



1 (a) Work out the following.

(i)  $\frac{1}{0.2^2}$

Answer(a)(i) ..... [1]

(ii)  $\sqrt{5.1^2 + 4 \times 7.3^2}$

Answer(a)(ii) ..... [1]

(iii)  $25^{\frac{1}{2}} \times 1000^{-\frac{2}{3}}$

Answer(a)(iii) ..... [2]

(b) Mia invests \$7500 at 3.5% per year **simple** interest.  
Calculate the total amount she has after 5 years.

Answer(b) \$ ..... [3]

(c) Written as the product of prime factors  $48 = 2^4 \times 3$ .

(i) Write 60 as the product of prime factors.

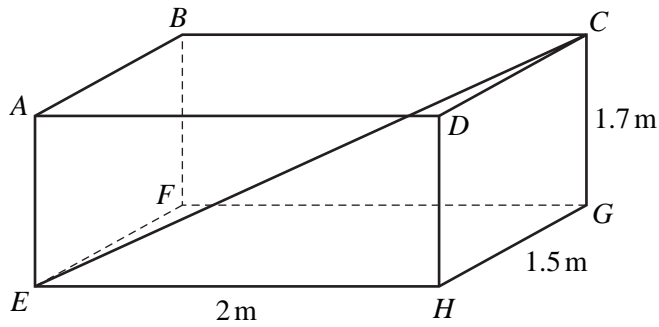
Answer(c)(i) ..... [2]

(ii) Work out the highest common factor (HCF) of 48 and 60.

Answer(c)(ii) ..... [2]

(iii) Work out the lowest common multiple (LCM) of 48 and 60.

Answer(c)(iii) ..... [2]



NOT TO SCALE

The diagram shows a box  $ABCDEFGH$  in the shape of a cuboid measuring 2 m by 1.5 m by 1.7 m.

(a) Calculate the length of the diagonal  $EC$ .

Answer(a)  $EC = \dots\dots\dots$  m [4]

(b) Calculate the angle between  $EC$  and the base  $EFGH$ .

Answer(b)  $\dots\dots\dots$  [3]

(c) (i) A rod has length 2.9 m, correct to 1 decimal place.

What is the upper bound for the length of the rod?

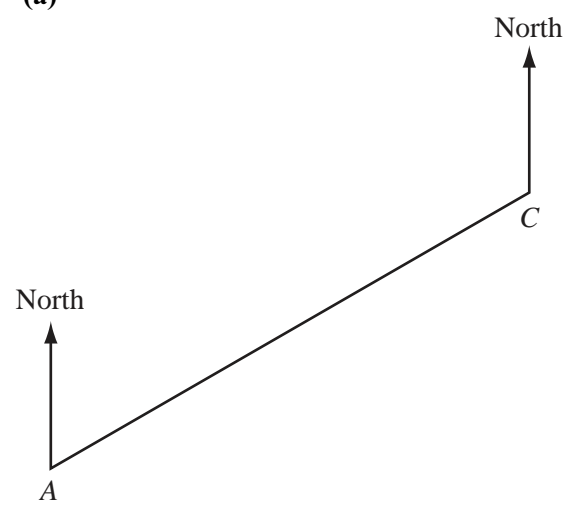
Answer(c)(i)  $\dots\dots\dots$  m [1]

(ii) Will the rod fit completely in the box?

Give a reason for your answer.

Answer(c)(ii)  $\dots\dots\dots$  [1]

3 (a)



The scale drawing shows the positions of two towns *A* and *C* on a map. On the map, 1 centimetre represents 20 kilometres.

(i) Find the distance in kilometres from town *A* to town *C*.

Answer(a)(i) ..... km [2]

(ii) Measure and write down the bearing of town *C* from town *A*.

Answer(a)(ii) ..... [1]

(iii) Town *B* is 140 km from town *C* on a bearing of  $150^\circ$ .

Mark accurately the position of town *B* on the scale drawing. [2]

(iv) Find the bearing of town *C* from town *B*.

Answer(a)(iv) ..... [1]

(v) A lake on the map has an area of  $0.15 \text{ cm}^2$ .

Work out the actual area of the lake.

