KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 10

MATHEMATICS PAPER 2

NOVEMBER 2023

NAME: **CLASS:**

MARKS: 100
TIME: 2 hours

This question paper consists of 16 pages including 1 page of additional space.

For educator only									
Questions	**Q1**	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
Marks									

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 9 questions.
2. Answer ALL the questions.
3. Clearly show ALL calculations, diagrams, graphs, etc. which you have used in determining your answers.
4. Answers only will NOT necessarily be awarded full marks.
5. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
6. If necessary, round off answers correct to TWO decimal places, unless stated otherwise.
7. Diagrams are NOT necessarily drawn to scale.
8. Write neatly and legibly.
9. Answer questions on spaces provided.

QUESTION 1

The data below shows the marks for a Mathematics test written out of 50 by 15 learners.

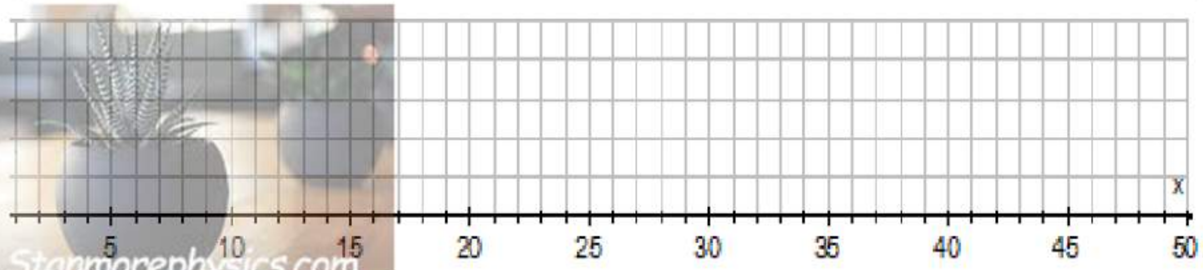
49 37 37 20 16 28 14 43 25 11 34 27 40 23 19

1.1 Calculate the range for the data. (1)

1.2 Determine the median mark for the test. (1)

1.3 Calculate the interquartile range (IQR). (2)

1.4 Draw a box and whisker diagram for the data above. (3)



[7]

QUESTION 2

Employees who use company cars were asked to record the number of kilometres they travel to and from work each day. The table below shows the results:

Number of kilometres	Number of employees	midpoint	midpoint × frequency
$5 \leq x < 10$	4		
$10 \leq x < 15$	7		
$15 \leq x < 20$	18		
$20 \leq x < 25$	10		
$25 \leq x < 30$	3		
$30 \leq x < 35$	3		

2.1 How many employees were there? (1)

2.2 Estimate the mean distance travelled. (3)

2.3 Write down the modal class. (1)

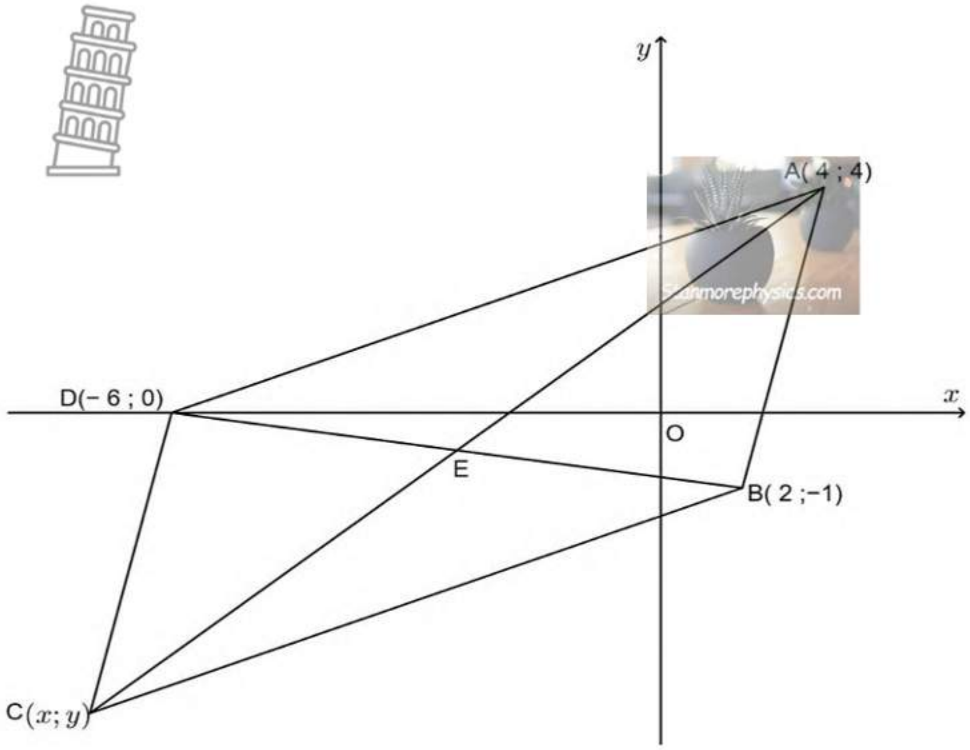
2.4 In which interval does the median distance lie? (1)

2.5 Calculate the percentage of employees who travel at least 25 km in a day. (2)

[8]

QUESTION 3

3,1 In the diagram below, $A(4;4)$, $B(2;-1)$, $C(x;y)$ and $D(-6;0)$ are four vertices of a quadrilateral ABCD.

