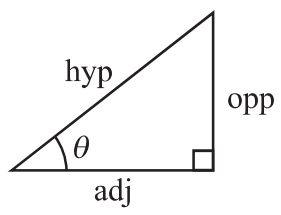
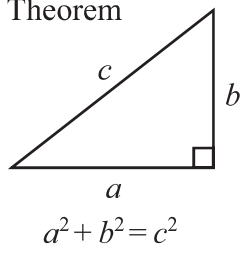


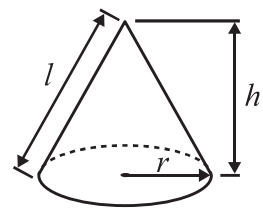
**International GCSE MATHEMATICS  
FORMULAE SHEET – HIGHER TIER**

Pythagoras' Theorem



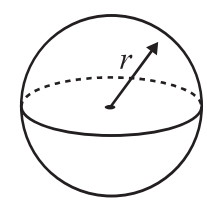
Volume of cone =  $\frac{1}{3} \pi r^2 h$

Curved surface area of cone =  $\pi r l$



Volume of sphere =  $\frac{4}{3} \pi r^3$

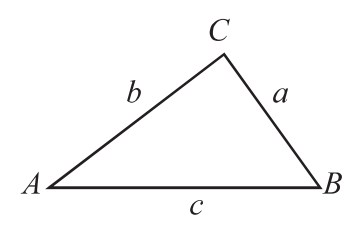
Surface area of sphere =  $4 \pi r^2$



adj = hyp  $\times$  cos  $\theta$   
opp = hyp  $\times$  sin  $\theta$   
opp = adj  $\times$  tan  $\theta$

or  $\sin \theta = \frac{\text{opp}}{\text{hyp}}$   
 $\cos \theta = \frac{\text{adj}}{\text{hyp}}$   
 $\tan \theta = \frac{\text{opp}}{\text{adj}}$

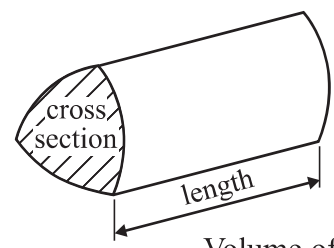
In any triangle ABC



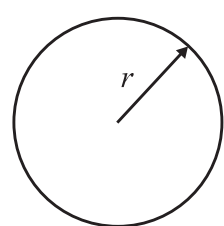
Sine rule:  $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule:  $a^2 = b^2 + c^2 - 2bc \cos A$

Area of triangle =  $\frac{1}{2} ab \sin C$



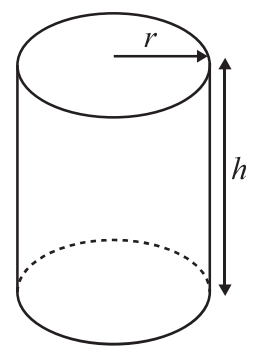
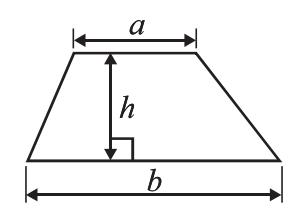
Volume of prism = area of cross section  $\times$  length



Circumference of circle =  $2 \pi r$

Area of circle =  $\pi r^2$

Area of a trapezium =  $\frac{1}{2} (a + b) h$



Volume of cylinder =  $\pi r^2 h$

Curved surface area of cylinder =  $2 \pi r h$

The Quadratic Equation  
The solutions of  $ax^2 + bx + c = 0$ ,  
where  $a \neq 0$ , are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$



**Answer ALL TWENTY FIVE questions.**

**Write your answers in the spaces provided.**

**You must write down all stages in your working.**

- 1** A box contains some coloured cards.  
Each card is red or blue or yellow or green.  
The table shows the probability of taking a red card or a blue card or a yellow card.

