Name and Surname : .....

Grade/Class : 10/..... **Mathematics Teacher** : Solns

MATHEMATICS
November Paper 2

ANSWER BOOK

100

06 November 2023

QUESTION 1

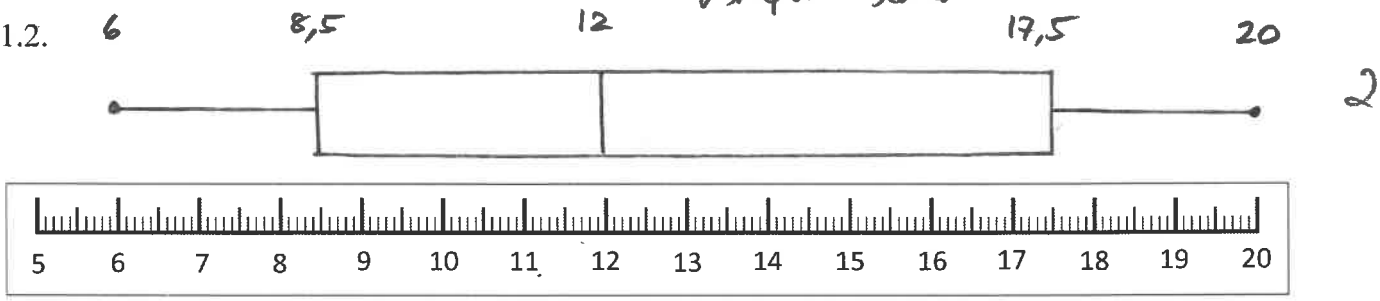
1.1. 6 ; 7 ; 10 ; 11 ; (12) ; 14 ; 17 ; 18 ; 20 $n = 9$

M

$\uparrow Q_1$ $\uparrow Q_2$

1.1.1.	min 6	
	Q_1 $\frac{10+7}{2} = 8,5$	
	M 12	
	Q_3 $\frac{17+18}{2} = 17,5$ ✓	
	max 20	1

1.1.2. ✓shape ✓scaled



2

1.1.3.	S-IQR = $\frac{17,5 - 8,5}{2}$	
	= $\frac{9}{2}$ ✓ 4,5	1

1.2.

x	Frequency	
5	17	17
10	13	30
15	21	51
20	11	62
25	12	74

$T_1; \ldots; T_{74}$

1.2.1	$M = T_{\frac{1}{2}(1+74)} = T_{37,5}$	
	$T_{38}; \ldots; T_{74}$	
	$Q_3 = T_{\frac{1}{2}(38+74)} = T_{56}$ ✓	
	$= 20$ ✓	2
	ans only 1/2	
1.2.2.	$D_3 = T_{\frac{3}{10}(1+74)} = T_{22,5}$ ✓	
	$= \frac{T_{22} + T_{23}}{2}$	
	$= \frac{10 + 10}{2}$	
	$= 10$ ✓	2
	ans only 1/2	

1.3.

Age (in years)	Number of athletes	
$0 < x \leq 10$	12	-12
$10 < x \leq 20$	30	-42
$20 < x \leq 30$	18	-60
$30 < x \leq 40$	12	-72