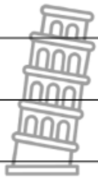


3.1.1 Calculate the gradient of AD. (2)

3.1.2 Determine the equation of line BC which is parallel to AD. (4)

3.1.3 Determine the coordinates of E, the midpoint of line BD. (2)

3.1.4 Given that the quadrilateral ABCD is a parallelogram, calculate the coordinates of point C. (4)



3.2 Given the points $P(-2;3)$, $Q(1;4)$, $R(-4;1)$ and $S(x;4)$. Determine the value of x if $PQ \perp RS$. (3)

[15]

QUESTION 4

4.1 Given $\sqrt{3}\,\text{cosec}\,\theta + 2 = 0$ and $90° < \theta < 270°$.

4.1.1 Use a sketch to determine the value of the following **WITHOUT USING A CALCULATOR**.

(i) $\cos\theta$ (4)

(ii) $\dfrac{\sin\theta\tan\theta}{\cos\theta}$ (4)

4.1.2 If $\theta = 25°$ and $\alpha = 38°$, determine the value of $\cos(2\alpha - \theta)$ correct to 1 decimal place. (3)

4.2 Simplify the following expression WITHOUT using a calculator.

$\operatorname{cosec}^2 60° + \tan^2 45° + \sec 60°$ (6)

4.3 Solve for θ correct to TWO decimal places, if

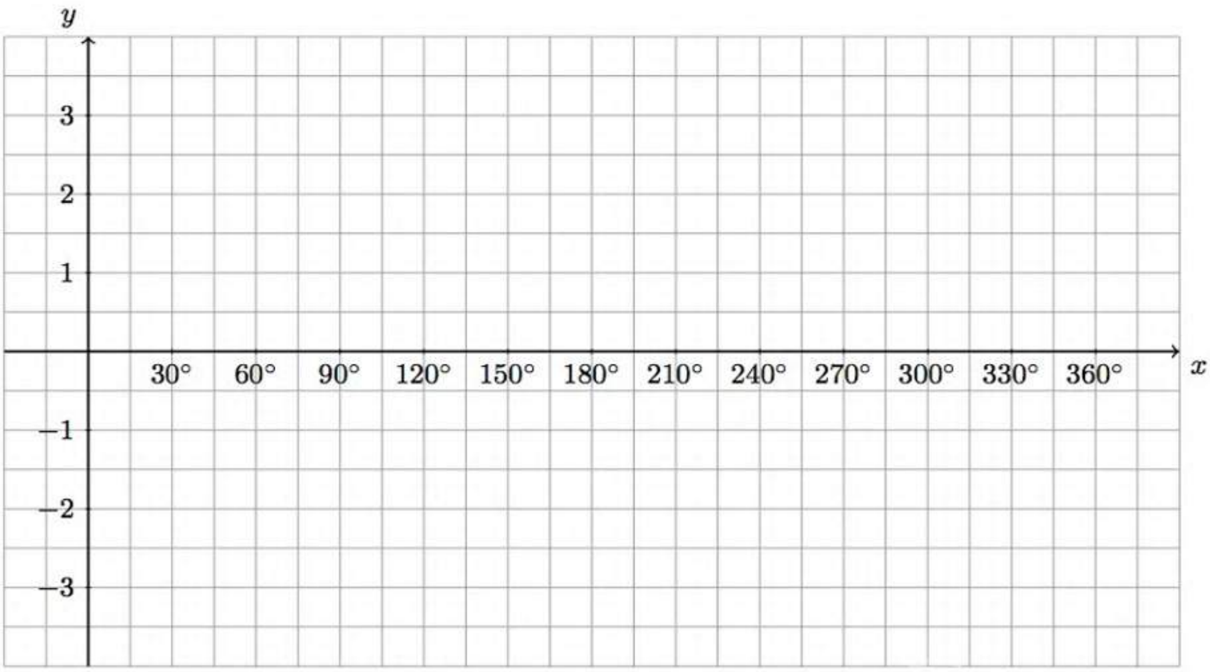
$$2\tan(\theta - 45^\circ) = 1 \text{ and } 0^\circ \leq \theta \leq 90^\circ$$ (3)

[20]

QUESTION 5

Given $f(x) = 3\sin x$ and $g(x) = 2\cos x + 1$

5.1 Sketch on the grid provided, the graphs of f and g for $0^\circ \leq \theta \leq 360^\circ$. (6)



5.2 Write down the following:

5.2.1 Amplitude of g (1)

5.2.2 Period of f (1)

5.3 For which value(s) of x is:

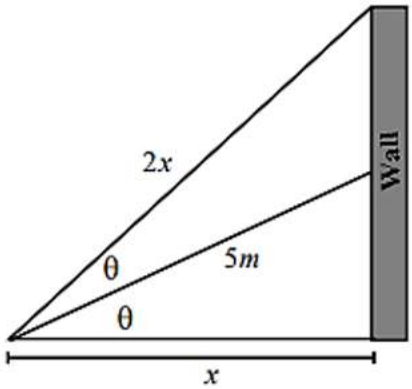
5.3.1 $g(x) - f(x) = 4$ (2)

5.3.2 $f(x).g(x) \geq 0$ (3)

[13]

QUESTION 6

A handyman attempts to reach the roof of a hall with a ladder 5 metres in length. Unfortunately, the ladder is too short, and a new ladder will be required. Suppose that the length of the ladder needed to reach the top has to be double the distance from the foot of the ladder to the wall. Also, the angle between his current ladder and the ground will need to be equal to the angle between the two ladders.



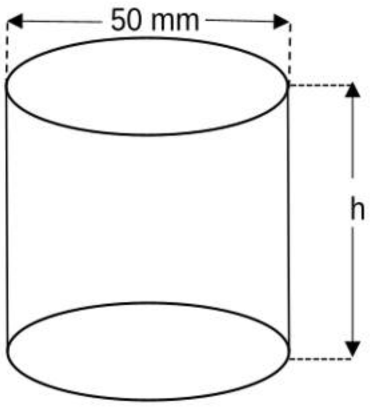
6.1 Calculate the value of θ (4)

6.2 Hence, or otherwise, determine what length the ladder should be to get the handyman to the roof. (4)

[8]

QUESTION 7

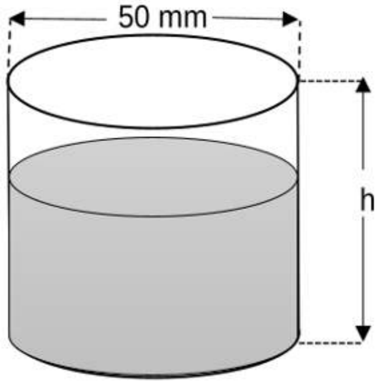
The diagram below shows a drinking glass with an inner diameter of 50 mm and a height h. Ignore the thickness of the glass,



The volume of the glass is 250 cm^3.