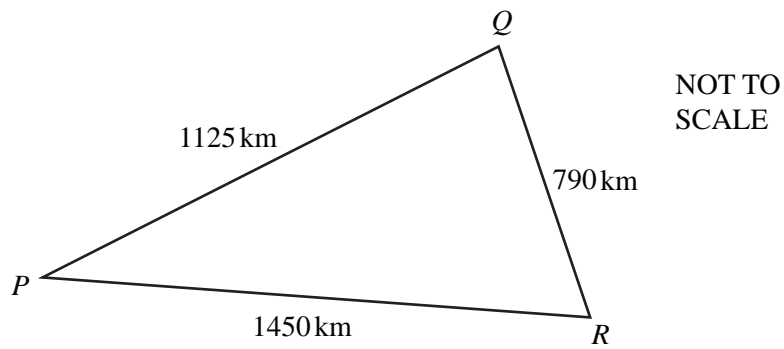
Answer(a)(v) .....  $\text{km}^2$  [2]

- (b) A plane leaves town  $C$  at 11 57 and flies 1500 km to another town, landing at 14 12.

Calculate the average speed of the plane.

*Answer(b)* ..... km/h [3]

- (c)



The diagram shows the distances between three towns  $P$ ,  $Q$  and  $R$ .

Calculate angle  $PQR$ .

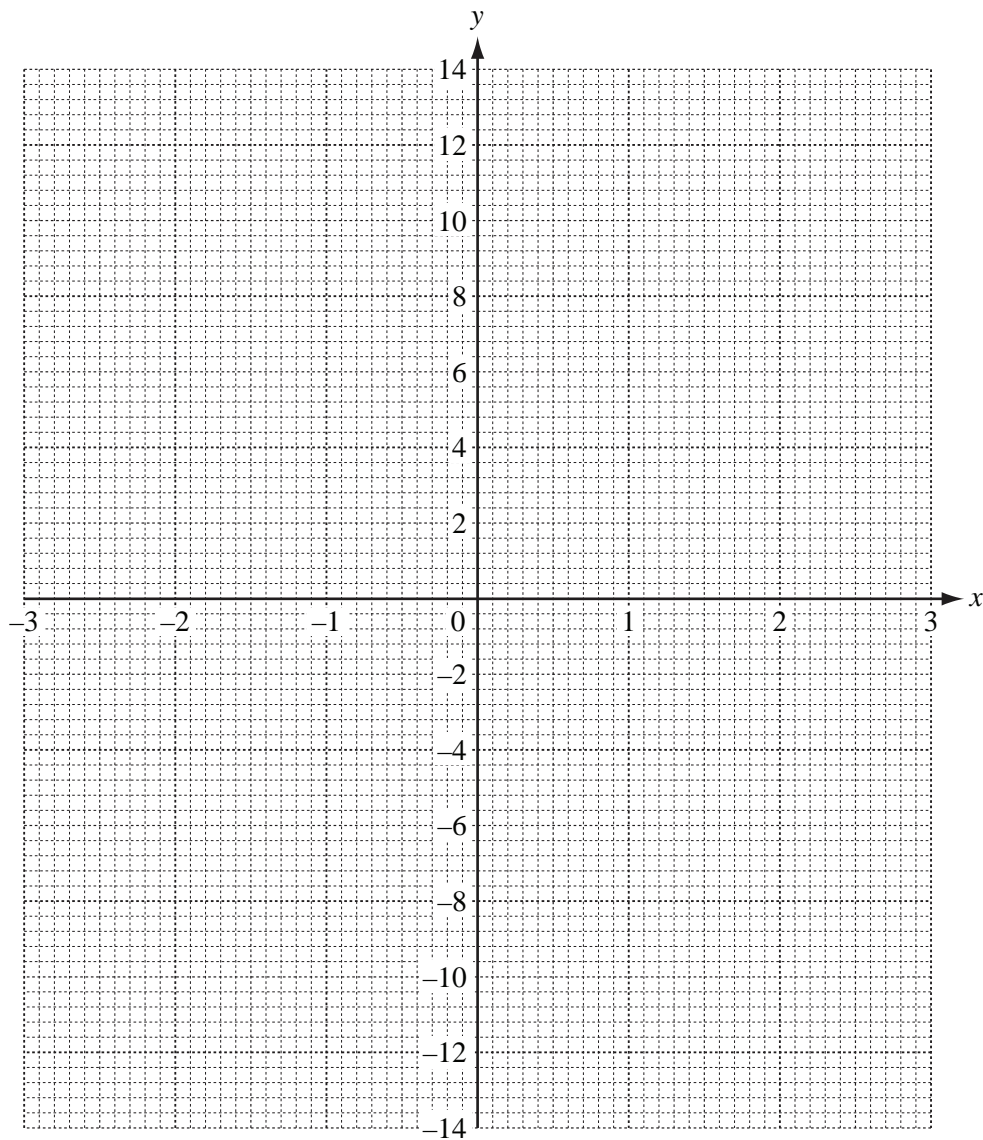
*Answer(c)* Angle  $PQR =$  ..... [4]