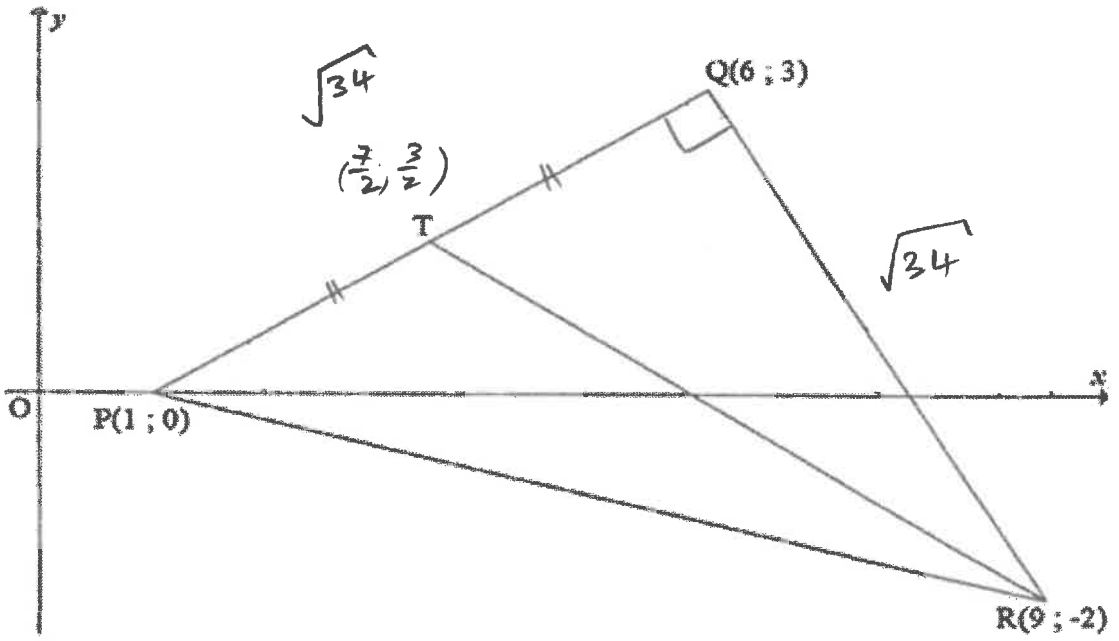
$T_1; \cdots; T_{72}$

1.3.1.	Modal class : $10 < x \leq 20$ ✓	1
1.3.2.	$\bar{x} = \frac{5\times12 + 15\times30 + 25\times18 + 35\times12}{72}$ ✓ num ✓ den	
	$= \frac{1380}{72}$	
	$= 19,17$ ✓	3
	. ans only 3/3	
	. if no x by f in num b/d 0/3	

1.4.	Total marks $25\times58 = 1450$ ✓	
	Correction $-18+81 = 1513$ ✓	
	$\bar{x}_{new} = \frac{1513}{25}$	
	$= 60,52\ \%$ ✓	3

QUESTION 2

2.



2.1.1.	$x_T = \frac{1+6}{2}$ $\quad y_T = \frac{0+3}{2}$	
	$= 2$ $\quad = \frac{3}{2}$	
	$\therefore T(\frac{7}{2}; \frac{3}{2})$. not coord max ½	2
2.1.2.	$m_{QR} = \frac{-2-3}{9-6} = -\frac{5}{3}$ ✓	
	$y = -\frac{5}{3}x + c$	
	Sub Q(6; 3)	
	$3 = -\frac{5}{3}(6) + c$ ✓	
	$13 = c$	
	$\therefore y = -\frac{5}{3}x + 13$ ✓	3

2.2. $m_{PQ} = \frac{3-0}{6-1} = \frac{3}{5}$ ✓

$\therefore m_{QR} \times m_{PQ} = -\frac{5}{3} \times \frac{3}{5}$ ✓

$= -1$ ✓

$\therefore$ $PQ \perp QR$ 3

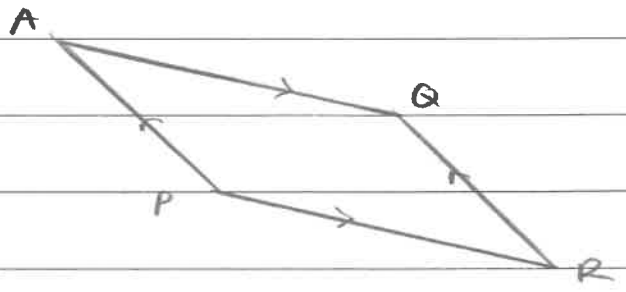
2.3.1. $PQ = \sqrt{(3-0)^2 + (6-1)^2} = \sqrt{34}$ 2

