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#1 HOME TUITION AGENCY

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**MATHEMATICS**

**0580/11**

Paper 1 (Core)

**October/November 2019**

**1 hour**

Candidates answer on the Question Paper.

Additional Materials:      Electronic calculator                      Geometrical instruments  
                                         Tracing paper (optional)

**READ THESE INSTRUCTIONS FIRST**

Write your centre number, candidate number and name on all the work you hand in.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams or graphs.

Do not use staples, paper clips, glue or correction fluid.

**DO NOT WRITE IN ANY BARCODES.**

Answer **all** questions.

If working is needed for any question it must be shown below that question.

Electronic calculators should be used.

If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.

For  $\pi$ , use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [ ] at the end of each question or part question.

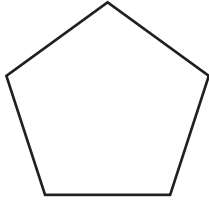
The total of the marks for this paper is 56.

This document consists of **10** printed pages and **2** blank pages.

1 Change 4.6 metres to centimetres.

..... cm [1]

2



Write down the order of rotational symmetry of this regular pentagon.

..... [1]

3 Work out 5% of \$25.

\$ ..... [1]

4 Factorise  $5p + pt$ .

..... [1]

5 Rui has a bag containing 5 black pens, 8 red pens and 3 blue pens only. He takes a pen out of the bag at random.

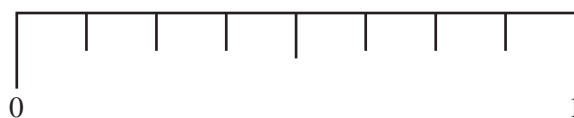
Draw an arrow ( $\downarrow$ ) on the probability scale to show the probability that Rui takes

(a) a red pen,



[1]

(b) a red pen or a blue pen.



[1]

6 (a) Write 8473 correct to the nearest ten.

..... [1]

(b) Write 16.086 correct to 2 decimal places.

..... [1]

7 Write these in order of size, starting with the smallest.

$\frac{9}{19}$       $\frac{3}{7}$      37%     0.43

..... < ..... < ..... < ..... [2]  
*smallest*

8



The diagram shows the base of a triangle.  
The lengths of the other two sides are 6 cm and 4 cm.

**Using a ruler and compasses only**, construct the other two sides of the triangle.  
Show all your construction arcs.

[2]

9 Calculate.

$$\frac{16.379 - 0.879}{4.2} \times 1.241$$

Give your answer correct to 2 significant figures.

..... [2]

10 Share 518 in the ratio 2 : 5.

....., ..... [2]

11 Write 15 060

(a) in words,

..... [1]

(b) in standard form.

..... [1]

12 Simplify  $5c - d - 3d - 2c$ .

..... [2]



13 Calculate the area of a circle with radius 12 cm.

..... cm<sup>2</sup> [2]

14 Levante changes 24 650 Hungarian forints to dollars.  
The exchange rate is \$1 = 290 forints.

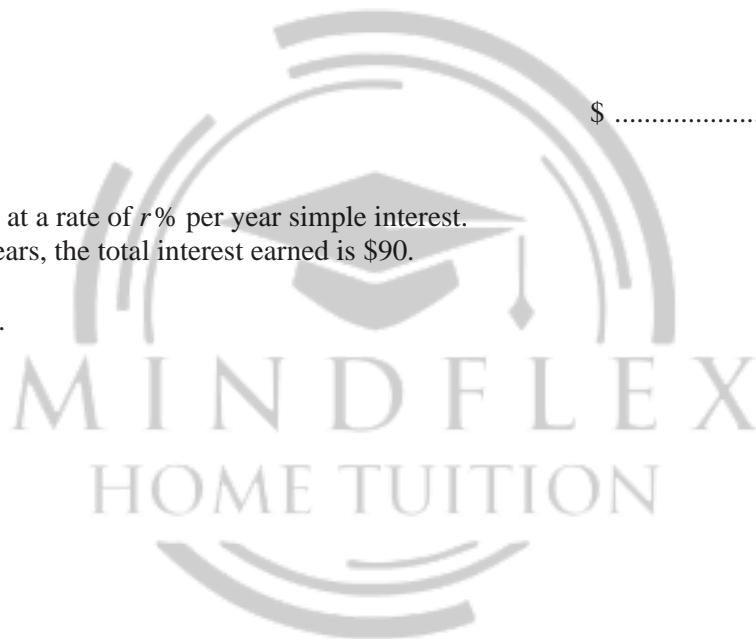
Calculate how many dollars Levante receives.

\$ ..... [2]

15 Paula invests \$600 at a rate of  $r\%$  per year simple interest.  
At the end of 10 years, the total interest earned is \$90.

Find the value of  $r$ .

$r =$  ..... [2]



16 Without using a calculator, work out  $\frac{5}{16} \times 1\frac{1}{7}$ .

You must show all your working and give your answer as a fraction in its simplest form.

..... [2]

17 Simplify  $2x^3 \times 3x^2$ .

..... [2]

18 Complete the table.

Fraction		Decimal		Percentage
$\frac{3}{4}$	=	0.75	=	
	=	0.2	=	20%
$\frac{2}{25}$	=		=	8%

[3]



19

27 14 8 93 32 55 14 38 73 47

From this list of numbers find

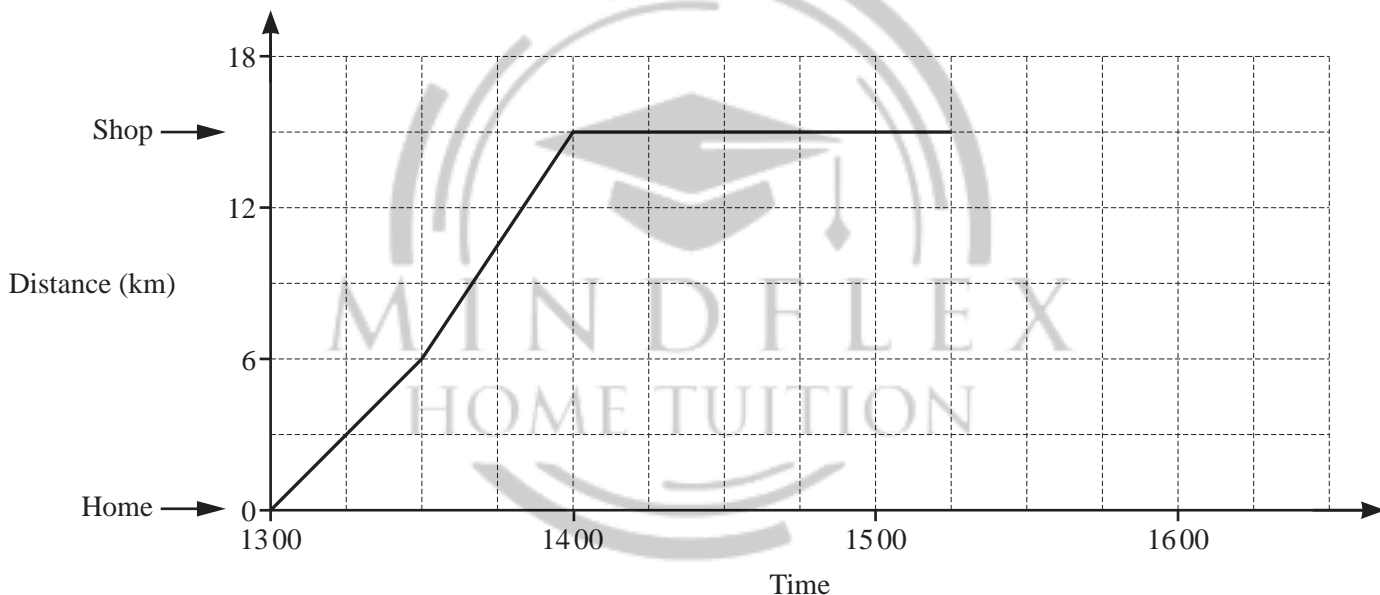
(a) the median,

..... [2]

(b) the range.

..... [1]

20 Juan travels from his home to a shop.  
The travel graph shows his journey.



(a) Find the distance Juan travels to the shop.

..... km [1]

(b) Write down what happens at 1400.

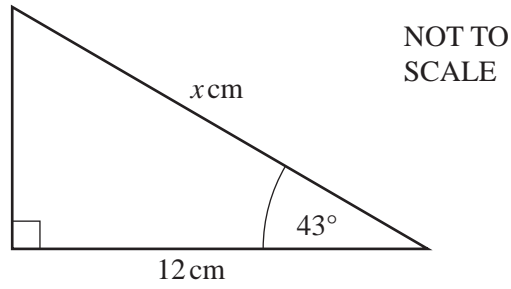
..... [1]

(c) Juan travels home at a constant speed of 15 km/h.  
He leaves the shop at 15 15.

Complete the travel graph.

[1]

21



Use trigonometry to calculate the value of  $x$ .

$x = \dots\dots\dots$  [3]

22 Solve.

(a)  $8(w + 11) = 120$

$w = \dots\dots\dots$  [2]

(b)  $\frac{x-2}{3} = 3$

$x = \dots\dots\dots$  [2]



- 23 Solve the simultaneous equations.  
You must show all your working.

$$5x + 4y = 10$$

$$7x - 6y = 43$$

$x = \dots\dots\dots$

$y = \dots\dots\dots$  [4]

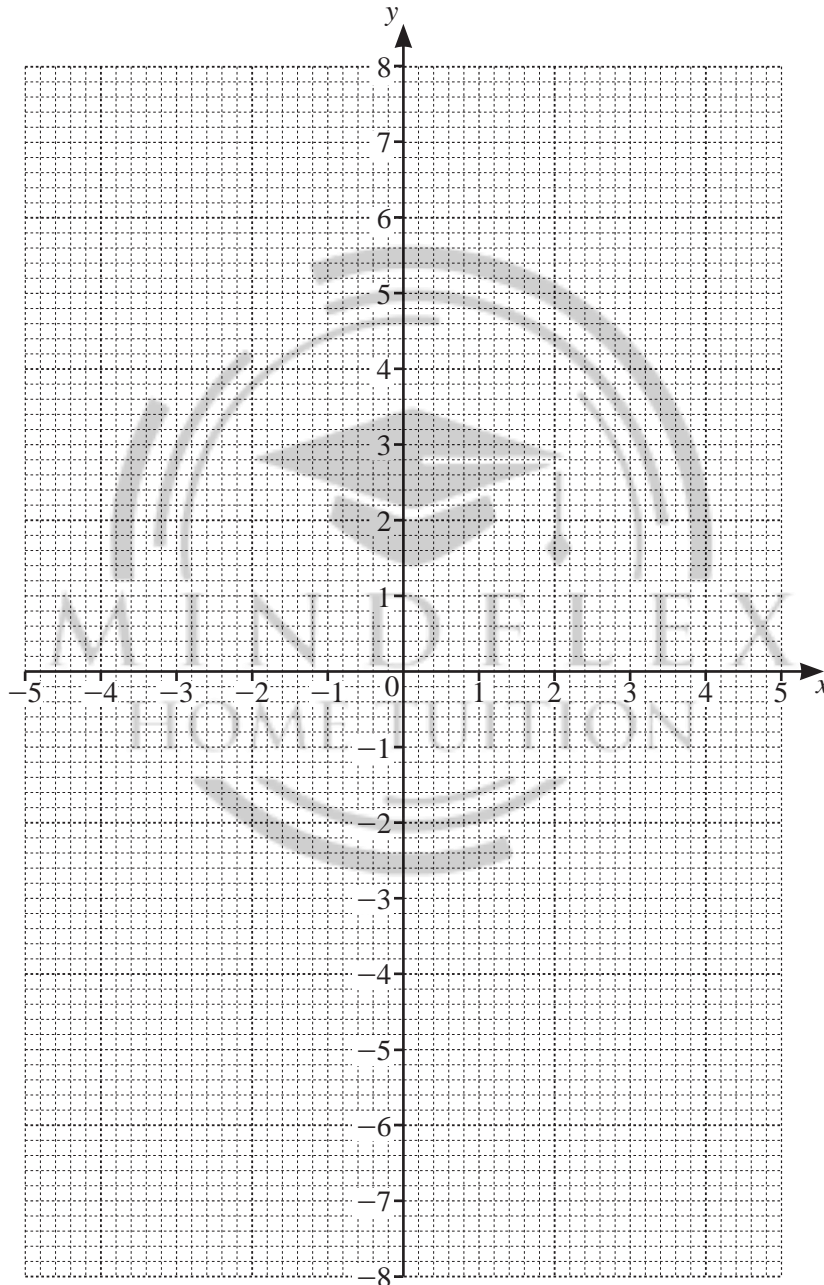


24 (a) Complete the table of values for  $y = \frac{8}{x}$ .

$x$	-5	-4	-3	-2	-1		1	2	3	4	5
$y$		-2	-2.7	-4	-8		8	4	2.7		

[2]

(b) On the grid, draw the graph of  $y = \frac{8}{x}$  for  $-5 \leq x \leq -1$  and  $1 \leq x \leq 5$ .



[4]

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**MATHEMATICS**

**0580/11**

Paper 1 (Core)

**October/November 2019**

MARK SCHEME

Maximum Mark: 56

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**Published**

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This document consists of **5** printed pages.



### Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

#### GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

#### GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

#### GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

#### GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

#### GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

#### GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.



**Abbreviations**

cao – correct answer only

dep – dependent

FT – follow through after error

isw – ignore subsequent working

oe – or equivalent

SC – Special Case

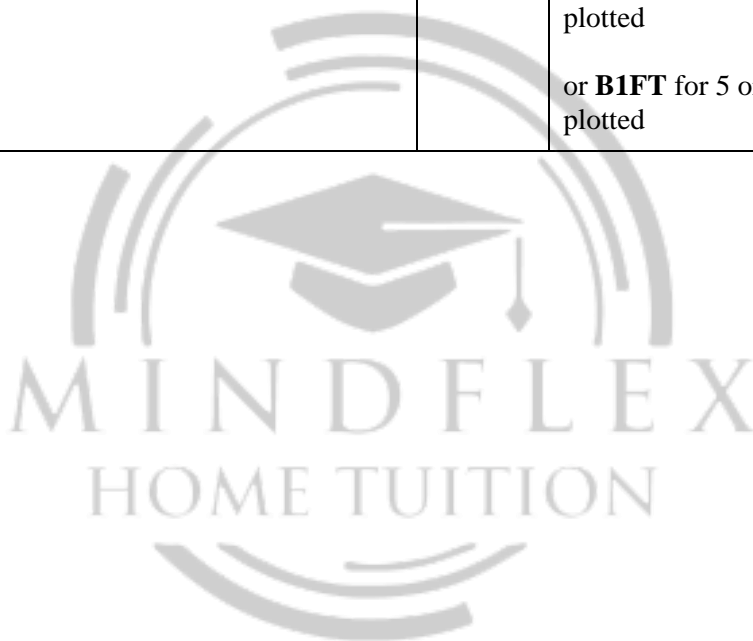
nfw – not from wrong working

soi – seen or implied

Question	Answer	Marks	Partial Marks
1	460	1	
2	5	1	
3	1.25	1	
4	$p(5 + t)$ final answer	1	
5(a)	Arrow at $\frac{1}{2}$	1	
5(b)	Arrow at $\frac{11}{16}$	1	
6(a)	8470 cao	1	
6(b)	16.09 cao	1	
7	37% $\frac{3}{7}$ 0.43 $\frac{9}{19}$	2	<b>B1</b> for 3 in correct order as answer or <b>M1</b> for two of 0.47... 0.42... 0.37
8	Correct triangle with sides 6 cm and 4 cm <b>and</b> correct arcs	2	<b>B1</b> for correct triangle with no or incorrect arcs or correct arcs with no or inaccurate sides drawn
9	4.6 cao nfw	2	<b>B1</b> for 4.57 or 4.58 or 4.579 to 4.580 If 0 scored, <b>SC1</b> for their calculation rounded to 2 sf if more than 2sf seen
10	148 370	2	<b>M1</b> for $518 \div (2 + 5)$
11(a)	Fifteen thousand [and] sixty	1	
11(b)	$1.506[0] \times 10^4$	1	
12	$3c - 4d$ final answer	2	<b>B1</b> for $3c + kd$ or $kc - 4d$
13	452 or 452.3 to 452.4...	2	<b>M1</b> for $12^2 \times \pi$
14	85	2	<b>M1</b> for $24650 \div 290$

