AG \times \sin GAB = 30$ oe or $\frac{1}{2} \times a \times b \times \sin [128.5 \dots] = 30$ oe or $\frac{1}{2} \times x \times x \times \sin [128.5 \dots] = 30$ oe or $\frac{1}{2} \times AG \times \frac{1}{2}GB \times \sin AGB = 15$ oe or for a relationship linking GB and h , $\frac{1}{2} \times GB \times h = 30$ oe	Any symbols used in formulae must be consistent with any labels on the diagram. For this mark, [128.5...] does not have to come from a correct process but is the value that the student believes is the interior angle.
		P1	for process to find the length of a side of the polygon eg $\sqrt{\frac{2 \times 30}{\sin "128.5..."}}$ oe (= 8.76...) or for process to get a second relationship linking AG and $\frac{1}{2}GB$, eg $AG \times \cos "25.7..." = \frac{1}{2}GB$ oe or for process to get a second relationship linking GB and h , eg $\tan "25.7..." = \frac{h}{\frac{1}{2}GB}$ oe	

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
		P1	for complete process to find <i>GB</i> eg $\frac{8.76 \times \sin 128.5}{\sin 25.7}$ oe or $\sqrt{8.76^2 + 8.76^2 - 2 \times 8.76^2 \times \cos 128.5}$ oe or $2 \times 8.76 \times \sin 64.2$ or $2 \times 8.76 \times \cos 25.7$ oe or $\sqrt{\frac{2 \times 60}{\tan 25.7}}$ oe	
		A1	for answer in the range 15.7 to 15.8	



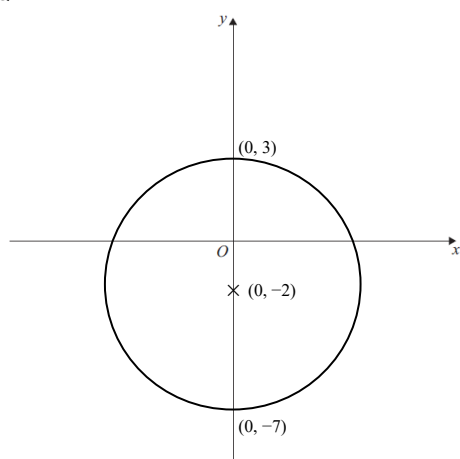
Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
18	52.5	P1	for start of process to find length of AC, eg $\frac{1}{2} \times 17 \times AC \times \sin 35 = 54$ or $(AC =) 54 \div (\frac{1}{2} \times 17 \times \sin 35) (= 11.076\dots)$	Check diagram for working throughout
		P1	for start of process to find AD or CD, eg $\frac{AD}{\sin 48} = \frac{11.076}{\sin 57}$ oe or $\frac{AD}{\sin 48} = \frac{[AC]}{\sin 57}$ oe or $\frac{CD}{\sin 75} = \frac{11.076}{\sin 57}$ oe or $\frac{CD}{\sin 75} = \frac{[AC]}{\sin 57}$ oe	Throughout "75" = 180 – 48 – 57 [AC] must be a numerical value and clearly identified by labelling or on the diagram with no contradiction.
		P1	for complete process to find AD or CD $(AD =) \frac{11.076}{\sin 57} \times \sin 48 (= 9.81\dots)$ or $(AD =) \frac{[AC]}{\sin 57} \times \sin 48$ or $(CD =) \frac{11.076}{\sin 57} \times \sin 75 (= 12.7\dots)$ or $(CD =) \frac{[AC]}{\sin 57} \times \sin 75$	
		P1	for process to find area of triangle ACD, eg $\frac{1}{2} \times 11.076 \times 12.7 \times \sin 48$ or $\frac{1}{2} \times [AC] \times [CD] \times \sin 48$ or $\frac{1}{2} \times 11.076 \times 9.81 \times \sin 75$ or $\frac{1}{2} \times [AC] \times [AD] \times \sin 75$ or $\frac{1}{2} \times 9.81 \times 12.7 \times \sin 57$ or $\frac{1}{2} \times [AD] \times [CD] \times \sin 57$	[AC], [AD], [CD] must be numerical values and clearly identified by labelling or on the diagram with no contradiction.
		A1	for answer in the range 52.4 to 52.52	If an answer is shown in the range in working and then incorrectly rounded award full marks



Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
23	73	P1	for process to work with cosine eg $(DB^2 =) 12^2 + 9^2 - 2 \times 12 \times 9 \times \cos 60 (= 117)$	$\sqrt{117} = 3\sqrt{13}$ Can be implied by correct use in subsequent calculations 3 rd and 4 th P1 can be awarded in any order [DB] must be clearly identified but may not be correct, but cannot be 6 or 9 or 12 CBD and ABD may be given as a variable, award marks unless contradicted
		P1	for a correct order of operations to find DB, eg $\sqrt{225 - 216 \times \cos 60}$ or $\sqrt{117}$ (= 10.8...)	
		P1	for working with sine rule and 60° eg $\frac{\sin CBD}{9} = \frac{\sin 60}{[DB]}$ or $\sin CBD = 0.720...$ or $CBD = 46.10...$	
		P1	for working with sine rule and 125° eg $\frac{\sin ABD}{6} = \frac{\sin 125}{[DB]}$ or $\sin ABD = 0.454...$ or $ABD = 27.02...$	
		A1	for answer within the range 72.5 to 73.5	



Qu22



Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
21	71	M1	for method to find angle BAD or angle OAB or angle OBD , eg angle $BAD = 64 \div 2 (= 32)$ or angle $OAB = 51$ or angle $OBD = (180 - 64) \div 2 (= 58)$	Angles may be seen on the diagram
		M1	for method to find angle ADO or angle AXD (where X is a point on the major arc AD) eg $ADO = 180 - 64 - (180 - 51 - "32") (= 19)$ or $ADO = (180 - 64 - (180 - 2 \times "51")) \div 2 (= 19)$ or angle $AXD = 180 - "58" - 51 (= 71)$	
		A1	for angle $ADC = 71$	
		C1	(dep on M1) for one circle theorem relevant to their method, eg The <u>angle</u> at the <u>centre</u> of a circle is <u>twice</u> the angle at the <u>circumference</u> or The <u>tangent</u> to a circle is perpendicular to the <u>radius</u> (<u>diameter</u>) or <u>Opposite angles</u> of a <u>cyclic quadrilateral</u> add up to 180 or <u>Alternate segment</u> theorem	
22	30	P1	for a correct trig statement using angle ACF , eg $\sin x = \frac{6.8}{13.6}$ or $x = \sin^{-1}(\frac{6.8}{13.6})$ or $\sin x = 0.5$ or $\frac{6.8}{\sin x} = \frac{13.6}{\sin 90}$ oe	Check diagram for working
		A1	cao	



Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
20	10.8	P1	for process to find FC , eg $\tan 52 = \frac{8}{FC}$ ($FC = 6.25(028..)$)	
		P1	for process that will lead to side length of ABC , eg $\sin 60 = \frac{6.25 \times 1.5}{BC}$ or $\cos 30 = \frac{6.25 \times 1.5}{BC}$ or $(6.25 \times 1.5)^2 + (0.5x)^2 = x^2$ oe	
		A1	for answer in range 10.8 to 10.83	



Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
17 (a)	4, 6, 5, 4	M1	for a correct method to find at least 2 frequencies from bars of different widths, eg $10 \times 0.4 (=4)$, $10 \times 0.6 (=6)$, $5 \times 1 (=5)$, $20 \times 0.2 (=4)$	
		A1	cao	
(b)	10	M1	for $\frac{23+1}{4} (=6)$ or $\frac{23}{4} (=5.75)$ could fit from their table in (a)	
		A1	for 10 or 9.375	Be aware of 10 coming from incorrect working ft does not apply to the A1
18	39.5	P1	for a start to a process eg, for a correct trigonometric statement, eg $\sin 48 = \frac{7.3}{AC}$ or $\cos 42 = \frac{7.3}{AC}$ or $\frac{AC}{\sin 90} = \frac{7.3}{\sin 48}$ OR angle CAH unambiguously identified on a diagram	Must include correct values
		P1	for a complete correct process to find AC , eg $(AC =) \frac{7.3}{\sin(48)}$ ($=9.8..$) or $(AC =) \frac{7.3}{\cos(42)}$ ($=9.8..$) or $(AC =) \sin 90 \times \frac{7.3}{\sin 48}$ ($=9.8..$)	
		P1	for a correct statement using angle CAH , eg $\tan(CAH) = \frac{8.1}{9.8..}$ OR $\sqrt{8.1^2 + 9.8^2} (=12.7...)$ and $\frac{\sin CAH}{8.1} = \frac{\sin 90}{12.7}$	
		A1	for answer in the range 39.5 – 39.51	If an answer is given in the range but then incorrectly rounded award full marks.



Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
12	73.6	P1	for correct initial use of Pythagoras eg $5^2 + 5^2 (=50)$ or a trigonometric ratio in the form $\frac{5+2}{0.5AC} = \sin 45$ oe	do not accept $\sqrt{20} \div 2$
		P1	for finding the length of half of the diagonal eg $\sqrt{50} \div 2 (= 3.5...)$ or $0.5AC = \frac{5+2}{\sin 45} (=3.5...)$ oe	
		P1	for process to use tan eg $\tan TAC = (12 \div "3.5..") (=3.3..)$ or complete alternative method arriving at an equation with the subject as $\sin TAC$ or $\cos TAC$	
		A1	for an answer in the range 73.58 to 74.1	
13	408	M1	for $1.01 \times 400 (= 404)$ or 408.04 or 412.08	412(.08) on the answer line M1A0 1.01×400 may be seen as part of a calculation
		A1	cao	
14	Evidence of solution	M1	for constructing an equation eg $y \propto \frac{1}{x^2}$ or eg $y = \frac{k}{x^2}$ oe	Must show all steps clearly
		M1	for substituting in the values a and 44 into $y = \frac{k}{x^2}$	
		C1	for a complete method to use the equation, the value of k and $x = 2a$ to show $y=5.5$ eg $(2a)^2y = 44a^3$ and $y = 44a^3 \div 8a^3=5.5$	



Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
19	31.0	P1	for $\tan 35 = BE \div 15$ or $BE = 10.5(0\dots)$ OR finding the length $DM = \frac{2}{5} \times 15 (= 6)$ or $MA = \frac{3}{5} \times 15 (= 9)$ or 6:9 OR showing the required angle on a diagram eg with an arc	$MB = \sqrt{9^2 + 15^2} = \sqrt{306} (= 17.4(9\dots))$ or 17.5 $BE = 15 \times \tan 35 (= 10.5(0\dots))$ $AE = 15 \div \cos 35 (= 18.3(1\dots))$ $ME = \sqrt{9^2 + 18.31\dots^2} = \sqrt{416. (3\dots)}$ (=20.4(0...))
		P1	for $MB = \sqrt{15^2 + "9" ^2}$ or $\sqrt{306}$ or 17.4(9....) OR $ME = \sqrt{"9" ^2 + "18.3(1\dots)" ^2}$ or $\sqrt{416. (3\dots)}$ or 20.4(0...)	Check diagram for working
		P1	for using appropriate trigonometry ratio to set up an equation in angle <i>EMB</i> eg $\tan \theta = "10.5(0\dots)" \div "17.4(9\dots)"$ or $\cos \theta = "17.4(9\dots)" \div "20.4(0\dots)"$ or $\sin \theta = "10.5(0\dots)" \div "20.4(0\dots)"$	
		A1	for answer in the range 30.9 to 31	If an answer is shown in the range in working and then incorrectly rounded award full marks.



Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
20	56	P1	for a correct process to find AF , eg $\sqrt{13^2 - 9^2}$ ($= 9.38\dots$) or $2\sqrt{22}$ or $\sqrt{88}$	Decimal values truncated or rounded to 3 sf or more If a correct answer within the range is shown in working but incorrectly rounded award full marks
		P1	for a correct process to find FH , eg $\frac{9}{\cos(49)}$ ($= 13.7\dots$)	
		P1	for a correct trig statement involving FAH , eg $\tan(FAH) = \frac{13.7\dots}{9.38\dots}$	
		A1	answer in the range 55.6 to 56	
21 (a)	1.06	M1	for tangent drawn at $t=17.5$	No tangent drawn at $t=17.5$ scores zero marks Use of change in y over change in x Working may be seen on the diagram Answer of $\frac{10.5}{17.5}$ oe scores no marks Accept answers in the form a/b where a and b are integers
		M1	for a complete method to find the gradient, eg tangent drawn at $t = 17.5$, and $18.5 \div 17.5$	
		A1	answer in the range 0.9 to 1.2	
		C1	suitable explanation, eg the rate of change of volume	
(b)	Explanation	C1	suitable explanation, eg the rate of change of volume	If units are given they must be correct.
22	$\frac{x^3 - 3}{2}$	M1	for $(h(x)) = \sqrt[3]{2x + 3}$	$[h(x)]$ must be their composite function and cannot be either $\sqrt[3]{x}$ or $2x + 3$
		M1	for a correct first step to find the inverse of $[h(x)]$	
		A1	oe	