- 4 (a) Complete the table of values for the function  $y = x^2 - \frac{3}{x}$ ,  $x \neq 0$ .

$x$	-3	-2	-1	-0.5	-0.25		0.25	0.5	1	2	3
$y$	10	5.5		6.3	12.1		-11.9			2.5	8

[3]

- (b) Draw the graph of  $y = x^2 - \frac{3}{x}$  for  $-3 \leq x \leq -0.25$  and  $0.25 \leq x \leq 3$ .



[5]

- (c) Use your graph to solve  $x^2 - \frac{3}{x} = 7$ .

*Answer(c)*  $x =$  ..... or  $x =$  ..... or  $x =$  ..... [3]

- (d) Draw the tangent to the curve where  $x = -2$ .  
Use the tangent to calculate an estimate of the gradient of the curve where  $x = -2$ .

*Answer(d)* ..... [3]

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- 5 (a) Solve  $9 < 3n + 6 \leq 21$  for integer values of  $n$ .

Answer(a) ..... [3]

- (b) Factorise completely.

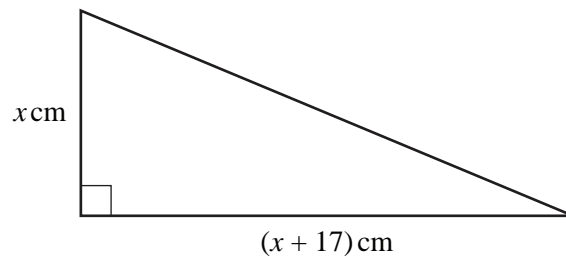
(i)  $2x^2 + 10xy$

Answer(b)(i) ..... [2]

(ii)  $3a^2 - 12b^2$

Answer(b)(ii) ..... [3]

- (c)



NOT TO  
SCALE

The area of this triangle is  $84 \text{ cm}^2$ .

- (i) Show that  $x^2 + 17x - 168 = 0$ .

Answer (c)(i)

[2]

- (ii) Factorise  $x^2 + 17x - 168$ .

Answer(c)(ii) ..... [2]

- (iii) Solve  $x^2 + 17x - 168 = 0$ .

Answer(c)(iii)  $x =$  ..... or  $x =$  ..... [1]



(d) Solve

$$\frac{15-x}{2} = 3 - 2x.$$

*Answer(d)*  $x =$  ..... [3]

(e) Solve  $2x^2 - 5x - 6 = 0$ .

Show all your working and give your answers correct to 2 decimal places.

*Answer(e)*  $x =$  ..... or  $x =$  ..... [4]

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6

Time ( $t$ mins)	$0 < t \leq 20$	$20 < t \leq 35$	$35 < t \leq 45$	$45 < t \leq 55$	$55 < t \leq 70$	$70 < t \leq 80$
Frequency	6	15	19	37	53	20

The table shows the times taken, in minutes, by 150 students to complete their homework on one day.

(a) (i) In which interval is the median time?

Answer(a)(i) ..... [1]

(ii) Using the mid-interval values 10, 27.5, .....calculate an estimate of the mean time.

Answer(a)(ii) ..... min [3]

(b) (i) Complete the table of cumulative frequencies.

Time ( $t$ mins)	$t \leq 20$	$t \leq 35$	$t \leq 45$	$t \leq 55$	$t \leq 70$	$t \leq 80$
Cumulative frequency	6	21				

[2]

(ii) On the grid, label the horizontal axis from 0 to 80, using the scale 1 cm represents 5 minutes and the vertical axis from 0 to 150, using the scale 1 cm represents 10 students.