Question	Answer	Marks	Partial Marks
15	1.5	2	<b>M1</b> for $\frac{600 \times r \times 10}{100} = 90$ oe or better
16	$\frac{5}{16} \times \frac{8}{7}$	<b>M1</b>	
	$\frac{5}{14}$ cao	<b>A1</b>	
17	$6x^5$ final answer	2	<b>B1</b> for $kx^5$ or $6x^k$
18	75% $\frac{1}{5}$ oe fraction [0].08	3	<b>B1</b> for each
19(a)	35	2	<b>M1</b> for first 6 or last 6 values listed in order  or for 32 <b>and</b> 38 identified
19(b)	85	1	
20(a)	15	1	
20(b)	He stopped or arrived at the shop	1	
20(c)	Ruled line from (15 15, 15) to (16 15, 0)	1	
21	16.4 or 16.40 to 16.41	3	<b>M2</b> for $[x =] \frac{12}{\cos 43}$ or $[x =] \frac{12}{\sin 47}$  or <b>M1</b> for $\cos [43][=] \frac{12}{x}$ or $\sin 47 [=] \frac{12}{x}$
22(a)	4	2	<b>M1</b> for $8w + 8 \times 11 = 120$ or $w + 11 = 120 \div 8$
22(b)	11	2	<b>M1</b> for $x - 2 = 3 \times 3$ oe or $\frac{x}{3} = 3 + \frac{2}{3}$  oe or better

Question	Answer	Marks	Partial Marks
23	Correctly equating one set of coefficients	<b>M1</b>	
	Correct method to eliminate one variable	<b>M1</b>	
	$[x = ] 4$	<b>A1</b>	
	$[y = ] -2.5$ oe	<b>A1</b>	If 0 scored, <b>SC1</b> for 2 values satisfying one of the original equations or for 2 correct values
24(a)	-1.6 2 1.6	<b>2</b>	<b>B1</b> for 2 correct
24(b)	Fully correct curve	<b>4</b>	<b>B3FT</b> for 9 or 10 points correctly plotted or <b>B2FT</b> for 7 or 8 points correctly plotted or <b>B1FT</b> for 5 or 6 points correctly plotted



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**MATHEMATICS**

**0580/21**

Paper 2 (Extended)

**October/November 2019**

**1 hour 30 minutes**

Candidates answer on the Question Paper.

Additional Materials:      Electronic calculator                      Geometrical instruments  
                                         Tracing paper (optional)

**READ THESE INSTRUCTIONS FIRST**

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Write in dark blue or black pen.

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**DO NOT WRITE IN ANY BARCODES.**

Answer **all** questions.

If working is needed for any question it must be shown below that question.

Electronic calculators should be used.

If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.

For  $\pi$ , use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [ ] at the end of each question or part question.

The total of the marks for this paper is 70.

This document consists of 11 printed pages and 1 blank page.

1 Work out 5% of \$25.

\$ ..... [1]

2 Factorise  $5p + pt$ .

..... [1]

3 Calculate.

$$\frac{16.379 - 0.879}{4.2} \times 1.241$$

Give your answer correct to 2 significant figures.

..... [2]

4 Write 15 060

(a) in words,

..... [1]

(b) in standard form.

..... [1]

5 Simplify  $5c - d - 3d - 2c$ .

..... [2]

6 Solve.

$$\frac{x-2}{3} = 3$$

$x =$  ..... [2]

7 Simplify  $2x^3 \times 3x^2$ .

..... [2]

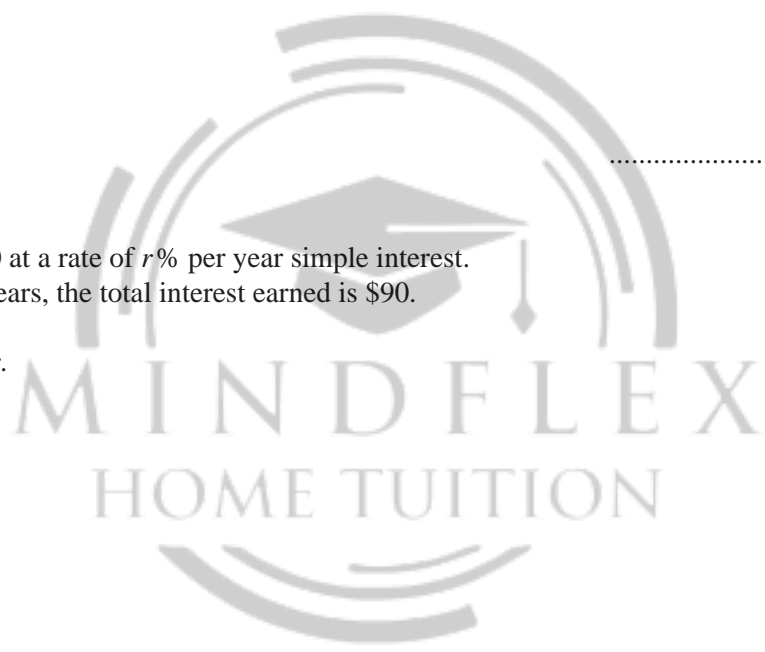
8 Without using a calculator, work out  $\frac{5}{16} \times 1\frac{1}{7}$ .

You must show all your working and give your answer as a fraction in its simplest form.

..... [2]

9 Paula invests \$600 at a rate of  $r\%$  per year simple interest.  
At the end of 10 years, the total interest earned is \$90.

Find the value of  $r$ .



$r =$  ..... [2]

10 Simplify.

$$\left(\frac{x^3}{8}\right)^{-\frac{4}{3}}$$

..... [2]

11  $P = 2r + \pi r$

Rearrange the formula to write  $r$  in terms of  $P$  and  $\pi$ .

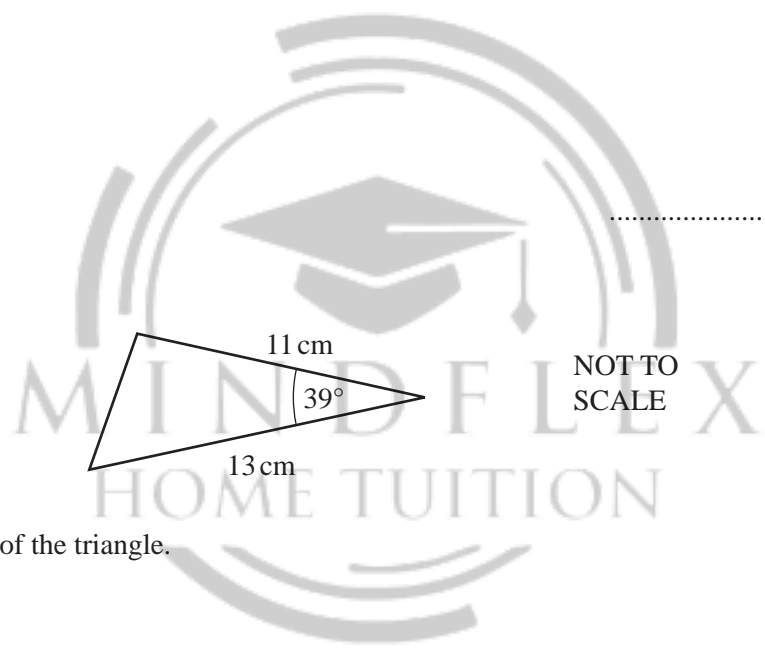
$r = \dots\dots\dots$  [2]

12 The sides of a square are 15.1 cm, correct to 1 decimal place.

Find the upper bound of the area of the square.

$\dots\dots\dots \text{cm}^2$  [2]

13



Calculate the area of the triangle.

$\dots\dots\dots \text{cm}^2$  [2]

- 14 The scale of a map is 1 : 10 000 000.  
On the map, the area of Slovakia is  $4.9 \text{ cm}^2$ .

Calculate the actual area of Slovakia.  
Give your answer in square kilometres.

.....  $\text{km}^2$  [3]

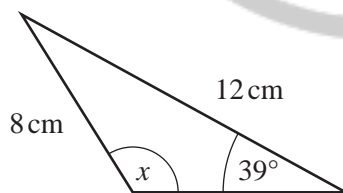
- 15  $y$  is inversely proportional to  $x^2$ .  
When  $x = 4$ ,  $y = 2$ .

Find  $y$  when  $x = \frac{1}{2}$ .



$y =$  ..... [3]

- 16



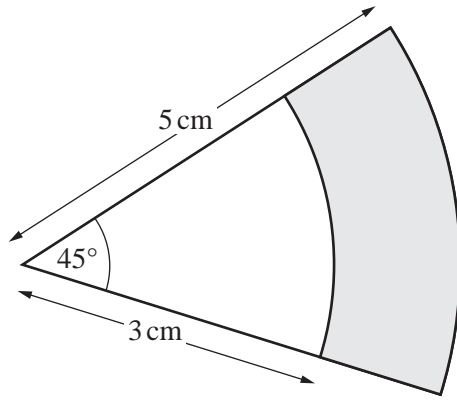
NOT TO  
SCALE

Calculate the **obtuse** angle  $x$  in this triangle.

$x =$  ..... [3]



17



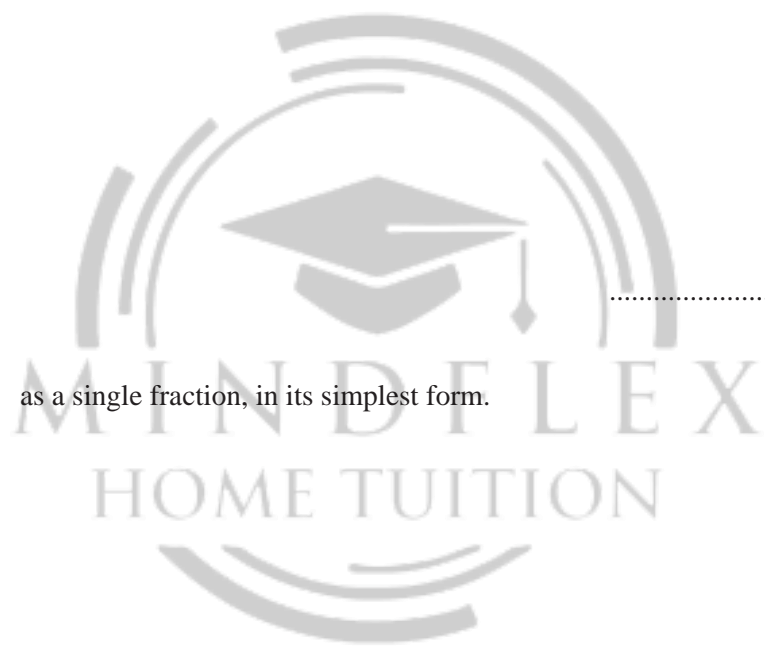
NOT TO  
SCALE

The diagram shows two sectors of circles with the same centre.

Calculate the shaded area.

..... cm<sup>2</sup> [3]

18 Write  $\frac{x}{2} - \frac{2x+4}{x+1}$  as a single fraction, in its simplest form.



..... [3]

19  $\mathbf{M} = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$        $\mathbf{P} = \begin{pmatrix} 5 & 6 \\ 7 & 8 \end{pmatrix}$

(a) Find  $\mathbf{MP}$ .

$\begin{pmatrix} & \\ & \end{pmatrix}$  [2]

(b) Find  $|\mathbf{M}|$ .

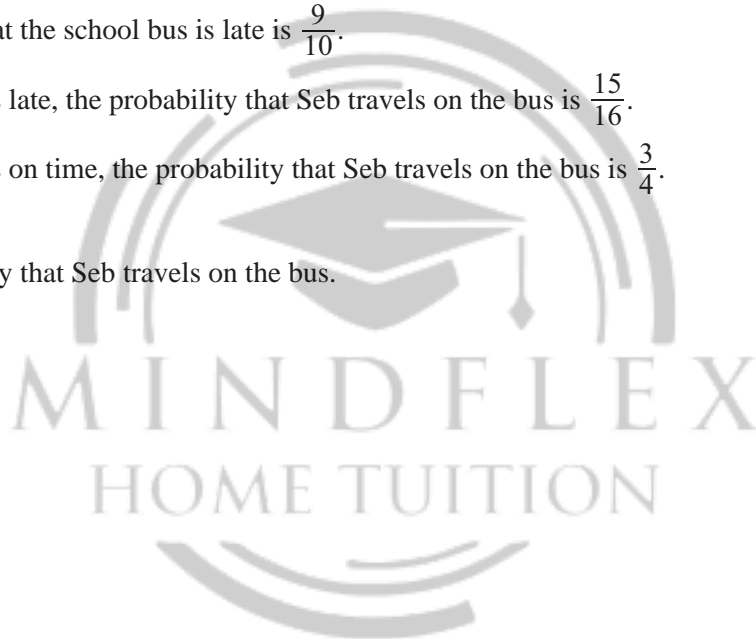
..... [1]

20 The probability that the school bus is late is  $\frac{9}{10}$ .

If the school bus is late, the probability that Seb travels on the bus is  $\frac{15}{16}$ .

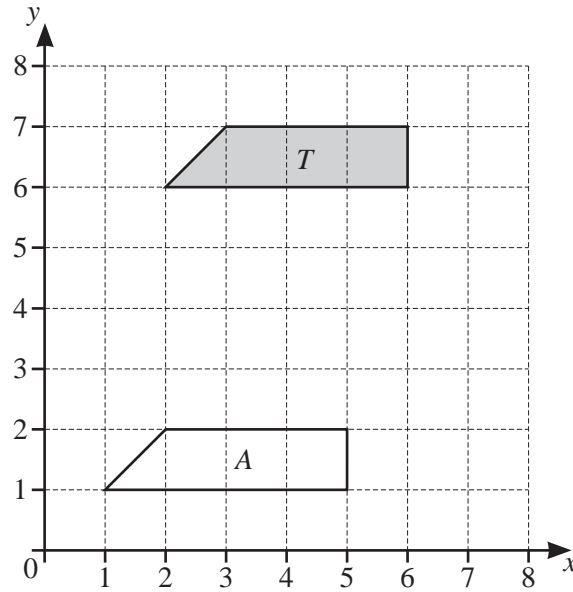
If the school bus is on time, the probability that Seb travels on the bus is  $\frac{3}{4}$ .

Find the probability that Seb travels on the bus.



..... [3]

21



(a) Describe fully the **single** transformation that maps shape *T* onto shape *A*.

.....  
 .....

[2]

(b) On the grid, reflect shape *T* in the line  $y = x$ .

[2]

22 A pipe is completely full of water.  
 Water flows through the pipe at a speed of 1.2 m/s into a tank.  
 The cross-section of the pipe has an area of  $6 \text{ cm}^2$ .

Calculate the number of litres of water flowing into the tank in 1 hour.