Card	Probability
Red	0.3
Blue	0.35
Yellow	0.15
Green	

George takes at random a card from the box.

- (a) Work out the probability that George takes a green card.

.....  
(2)

George replaces his card in the box.

Anish takes a card from the box and then replaces the card.

Anish does this 40 times.

- (b) Work out an estimate for the number of times Anish takes a yellow card.

.....  
(2)

**(Total for Question 1 is 4 marks)**

**Do NOT write in this space.**



- 2 Wendy travelled on the Eurostar train from St Pancras station to the Gare du Nord station. The Eurostar train travelled a distance of 495 km. The journey time was 2 hours 15 minutes.

Work out the average speed of the Eurostar train in kilometres per hour.

..... km/h

**(Total for Question 2 is 3 marks)**

- 3 The table shows information about the time, in minutes, spent on homework by each of 32 pupils in one night.

Time ( $t$ minutes)	Number of pupils
$0 < t \leq 20$	7
$20 < t \leq 40$	16
$40 < t \leq 60$	3
$60 < t \leq 80$	6

- (a) Calculate the percentage of the 32 pupils who spent more than 60 minutes on their homework.

..... %  
(2)

- (b) Calculate an estimate for the total time spent on homework by the 32 pupils.

..... minutes  
(3)

**(Total for Question 3 is 5 marks)**



4 (a) Expand  $6(3a - 2b + c)$

.....  
(1)

(b) Factorise  $t^2 - 10t$

.....  
(2)

(c) Solve  $x = \frac{7 - 2x}{3}$

Show clear algebraic working.