2.3.2. $QR = \sqrt{(3-(-2))^2 + (6-9)^2} = \sqrt{34}$ ✓

area $\triangle PQR = \frac{1}{2}\sqrt{34} \cdot \sqrt{34}$ ✓

$= 17 \text{ u}^2$ ✓ 3

2.4



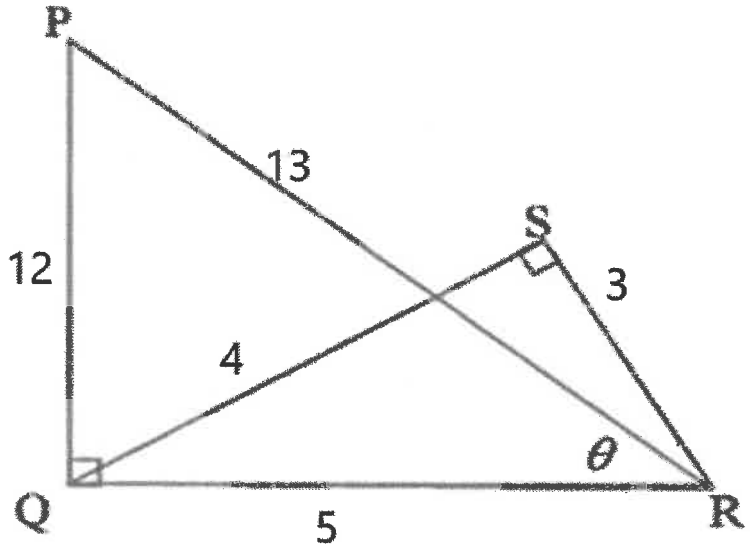
$R(9;-2) \xrightarrow[2\uparrow]{8\leftarrow} P(1;0)$

$Q(6;3) \xrightarrow[2\uparrow]{8\leftarrow} A(-2;5)$ 2

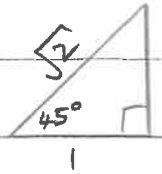
✓ ✓

QUESTION 3

3.1.

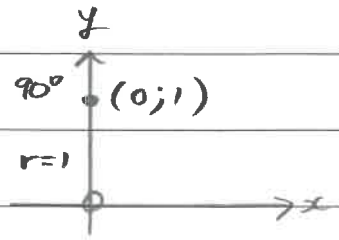


3.1.1.	$\sin S\hat{Q}R = \frac{3}{5}$ ✓ $\frac{o}{h}$	1
3.1.2.	$\sec\theta = \frac{13}{5}$ ✓ $\frac{h}{a}$	1
3.1.3.	$\hat{P} + \theta + 90° = 180°$ sum ^'s in $\Delta = 180°$	
	$\hat{P} = 90° - \theta$	
	$\therefore \tan(90° - \theta) = \tan\hat{P}$	
	$= \frac{5}{12}$ ✓ $\frac{o}{a}$	1
3.2.	$\sin 45° = \frac{1}{\sqrt{2}}$ ✓ $\frac{o}{h}$	
	$\cos 45° = \frac{1}{\sqrt{2}}$ ✓ $\frac{a}{h}$	

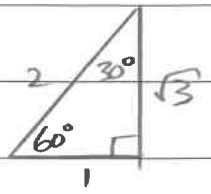


$\cot 90° = \frac{0}{1}$ $\quad \frac{x}{y}$

$= 0$ ✓



$\tan 30° = \frac{1}{\sqrt{3}}$ ✓ $\quad \frac{0}{a}$



$\therefore \quad \frac{\frac{1}{\sqrt{2}} + 0}{\frac{1}{\sqrt{2}}\left(\frac{1}{\sqrt{3}}\right)^2} = \frac{\frac{1}{\sqrt{2}}}{\frac{1}{\sqrt{2}} \cdot \frac{1}{3}} = 1 \times \frac{3}{1} = 3$ ✓ → 5

(1)