..... litres [4]

23  $\mathcal{C} = \{0, 1, 2, 3, 4, 5, 6\}$                        $A = \{0, 2, 4, 5, 6\}$                        $B = \{1, 2, 5\}$

Complete each of the following statements.

$A \cap B = \{.....\}$

$n(B) = .....$

$\{0, 4, 6\} = ..... \cap .....$

$\{2, 4\} ..... A$  [4]

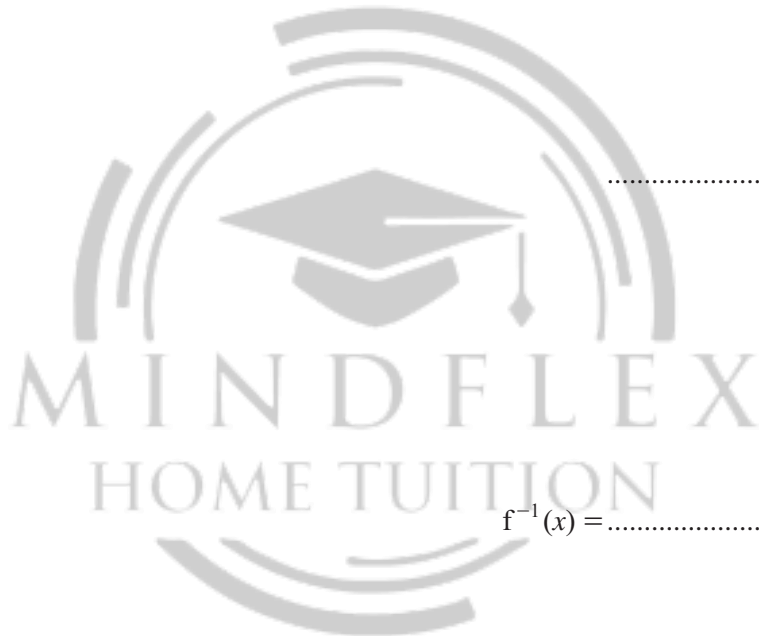
24  $f(x) = 3x - 5$                                                $g(x) = 2^x$

(a) Find  $fg(3)$ .

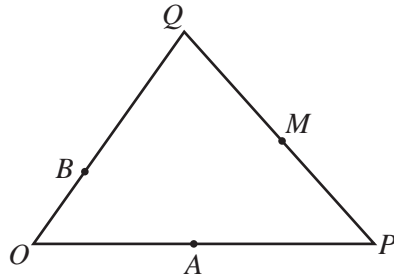
..... [2]

(b) Find  $f^{-1}(x)$ .

$f^{-1}(x) = .....$  [2]



25



NOT TO  
SCALE

$O$  is the origin,  $\vec{OP} = 2\vec{OA}$ ,  $\vec{OQ} = 3\vec{OB}$  and  $\vec{PM} = \vec{MQ}$ .

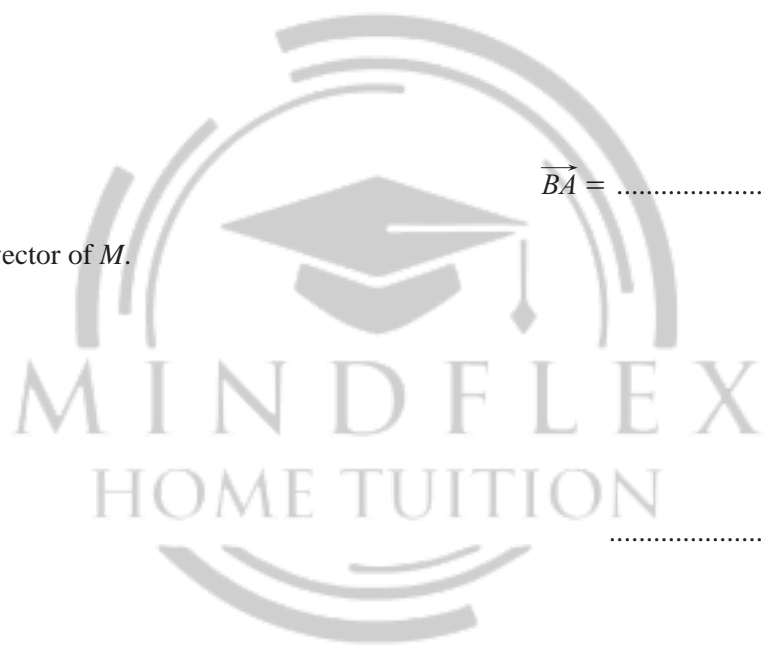
$\vec{OP} = \mathbf{p}$  and  $\vec{OQ} = \mathbf{q}$ .

Find, in terms of  $\mathbf{p}$  and  $\mathbf{q}$ , in its simplest form

(a)  $\vec{BA}$ ,

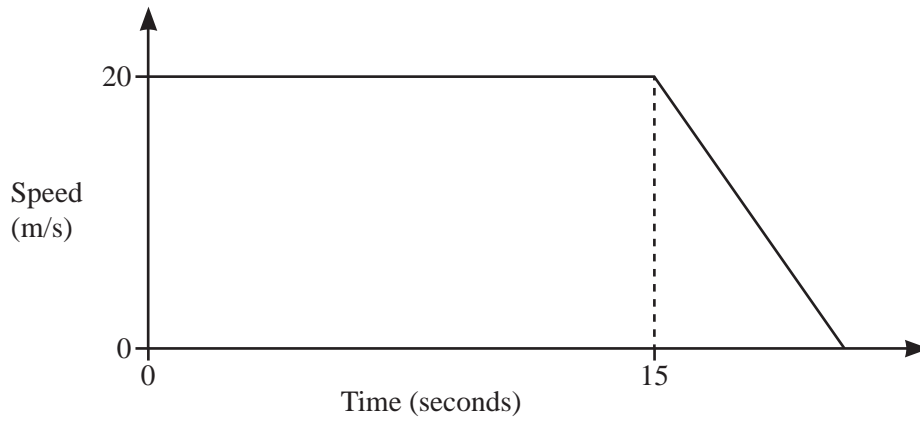
$\vec{BA} = \dots\dots\dots$  [2]

(b) the position vector of  $M$ .



$\dots\dots\dots$  [2]

26



NOT TO  
SCALE

A car travels at 20 m/s for 15 seconds before it comes to rest by decelerating at  $2.5 \text{ m/s}^2$ .

Find the total distance travelled.



..... m [5]

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Cambridge International General Certificate of Secondary Education

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**MATHEMATICS**

**0580/21**

Paper 2 (Extended)

**October/November 2019**

MARK SCHEME

Maximum Mark: 70

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**Published**

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#### GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

#### GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

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Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

**Abbreviations**

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1	1.25	1	
2	$p(5 + t)$ final answer	1	
3	4.6 cao nfw	2	<b>B1</b> for 4.57 or 4.58 or 4.579 to 4.580  If 0 scored, <b>SC1</b> for their calculation rounded to 2 sf if more than 2sf seen
4(a)	Fifteen thousand [and] sixty	1	
4(b)	$1.506[0] \times 10^4$	1	
5	$3c - 4d$ final answer	2	<b>B1</b> for $3c + kd$ or $kc - 4d$
6	11	2	<b>M1</b> for $x - 2 = 3 \times 3$ oe or $\frac{x}{3} = 3 + \frac{2}{3}$ oe or better
7	$6x^5$ final answer	2	<b>B1</b> for $kx^5$ or $6x^k$
8	$\frac{5}{16} \times \frac{8}{7}$	<b>M1</b>	
	$\frac{5}{14}$ cao	<b>A1</b>	
9	1.5	2	<b>M1</b> for $\frac{600 \times r \times 10}{100} = 90$ oe or better
10	$\frac{16}{x^4}$ or $16x^{-4}$	2	<b>M1</b> for $\left(\frac{x}{2}\right)^{-4}$ or $\left(\frac{8}{x^3}\right)^{\frac{4}{3}}$ or $\left(\frac{x^{12}}{4096}\right)^{-\frac{1}{3}}$ or better  or <b>B1</b> for $\frac{16}{x^k}$ or $16x^k$ or $\frac{k}{x^4}$ or $kx^{-4}$ final answer
11	$\frac{P}{2 + \pi}$	2	<b>M1</b> for $P = r(2 + \pi)$
12	229.5225 final answer cao	2	<b>M1</b> for $(15.1 + 0.05)^2$ or <b>B1</b> for 15.15 seen

Question	Answer	Marks	Partial Marks
13	45[.0] or 44.99 to 45.00	2	<b>M1</b> for $\frac{1}{2} \times 13 \times 11 \times \sin 39$ oe
14	49 000	3	<b>M1</b> for $4.9 \times (10\,000\,000)^2$ <b>M1</b> for $\div (100\,000)^2$ OR <b>M1</b> for 1 cm : 100 km <b>M1</b> for $4.9 \times (\textit{their } 100)^2$ OR <b>M2</b> for $(\sqrt{4.9} \times 10\,000\,000 \div 100\,000)^2$ or <b>M1</b> for $\sqrt{4.9} \times 10\,000\,000 \div 100\,000$
15	128	3	<b>M1</b> for $y = \frac{k}{x^2}$ <b>M1</b> for $y = \frac{\textit{their } k}{\left(\frac{1}{2}\right)^2}$ OR <b>M2</b> for $\frac{2 \times 4^2}{\left(\frac{1}{2}\right)^2}$ or <b>M1</b> for $2 \times 4^2 = y \times \left(\frac{1}{2}\right)^2$
16	109.3 or 109.26 to 109.27	3	<b>M2</b> for $\frac{12 \sin 39}{8}$ or <b>M1</b> for $\frac{8}{\sin 39} = \frac{12}{\sin(\dots)}$ oe
17	6.28 or 6.283 to 6.284	3	<b>M2</b> for $\frac{45}{360} \times \pi \times 5^2$ oe <b>and</b> $\frac{45}{360} \times \pi \times 3^2$ oe or <b>M1</b> for $\frac{45}{360} \times \pi \times 5^2$ oe or $\frac{45}{360} \times \pi \times 3^2$ oe or $\pi \times 5^2 - \pi \times 3^2$ oe
18	$\frac{x^2 - 3x - 8}{2(x + 1)}$ or $\frac{x^2 - 3x - 8}{2x + 2}$ final answer	3	<b>B1</b> for common denominator $2(x + 1)$ or $2x + 2$ <b>M1</b> for $x(x + 1) - 2(2x + 4)$ or better
19(a)	$\begin{pmatrix} 19 & 22 \\ 43 & 50 \end{pmatrix}$	2	<b>B1</b> for 2 or 3 elements correct

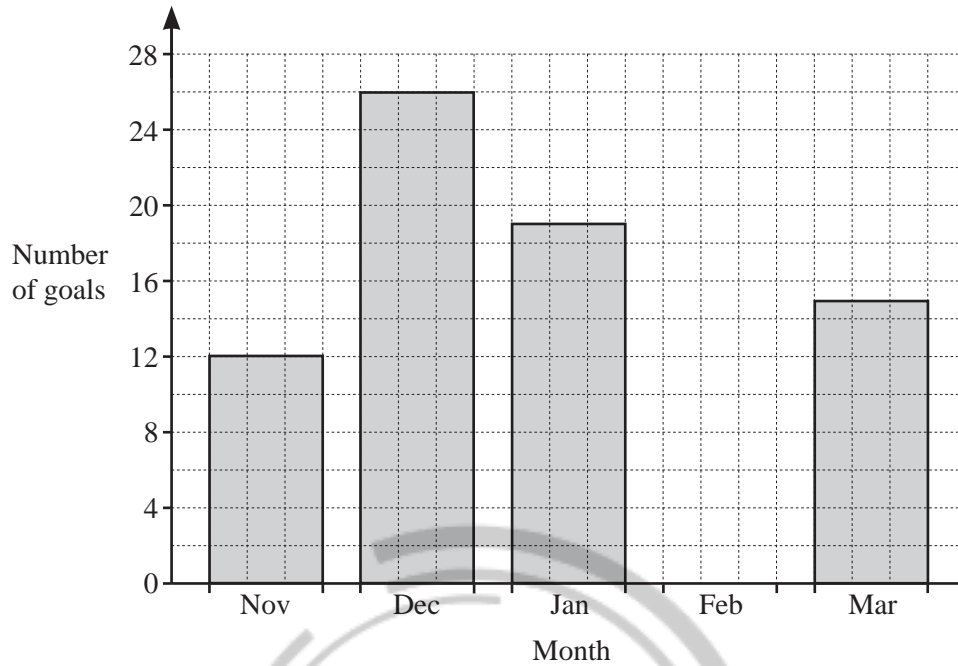
Question	Answer	Marks	Partial Marks
19(b)	-2 final answer	1	
20	$\frac{147}{160}$ oe	3	<b>M2</b> for $\frac{1}{10} \times \frac{3}{4} + \frac{9}{10} \times \frac{15}{16}$ or <b>M1</b> for $\frac{1}{10} \times \frac{3}{4}$ or $\frac{9}{10} \times \frac{15}{16}$
21(a)	Translation $\begin{pmatrix} -1 \\ -5 \end{pmatrix}$	2	<b>B1</b> for each
21(b)	Correct reflection at (6, 2), (6, 6), (7, 6), (7, 3)	2	<b>B1</b> for three correct vertices
22	2592	4	<b>M3</b> for $1.2 \times 100 \times 60 \times 60 \times 6 \div 1000$ oe or <b>M2</b> for $1.2 \times 60 \times 60 \times 6$ oe or <b>M1</b> for figs 12 $\times$ figs 6 or 60 $\times$ 60 or correct conversion e.g. their value in $\text{cm}^3 \div 1000$ their value in $\text{m}^3 \times 1000$ 1.2 $\times$ 100 6 $\div$ 10 000
23	2, 5 3 A....B' C	4	<b>B1</b> for each
24(a)	19	2	<b>M1</b> for $3(2^x) - 5$ soi or for f(8)
24(b)	$\frac{x+5}{3}$ oe final answer	2	<b>M1</b> for correct first step $y+5=3x$ or $\frac{y}{3}=x-\frac{5}{3}$ or $x=3y-5$
25(a)	$-\frac{1}{3}\mathbf{q} + \frac{1}{2}\mathbf{p}$ oe	2	<b>M1</b> for correct unsimplified answer or correct route
25(b)	$\frac{1}{2}\mathbf{p} + \frac{1}{2}\mathbf{q}$ oe	2	<b>M1</b> for correct unsimplified answer or correct route

Question	Answer	Marks	Partial Marks
26	380	5	<b>B2</b> for time = 8, implied by 23 on t-axis or <b>M1</b> for $\frac{20}{t} = 2.5$ or $\frac{20}{t-15} = 2.5$ or $\frac{0-20}{t-15} = -2.5$ oe <b>M2</b> for $\frac{1}{2}(\text{their } 23 + 15) \times 20$ or $20 \times 15 + \frac{1}{2} \times \text{their } 8 \times 20$ oe or <b>M1</b> for any relevant area found





- 1 (a) José manages a football team.  
He records the number of goals scored by the team for each of five months.  
Some of the results are shown on the bar chart.



- (i) In February, 10 goals were scored.  
Complete the bar chart. [1]
- (ii) Write down the month in which most goals were scored.  
..... [1]
- (iii) Find the total number of goals scored.  
..... [1]
- (iv) Calculate the mean number of goals scored each month.  
..... [1]

(b) Jodie and her two children go to a football match.

(i) Ticket prices are \$15.30 for an adult and \$6.50 for a child.

Calculate the total cost of the three tickets.