7.1 Calculate the height h. (3)

7.2 Water is now poured into the glass until it is 65% full.

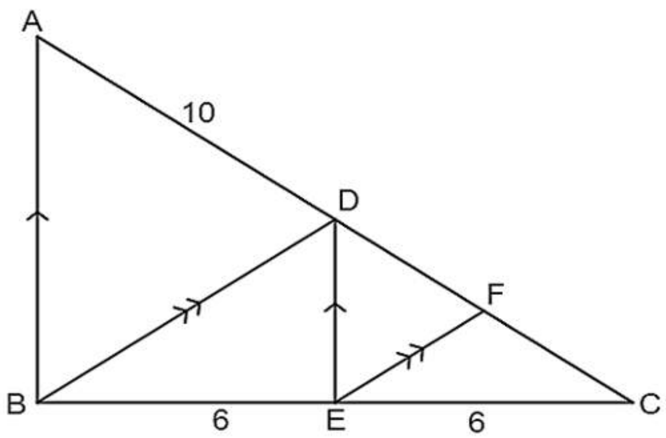


Calculate the total surface area covered by the water. (4)

[7]

QUESTION 8

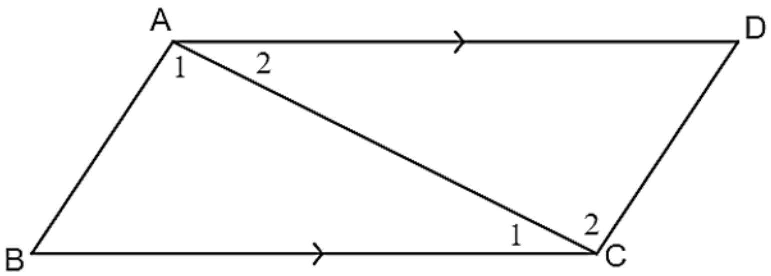
8.1 In the diagram below $BD \parallel EF$, $AB \parallel DE$; $BE = EC = 6\text{cm}$ and $AD = 10\text{cm}$



8.1.1 Show that $FC = 5\text{cm}$ (2)

8.1.2 If $AB = \frac{16}{5}FC$, prove that $A\hat{B}C = 90^\circ$ (3)

8.2 In quadrilateral ABCD, $AD \parallel BC$ and $\hat{B} = \hat{D}$. Prove that ABCD is a parallelogram.

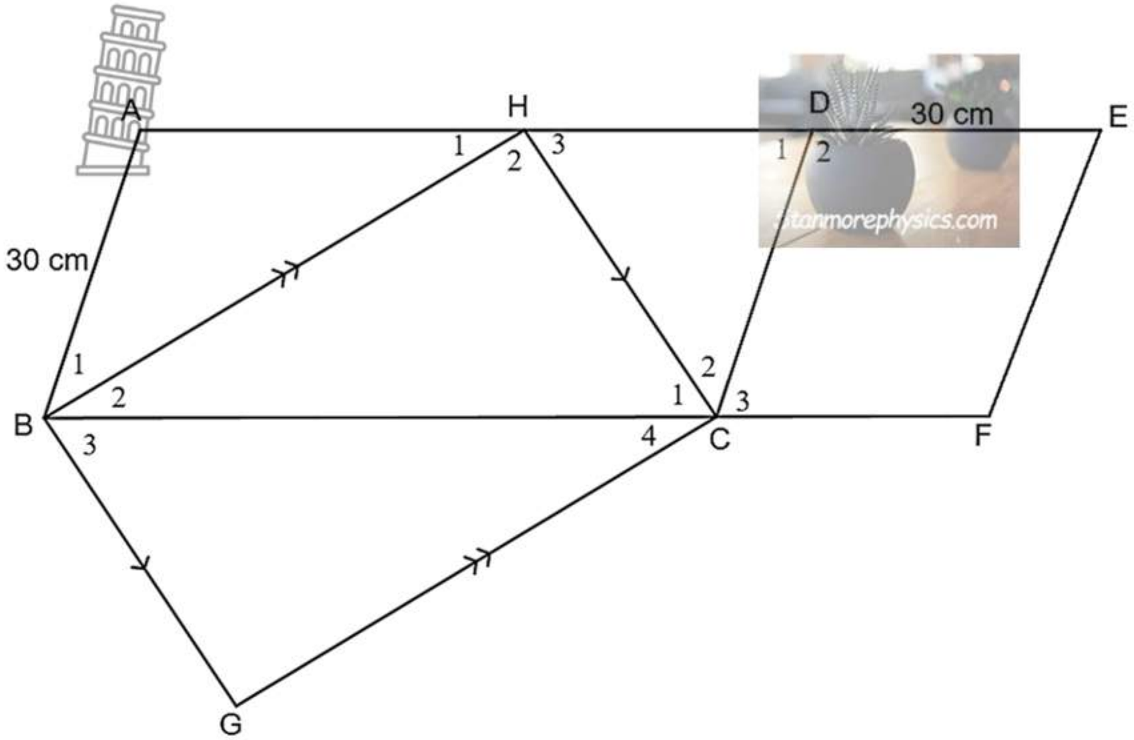


(5)

[10]

QUESTION 9

ABCD is a parallelogram. BH bisects $A\hat{B}C$ and HC bisects $B\hat{C}D$.
$A\hat{B}C = 60°$, $\hat{F} = 120°$, $BH \parallel GC$ and $BG \parallel HC$. AD is produced to E such that $AB = DE = 30$ cm.
BC is produced to F.