- no diagrams 0/5

3.3.1. $2\tan x = 3$ — 1 dp — 3.3.1 – 3.3.3. NB =

$\tan x = 3/2$ ✓ isolate

$x = \tan^{-1}\left(\frac{3}{2}\right)$

$= 56,3°$ ✓ → 2

3.3.2. $\sin 2(x+30°) = \tan 2565°$

let $A = 2(x+30°)$

$\sin A = 1$ ✓

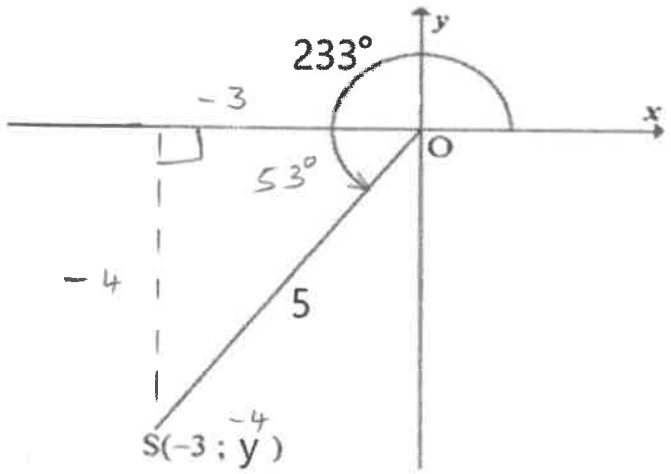
$A = \sin^{-1}(1)$

$2(x+30°) = 90°$ ✓

$x = 15°$ ✓ → 3

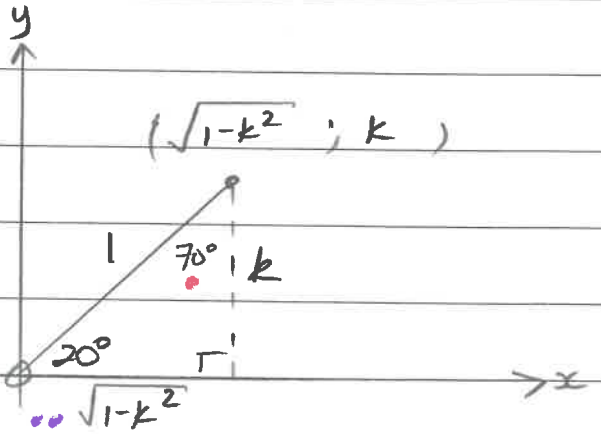
3.3.3.	$\frac{\text{Cosec } x}{2} = 3$	
	$\text{Cosec } x = 6$ ✓	
	$\frac{1}{\sin x} = 6$	
	$\frac{1}{\sin x} = \frac{6}{1}$	
	$6 \sin x = 1$ cross multiply	
	$\sin x = \frac{1}{6}$ ✓	
	$x = \sin^{-1}\left(\frac{1}{6}\right)$	
	$= 9{,}6^\circ$ ✓	3

3.4.

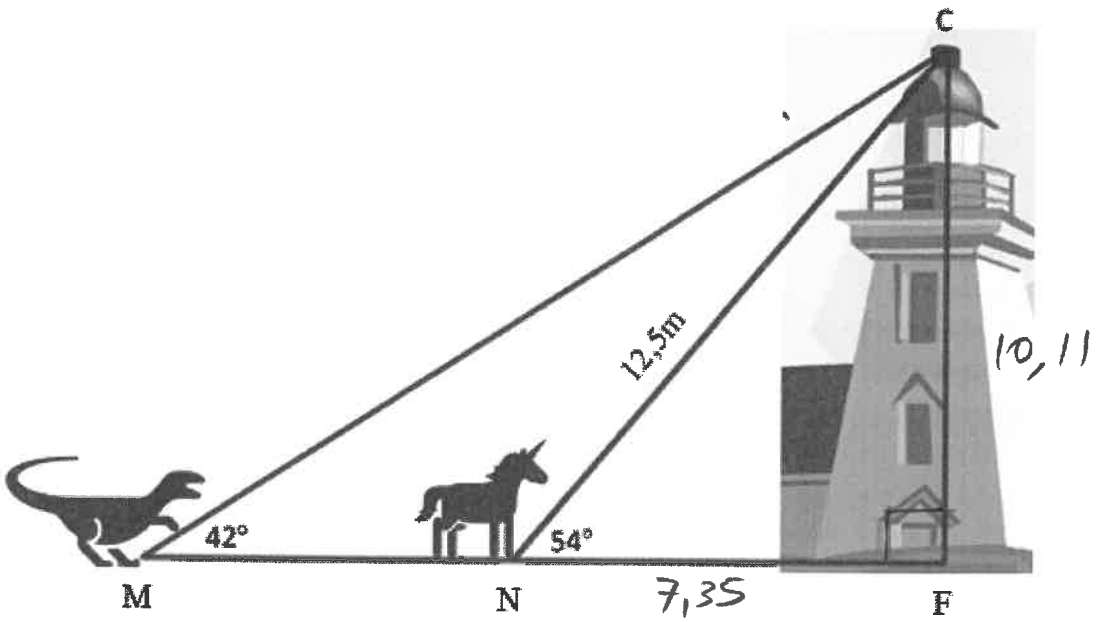


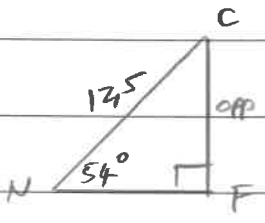
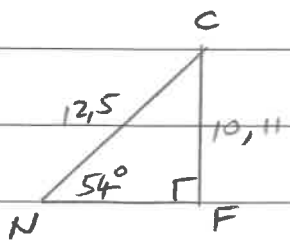
∠'s on str line = 180°