\$..... [2]

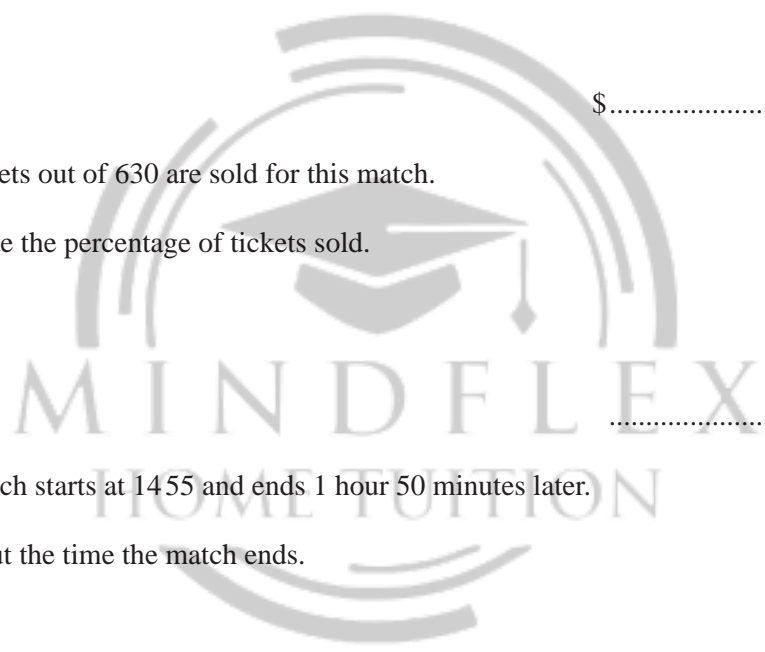
(ii) A match programme costs \$3.75 .  
Jodie buys two match programmes.

Calculate the change she receives from a \$10 note.

\$..... [2]

(iii) 540 tickets out of 630 are sold for this match.

Calculate the percentage of tickets sold.



..... % [1]

(iv) The match starts at 14 55 and ends 1 hour 50 minutes later.

Work out the time the match ends.

..... [1]

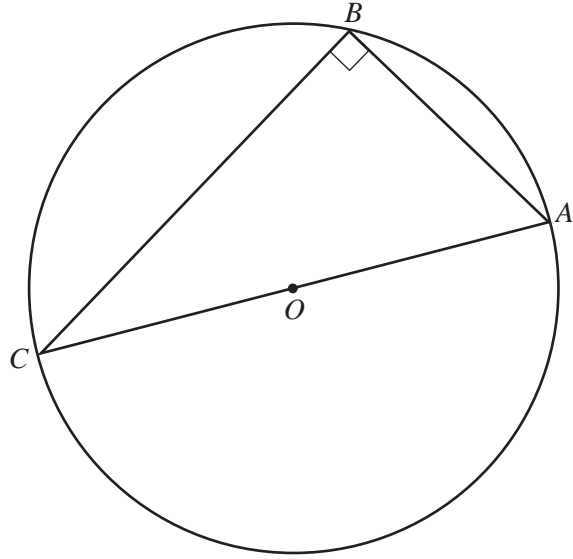
(v) Jodie travels 66 km to get home after the match.  
She leaves at 5 pm and arrives home at 6.12 pm.

Calculate her average speed in kilometres per hour.

..... km/h [3]



2 (a)



In the diagram,  $A$ ,  $B$  and  $C$  are points on the circle, centre  $O$ .

(i) On the diagram, draw a chord. [1]

(ii) Explain why angle  $ABC$  is  $90^\circ$ .  
..... [1]

(b) The length of the edge of a cube is 8 cm.

Calculate the surface area of this cube.



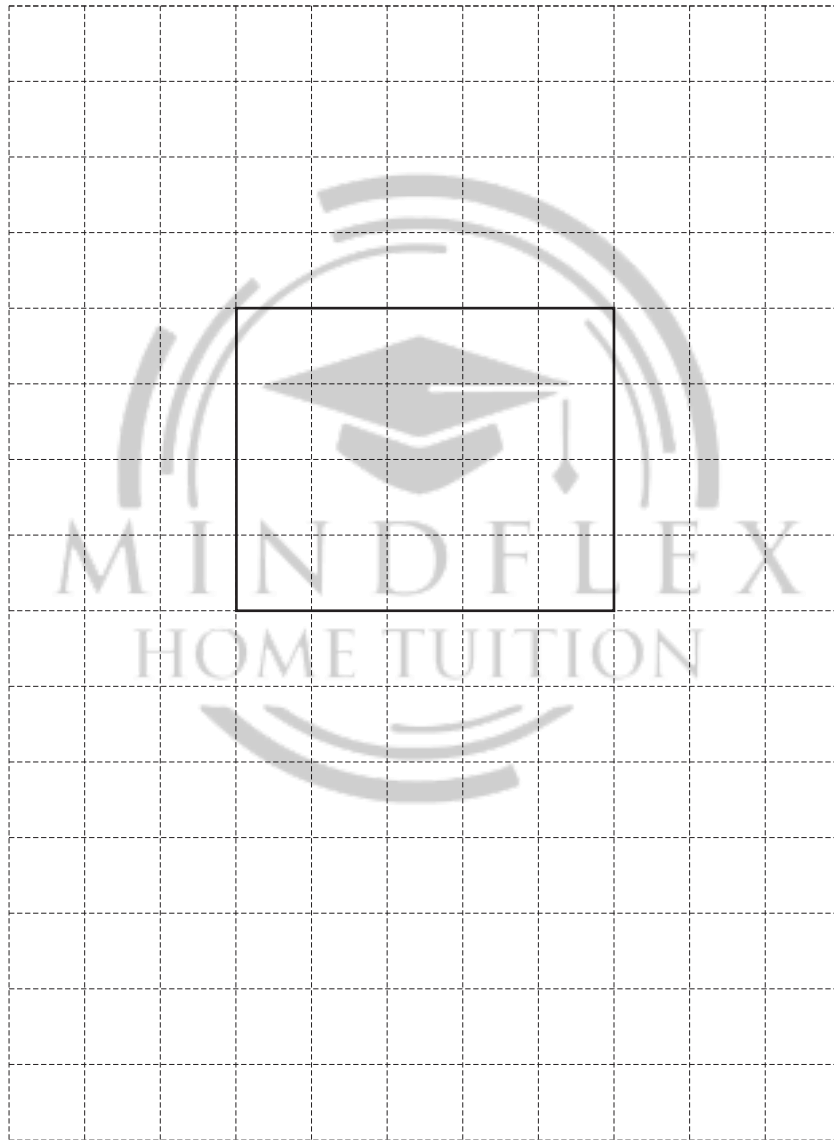
.....  $\text{cm}^2$  [2]

(c) A cuboid measures 5 cm by 4 cm by 2 cm.

- (i) Calculate the volume of this cuboid.  
Give the units of your answer.

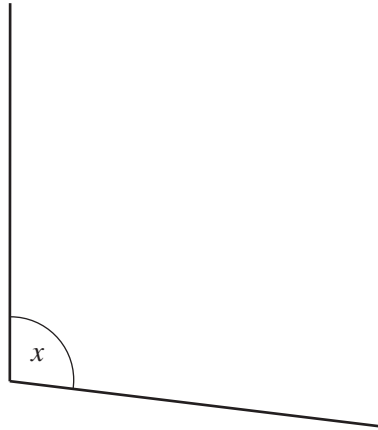
..... [3]

- (ii) On the  $1\text{ cm}^2$  grid, draw an accurate net of this cuboid.  
One face has been drawn for you.



[3]

3 (a)



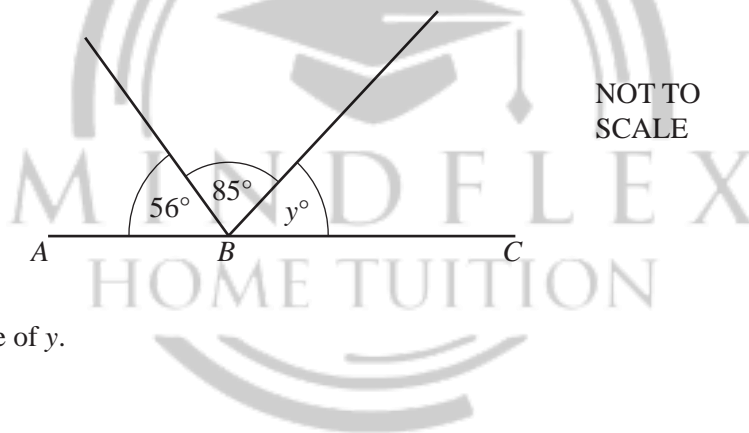
(i) Measure the size of angle  $x$ .

..... [1]

(ii) Write down the mathematical name of this type of angle.

..... [1]

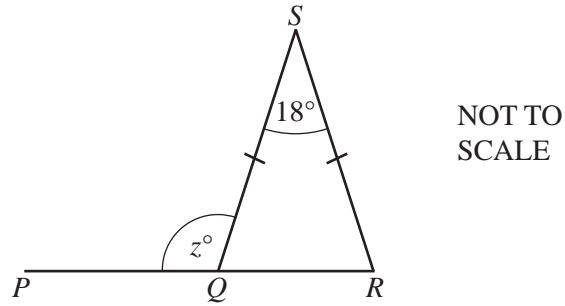
(b)  $ABC$  is a straight line.



Find the value of  $y$ .

$y =$  ..... [1]

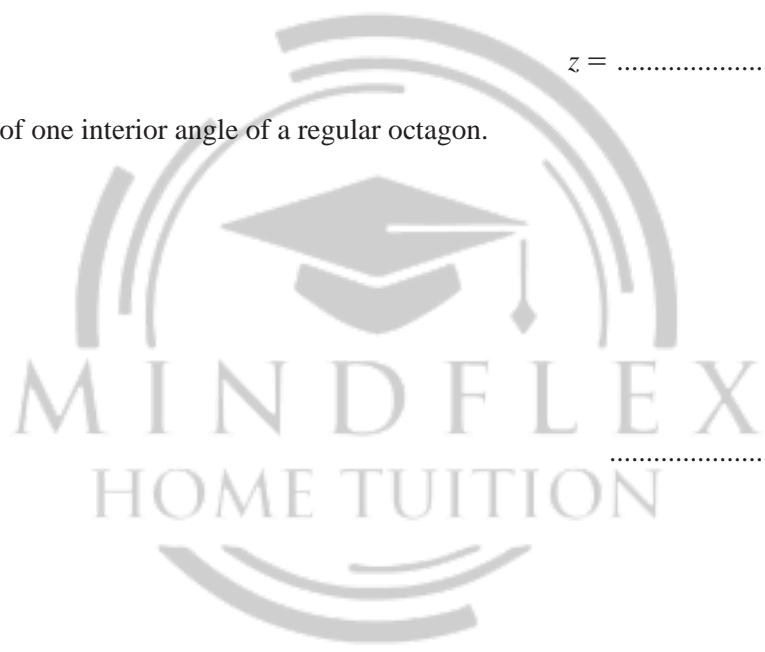
- (c)  $QRS$  is an isosceles triangle and  $PQR$  is a straight line.



Find the value of  $z$ .

$z = \dots\dots\dots$  [2]

- (d) Find the size of one interior angle of a regular octagon.



$\dots\dots\dots$  [3]

4 (a) Write the number four hundred and eighteen thousand and seventy two in figures.

..... [1]

(b) Write down all the factors of 16.

..... [2]

(c) Write down a prime number between 30 and 40.

..... [1]

(d) Find the value of

(i)  $\sqrt{729}$ ,

..... [1]

(ii)  $18^3$ ,

..... [1]

(iii)  $7^0$ .

..... [1]

(e) Saskia has \$600.

She spends  $\frac{1}{5}$  of the \$600 on a coat and gives  $\frac{1}{3}$  of the \$600 to her son.

What fraction of the \$600 does she have left?

Give your answer in its simplest form.

..... [3]

(f) Find the lowest common multiple (LCM) of 15 and 27.

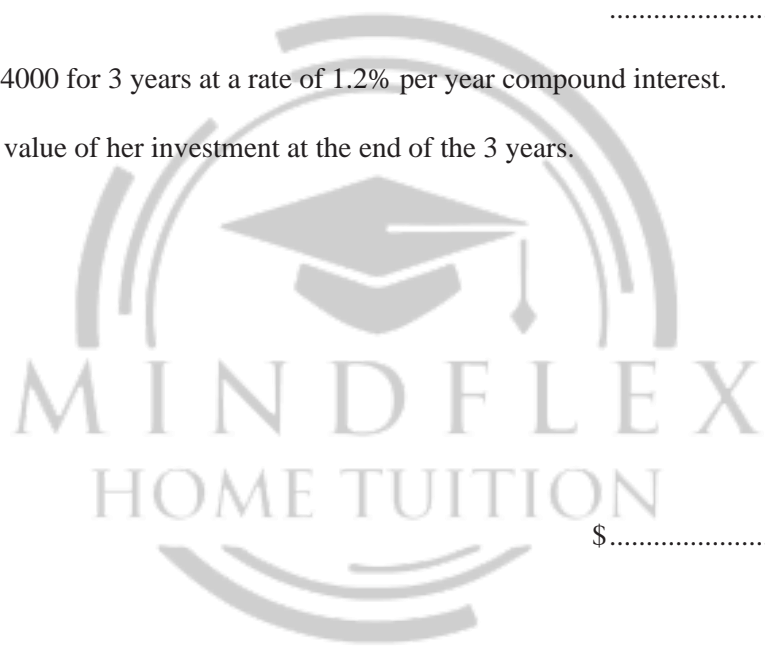
..... [2]

(g) Write 432 as the product of its prime factors.

..... [2]

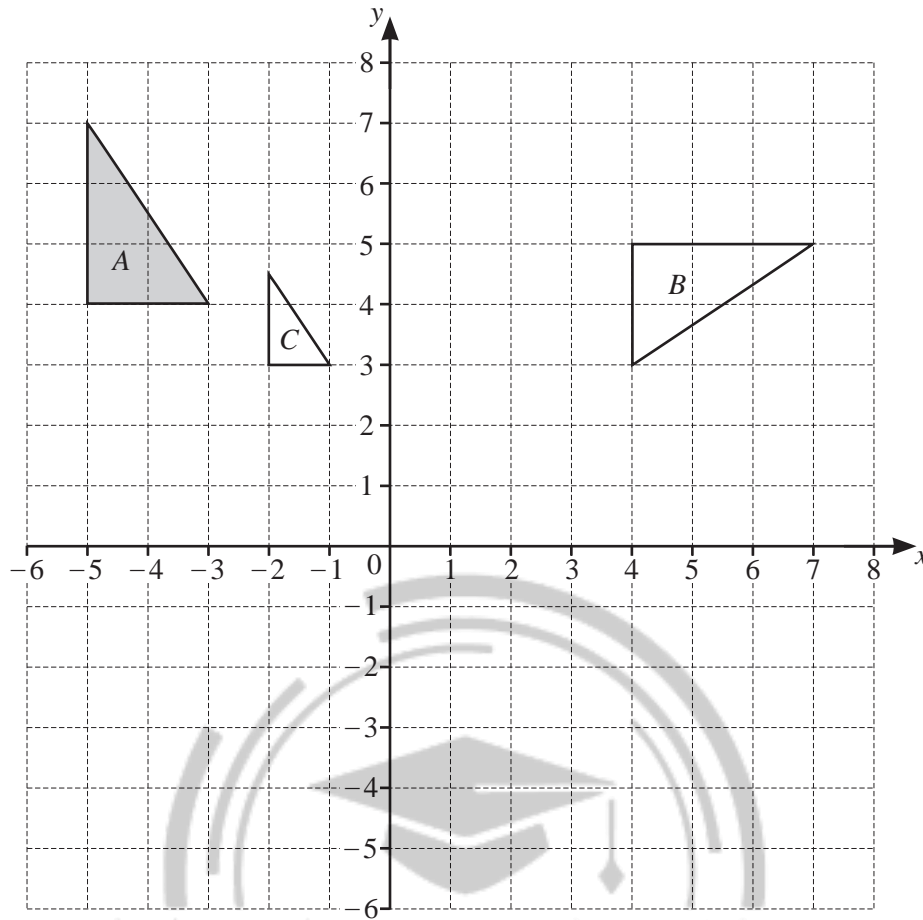
(h) Ella invests \$4000 for 3 years at a rate of 1.2% per year compound interest.