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

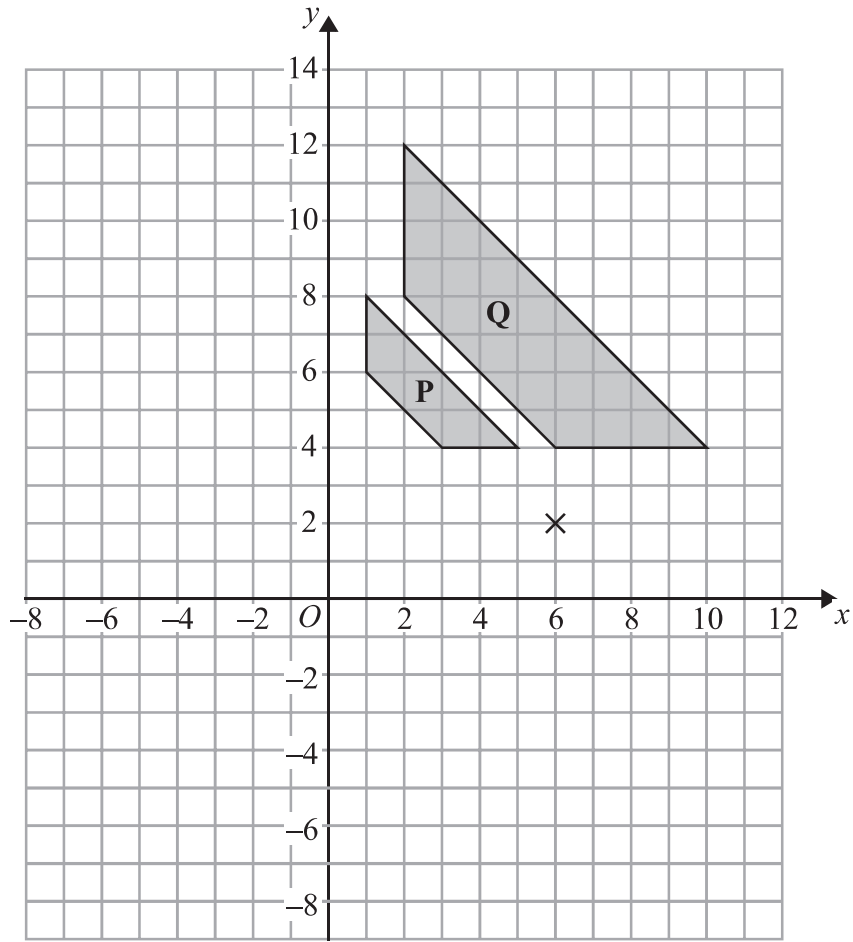
**(Total for Question 4 is 6 marks)**

5 Show that  $\frac{4}{9} - \frac{1}{6} = \frac{5}{18}$

**(Total for Question 5 is 2 marks)**



6



(a) Describe fully the single transformation that maps shape **P** onto shape **Q**.

.....

.....

(3)

(b) On the grid, rotate shape **Q**  $180^\circ$  about the point  $(6, 2)$ .  
Label the new shape **R**.

(2)

**(Total for Question 6 is 5 marks)**

**Do NOT write in this space.**



7  $M = 3x^2 - nx$

(a) Work out the value of  $M$  when

$$x = -2 \text{ and } n = 5$$

$$M = \dots\dots\dots$$

(2)

(b) Work out the value of  $n$  when

$$M = 12 \text{ and } x = 4$$

$$n = \dots\dots\dots$$

(3)

---

**(Total for Question 7 is 5 marks)**

**Do NOT write in this space.**



- 8 (a)  $A = \{s, u, p, e, r\}$   
 $B = \{c, o, m, p, u, t, e, r\}$

List the members of the set

(i)  $A \cap B$

.....

(ii)  $A \cup B$

.....

(2)

- (b)  $X = \{\text{prime numbers}\}$   
 $Y = \{\text{factors of } 12\}$

Is it true that  $X \cap Y = \emptyset$ ?

Tick (✓) the appropriate box.

Yes

No



Explain your answer.

.....

(1)

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

- 9 (a) Simplify, leaving your answers in index form,

(i)  $6^5 \times 6^2 \times 6$

.....

(ii)  $(9^7)^2$

.....

(2)

(b)  $\frac{5^n \times 5^3}{5^6} = 5^4$

Find the value of  $n$ .

$n =$  .....

(2)

**(Total for Question 9 is 4 marks)**



10 The diagram shows the path of an athlete on a running track.

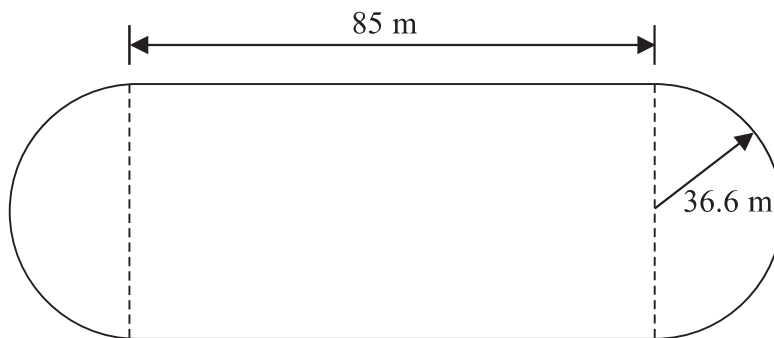


Diagram **NOT**  
accurately drawn

The path consists of two straight lengths and a semicircle at each end.  
Each straight length is 85 metres.  
Each semicircle has a radius of 36.6 metres.

Calculate the area enclosed by the path.  
Give your answer correct to 3 significant figures.

..... m<sup>2</sup>

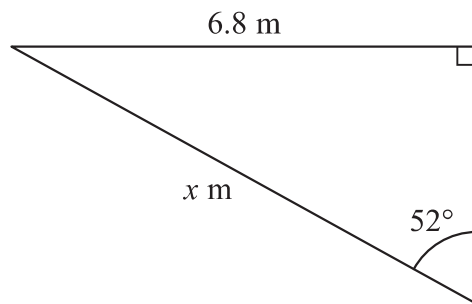
(Total for Question 10 is 4 marks)

Do NOT write in this space.