3.4.1.	$(-3)^2 + y^2 = (5)^2$ Pythag	
	$9 + y^2 = 25$	
	$y^2 = 16$	
	$y = \pm 4$ reject +	
	$\therefore y = -4$ ✓	1
3.4.2.	$\sin 233° = \frac{-4}{5}$ ✓ $\frac{y}{r}$	1
3.4.3	$\cos 53° = \frac{3}{5}$ ✓ $\frac{a}{h}$ NOT $\frac{x}{r}$!! NB +	1

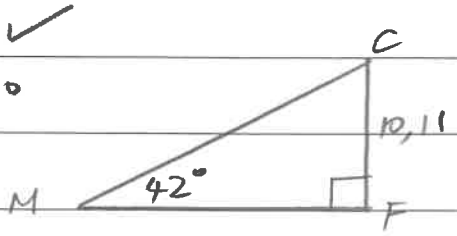
3.5.	$\sin 20° = k$	
3.5.1.	$\sin 20° = \frac{k}{1}$ $\frac{y}{r}$	
	• sum $\angle$'s in $\Delta = 180°$ •• pythag	
	y, r ✓ x ✓	2
3.5.2.	(a) $\tan 20° = \frac{k}{\sqrt{1-k^2}}$ ✓ $\frac{y}{x}$	1
	(b) $\cos 70° = \frac{k}{1}$ ✓ $\frac{a}{h}$ $= k$	1

3.6.



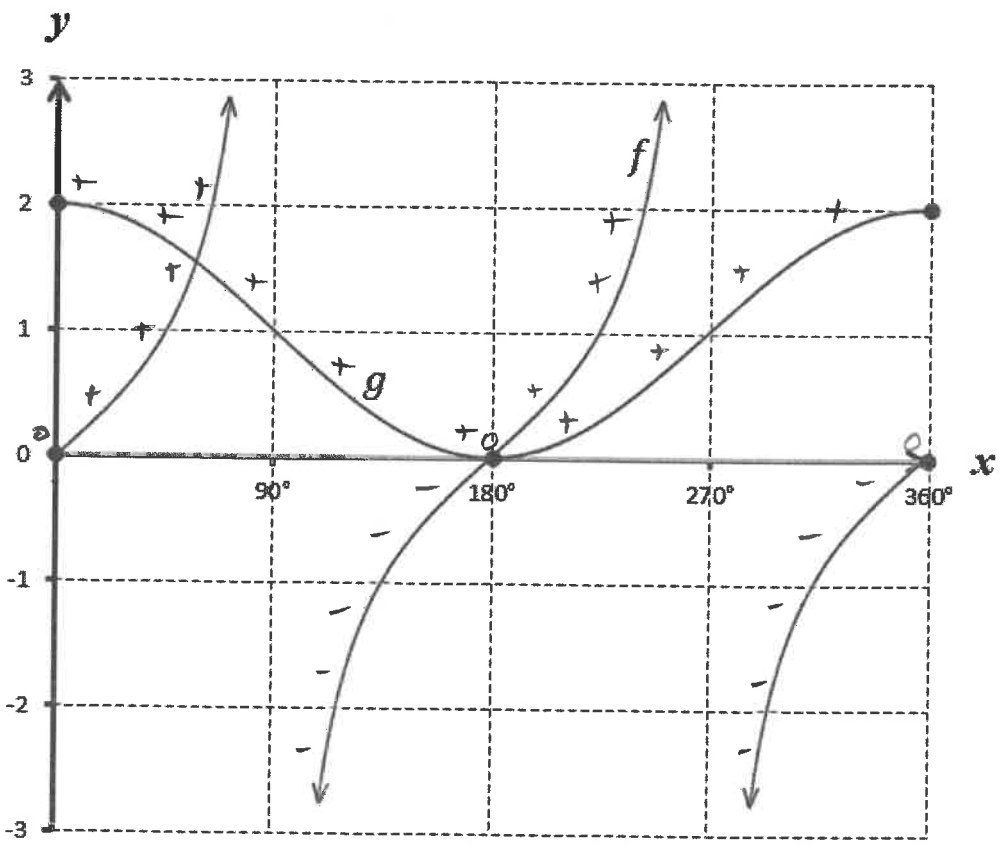
3.6.1.	$\frac{CF}{12,5} = \sin 54° \checkmark$ $CF = 12,5 . \sin 54°$ $= 10,11 \text{ m} \checkmark$ 	2
3.6.2.	$\frac{NF}{12,5} = \cos 54° \checkmark$ $NF = 12,5 . \cos 54°$ $= 7,35 \text{ m} \checkmark$ 	2
	(OR)	
	$NF^2 + 10,11^2 = 12,5^2$ Pythag	
	$NF^2 = 54,0379$	
	$NF = 7,35 \text{ m}$	