Calculate the value of her investment at the end of the 3 years.



\$..... [3]

5 Triangles  $A$ ,  $B$  and  $C$  are shown on the grid.



(a) Describe fully the **single** transformation that maps

(i) triangle  $A$  onto triangle  $B$ ,

.....  
 ..... [3]

(ii) triangle  $A$  onto triangle  $C$ .

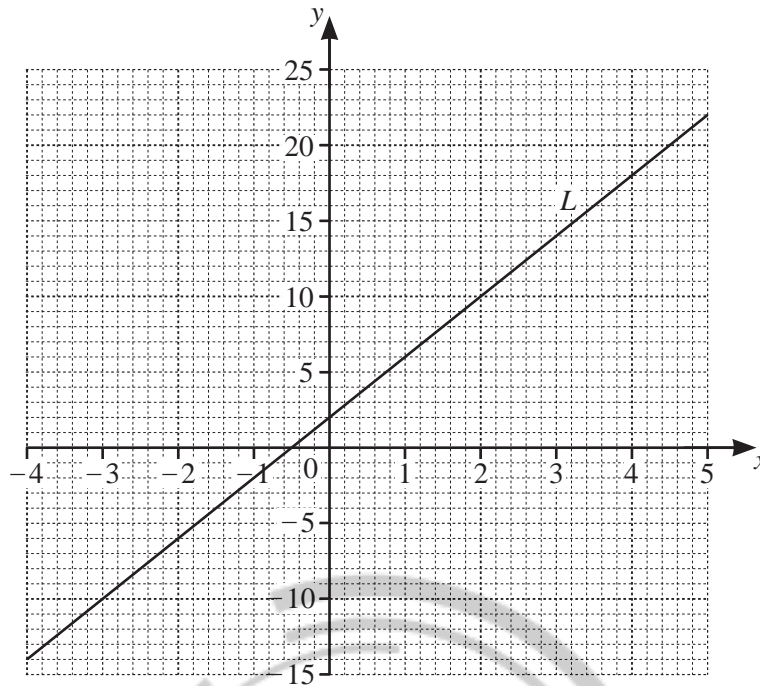
.....  
 ..... [3]

(b) On the grid,

(i) translate triangle  $A$  by the vector  $\begin{pmatrix} 6 \\ -2 \end{pmatrix}$ , [2]

(ii) reflect triangle  $A$  in the line  $y = 1$ . [2]

6 The line  $L$  is shown on the grid.



(a) Find the equation of the line  $L$  in the form  $y = mx + c$ .

$y = \dots\dots\dots$  [3]

(b) The equation of a different line is  $y = 3x - 4$ .

(i) Write down the gradient of this line.

$\dots\dots\dots$  [1]

(ii) Write down the co-ordinates of the point where this line crosses the y-axis.

( $\dots\dots\dots$ ,  $\dots\dots\dots$ ) [1]

(c) On the grid, draw the graph of  $y = -2x + 1$  for  $-4 \leq x \leq 5$ .

[3]



- 7 (a) Soraya makes rectangular flags.



- (i) On the rectangle, draw the lines of symmetry. [2]
- (ii) Each flag measures 1.2 m by 1.8 m.

Calculate the area of one flag.

..... m<sup>2</sup> [2]

- (b) Each flag costs \$15 to make.  
Soraya sells one flag for \$21.

Calculate the percentage profit.

..... % [3]

- (c) Soraya makes 30 flags.  
11 flags are pink, 7 are yellow, 5 are blue, 4 are silver and 3 are green.  
Soraya takes a flag at random.

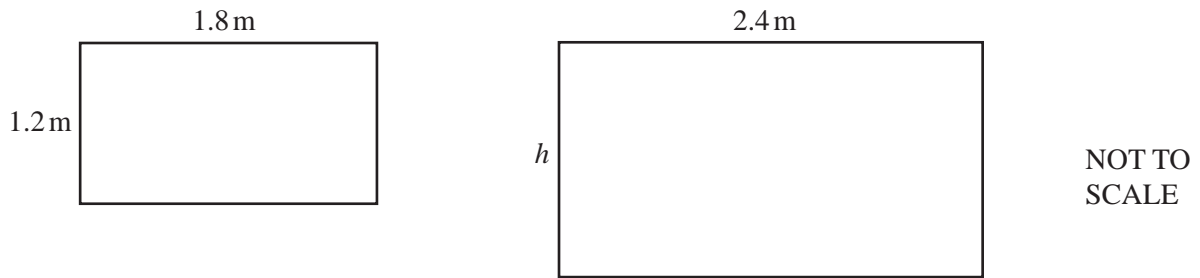
Find the probability that the flag she takes is

- (i) pink, ..... [1]

- (ii) not blue, ..... [1]

- (iii) red. .... [1]

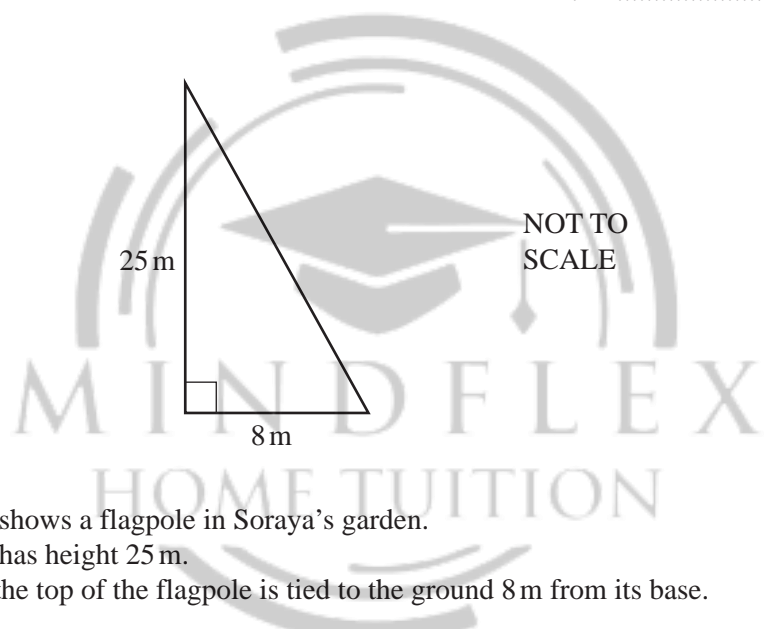
(d) Soraya decides to make a mathematically similar flag.



Calculate the height,  $h$ , of the new flag.

$h = \dots\dots\dots$  m [2]

(e)

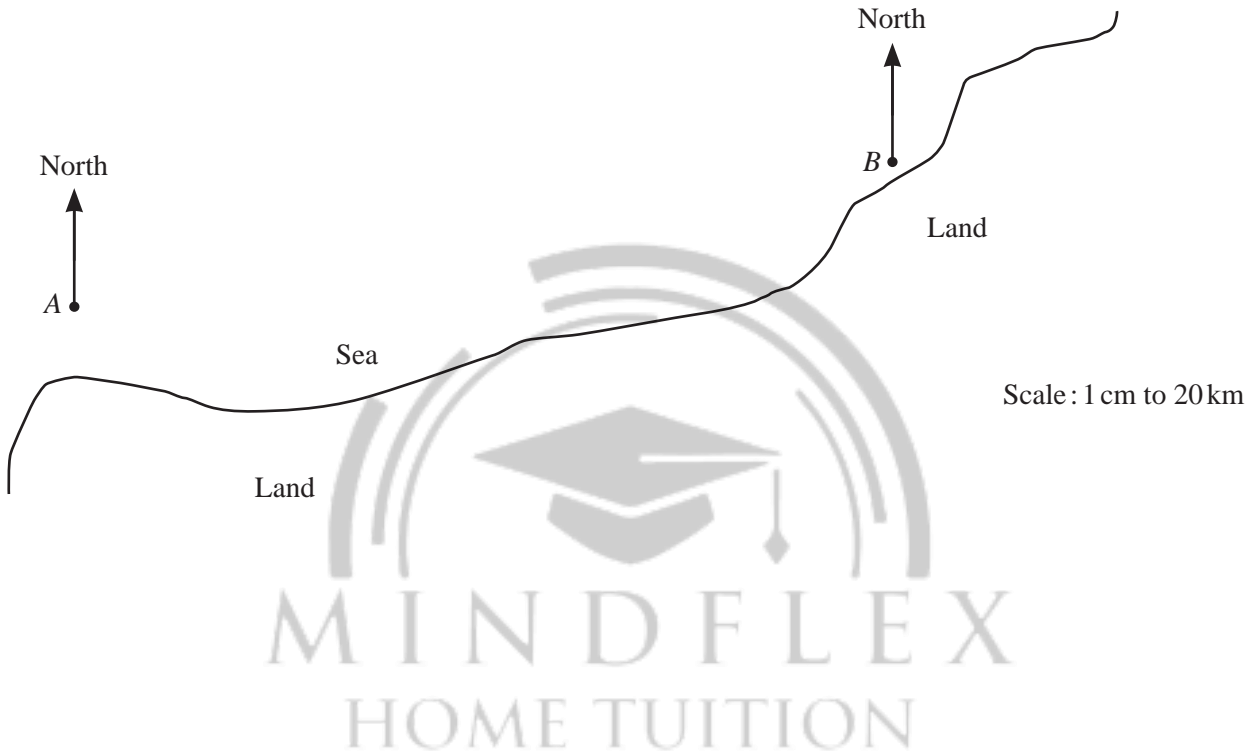


The diagram shows a flagpole in Soraya's garden.  
The flagpole has height 25 m.  
A rope from the top of the flagpole is tied to the ground 8 m from its base.

Calculate the length of this rope.

$\dots\dots\dots$  m [2]

- 8 (a) The scale drawing shows the positions of two buoys, *A* and *B*, in the sea.  
The scale is 1 centimetre represents 20 kilometres.



- (i) Work out the actual distance between buoy *A* and buoy *B*.

..... km [2]

- (ii) Measure the bearing of buoy *B* from buoy *A*.

..... [1]

- (iii) Buoy *C* is 120 km from buoy *B* on a bearing of  $300^\circ$ .

On the scale drawing, mark the position of buoy *C*. [2]

- (iv) Marco sails his boat so that he is always equidistant from buoy *A* and buoy *B*.

On the scale drawing, **use a straight edge and compasses only** to construct the path of the boat.  
Show all your construction arcs. [2]

- (b) The amount of fuel,  $t$  litres, in the boat's fuel tank is 135 litres, correct to the nearest litre.

Complete the statement about the value of  $t$ .

.....  $\leq t <$  ..... [2]

- (c) Marco has ropes of four different colours.  
He takes a rope at random.

Colour	Brown	White	Red	Green
Probability	0.35		0.04	0.2

Complete the table.

[2]

- (d) When Marco arrives at a port the temperature is  $5^{\circ}\text{C}$ .  
At midnight the temperature has fallen by  $7^{\circ}\text{C}$ .

Find the temperature at midnight.

.....  $^{\circ}\text{C}$  [1]

- (e) Last year the cost to keep a boat at the port was \$14 per night.  
This year the cost has increased by 12%.

Calculate the cost this year.

\$..... [2]

- (f) Marco watched 25 boats enter the port, of which 9 had a mast.  
There are a total of 200 boats in the port.

Calculate an estimate of the number of boats in the port that have a mast.

..... [2]

**Question 9 is printed on the next page.**

9 (a) These are the first four terms of a sequence.

29                  32                  35                  38

(i) Write down the next term.

..... [1]

(ii) Write down the rule for continuing this sequence.

..... [1]

(b) The  $n$ th term of another sequence is  $n^2 + 5$ .

(i) Find the first three terms.

....., ....., ..... [2]

(ii) Show that 261 is a term in this sequence.

.....  
..... [2]

(c) These are the first four terms of a different sequence.

27                  33                  39                  45

Find the  $n$ th term of this sequence.

..... [2]

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**MATHEMATICS**

**0580/31**

Paper 3 (Core)

**October/November 2019**

MARK SCHEME

Maximum Mark: 104

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**Published**

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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This document consists of **6** printed pages.



### Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

#### GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

#### GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

#### GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

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Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

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dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	Correct bar	1	
1(a)(ii)	December	1	
1(a)(iii)	82	1	
1(a)(iv)	16.4	1	<b>FT</b> <i>their (a)(iii) ÷ 5</i>
1(b)(i)	28.3[0]	2	<b>M1</b> for $15.3 + (2 \times 6.5)$ oe
1(b)(ii)	2.5[0]	2	<b>M1</b> for $[10 -](2 \times 3.75)$ oe
1(b)(iii)	85.7	1	
1(b)(iv)	1645	1	
1(b)(v)	55	3	<b>B1</b> for 72 or 1.2 seen <b>M1</b> for $66 \div$ <i>their</i> time
2(a)(i)	Chord correctly drawn	1	
2(a)(ii)	Angle [in a] semicircle [is $90^\circ$ ]	1	
2(b)	384	2	<b>M1</b> for $8 \times 8[\times 6]$
2(c)(i)	40	2	<b>M1</b> for $5 \times 4 \times 2$
	cm <sup>3</sup>	1	
2(c)(ii)	Correct net	3	<b>B2</b> for 4 more correct faces in correct position <b>B1</b> for 2 or 3 more correct faces in correct position
3(a)(i)	97	1	
3(a)(ii)	Obtuse	1	
3(b)	39	1	
3(c)	99	2	<b>M1</b> for $(180 - 18) \div 2$ soi by 81



Question	Answer	Marks	Partial Marks
3(d)	135	3	<b>M2</b> for $180 - (360 \div 8)$ oe or $\frac{180 \times (8-2)}{8}$ oe <b>M1</b> for $360 \div 8$ soi by 45 or $180 \times (8-2)$ oe soi by 1080
4(a)	418072	1	
4(b)	1 2 4 8 16	2	<b>B1</b> for 3 or 4 correct and no extra or all correct and one extra
4(c)	31 or 37	1	
4(d)(i)	27	1	
4(d)(ii)	5832	1	
4(d)(iii)	1	1	
4(e)	$\frac{7}{15}$ cao	3	<b>M2</b> for $\frac{5}{15} + \frac{3}{15}$ or $\frac{8k}{15k}$ or $\frac{320}{600}$ or $\frac{280}{600}$ or $\frac{7k}{15k}$ , $k$ must be an integer or <b>M1</b> for $\frac{1}{5} + \frac{1}{3}$ or $120 + 200$ or $320$ or $280$ or $600 - 120 - 200$ oe If <b>M0</b> scored, <b>SC1</b> for answer of $\frac{47}{100}$ $\frac{467}{1000}$ $\frac{4667}{10000}$
4(f)	135	2	<b>M1</b> for listing at least 3 multiples of 15 and 27 or $[15=]3 \times 5$ and $[27=]3 \times 3 \times 3$ or $3^3$ or <b>B1</b> for $135k$ as final answer or <b>B1</b> for $3 \times 3 \times 3 \times 5$ or $3^3 \times 5$
4(g)	$2^4 \times 3^3$ or $2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3$	2	<b>M1</b> for a complete correct factor tree or 2,2,2,2,3,3,3 clearly identified as factors or <b>B1</b> for a correct product that equals 432
4(h)	4145.7[3] or 4145.70 or 4150 or 4146	3	<b>M2</b> for $4000 \times \left(1 + \frac{1.2}{100}\right)^3$ oe or <b>M1</b> for $4000 \times \left(1 + \frac{1.2}{100}\right)^2$ oe