Prove that:

9.1 $\hat{C}_1 = 60°$ (3)

9.2 BGCH is a rectangle (2)

9.3 DC || EF (2)

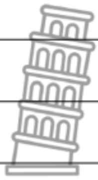
9.4 DC = DE (2)

9.5 DCFE is a rhombus (3)

[12]

TOTAL MARKS: 100

EXTRA SPACE



INFORMATION SHEET

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

$A = P(1 + ni)$  $A = P(1 - ni)$ $A = P(1 - i)^n$ $A = P(1 + i)^n$

$T_n = a + (n-1)d$ $S_n = \frac{n}{2}[2a + (n-1)d]$

$T_n = ar^{n-1}$ $S_n = \frac{a(r^n - 1)}{r - 1}$; $r \neq 1$ $S_\infty = \frac{a}{1-r}$; $-1 < r < 1$

$F = \frac{x[(1+i)^n - 1]}{i}$ $P = \frac{x[1 - (1+i)^{-n}]}{i}$

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $M\left(\frac{x_1 + x_2}{2} ; \frac{y_1 + y_2}{2}\right)$

$y = mx + c$ $y - y_1 = m(x - x_1)$ $m = \frac{y_2 - y_1}{x_2 - x_1}$ $m = \tan\theta$

$$(x - a)^2 + (y - b)^2 = r^2$$

In ΔABC: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

$a^2 = b^2 + c^2 - 2bc.\cos A$

$\text{area } \Delta ABC = \frac{1}{2}ab.\sin C$

$\sin(\alpha + \beta) = \sin\alpha\cos\beta + \cos\alpha\sin\beta$ $\sin(\alpha - \beta) = \sin\alpha\cos\beta - \cos\alpha\sin\beta$

$\cos(\alpha + \beta) = \cos\alpha\cos\beta - \sin\alpha\sin\beta$ $\cos(\alpha - \beta) = \cos\alpha\cos\beta + \sin\alpha\sin\beta$

$\cos 2\alpha = \begin{cases} \cos^2\alpha - \sin^2\alpha \\ 1 - 2\sin^2\alpha \\ 2\cos^2\alpha - 1 \end{cases}$ $\sin 2\alpha = 2\sin\alpha\cos\alpha$

$\bar{x} = \frac{\sum x}{n}$ $\sigma^2 = \frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n}$

$P(A) = \frac{n(A)}{n(S)}$ $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

$\hat{y} = a + bx$ $b = \frac{\sum(x - \bar{x})(y - \bar{y})}{\sum(x - \bar{x})^2}$

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MATHEMATICS P2

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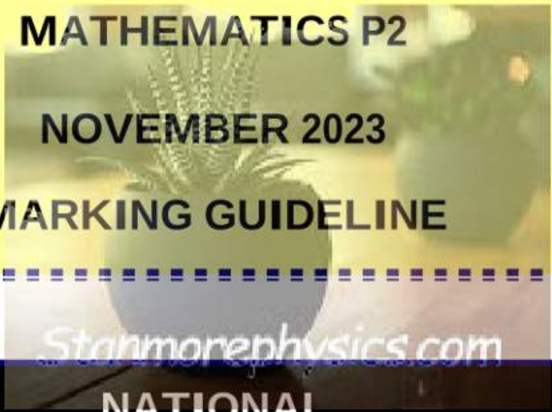
MARKING GUIDELINE



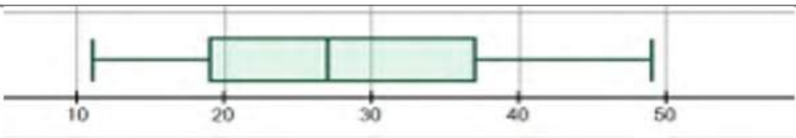
NATIONAL SENIOR CERTIFICATE

GRADE 10

MARKS: 100

This marking guideline consists of 14 pages.

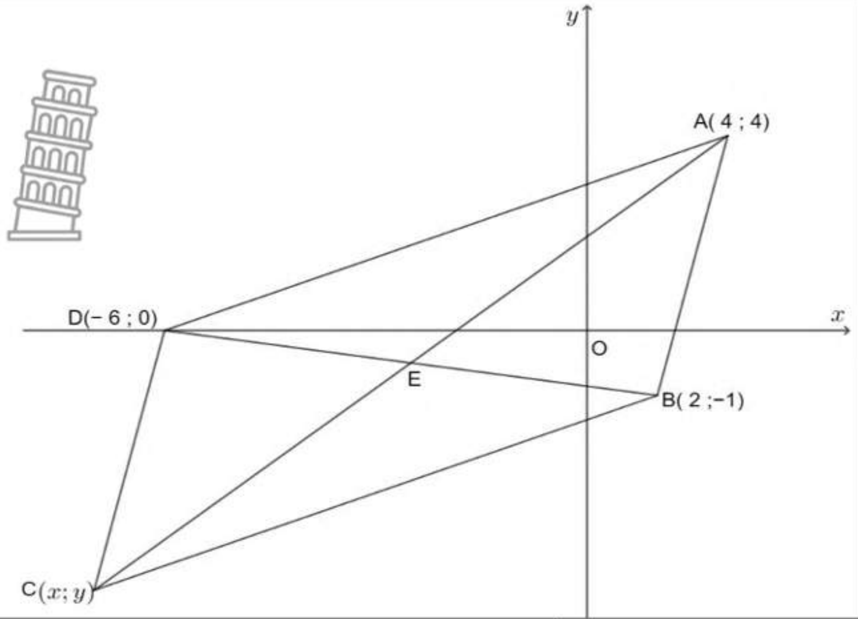
QUESTION 1

1.1	$\text{range} = 49 - 11$ $= 38$	✓ Answer	(1)
1.2	$Q_2 = 27$	✓ Answer	(1)
1.3	$IQR = Q_3 - Q_1$ $= 37 - 19$ $= 18$	✓ Q_1 and Q_3 ✓ Answer	(2)
1.4		✓ max and min ✓ Q_1, Q_2 and Q_3 ✓ box and whiskers	(3)
			[7]