3.1.3.	$\frac{10,11}{MF} = \tan 42^\circ$ ✓	
	$10,11 = MF \cdot \tan 42^\circ$	
	$\frac{10,11}{\tan 42^\circ} = MF$	
	$11,22\ldots =$ ✓	
	$\therefore MN = 11,22\ldots - 7,35$	
	$= 3,88$ m ✓	3
	• no penalty if units omitted	



QUESTION 4

4.1.

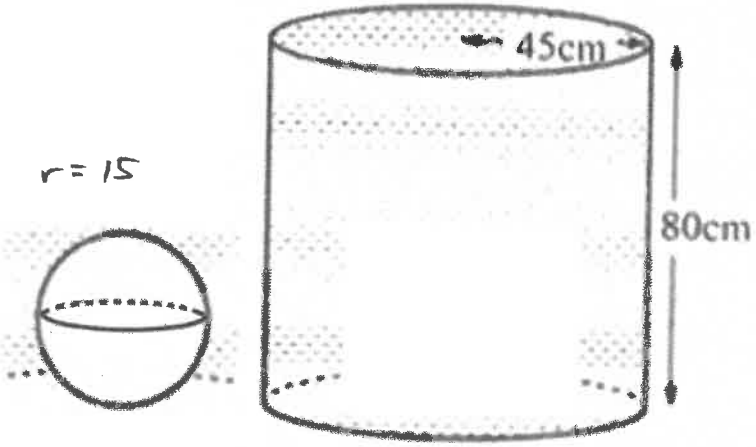


4.1.1.	(a) $x = 90°$ or $x = 270°$ ✓ ✓	2
	(b) Amp of $g = 1$ ✓	1
	(c) R_g : $y \in [0; 2]$ $3g$: $y \in [0; 6]$ $+2$: $y \in [2; 8]$ ✓	1

4.1.2	(a) $g(360°)$ y_g when $x = 360°$ $= 0$ ✓	1
	(b) $f(x) \cdot g(x) \leq 0$ $y_f \cdot y_g \leq 0$ $\therefore x = 0°$ or $x \in (90°; 180°]$ or $(270°; 360°]$ ✓A ✓A ✓A NB Accuracy marks!	3
4.1.3	g: $y = \cos x + 1$ refl x $-y = \cos x + 1$ ✓ $y = -\cos x - 1$ ✓ ans only 2/2	2

QUESTION 5

5.1.