Question	Answer	Marks	Partial Marks
5(a)(i)	Rotation 90° clockwise oe [centre] (0, 0) oe	3	<b>B1</b> for each
5(a)(ii)	Enlargement [sf] 0.5 oe [centre] (1, 2)	3	<b>B1</b> for each
5(b)(i)	Triangle at (3, 2) (1, 5) (1, 2)	2	<b>B1</b> for translation of $\begin{pmatrix} 6 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -2 \end{pmatrix}$
5(b)(ii)	Triangle at (-3, -2) (-5, -2) (-5, -5)	2	<b>B1</b> for reflection in $y = k$ or $x = 1$
6(a)	$4x + 2$	3	<b>B2</b> for $4x + c$ or <b>B1</b> for $mx + 2, m \neq 0$ and <b>M1</b> for rise/run of $\frac{4k}{k}$
6(b)(i)	3	1	
6(b)(ii)	(0, -4)	1	
6(c)	Correct ruled line from $x = -4$ to $x = 5$	3	<b>B2</b> for 2 correct points plotted or <b>B1</b> for one correct point plotted soi or <b>M1</b> for line with gradient -2  If <b>B0</b> or <b>M0</b> scored, <b>SC1</b> for a correct table with a minimum of 3 correct coordinates
7(a)(i)	Two correct lines drawn	2	<b>B1</b> for one correct, no extras or two correct and one extra
7(a)(ii)	2.16	2	<b>M1</b> for $1.2 \times 1.8$
7(b)	40	3	<b>M2</b> for $\frac{21-15}{15} [\times 100]$ or $\left(\frac{21}{15} - 1\right) [\times 100]$ or $\frac{21}{15} \times 100 [-100]$ oe or <b>M1</b> for $\frac{21}{15}$ or $21-15$
7(c)(i)	$\frac{11}{30}$ oe	1	
7(c)(ii)	$\frac{25}{30}$ oe	1	
7(c)(iii)	0	1	

Question	Answer	Marks	Partial Marks
7(d)	1.6	2	<b>M1</b> for $\frac{2.4}{1.8}$ or $\frac{1.8}{2.4}$ or $\frac{1.8}{1.2}$ or $\frac{1.2}{1.8}$ soi
7(e)	26.2 or 26.24 to 26.25	2	<b>M1</b> for $25^2 + 8^2$ or better
8(a)(i)	220	2	<b>M1</b> for 11
8(a)(ii)	[0]80°	1	
8(a)(iii)	<i>C</i> in correct position	2	<b>B1</b> for correct distance of 6 cm or bearing of 300° from <i>B</i>
8(a)(iv)	Correct line drawn with 2 pairs of correct arcs	2	<b>B1</b> for correct line with no or incorrect arcs or correct arcs but no line
8(b)	134.5, 135.5	2	<b>B1</b> for one correct or both correct but reversed
8(c)	0.41	2	<b>M1</b> for $1 - (0.35 + 0.04 + 0.2)$
8(d)	-2	1	
8(e)	15.68 cao	2	<b>M1</b> for $(1 + \frac{12}{100}) \times 14$ oe
8(f)	72	2	<b>M1</b> for $\frac{9}{25} \times 200$ oe
9(a)(i)	41	1	
9(a)(ii)	Add 3 oe	1	
9(b)(i)	6, 9, 14	2	<b>B1</b> for one correct term in correct position If 0 scored, <b>SC1</b> for 5, 6, 9
9(b)(ii)	$n^2 + 5 = 261$ or $261 - 5 = 256$ or $256 + 5 = 261$ or $\sqrt{261 - 5}$	<b>M1</b>	
	$(n =) \sqrt{256} = 16$ or 256 is a square number	<b>A1</b>	
9(c)	$6n + 21$ oe final answer	2	<b>M1</b> for $6n + j$ or $kn + 21$ $k \neq 0$

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**MATHEMATICS**

**0580/41**

Paper 4 (Extended)

**October/November 2019**

**2 hours 30 minutes**

Candidates answer on the Question Paper.

Additional Materials:      Electronic calculator                      Geometrical instruments  
                                         Tracing paper (optional)

**READ THESE INSTRUCTIONS FIRST**

Write your centre number, candidate number and name on all the work you hand in.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams or graphs.

Do not use staples, paper clips, glue or correction fluid.

**DO NOT WRITE IN ANY BARCODES.**

Answer **all** questions.

If working is needed for any question it must be shown below that question.

Electronic calculators should be used.

If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.

For  $\pi$ , use either your calculator value or 3.142.

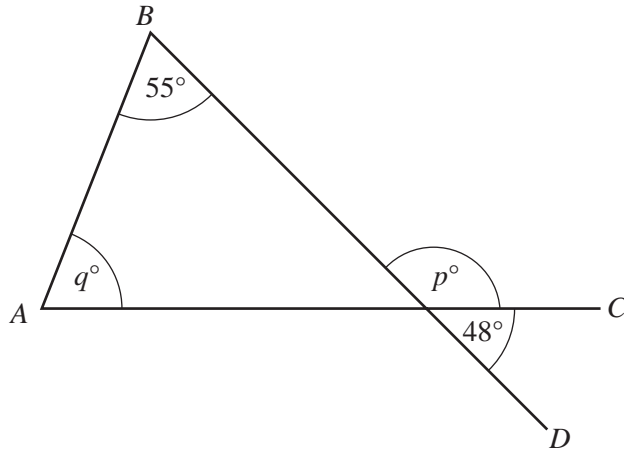
At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [ ] at the end of each question or part question.

The total of the marks for this paper is 130.

This document consists of **16** printed pages.

1 (a)



NOT TO  
SCALE

In the diagram,  $AC$  and  $BD$  are straight lines.

Find the value of  $p$  and the value of  $q$ .

$p = \dots\dots\dots$

$q = \dots\dots\dots$  [3]

(b) The angles of a quadrilateral are  $x^\circ$ ,  $(x + 5)^\circ$ ,  $(2x - 25)^\circ$  and  $(x + 10)^\circ$ .

Find the value of  $x$ .

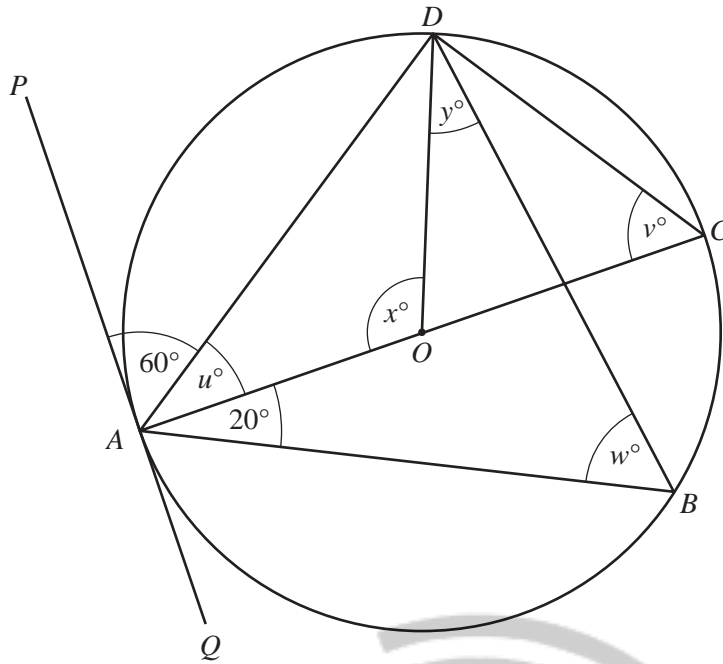
$x = \dots\dots\dots$  [3]

(c) A regular polygon has 72 sides.

Find the size of an interior angle.

$\dots\dots\dots$  [3]

(d)



NOT TO  
SCALE

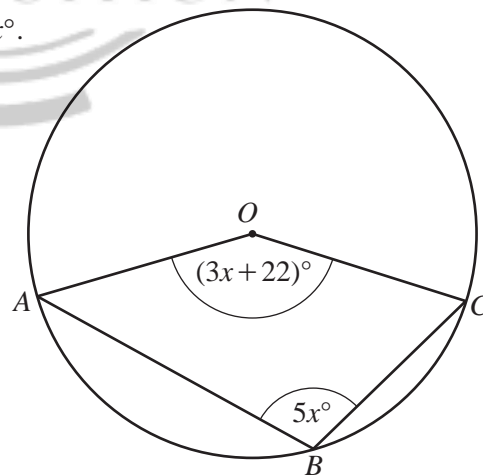
$A, B, C$  and  $D$  lie on the circle, centre  $O$ , with diameter  $AC$ .  
 $PQ$  is a tangent to the circle at  $A$ .  
Angle  $PAD = 60^\circ$  and angle  $BAC = 20^\circ$ .

Find the values of  $u, v, w, x$  and  $y$ .

$u = \dots\dots\dots$ ,  $v = \dots\dots\dots$ ,  $w = \dots\dots\dots$ ,  $x = \dots\dots\dots$ ,  $y = \dots\dots\dots$  [6]

(e)  $A, B$  and  $C$  lie on the circle, centre  $O$ .  
Angle  $AOC = (3x + 22)^\circ$  and angle  $ABC = 5x^\circ$ .

Find the value of  $x$ .



NOT TO  
SCALE

$x = \dots\dots\dots$  [4]

- 2 (a) Ali and Mo share a sum of money in the ratio Ali : Mo = 9 : 7.  
Ali receives \$600 more than Mo.

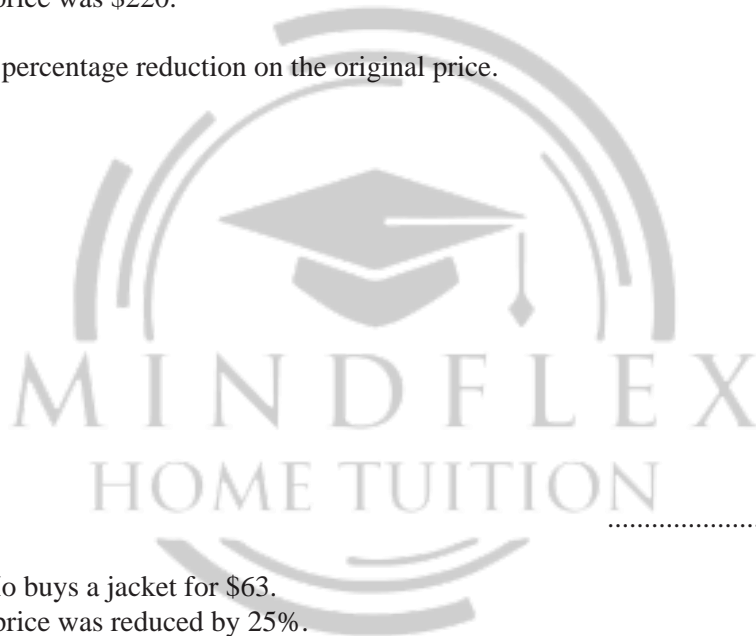
Calculate how much each receives.

Ali \$ .....

Mo \$ ..... [3]

- (b) In a sale, Ali buys a television for \$195.80 .  
The original price was \$220.

Calculate the percentage reduction on the original price.



..... % [3]

- (c) In the sale, Mo buys a jacket for \$63.  
The original price was reduced by 25%.

Calculate the original price of the jacket.

\$ ..... [3]

- 3 (a) Dina invests \$600 for 5 years at a rate of 2% per year compound interest.

Calculate the value of this investment at the end of the 5 years.

\$ ..... [2]

- (b) The value of a gold ring increases exponentially at a rate of 5% per year.  
The value is now \$882.

- (i) Calculate the value of the ring 2 years ago.

\$ ..... [2]

- (ii) Find the number of complete years it takes for the ring's value of \$882 to increase to a value greater than \$1100.

..... [2]



- 4 (a) (i) Calculate the **external curved** surface area of a cylinder with radius 8 m and height 19 m.

..... m<sup>2</sup> [2]

- (ii) This surface is painted at a cost of \$0.85 per square metre.

Calculate the cost of painting this surface.

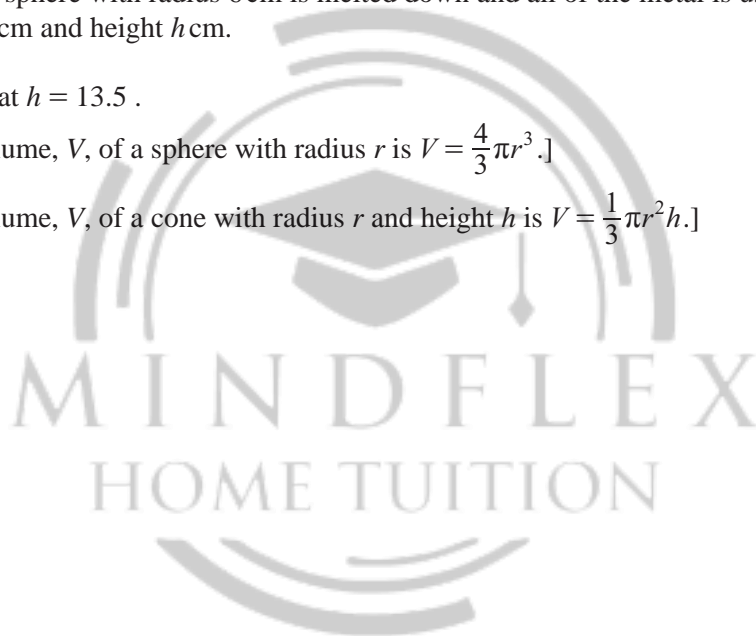
\$ ..... [2]

- (b) A solid metal sphere with radius 6 cm is melted down and all of the metal is used to make a solid cone with radius 8 cm and height  $h$  cm.

- (i) Show that  $h = 13.5$ .

[The volume,  $V$ , of a sphere with radius  $r$  is  $V = \frac{4}{3}\pi r^3$ .]

[The volume,  $V$ , of a cone with radius  $r$  and height  $h$  is  $V = \frac{1}{3}\pi r^2 h$ .]



[2]

- (ii) Calculate the slant height of the cone.

..... cm [2]

- (iii) Calculate the curved surface area of the cone.

[The curved surface area,  $A$ , of a cone with radius  $r$  and slant height  $l$  is  $A = \pi r l$ .]

..... cm<sup>2</sup> [1]

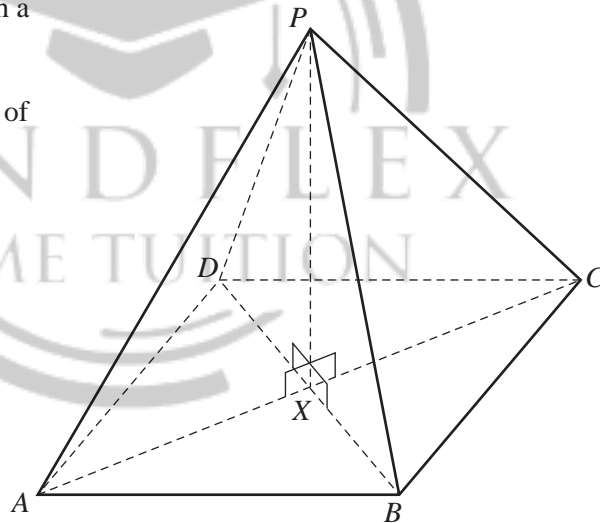
- (c) Two cones are mathematically similar.  
The total surface area of the smaller cone is  $80 \text{ cm}^2$ .  
The total surface area of the larger cone is  $180 \text{ cm}^2$ .  
The volume of the smaller cone is  $168 \text{ cm}^3$ .