11

Diagram **NOT**  
accurately drawn

Calculate the value of  $x$ .  
Give your answer correct to 3 significant figures.

 $x = \dots\dots\dots$ **(Total for Question 11 is 3 marks)**

12 (a) Write as an ordinary number

(i)  $4.2 \times 10^6$

 $\dots\dots\dots$ 

(ii)  $3.82 \times 10^{-4}$

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

(b) Here are three numbers written in standard form.  
Arrange these numbers in order of size.  
Start with the smallest number.

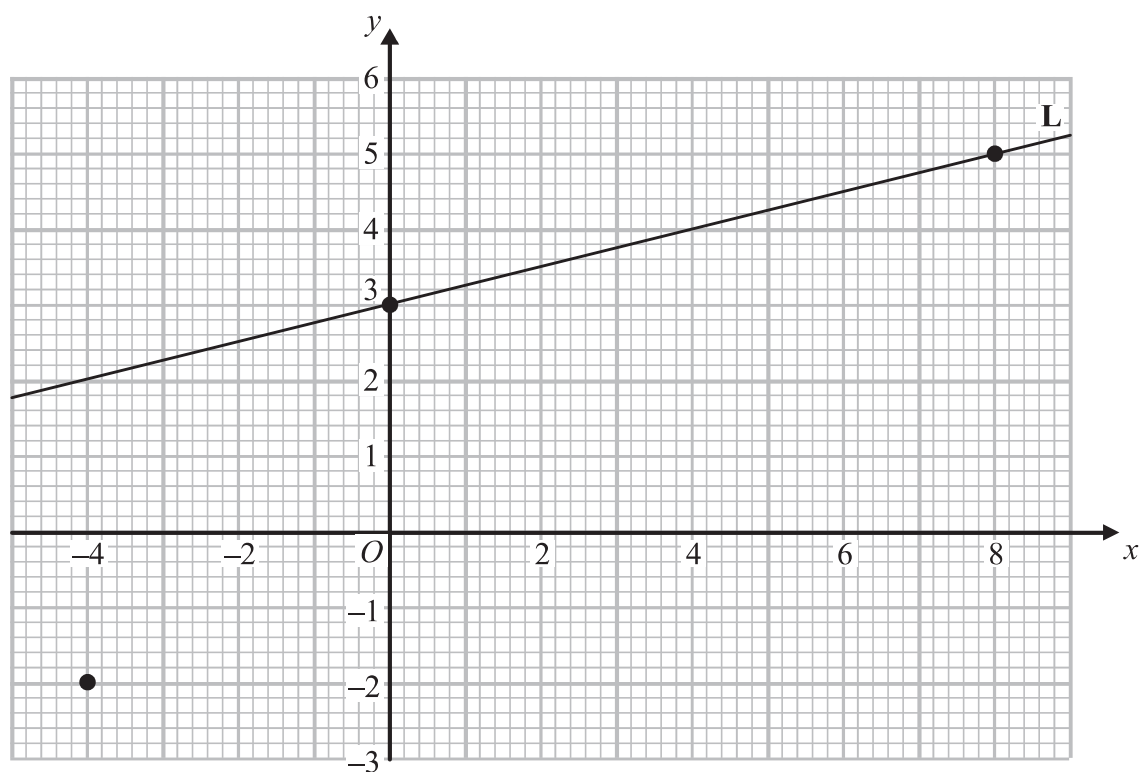
$5.6 \times 10^{-7}$

$8.6 \times 10^{-9}$

$5.64 \times 10^{-8}$

 $\dots\dots\dots$ **(2)****(Total for Question 12 is 4 marks)**

- 13 The points with coordinates  $(0, 3)$  and  $(8, 5)$  lie on the straight line **L**.



- (a) Work out the gradient of **L**.

.....  
(2)

- (b) Write down an equation of **L**.