Draw a cumulative frequency diagram to show this information. [5]



(c) Use your graph to estimate

(i) the median time, *Answer(c)(i)* ..... min [1]

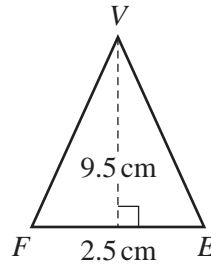
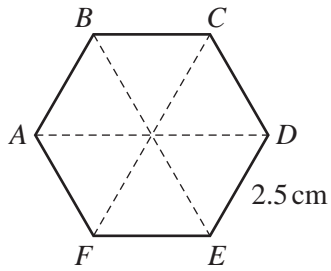
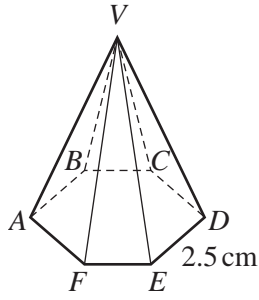
(ii) the inter-quartile range, *Answer(c)(ii)* ..... min [2]

(iii) the number of students whose time was in the range  $50 < t \leq 60$ ,  
*Answer(c)(iii)* ..... [1]

(iv) the probability, as a fraction, that a student, chosen at random, took longer than 50 minutes,  
*Answer(c)(iv)* ..... [2]

(v) the probability, as a fraction, that two students, chosen at random, both took longer than 50 minutes.  
*Answer(c)(v)* ..... [2]

7 (a)



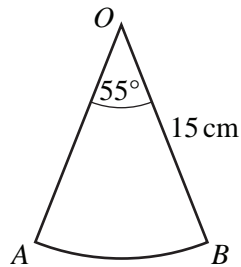
NOT TO SCALE

A solid pyramid has a **regular hexagon** of side 2.5 cm as its base. Each sloping face is an isosceles triangle with base 2.5 cm and height 9.5 cm.

Calculate the **total** surface area of the pyramid.

Answer(a) ..... cm<sup>2</sup> [4]

(b)



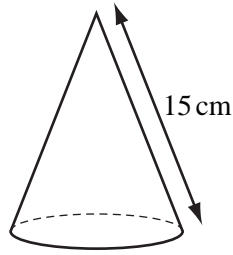
NOT TO SCALE

A sector *OAB* has an angle of  $55^\circ$  and a radius of 15 cm.

Calculate the area of the sector and show that it rounds to  $108 \text{ cm}^2$ , correct to 3 significant figures.

Answer (b)

(c)



NOT TO SCALE

The sector radii  $OA$  and  $OB$  in **part (b)** are joined to form a cone.

(i) Calculate the base radius of the cone.

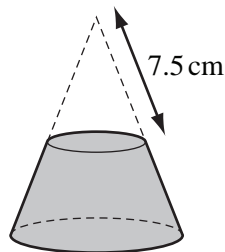
[The curved surface area,  $A$ , of a cone with radius  $r$  and slant height  $l$  is  $A = \pi rl$ .]

Answer(c)(i) ..... cm [2]

(ii) Calculate the perpendicular height of the cone.

Answer(c)(ii) ..... cm [3]

(d)



NOT TO SCALE

A solid cone has the same dimensions as the cone in **part (c)**.

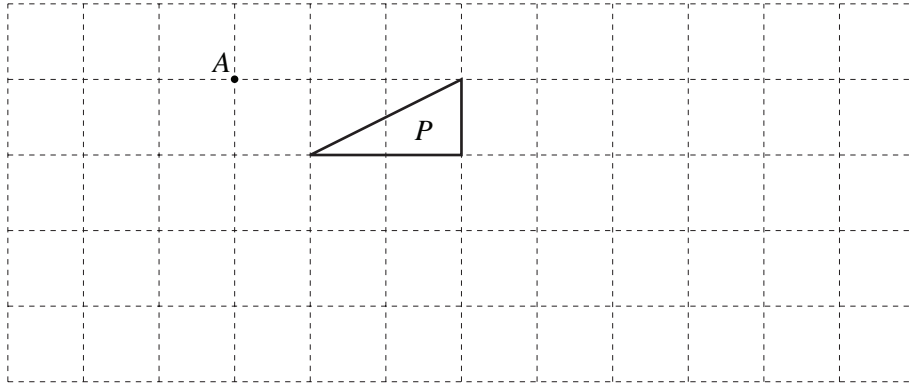
A small cone with slant height 7.5 cm is removed by cutting parallel to the base.