Calculate the volume of the larger cone.

.....  $\text{cm}^3$  [3]

- (d) The diagram shows a pyramid with a square base  $ABCD$ .  
 $DB = 8 \text{ cm}$ .  
 $P$  is vertically above the centre,  $X$ , of the base and  $PX = 5 \text{ cm}$ .

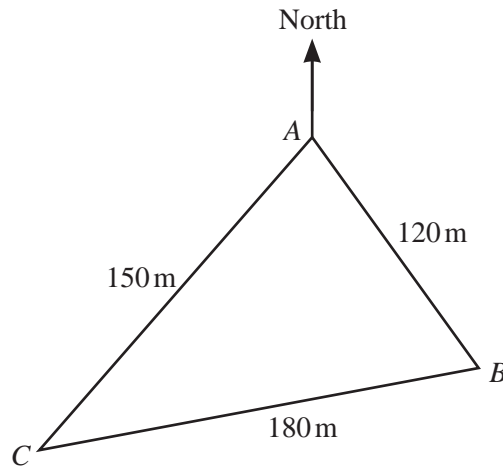
NOT TO SCALE



Calculate the angle between  $PB$  and the base  $ABCD$ .

..... [3]

5

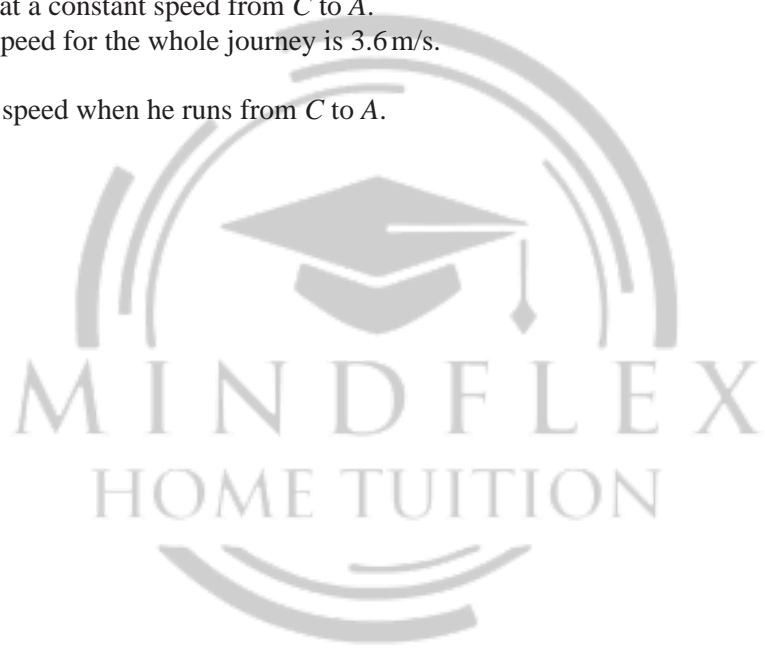


NOT TO  
SCALE

The diagram shows a triangular field,  $ABC$ , on horizontal ground.

- (a) Olav runs from  $A$  to  $B$  at a constant speed of  $4\text{ m/s}$  and then from  $B$  to  $C$  at a constant speed of  $3\text{ m/s}$ . He then runs at a constant speed from  $C$  to  $A$ . His average speed for the whole journey is  $3.6\text{ m/s}$ .

Calculate his speed when he runs from  $C$  to  $A$ .



..... m/s [3]

- (b) Use the cosine rule to find angle  $BAC$ .

Angle  $BAC = \dots\dots\dots$  [4]

(c) The bearing of  $C$  from  $A$  is  $210^\circ$ .

(i) Find the bearing of  $B$  from  $A$ .

..... [1]

(ii) Find the bearing of  $A$  from  $B$ .

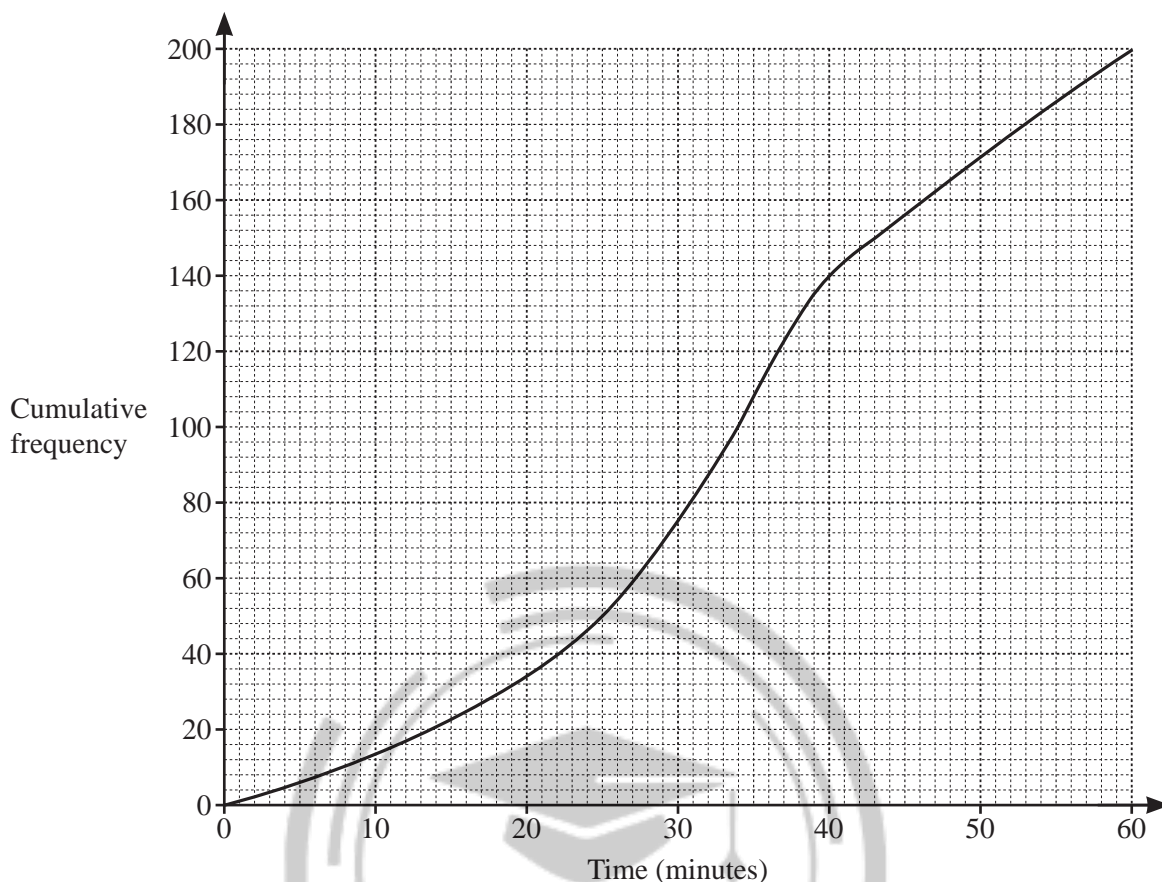
..... [2]

(d)  $D$  is the point on  $AC$  that is nearest to  $B$ .

Calculate the distance from  $D$  to  $A$ .



- 6 (a) The cumulative frequency diagram shows information about the times taken by 200 students to solve a problem.



Use the cumulative frequency diagram to find an estimate for

(i) the median, ..... min [1]

(ii) the interquartile range, ..... min [2]

(iii) the number of students who took more than 40 minutes. .... [2]

- (b) Roberto records the value of each of the coins he has at home. The table shows the results.

Value (cents)	1	2	5	10	20	50
Frequency	3	1	3	2	4	2

(i) Find the range. .... cents [1]

(ii) Find the mode. .... cents [1]

(iii) Find the median. .... cents [1]

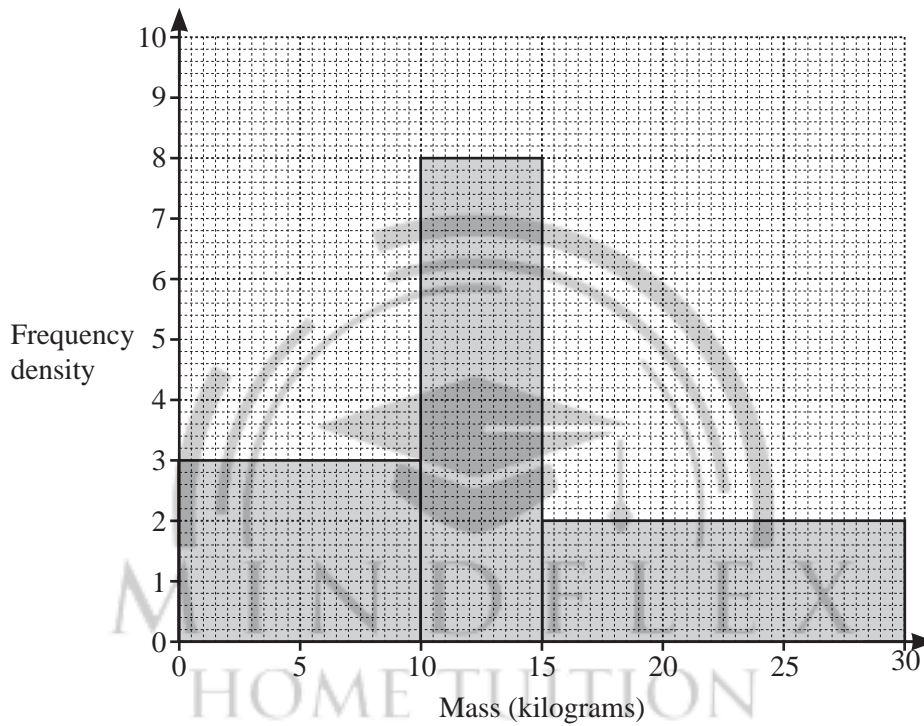
(iv) Work out the total value of Roberto's coins.

..... cents [2]

(v) Work out the mean.

..... cents [1]

(c) The histogram shows information about the masses of 100 boxes.



Calculate an estimate of the mean.

..... kg [6]

- 7 (a) Oranges cost 21 cents each.  
Alex buys  $x$  oranges and Bobbie buys  $(x + 2)$  oranges.  
The total cost of these oranges is \$4.20 .

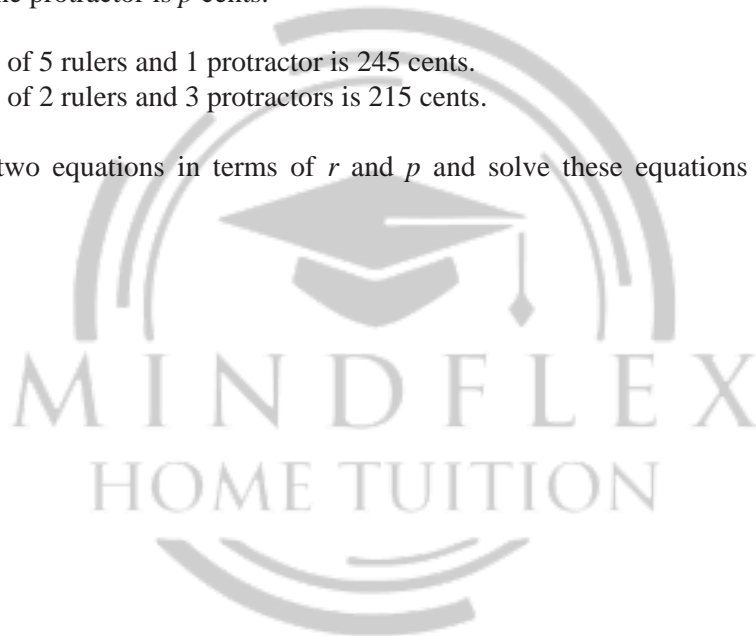
Find the value of  $x$ .

$x = \dots\dots\dots$  [3]

- (b) The cost of one ruler is  $r$  cents.  
The cost of one protractor is  $p$  cents.

The total cost of 5 rulers and 1 protractor is 245 cents.  
The total cost of 2 rulers and 3 protractors is 215 cents.

Write down two equations in terms of  $r$  and  $p$  and solve these equations to find the cost of one protractor.



$\dots\dots\dots$  cents [5]

(c) Carol walks 12 km at  $x$  km/h and then a further 6 km at  $(x - 1)$  km/h.  
The total time taken is 5 hours.

(i) Write an equation, in terms of  $x$ , and show that it simplifies to  $5x^2 - 23x + 12 = 0$ .

[3]

(ii) Factorise  $5x^2 - 23x + 12$ .



[2]

(iii) Solve the equation  $5x^2 - 23x + 12 = 0$ .

$x = \dots\dots\dots$  or  $x = \dots\dots\dots$  [1]

(iv) Write down Carol's walking speed during the final 6 km.

$\dots\dots\dots$  km/h [1]



8



The diagram shows 5 cards.

(a) Donald chooses a card at random.

(i) Write down the probability that the number of dots on this card is an even number.

..... [1]

(ii) Write down the probability that the number of dots on this card is a prime number.

..... [1]

(b) Donald chooses two of the five cards at random, without replacement.  
He works out the total number of dots on these two cards.

(i) Find the probability that the total number of dots is 5.

MIND FLEX ..... [3]

HOME TUITION

(ii) Find the probability that the total number of dots is an odd number.

..... [3]

- 9 A car hire company has  $x$  small cars and  $y$  large cars.  
The company has at least 6 cars in total.  
The number of large cars is less than or equal to the number of small cars.  
The largest number of small cars is 8.

(a) Write down three inequalities, in terms of  $x$  and/or  $y$ , to show this information.

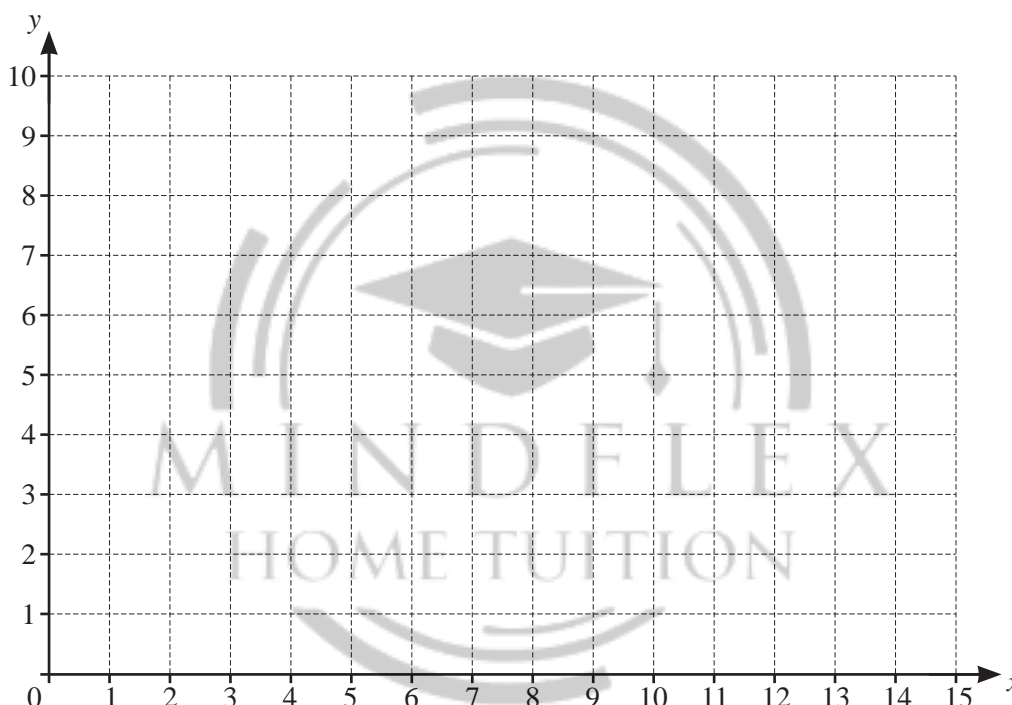
....., ....., ..... [3]

(b) A small car can carry 4 people and a large car can carry 6 people.  
One day, the largest number of people to be carried is 60.

