MATHEMATICS
PAPER 1 2023

MARKING SCHEME

1.	$\sqrt[3]{\frac{119\times256}{68\times7\times1000}}$ $\sqrt[3]{\frac{64}{1000}}=\frac{4}{10}$ $=\frac{2}{5}$	M1 M1 A1	✓ removal of decimal and simplification ✓cube root C.A.O.
		3	
2.	Share of elder boy $=\frac{4}{9}x$ Share of younger boy$=\frac{2}{5}\left(\frac{5}{9}x\right)$ $=\frac{2}{9}x$ Girls share = $x-\left(\frac{4}{9}x+\frac{2}{9}x\right)$ $=\frac{3}{9}x$ $=\frac{1}{3}x$ % share of younger boy to girls share $=\left(\frac{2}{9}x\div\frac{1}{3}x\right)\times100$ $=\frac{2}{9}\times\frac{3}{1}\times100$ $=66.67\%\ or\ 66\frac{2}{3}\%$	B1 B1 M1 A1	
		4	

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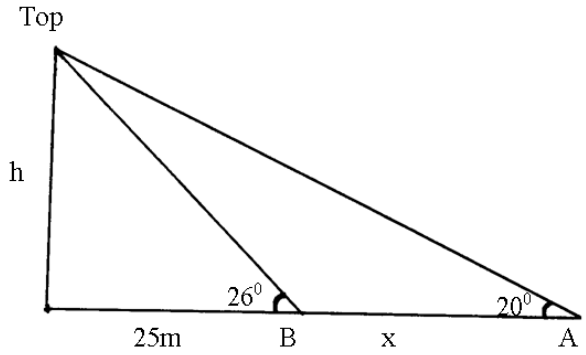
3.	 $h = 25\tan 26^0$ $= 12.1933$ $\frac{h}{25+x} = \tan 20^0$ $h = (25+x)\tan 20^0$ $12.19 = 25\tan 20^0 + x\tan 20^0$ $x = \frac{12.1933 + 25\tan 20^0}{\tan 20^0}$ $= \frac{12.1933 - 9.0993}{\tan 20^0}$ $= \frac{3.094}{\tan 20^0}$ $= 8.501m$	B1 M1 A1	✓ height for equation in x ✓ solution
		3	
4.	$5<2x^2<35$ $2.5<x^2<17.5$ $1.581<x<4.183$ 2,3,4	B1 B1 B1	Removal of fraction or equivalent ✓Square roots ✓ integral values
5.	Overtaking speed (Relative speed) =80km/h-40km/h=40km/h Distance= 60m+20m =80m $\frac{80}{1000} = 0.08km$ Time take = $0.08 \times \frac{1}{40}$ =0.002hrs =7.2seconds	 M1 M1 A1	 ✓ distance Expression for time
		3	

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6.	Let no. be XY $\therefore$ product XY =20----------(i) Reversed no YX $\Rightarrow$(10y+x)-(10x+y)=9----------(ii) $\Rightarrow$9y-9x=9 y-x=1 $\Rightarrow$y=1+x Substitution in (i) we've x(1+x)=20 $x+x^2=20$ $x^2+x-20=0$ $x^2+5x-4x-20=0$ x(x+5)-4(x+5)=0 (x+5)(x-4)=0 $\therefore$ x=-5 or x=4	M1 M1	✓ Formation of the two equation ✓solving of any unknown
7.	(a) $(x-5)^2+(y-5)^2=5^2$ $x^2-10x+25+y^2-10y+25=25$ $x^2-10x+y^2-10y+25=0$ (b) Grad PQ= $\frac{8-5}{7-5}=\frac{3}{2}$ (c) grad of the tangent at Q = $\frac{-2}{3}$ Let (x,y) be any other point on it $\Rightarrow \frac{y-8}{x-7}=\frac{-3}{2}$ $3y-24=-2x+14$ $2x+3y=38$	B1 B1 M1 A1	
		4	
8.	Area of A = ½ ×4×15=30cm^2 Area of B = ½ QR×15 ½ QR×15=30 QR=4cm Area of C= ½ ST×PR = ½ ST×8=30 ST=7.5cm $PT^2+PR^2=TR^2$ $22.5^2+8^2=X^2$ $X=\sqrt{570.25}$ $=23.88cm$	B1 B1 M1 A1	
		4	
9.	(2500×5)+270(480-30×5) =SH. 101,600	M1 A1	
		2	

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10.	$I=\frac{PRT}{100}$ $=\frac{90,000\times13\times5}{100\times2}$ $=Sh.29,250$ A =(90,000+29,250) =SH. 119,250	M1 A1 B1	
		3	
11.	$3^{2(t+1)}+3^{2t}=30$ $3^{2t}\,.\,3^2+3^{2t}=30$ $3^{2t}(3^2+1)=30$ $3^{2t}\times10=30$ $3^{2t}=3^1$ $2t=1$ $t=½$	M1 M1 A1	
		3	
12.	$\frac{dy}{dx}=2x-2$ $2x-2=4$ $x=3$ $y=3^2-2(3)+6$ $=9-6+6$ $=9$ $\therefore$ point is (3,9)	M1 A1	
		2	
13.	Let 50 shilling notes = x And 20 shilling coins = y $\Rightarrow$ x=3y----------(i) 50x+20y=3400----------(ii) Substitute (i) in (ii) 50(3y)+20y=3400 150y+20y=3400 170y=3400 y=20 x=3(20) x=60	M1 M1 A1	Formation of both equations ✓elimination of one unknown Both ✓
		3	
14.	45×10=450 45×4=180 Remaining day =270 No. of days $=\frac{270}{30}$ =9 days	M1 M1 A1	
		3	