QUESTION 2

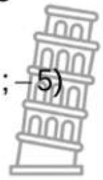
2.1	45	✓ answer	(1)
2.2	$\bar{x} = \dfrac{\sum x.f}{\sum f}$ $= \dfrac{837,5}{45}$ $= 18,61$	✓837,5 ✓45 ✓ Answer	(3)
2.3	$15 \leq x < 20$	✓ Answer	(1)
2.4	$15 \leq x < 20$	✓ Answer	(1)
2.5	$\dfrac{6}{45} \times 100\%$ $= 13,33\%$	✓ 6 ✓ Answer	(2)
			[8]

QUESTION 3



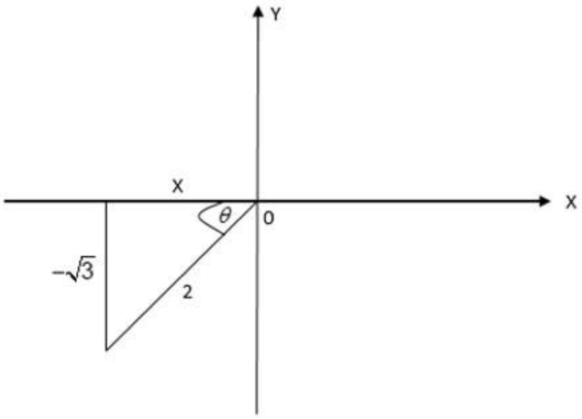
3.1.1	$m_{AD}=\frac{y_2-y_1}{x_2-x_1}$ $m_{AD}=\frac{4-0}{4-(-6)}$ $=\frac{4}{10}$ $=\frac{2}{5}$	✓ substitution ✓ Answer	(2)
3.1.2	$m_{BC}=m_{AD}=\frac{2}{5}$ ….. BC || AD $y=\frac{2}{5}x+c$ $-1=\frac{2}{5}(2)+c$ $c=-\frac{9}{5}$ $\therefore y=\frac{2}{5}x-\frac{9}{5}$ OR	✓ m_{BC} ✓ substitution of $(2;-1)$ ✓ value of c ✓ Answer	(4)

	$m_{BC} = m_{AD} = \frac{2}{5}$ …..BC || AD $\frac{y-(-1)}{x-2} = \frac{2}{5}$ $\frac{y+1}{x-2} = \frac{2}{5}$ $5(y+1) = 2(x-2)$ $5y+5 = 2x-4$ $5y = 2x-9$ $y = \frac{2}{5}x - \frac{9}{5}$ **OR** $m_{BC} = m_{AD} = \frac{2}{5}$ ... BC || AD $y - y_1 = m(x - x_1)$ $y-(-1) = \frac{2}{5}(x-2)$ $y+1 = \frac{2}{5}(x-2)$ $y = \frac{2}{5}x - \frac{9}{5}$	✓ S ✓ R ✓ equating ✓ Answer ✓ S ✓ R ✓ substitution ✓ Answer	(4) (4)
3.1.3	midpt of BD=$E\left(\frac{2+-6}{2} ; \frac{0+-1}{2}\right)$ $= E\left(-2 ; -\frac{1}{2}\right)$ **OR** $x = \frac{-6+2}{2}$, $y = \frac{0+(-1)}{2}$ $x = \frac{-4}{2}$ $y = \frac{-1}{2}$ $x = -2$ $y = -\frac{1}{2}$ $E\left(-2 ; -\frac{1}{2}\right)$	✓ x-coordinate ✓ y-coordinate ✓ x-coordinate ✓ y-coordinate	(2) (2)
3.1.4	midpt of BD = midpt of AC ... diagonals of a parm	✓ S/R	

	$\frac{x+4}{2}=-2$ $\frac{y+4}{2}=-\frac{1}{2}$ $x=8$ $y=-5$ $\therefore\ C(-8\ ;-5)$	✓ $\frac{x+4}{2}=-2$ and $\frac{y+4}{2}=-\frac{1}{2}$ ✓ $x=-8$ ✓ $y=-5$	(4)
			
	OR		
	Transformation Rule is C $C(x-10;\ y-4)$ $C(2-10;-1-4)$ $C(-8;-5)$	✓✓Rule ✓ $x=-8$ ✓ $y=-5$	
	OR		
	Equation of line BC: $y=\frac{2}{5}x-\frac{9}{5}$ (from 3.1.2) Equation of line DC $m_{DC}=m_{AB}$ ... DC || AD $m_{DC}=\frac{4-(-1)}{4-2}$ $m_{DC}=\frac{5}{2}$ $y=\frac{5}{2}x+c$ $0=\frac{5}{2}(-6)+c$ $c=15$ $\therefore\ y=\frac{5}{2}x+15$	✓ equation of line DC	
	$\frac{2}{5}x-\frac{9}{5}=\frac{5}{2}x+15$	✓ equating	
	$-\frac{21}{10}x=\frac{84}{5}$ $x=-8$	✓ $x=-8$	
	when $x=-8$ $y=\frac{5}{2}(-8)+15$ $y=-5$ $\therefore C(-8\ ;\ -5)$	✓ $y=-5$	(4)

3.2	$m_{PQ}.m_{RS}=-1$ .... $PQ\perp RS$ $\left(\frac{4-3}{1-(-2)}\right).\left(\frac{4-1}{x-(-4)}\right)=-1$ $\frac{1}{x+4}=-1$ $1=-x-4$ $x=-5$	✓ $m_{PQ}.m_{RS}=-1$ ✓ substitution ✓ Answer	(3)
			[15]