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
24	12.2	P1	for process to find AP , eg $\frac{5}{7} \times 14.7 (= 10.5)$ or for showing the required angle on a diagram eg with an arc	Check diagram for working
		P1	for process to find MP , eg $\sqrt{10.5^{n2} + 1.9^2}$ oe ($= 10.6...$) or for a process to find TP , eg $\sqrt{10.5^{n2} + 1.9^2 + 2.3^2}$ oe ($= 10.9...$)	
		P1	for using appropriate trigonometry ratio to find angle TPM , eg $\tan TPM = \frac{2.3}{10.6...}$ or $\sin TPM = \frac{2.3}{10.9...}$ or $\cos TPM = \frac{10.6...}{10.9...}$	
		A1	for answer in the range 12.1 to 12.2	
				If an answer is shown in the range in working and then incorrectly rounded award full marks.



Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
18	Shown	M1 M1 C1	for beginning to find K eg $2400 = K \times 2000$ or $K = 1.2$ oe For a correct method to find the value for 2021 or 2022, eg $2400 \times "1.2" (= 2880)$ or $2400 \times ("1.2")^2 (= 3456)$ or $2000 \times ("1.2")^2 (= 2880)$ or $2000 \times ("1.2")^3 (= 3456)$ OR method to find rate leading to 3000 in 2022, eg $\sqrt[3]{\frac{3000}{2000}} (= 1.144...)$ for comparative figures eg 3456 (and 3000) OR $3000 \div 2880 = 1.041... \text{ and } 1.2$ OR 1.144... and 1.2	M marks can be awarded in either order $1.2^2 = 1.44$ 3000 need not be restated to award this mark If comparison made with 2023 or beyond do not award C1
19	17	P1 P1 P1 A1	for a process to use trigonometry to find BG eg $\frac{BG}{15} = \tan 27$ or 7.64(28...) for a process to find to find EG eg $\frac{15}{EG} = \cos 52$ or 24.3(64...) for a process to use trigonometry to find angle GEB eg $\tan GEB = \frac{"7.64..."}{"24.36..."}$ for an answer in the range 17 to 17.6	Other methods are possible for all P marks but only award the mark at the point of an equation with the correct length or angle as the only unknown



Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
17 (a)	histogram drawn	B3	for fully correct histogram, eg. relative heights 90, 96, 44, 8, 6	
		(B2 or (B1	for 4 correct bars or for frequency ÷ class interval for all 5 frequencies and 2 correct bars of different widths) for 2 correct bars of different widths or for frequency ÷ class interval for at least 3 frequencies)	
(b)	0.4n	M1	for finding ratio of heights or widths of bars, eg $5 : 1$ or $\frac{1}{5} : 1 : 2$ or $\frac{n}{5}$ oe or $2n$ oe as answer or compares areas of bars, eg 6 and 2.4 or 3 and 1.2 or 150 and 60	
		A1	for 0.4n oe	
18	30.6	P1	for process to find TC, eg. $(TC =) 14 \times \frac{3}{3+4} (= 6)$	Lengths of TC, TD, SD may be seen on the diagram
		P1	for process to find TD, eg. $(TD =) \sqrt{14^2 + "6"'^2}$ or $\sqrt{232}$ or $2\sqrt{58}$ ($= 15.2\dots$)	
		P1	for process to find SD, using area of a trapezium, $147 = 0.5 \times (SD + 12) \times 14$, or $SD = 9$	A complete set of processes to find the angle is needed where an alternative route is involved with more than one stage in the working If an answer is given in the range in working and then rounded incorrectly award full marks.
		P1	for $\tan^{-1}\left(\frac{"9"}{"15.2\dots"}\right)$	
		A1	for answer in the range 30.4 to 30.7	