.....  
(1)

- (c) Find an equation of the line which is parallel to **L** and which passes through the point  $(-4, -2)$

.....  
(2)

(Total for Question 13 is 5 marks)



14 Triangles  $ABC$  and  $ACD$  are similar.

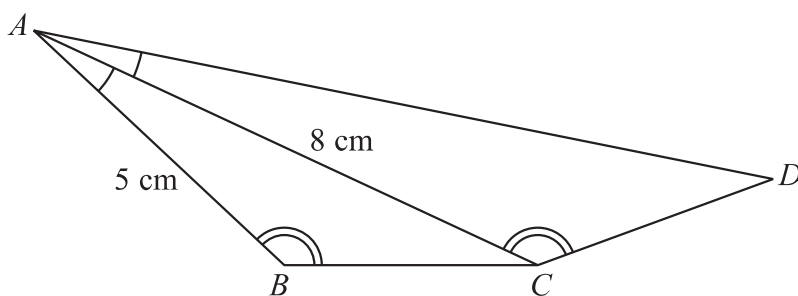


Diagram **NOT** accurately drawn

Angle  $BAC =$  angle  $CAD$ .  
 Angle  $ABC =$  angle  $ACD$ .  
 $AB = 5$  cm and  $AC = 8$  cm.

(a) Calculate the length of  $AD$ .

..... cm  
 (2)

The area of triangle  $ABC$  is  $12 \text{ cm}^2$

(b) Calculate the area of triangle  $ACD$ .

.....  $\text{cm}^2$   
 (2)

(Total for Question 14 is 4 marks)

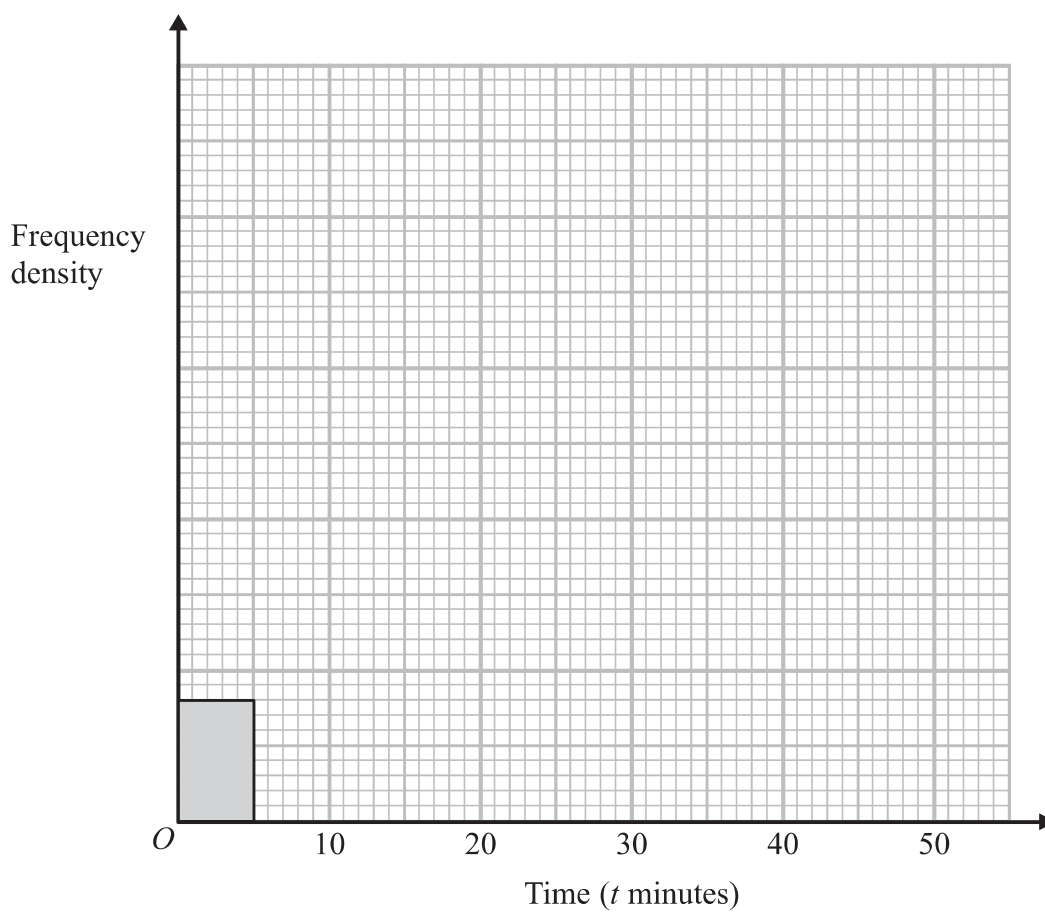
Do NOT write in this space.