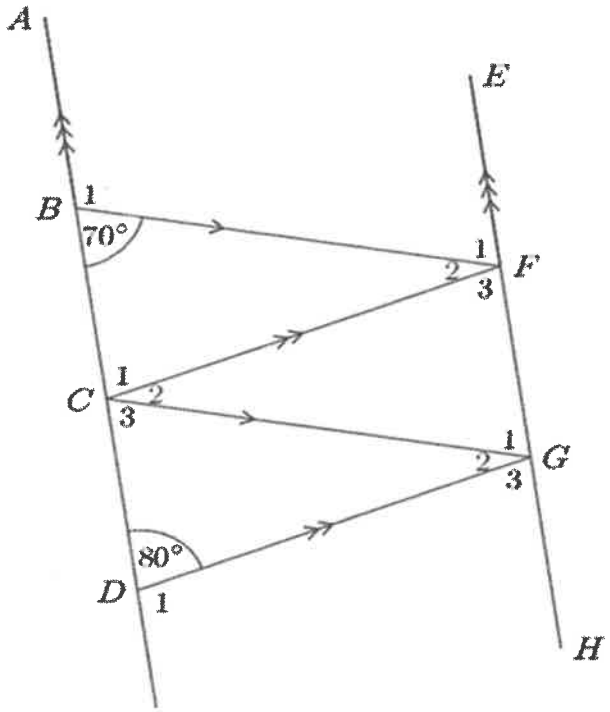


5.1.1.	$TSA = 4\pi r^2$	
	$= 4\pi(15)^2$ ✓	
	$= 900\pi$	
	$= 2827,43\ cm^2$ ✓	2
5.1.2.	$V_{sphere} = \frac{4}{3}\pi r^3$	
	$= \frac{4}{3}\pi(15)^3$ ✓	
	$= 4500\pi$ 14 137,16...	
	$V_{can} = \pi r^2 h$	
	$= \pi(45)^2 . 80$ ✓	
	$= 162\,000\pi$ 508 938,00...	
	$\therefore V_{water} = 162\,000\pi - 4500\pi$	
	$= 494\,800,84\ cm^3$ ✓	3

5.2.	$E = \frac{1}{2}mv^2$	$E_2 = \frac{1}{2} m_2 V_2^{\,2}$	
	$= 64$	$= \frac{1}{2}(3m)\left(\frac{1}{4}v\right)^2$	
		$= \frac{1}{2} \cdot 3m \cdot \frac{1}{16} v^2$	
		$= \frac{3}{16} \cdot \frac{1}{2} mv^2$	
		$= \frac{3}{16} \cdot 64$	
		$= 12$ ✓	2
		→	

QUESTION 6

6.1.

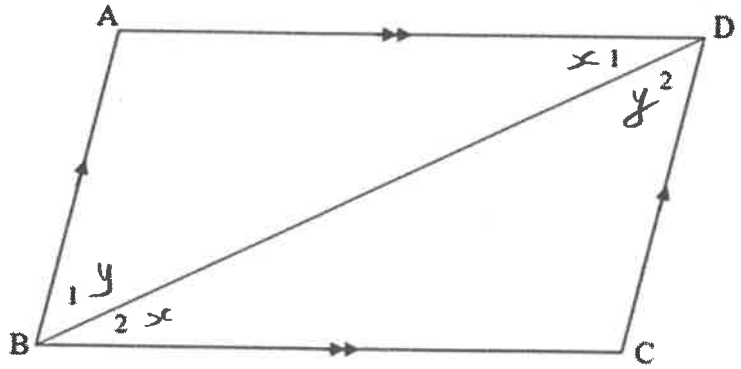


STATEMENT	REASONS
$\hat{B}_1 = B\hat{C}G$	6.1.1. corr ^'s =, BF ∥ CG ✓
$\hat{F}_1 = 70°$	6.1.2. alt ^'s =, AD ∥ EH ✓
$\hat{C}_2 + \hat{F}_3 + \hat{G}_1 = 180°$	6.1.3. sum ^'s in Δ = 180° ✓
$\hat{G}_2 + \hat{G}_3 = \hat{C}_2 + \hat{F}_3$	6.1.4. ext ^ Δ ✓
$\hat{F}_2 + \hat{F}_3 + 70° = 180°$	6.1.5. coint ^'s = 180°, AD ∥ EH ✓ 5

6.2.	trapezium ✓	1

QUESTION 7

7.1.