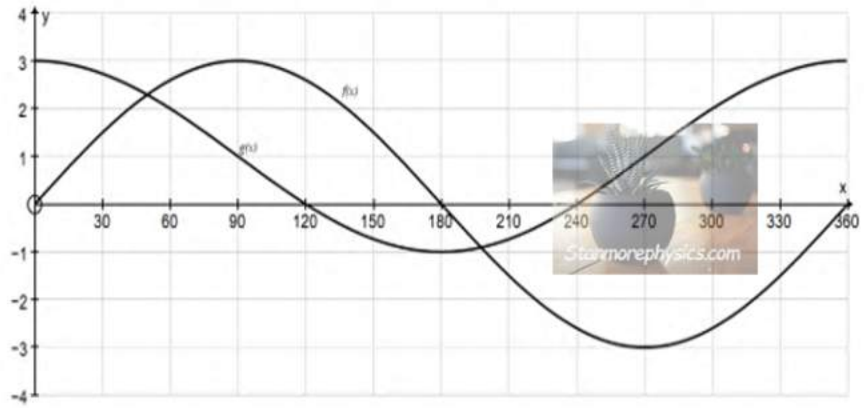
QUESTION 4

4.1.1(i)	$\sqrt{3}\operatorname{cosec}\theta + 2 = 0$ $\operatorname{cosec}\theta = -\frac{2}{\sqrt{3}}$ $\sin\theta = -\frac{\sqrt{3}}{2}$ **OR** $\operatorname{cosec}\theta = -\frac{2}{\sqrt{3}}$ $\frac{1}{\sin\theta} = -\frac{2}{\sqrt{3}}$ $-2\sin\theta = \sqrt{3}$ $\sin\theta = -\frac{\sqrt{3}}{2}$  $x^2 + \left(-\sqrt{3}\right)^2 = 2^2$ [Theorem of pythagoras] $x = -1$ $\therefore \cos\theta = -\frac{1}{2}$	✓ $\sin\theta = -\frac{\sqrt{3}}{2}$ or $\operatorname{cosec}\theta = -\frac{2}{\sqrt{3}}$ ✓ diagram ✓ $x = -1$ ✓ $\cos\theta = -\frac{1}{2}$	(4)
4.1.1(ii)	$\frac{\sin\theta\tan\theta}{\cos\theta} = \frac{\left(-\frac{\sqrt{3}}{2}\right)\left(\frac{-\sqrt{3}}{-1}\right)}{\left(-\frac{1}{2}\right)}$ $= 3$ **OR** $\frac{\sin\theta\left(\frac{\sin\theta}{\cos\theta}\right)}{\cos\theta} = \frac{\sin^2\theta}{\cos\theta} \times \frac{1}{\cos\theta}$ $= \frac{\left(-\frac{\sqrt{3}}{2}\right)^2}{\left(-\frac{1}{2}\right)} \times \frac{1}{\left(-\frac{1}{2}\right)}$ $= 3$	✓ $-\frac{\sqrt{3}}{2}$ ✓ $\frac{-\sqrt{3}}{-1}$ ✓ $-\frac{1}{2}$ ✓Answer ✓ $\frac{\sin\theta}{\cos\theta}$ ✓ $-\frac{\sqrt{3}}{2}$ ✓ $-\frac{1}{2}$ ✓ Answer	(4)

	OR $\frac{\sin^2\theta}{\cos^2\theta}=\left(-\frac{\sqrt{3}}{2}\right)^2\div\left(-\frac{1}{2}\right)^2$ $=3$	✓ $\frac{\sin^2\theta}{\cos^2\theta}$ ✓ $-\frac{\sqrt{3}}{2}$ ✓ $-\frac{1}{2}$ ✓ Answer	(4) (4)
4.1.2	$\cos(2\alpha-\theta)$ $=\cos\left[2(38^\circ)-25^\circ\right]$ $=\cos 51^\circ$ $=0,6$	✓ substitution ✓ $\cos 51^\circ$ ✓ Answer	(3)
4.2	$\text{cosec}^2 60^\circ+\tan^2 45^\circ+\sec 60^\circ$ $=\frac{1}{\sin^2 60^\circ}+\tan^2 45^\circ+\frac{1}{\cos 60^\circ}$ $=\frac{1}{\left(\frac{\sqrt{3}}{2}\right)^2}+(1)^2+\frac{1}{\left(\frac{1}{2}\right)}$ $=\frac{4}{3}+1+2$ $=\frac{13}{3}$ **OR** $\text{cosec}^2 60^\circ+\tan^2 45^\circ+\sec 60^\circ$ $=\frac{1}{\sin^2 60^\circ}+\tan^2 45^\circ+\frac{1}{\cos 60^\circ}$ $=\left(\frac{2}{\sqrt{3}}\right)^2+(1)^2+2$ $=\frac{13}{3}$	✓ $\frac{1}{\sin^2 60^\circ}$ ✓ $\frac{1}{\cos 60^\circ}$ ✓ $\frac{\sqrt{3}}{2}$ ✓ 1 ✓ $\frac{1}{2}$ ✓ Answer ✓ $\frac{1}{\sin^2 60^\circ}$ ✓ $\frac{1}{\cos 60^\circ}$ ✓ $\frac{2}{\sqrt{3}}$ ✓ 1 ✓ 2 ✓ Answer	(6) (6)

4.3	$2\tan(\theta - 45°) = 1$ $\tan(\theta - 45°) = \frac{1}{2}$ $\theta - 45° = 26,57°$ $\theta = 71,57°$	✓ $\tan(\theta - 45°) = \frac{1}{2}$ ✓ $\theta - 45° = 26,57°$ ✓ Answer	(3)
			[20]