15 The table shows information about the times, in minutes, that some people took to complete a sudoku puzzle.

Time ( $t$ minutes)	$0 < t \leq 5$	$5 < t \leq 20$	$20 < t \leq 30$	$30 < t \leq 50$
Number of people	4	18	34	30

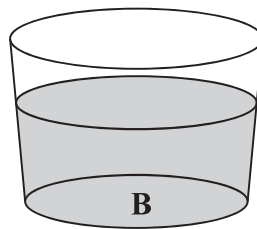
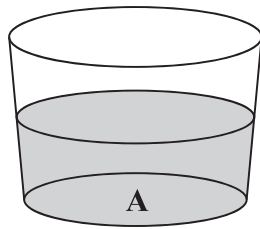
Complete the histogram for this information.



(Total for Question 15 is 3 marks)



16



Glass **A** contains 122 millilitres of water, correct to the nearest millilitre.

Glass **B** contains 168 millilitres of water, correct to the nearest millilitre.

Calculate the upper bound of the difference, in millilitres, between the volume of water in glass **A** and the volume of water in glass **B**.

..... millilitres

**(Total for Question 16 is 2 marks)**

17 Make  $n$  the subject of the formula

$$t = \sqrt{\frac{n+3}{n}}$$

$n =$  .....

**(Total for Question 17 is 4 marks)**





19 A particle is moving in a straight line which passes through a fixed point  $O$ .  
The displacement,  $s$  metres, of the particle from  $O$  at time  $t$  seconds is given by

$$s = 10 + 9t^2 - t^3$$

(a) Find an expression for the velocity,  $v$  m/s, of the particle at time  $t$  seconds.

$v = \dots\dots\dots$   
(2)

(b) Find the time at which the acceleration of the particle is zero.

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

(Total for Question 19 is 4 marks)

20  $PTR$  and  $QTS$  are chords of a circle.

- $PT = 3$  cm.
- $ST = 10$  cm.
- $RT = 15$  cm.
- $QT = x$  cm.

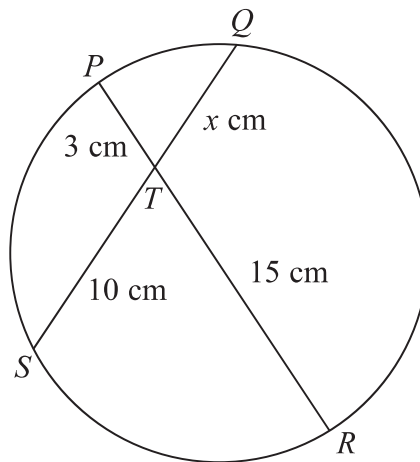


Diagram **NOT** accurately drawn

Calculate the value of  $x$ .

$x = \dots\dots\dots$

(Total for Question 20 is 2 marks)



- 21** A bag contains  $x$  counters.  
 7 of the counters are blue.  
 Sam takes at random a counter from the bag and does not replace it.  
 Jill then takes a counter from the bag.  
 The probability they both take a blue counter is 0.2

- (a) Form an equation involving  $x$ .  
 Show that your equation can be expressed as  $x^2 - x - 210 = 0$

(2)

- (b) Solve  $x^2 - x - 210 = 0$   
 Show clear algebraic working.