Show that  $2x + 3y \leq 30$ .

[1]

(c)



By shading the **unwanted** regions on the grid, show and label the region  $R$  that satisfies all four inequalities. [6]

(d) (i) Find the number of small cars and the number of large cars needed to carry exactly 60 people.

..... small cars, ..... large cars [1]

(ii) When the company uses 7 cars, find the largest number of people that can be carried.

..... [2]

Question 10 is printed on the next page.

10 (a) Complete the table for the 5th term and the  $n$ th term of each sequence.

1st term	2nd term	3rd term	4th term	5th term		$n$ th term
9	5	1	-3			
4	9	16	25			
1	8	27	64			
8	16	32	64			

[11]

(b) 0, 1, 1, 2, 3, 5, 8, 13, 21, ...

This sequence is a Fibonacci sequence.

After the first two terms, the rule to find the next term is “add the two previous terms”.

For example,  $5 + 8 = 13$ .

Use this rule to complete each of the following Fibonacci sequences.

2            4            .....            .....            .....  
 1            .....            .....            .....            11  
 .....            -1            .....            .....            1

[3]

(c)  $\frac{1}{3}, \frac{3}{4}, \frac{4}{7}, \frac{7}{11}, \frac{11}{18}, \dots$

(i) One term of this sequence is  $\frac{p}{q}$ .

Find, in terms of  $p$  and  $q$ , the next term in this sequence.

..... [1]

(ii) Find the 6th term of this sequence.

..... [1]

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**MATHEMATICS**

**0580/41**

Paper 4 (Extended)

**October/November 2019**

MARK SCHEME

Maximum Mark: 130

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**Published**

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

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This document consists of **8** printed pages.



### Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

#### GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

#### GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

#### GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

#### GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

#### GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

#### GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

**Abbreviations**

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)	$[p = ] 132$ $[q = ] 77$	<b>3</b>	<b>B1</b> for 132 [=p] <b>B2</b> for 77 [=q] or <b>M1</b> for $180 - (55 + 48)$ oe or for <i>their</i> $p - 55$
1(b)	74	<b>3</b>	<b>B2</b> for $5x - 10 = 360$ or <b>M1</b> for $x + (x + 5) + (2x - 25) + (x + 10) = 360$ or for $5x - 10 = k$
1(c)	175	<b>3</b>	<b>M2</b> for $180 - \frac{360}{72}$ or for $\frac{180(72 - 2)}{72}$ or <b>M1</b> for $\frac{360}{72}$ or for $180(72 - 2)$
1(d)	$[u = ] 30$ $[v = ] 60$ $[w = ] 60$ $[x = ] 120$ $[y = ] 40$	<b>6</b>	<b>B1</b> for 30 <b>B1</b> for 60 <b>B1</b> for 60 FT <i>their v</i> <b>B1</b> for 120 FT $2 \times$ <i>their w</i> <b>B2</b> for 40 or <b>B1</b> for angle $BDC = 20$ or angle $ADO = 30$ or angle $ADB = 70$
1(e)	26	<b>4</b>	<b>B3</b> for $360 - 22 = 10x + 3x$ oe or better or for $5x + 1.5x = 180 - 11$ oe or better  or <b>M2</b> for $360 - (3x + 22) = 2 \times 5x$ oe or for $5x + \frac{1}{2}(3x + 22) = 180$ oe or <b>SC2</b> for $360 + 22 = 10x + 3x$ oe or better  or <b>M1</b> for $180 - 5x$ , $10x$ or $360 - (3x + 22)$ correctly placed on the diagram or identified or for angle $A +$ angle $C = 5x$
2(a)	$[Ali] 2700$ $[Mo] 2100$	<b>3</b>	<b>B2</b> for one correct or for correct values reversed or <b>M1</b> for $600 \div (9 - 7)$ or for any equation that would lead to an answer of 300, 2700 or 2100, or 4800 (for the total)

Question	Answer	Marks	Partial Marks
2(b)	11	3	<b>M2</b> for $\frac{220 - 195.8}{220} [\times 100]$ or for $[100 - ] \frac{195.8}{220} \times 100$ or <b>M1</b> for $220 - 195.8$ or for $\frac{195.8}{220}$ or a correct implicit equation for percentage reduction or for $\frac{195.8 - 220}{220}$
2(c)	84	3	<b>M2</b> for $\frac{63}{1 - \frac{25}{100}}$ oe or <b>M1</b> for associating 63 with $(100 - 25)\%$ or a correct implicit equation for the original price.
3(a)	662.45	2	<b>M1</b> for $600 \times \left(1 + \frac{2}{100}\right)^5$ oe
3(b)(i)	800	2	<b>M1</b> for $x \left(1 + \frac{5}{100}\right)^2 = 882$ oe or <b>SC1</b> for answer 82
3(b)(ii)	5 nfw	2	<b>M1</b> for trial with $882 \times \left(1 + \frac{5}{100}\right)^n$ with $n > 1$
4(a)(i)	955 or 955.0 to 955.2	2	<b>M1</b> for $2 \times \pi \times 8 \times 19$ oe
4(a)(ii)	812 or 811.7 to 811.9...	2	<b>FT</b> <i>their</i> (i) $\times 0.85$ <b>M1</b> for <i>their</i> (i) $\times 0.85$ or <i>their</i> (i) $\times 85$
4(b)(i)	$\frac{4}{3} \times \pi \times 6^3$ $\frac{1}{3} \times \pi \times 8^2$ or cancelling clearly seen to reach 13.5	<b>M2</b>	<b>M1</b> for $\frac{4}{3} \times \pi \times 6^3 = \frac{1}{3} \times \pi \times 8^2 \times h$
4(b)(ii)	15.7 or 15.69...	2	<b>M1</b> for $8^2 + 13.5^2$ or better
4(b)(iii)	394 or 395 or 394.3 to 394.6...	1	<b>FT</b> $\pi \times 8 \times$ <i>their</i> (b)(ii)

Question	Answer	Marks	Partial Marks
4(c)	567	3	<b>M2</b> for $\frac{168}{V} = \left(\frac{80}{180}\right)^{\frac{3}{2}}$ oe or better or <b>M1</b> for $\left(\frac{180}{80}\right)^{\frac{1}{2}}$ or $\left(\frac{80}{180}\right)^{\frac{1}{2}}$ oe seen or better
4(d)	51.3 or 51.34...	3	<b>M2</b> for $\tan = \frac{5}{4}$ oe or <b>M1</b> for recognition of angle <i>PBX</i>
5(a)	4.29 or 4.285 to 4.286	3	<b>M2</b> for $\frac{150}{\frac{450}{3.6} - \frac{120}{4} - \frac{180}{3}}$ or <b>M1</b> for [time =] $120 \div 4$ or $180 \div 3$ or $450 \div 3.6$ or $3.6 = \frac{150 + 180 + 120}{\text{total time}}$
5(b)	82.8 or 82.81 to 82.82 using cosine rule	4	<b>M2</b> for $\frac{150^2 + 120^2 - 180^2}{2 \times 150 \times 120}$ or <b>M1</b> for $180^2 = 120^2 + 150^2 - 2 \times 120 \times 150 \cos(\dots)$ <b>A1</b> for $\frac{4500}{36000}$ oe
5(c)(i)	127.2 or 127.1 to 127.2 or 127	1	<b>FT</b> 210 – <i>their</i> (b)
5(c)(ii)	307.2 or 307.1 to 307.2 or 307	2	<b>FT</b> 180 + <i>their</i> (c)(i) <b>M1</b> for 180 + <i>their</i> (c)(i)
5(d)	15 or 14.99 to 15.04	2	<b>M1</b> for $\cos(\text{their (b)}) = \frac{\text{dist}}{120}$ oe
6(a)(i)	34	1	
6(a)(ii)	18	2	<b>B1</b> for [l.q. = ] 25 or [u.q. = ] 43 seen
6(a)(iii)	60	2	<b>M1</b> for 140 written
6(b)(i)	49	1	
6(b)(ii)	20	1	
6(b)(iii)	10	1	
6(b)(iv)	220	2	<b>M1</b> for $3 \times 1 + 1 \times 2 + 3 \times 5 + 2 \times 10 + 4 \times 20 + 2 \times 50$
6(b)(v)	14.7 or 14.66 to 14.67	1	<b>FT</b> <i>their</i> (iv) $\div 15$



Question	Answer	Marks	Partial Marks
6(c)	13.25 nfw	6	<p><b>B2</b> for frequencies 30, 40, 30 soi or <b>B1</b> for 2 of these</p> <p><b>M1</b> for 5, 12.5, 22.5</p> <p><b>M1</b> <math>\Sigma fx</math> with <i>their</i> frequencies (if seen) and each <math>x</math> in correct interval including boundaries</p> <p><b>M1 dependent</b> for <math>\frac{\Sigma fx}{100}</math> (dependent on second M1)</p> <p><b>OR</b></p> <p><b>Alternative Method</b></p> <p><b>B2</b> for frequencies 15, 15, 40, 10, 10, 10 soi or <b>B1</b> for 2 of 15, 40, 10</p> <p><b>M1</b> for 2.5, 7.5, 12.5, 17.5, 22.5, 27.5</p> <p><b>M1</b> <math>\Sigma fx</math> with <i>their</i> frequencies (if seen) and each <math>x</math> in correct interval including boundaries</p> <p><b>M1 dependent</b> for <math>\frac{\Sigma fx}{100}</math> (dependent on second M1)</p>
7(a)	9	3	<p><b>M2</b> for <math>0.42x + 0.42 = 4.2</math> oe or better</p> <p>or <b>M1</b> for <math>0.21x + 0.21(x + 2)</math> oe [= 420 or 4.20]</p> <p>or for <math>21x + 21(x + 2)</math> oe [= 420 or 4.20]</p> <p>or for <math>420 \div 21</math> oe [=20]</p>
7(b)	$5r + p = 245$	<b>B1</b>	
	$2r + 3p = 215$	<b>B1</b>	
	45	3	<p>Finds <math>p</math></p> <p><b>M1</b> for correctly equating coefficients of <math>r</math></p> <p><b>M1</b> for correct method to eliminate <math>r</math></p> <p><b>OR</b></p> <p><b>M1</b> for correctly making <math>r</math> the subject of one of <i>their</i> equations</p> <p><b>M1</b> for correctly substituting <i>their</i> correct <math>r</math> to form an equation in <math>p</math></p> <p><b>OR</b></p> <p>Finds <math>r</math> first</p> <p><b>M1</b> for correctly eliminating <math>p</math> from <i>their</i> equations</p> <p><b>M1</b> for correctly substituting <i>their</i> value of <math>r</math> to find <math>p</math></p>

Question	Answer	Marks	Partial Marks
7(c)(i)	$\frac{12}{x} + \frac{6}{x-1} [= 5]$	<b>M1</b>	
	$12(x-1) + 6x = 5x(x-1)$	<b>M1</b>	<b>Dependent</b> on previous M1 earned May be over common denominator
	$5x^2 - 23x + 12 = 0$ reached, with at least one more line of working and with no errors or omissions	<b>A1</b>	
7(c)(ii)	$(5x-3)(x-4)$ final answer	<b>2</b>	<b>B1</b> for $(5x+a)(x+b)$ with $ab = 12$ or $a+5b = -23$ or for $5x(x-4) - 3(x-4)$ or $x(5x-3) - 4(5x-3)$
7(c)(iii)	$\frac{3}{5}$ oe and 4	<b>1</b>	<b>FT</b> from their two brackets in (c)(ii)
7(c)(iv)	3 cao	<b>1</b>	
8(a)(i)	$\frac{4}{5}$ oe	<b>1</b>	
8(a)(ii)	$\frac{4}{5}$ oe	<b>1</b>	
8(b)(i)	$\frac{6}{20}$ oe nfw	<b>3</b>	<b>M2</b> for $\frac{1}{5} \times \frac{3}{4} + \frac{3}{5} \times \frac{1}{4}$ oe or $2 \times \frac{1}{5} \times \frac{3}{4}$ oe or <b>M1</b> for $\frac{1}{5} \times \frac{3}{4}$ alone or $\frac{3}{5} \times \frac{1}{4}$ alone or for answer $\frac{3}{20}$ nfw After 0 scored, <b>SC1</b> for answer $\frac{6}{25}$
8(b)(ii)	$\frac{8}{20}$ oe nfw	<b>3</b>	<b>M2</b> for $1 - \frac{4}{5} \times \frac{3}{4}$ or $\frac{1}{5} \times 1 + \frac{4}{5} \times \frac{1}{4}$ oe or $2 \times \frac{1}{5} \times 1$ or $2 \times \frac{1}{5} \times \frac{3}{4} + 2 \times \frac{1}{5} \times \frac{1}{4}$ or <i>their</i> (b)(i) + $2 \times \frac{1}{5} \times \frac{1}{4}$ or <b>M1</b> for answer $\frac{2 \text{ or } 4 \text{ or } 5 \text{ or } 6 \text{ or } 7}{20}$ oe nfw After 0 scored, <b>SC1</b> for answer $\frac{8}{25}$

9(a)	$x + y \geq 6$ oe $y \leq x$ oe $x \leq 8$	<b>3</b>	<b>B1</b> for each
9(b)	$4x + 6y \leq 60$	<b>1</b>	
9(c)	Correct region indicated cao	<b>6</b>	<b>B1</b> for $x + y = 6$ ruled and long enough <b>B1</b> for $x = y$ ruled and long enough <b>B1</b> for $x = 8$ ruled and long enough <b>B2</b> for $2x + 3y = 30$ ruled and long enough or <b>B1</b> for ruled line through (0, 10) or (15, 0) but not $y = 10$ or $x = 15$
9(d)(i)	6, 6	<b>1</b>	
9(d)(ii)	34	<b>2</b>	<b>M1</b> for trying $4x + 6y$ with (4, 3) or (5, 2) or (6, 1) or (7, 0)
10(a)	$-7$ $13 - 4n$ oe  $36$ $(n + 1)^2$ oe  $125$ $n^3$ oe  $128$ $2^{n+2}$ oe	<b>11</b>	<b>B1</b> <b>B2</b> or <b>B1</b> for $13 - kn$ ( $k \neq 0$ ) or for $k - 4n$  <b>B1</b> <b>B2</b> or <b>B1</b> for any quadratic  <b>B1</b> <b>B1</b>  <b>B1</b> <b>B2</b> or <b>B1</b> for $2^k$ oe
10(b)	....., ....., 6, 10, 16  ...., 3, 4, 7, .....  2, ....., 1, 0, ....	<b>3</b>	<b>B1</b> for each correct row
10(c)(i)	$\frac{q}{p + q}$	<b>1</b>	
10(c)(ii)	$\frac{18}{29}$	<b>1</b>	