QUESTION 5

5.1		f(x) ✓x-intercepts ✓turning points ✓shape g(x) ✓x-intercepts ✓turning points ✓shape	(6)
5.2.1	$\text{Amplitude} = \frac{3-(-1)}{2}$ $= 2$	✓ Answer	(1)
5.2.2	$\text{Period} = 360°$	✓ Answer	(1)
5.3.1	$g(x) - f(x) = 4$ $1-(-3) = 4$ $x = 270°$	✓✓ answer	(2)
5.3.2	$0° \leq x \leq 120°$ or $180° \leq x \leq 240°$ **OR** $x \in [0° ; 120°] \cup [180° ; 240°]$	✓ end points ✓end points ✓ notation	(3)
			[13]

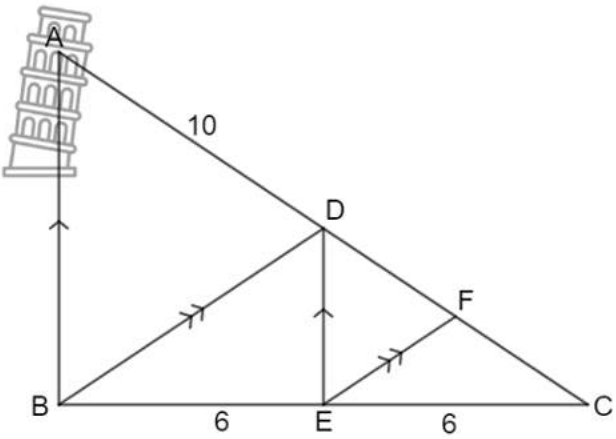
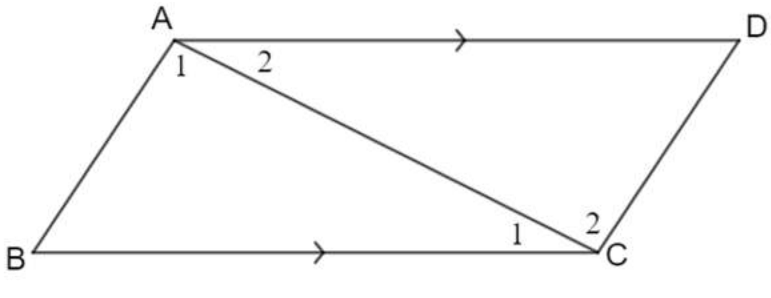
QUESTION 6

6.1	$\cos 2\theta = \frac{x}{2x}$ $\cos 2\theta = \frac{1}{2}$ $2\theta = 60°$ $\therefore \quad \theta = 30°$	✓ $\cos 2\theta = \frac{x}{2x}$ ✓ $\cos 2\theta = \frac{1}{2}$ ✓ $2\theta = 60°$ ✓ Answer	(4)
6.2	$\frac{x}{5} = \cos 30°$ $x = 5\cos 30°$ $\text{ladder} = 2x$ $= 2(5\cos 30°)$ $= 5\sqrt{3}\text{m}$	✓ trig ratio ✓ $x = 5\cos 30°$ ✓ substitution in 2x ✓ Answer	(4)
			[8]

QUESTION 7

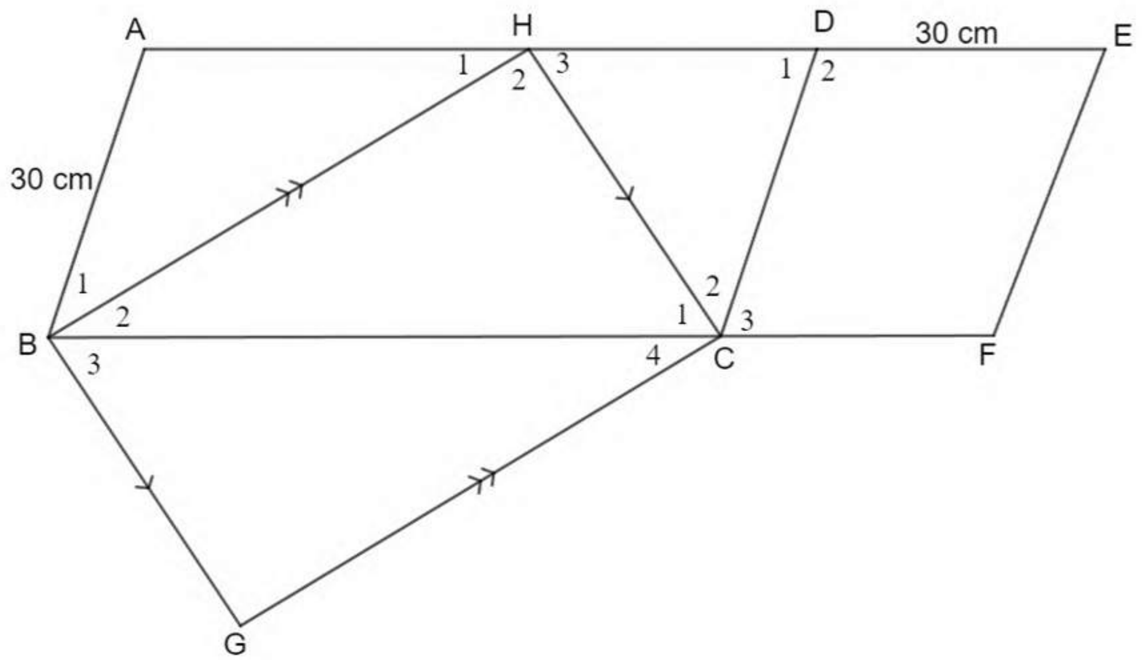
7.1	$r = 25\text{mm}$ = 2,5cm $V = \pi r^2 h$ $250 = \pi(2,5)^2 h$ $h = \frac{250}{19,63}$ $h = 12,736$ cm	✓ r in cm ✓substitution in correct formula ✓ Answer	(3)
7.2	$h_{water} = 0,65 \times 12,736 = 8,034$ $TSA = \pi r^2 + (2\pi r \times h)$ $= \pi(2,5)^2 + [2\pi(2,5) \times 8,034]$ $= 70,11\text{cm}^2$	✓ $h_{water} = 0,65 \times 12,736 = 8,034$ ✓ TSA formula ✓ substitution ✓ Answer	(4)
			[7]