(3)

(Total for Question 21 is 5 marks)

**22**  $(\sqrt{a} + \sqrt{8a})^2 = 54 + b\sqrt{2}$

- $a$  and  $b$  are positive integers.  
 Find the value of  $a$  and the value of  $b$ .  
 Show your working clearly.

$a =$  .....

$b =$  .....

(Total for Question 22 is 3 marks)





23

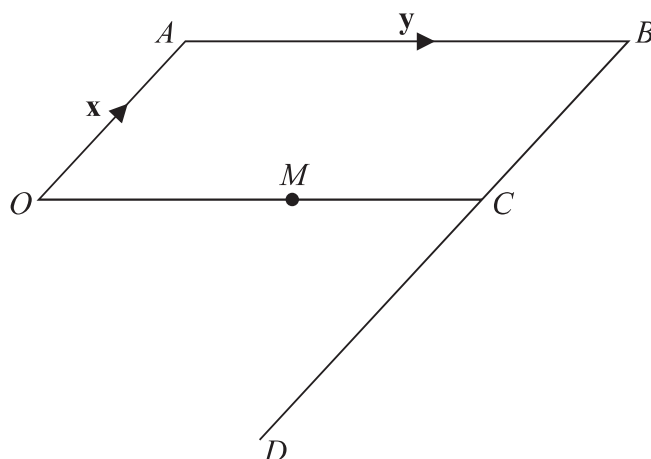


Diagram **NOT** accurately drawn

$OABC$  is a parallelogram.

$BCD$  is a straight line.

$BD = 3BC$ .

$M$  is the midpoint of  $OC$ .

$\vec{OA} = \mathbf{x}$      $\vec{AB} = \mathbf{y}$

(a) Find, in terms of  $\mathbf{x}$  and  $\mathbf{y}$ ,

(i)  $\vec{AM}$

.....

(ii)  $\vec{OD}$

.....

(2)

(b) Use your answers to (a)(i) and (ii) to write down two different geometric facts about the lines  $AM$  and  $OD$ .

.....

.....

(2)

(Total for Question 23 is 4 marks)



- 24 The diagram shows a cube  $ABCDEFGH$ .  
The sides of the cube are of length 5 cm.

Calculate the size of the angle between the diagonal  $AH$  and the base  $EFGH$ .  
Give your answer correct to 1 decimal place.

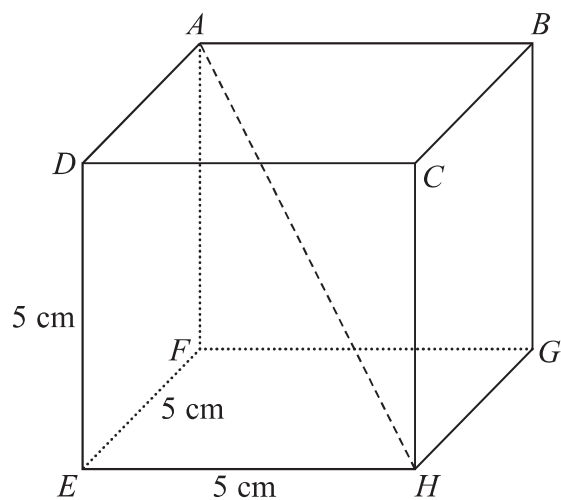


Diagram **NOT**  
accurately drawn

(Total for Question 24 is 4 marks)



25 Solve the simultaneous equations

$$x^2 + y^2 = 26$$

$$y = 3 - 2x$$

Show clear algebraic working.

.....  
(Total for Question 25 is 6 marks)

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**TOTAL FOR PAPER IS 100 MARKS**