Calculate the volume of the remaining solid.

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

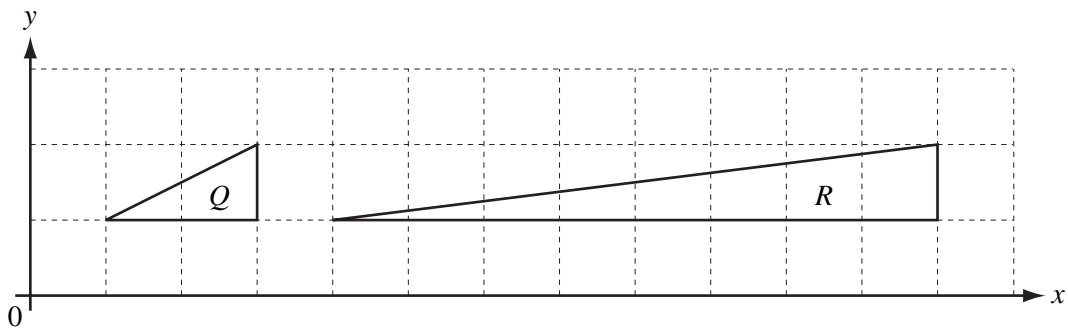
Answer(d) ..... cm<sup>3</sup> [3]

8 (a)



Draw the enlargement of triangle  $P$  with centre  $A$  and scale factor 2. [2]

(b)



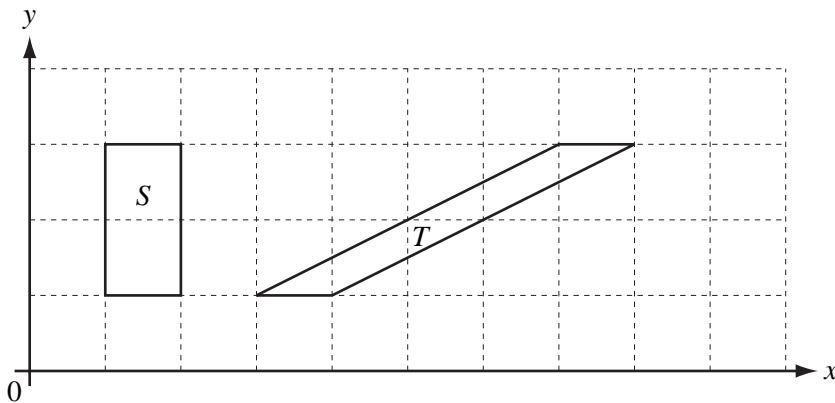
(i) Describe fully the **single** transformation which maps shape  $Q$  onto shape  $R$ .

Answer(b)(i) ..... [3]

(ii) Find the matrix which represents this transformation.

Answer(b)(ii)  $\left( \begin{array}{cc} & \\ & \end{array} \right)$  [2]

(c)



Describe fully the **single** transformation which maps shape  $S$  onto shape  $T$ .

Answer(c) ..... [3]

- 9 (a) (i) Work out the first 3 terms of the sequence whose  $n$ th term is  $n(n + 2)$ .

Answer(a)(i) ..... , ..... , ..... [2]

- (ii) Which term in this sequence is equal to 168?

Answer(a)(ii) ..... [3]

- (b) Find a formula for the  $n$ th term of the following sequences.

- (i) 5      8      11      14      17 .....

Answer(b)(i) ..... [2]

- (ii) 1      2      4      8      16 .....

Answer(b)(ii) ..... [2]

- (c)



Diagram 1

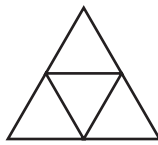


Diagram 2

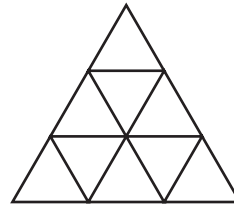


Diagram 3

A sequence of diagrams is formed by drawing equilateral triangles each of side one centimetre.  
Diagram 1 has 3 one centimetre lines.  
Diagram 2 has 9 one centimetre lines.

The formula for the **total** number of one centimetre lines needed to draw **all of the first  $n$  diagrams** is

$$an^3 + bn^2 + n.$$

Find the values of  $a$  and  $b$ .

Answer(c)  $a =$  .....

$b =$  ..... [6]