QUESTION 8

			
8.1.1	In $\triangle ABC$ $DC = 10cm$ line through midpt $\parallel$ 2^{nd} side Similarly, in $\triangle BDC$ $FC = 5cm$ line through midpt $\parallel$ 2^{nd} side	✓ S/R ✓ R	(2)
8.1.2	$AB = \frac{16}{5} \times 5$ $= 16cm$ $AC = 20cm$ $\sqrt{16^2 + 12^2} = 20$ $\therefore A\hat{B}C = 90^\circ$ conv Pyth theorem	✓ value of AB ✓ $\sqrt{16^2 + 12^2} = 20$ ✓	(3)
			

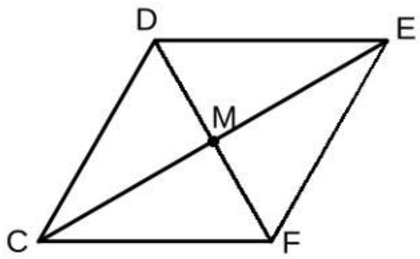
8.2	Consider ΔACD and ΔCAB $\hat{D}=\hat{B}$ (given) $\hat{A}_2=\hat{C}$ (alt $\angle$s, AD $\parallel$ BC) AC is common $\therefore\ \Delta ACD \equiv \Delta CAB$ (AAS) AD=BC ($\equiv\Delta$s) ABCD is a parallelogram (opp sides = and $\parallel$)	✓ S/R ✓ S ✓ R ✓ S/R ✓ R	(5)
			[10]

QUESTION 9



9.1	$A\hat{B}C = 60°$ (given) $B\hat{C}D = 120°$ (co-int $\angle$s, AB $\parallel$ DC) But HC bisects $B\hat{C}D$ $\hat{C}_1 = \hat{C}_2 = 60°$ $\therefore \hat{C}_1 = 60°$ (proved) **OR**	✓ S ✓R ✓ $\hat{C}_1 = \hat{C}_2 = 60°$	(3)

	$A\hat{B}C = 60°$ (given) $\hat{D}_1 = 60°$ (app $\angle$s of a parm) $B\hat{C}D = 120°$ (co-int $\angle$s, AD ∥ BC) But HC bisects $B\hat{C}D$ $\therefore \hat{C}_1 = 60°$ (proved)	✓ S /R ✓ S ✓R	(3)
9.2	BH bisects $A\hat{B}C$ (given) $\therefore \hat{B}_1 = \hat{B}_2 = 30°$ $\hat{B}_2 = \hat{C}_4 = 30°$ (alt $\angle$s, BH ∥ GC) $\hat{C}_1 = \hat{B}_3 = 60°$ (alt $\angle$s, BG ∥ HC) $\Rightarrow G\hat{B}H = 60° + 30° = 90°$ $G\hat{C}H = 60° + 30° = 90°$ $\therefore$ BGCH is a rectangle (BGCH is a Parm with $\angle s = 90°$)	✓ $G\hat{B}H/G\hat{C}H = 90°$ ✓ R	(2)
9.3	$\hat{F} = 120°$ (given) $\hat{C}_1 + \hat{C}_2 = 120°$ (calculated in 9.1) $\therefore \hat{F} = \hat{C}_1 + \hat{C}_2$ DC ∥ EF (corr $\angle$s =) **OR** $\hat{C}_3 = 180° - \hat{C}_1 - \hat{C}_2$ (adj $\angle$s on a str.line) $\hat{C}_3 = 180° - 60° - 60°$ $\hat{C}_3 = 60°$ $\hat{C}_3 + \hat{F} = 60° + 120°$ $= 180°$ $\therefore$ DC ∥ EF (co-int Ðs supplementary)	✓ $\hat{F} = \hat{C}_1 + \hat{C}_2$ ✓ R ✓ $\hat{C}_3 + \hat{F} = 60° + 120°$ ✓ R	(2)
9.4	AD ∥ BC (ABCD is a parm) ADE and BCF are straight lines (given) $\therefore$ DE ∥ CF DC ∥ EF (proven in 9.3) $\therefore$ DCFE is a parm (both pairs of opp sides ∥) DC=30 cm (opp sides of a parm are=) $\therefore$ DC= DE =30 cm **OR**	✓ S ✓R	(2)

	$DE = AB = 30cm$ (given) $DC = AB = 30cm$ (opp sides of a parm) $\therefore DC = DE$ (both = to AB)	✓ S ✓R	(2)
9.5	$DE = DC = 30cm$ (proven in 9.4) $\therefore$ DCFE is a rhombus (adj sides =) **OR**  Construct diagonal CE and consider ΔCDE $\hat{D} = \hat{F} = 120°$ (opp $\angle$s of a parm) $CD = DE = 30cm$ (proven in 9.4) $\therefore D\hat{C}E = D\hat{E}C = 30°$ ($\angle$s opp = sides) $DC \parallel EF$ (proven in 9.3) $\therefore DE = CF = 30cm$ But DC= DE (proven in 9.4) $\therefore DC = CF = 30cm$ (both = DE) Construct diagonal DF and consider ΔCDF $\hat{C}_3 = 60°$ (calculated in 9.3) $C\hat{D}F = C\hat{F}D = 60°$ ($\angle$s opp = sides) consider ΔCDM $D\hat{C}E + C\hat{D}F + C\hat{M}D = 180°$ (sum of $\angle$s in Δ) $30° + 60° + C\hat{M}D = 180°$ $C\hat{M}D = 90°$ $\therefore$ DCFE is a rhombus (diagonals bisect at $90°$)	✓ S ✓ S ✓ R ✓ $C\hat{M}D = 90°$ ✓S ✓R	(3) (3)
			[12]

TOTAL MARKS = 100