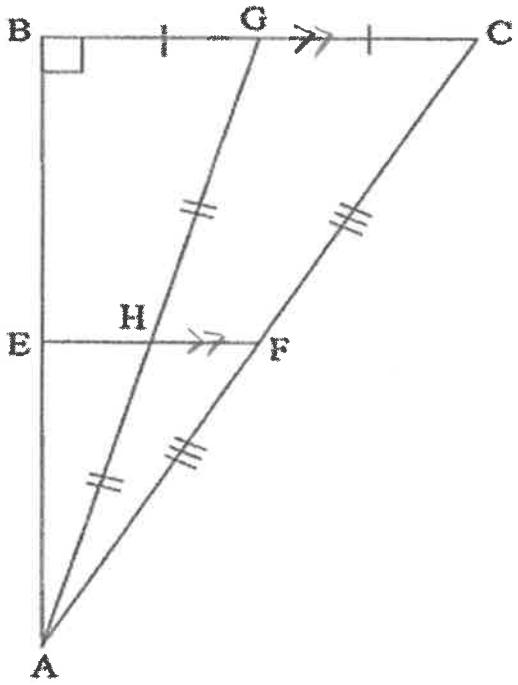
In Δ's BAD, DCB

1. $BD = BD$ ✓SR Common
2. $\hat{D}_1 = \hat{B}_2$ ✓SR alt $\angle$'s =, AD ∥ BC
3. $\hat{B}_1 = \hat{D}_2$ ✓SR alt $\angle$'s =, AB ∥ CD

$\therefore \Delta BAD \equiv \Delta DCB$ ✓SR AA Corr S

$\therefore AD = BC$ ✓R $\Delta B\hat{A}D \equiv \Delta D\hat{C}B$ 5

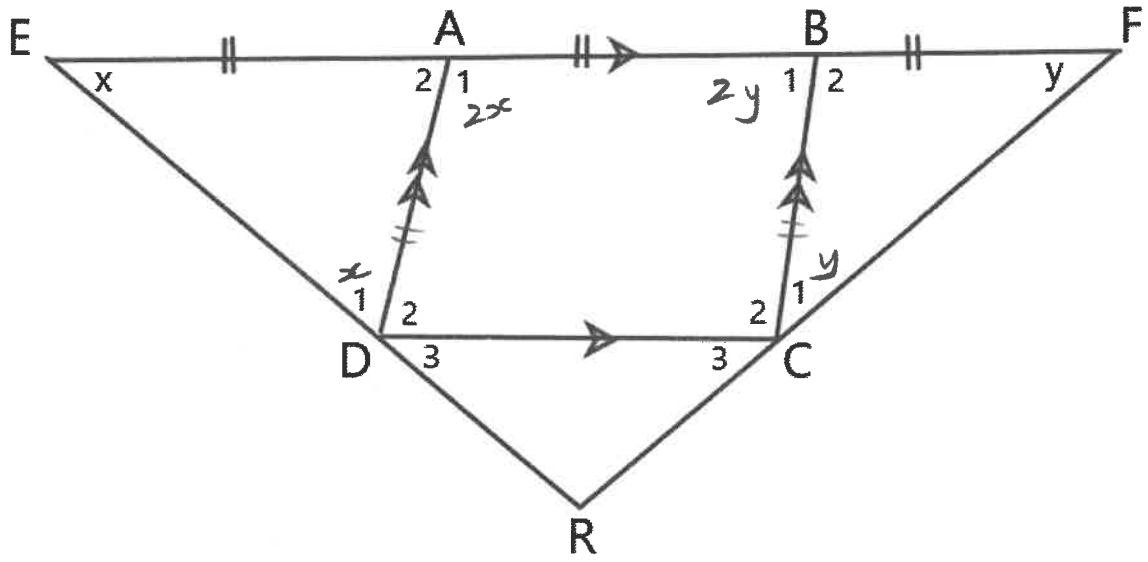
7.2.



7.2.1	HF ∥ BC ✓S ✓R midpt thm	
	∴ BE = EA ✓R line through midpt ∥ to 2nd side	3
7.2.2.	area ΔABG = area Δ AGC	
	✓R: same base BG = GC (given)	
	✓R: same height common vertex A	2

QUESTION 8

8.



Let $\hat{E} = x$ and $\hat{F} = y$.

8.1	$EA = AB$ given	
	$AB = AD$ ✓SR sides rhomb =	
	$\therefore EA = DA$ both = AB	1
8.2.	$\hat{D}_1 = x$ ✓SR ^'s opp = sides	
	$\hat{A}_1 = 2x$ ✓SR ext ^ Δ	
	Similarly, $\hat{B}_2 = 2y$ ✓S	
	$2x + 2y = 180°$ ✓SR coint ^'s = 180°, AD∥BC	
	$x + y = 90°$ ✓S ÷ 2	
	$x + y + E\hat{R}F = 180°$ ✓SR sum ^'s in Δ = 180°	
	$\therefore 90° + E\hat{R}F = 180°$	
	$\therefore E\hat{R}F = 90°$	6

ADDITIONAL SPACE