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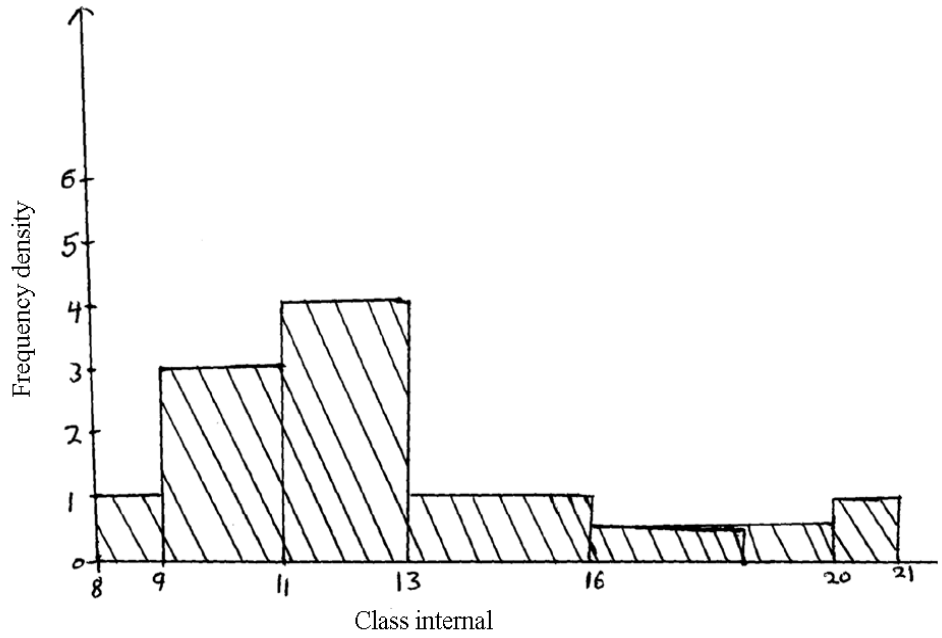
15.		B1 B1 B1	✓Frequency density ✓bars
		3	
16.	$\begin{pmatrix} 2 & -1 \\ -3 & 2 \end{pmatrix}$ $\begin{pmatrix} 2 & 1 \\ 3 & 2 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 21 \\ 34 \end{pmatrix}$ $\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 2 & -1 \\ -3 & 2 \end{pmatrix}\begin{pmatrix} 21 \\ 34 \end{pmatrix}$ $= \begin{pmatrix} 8 \\ 5 \end{pmatrix}$	B1 M1 M1 A1	
		4	

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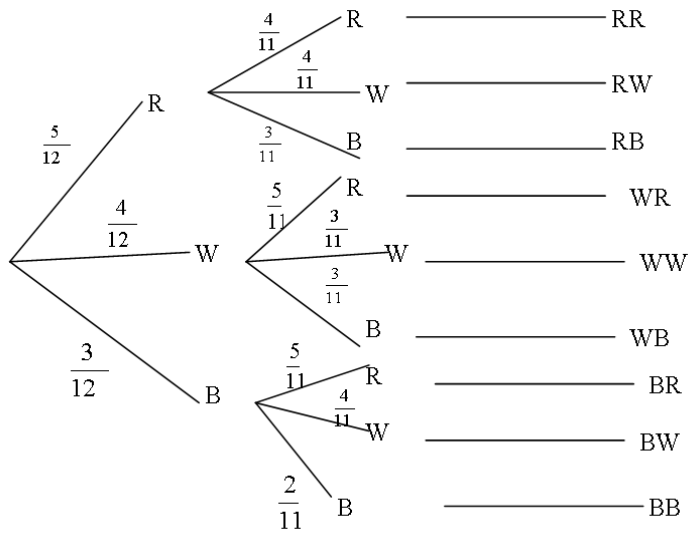
17.		B2 B1	
	(b) (i) P(RR) or P(WR) or P(BR) $= \frac{5}{12}\times\frac{4}{11}+\frac{4}{12}\times\frac{5}{11}+\frac{3}{12}\times\frac{5}{11}$ $= \frac{5}{33}+\frac{5}{33}+\frac{5}{44}$ $= \frac{5}{12} or 0.4167$	M1 A1	
	(ii) P(RR) or P(WW) or P(BB) $= \frac{5}{12}\times\frac{4}{11}+\frac{4}{12}\times\frac{3}{11}+\frac{3}{12}\times\frac{2}{11}$ $= \frac{5}{33}+\frac{1}{11}+\frac{1}{22}$ $= \frac{19}{66} or 0.2879$	M1 A1	
	(iii) P(RB) or P(WB) or P(BR) or B(BW) or P(BB) $= \frac{5}{12}\times\frac{3}{11}+\frac{4}{12}\times\frac{3}{11}+\frac{3}{12}\times\frac{5}{11}+\frac{3}{12}\times\frac{4}{11}+\frac{3}{12}\times\frac{2}{11}$ $= \frac{5}{44}+\frac{1}{11}+\frac{5}{44}+\frac{1}{11}+\frac{1}{22}$ $= \frac{5}{11} or 0.4545$	M1 M1 A1	
		10	

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18.	(a) < STQ= < PQS = 28^0(angle in alternate segment) (b) < TQU = $\frac{180^0 - 54^0}{2} = 63^0$ (base angles of isosceles triangles) (c) < TQS =63^0-28^0=35^0(< TUQ is alternate to <PQT=63^0) (d) < UOQ =54^0×2=108^0(angle subtended at centre is twice that at circumference by same chord UQ) ∴ Reflect < UOQ=360^0-108^0=252^0 (e) < TQR=< TSQ = 180^0-(28^0+35^0) = 117^0 (angle in alternate segment are equal)	B1 B1 B1 B1 B1 B1 B1 B1 B1 B1	Angle Reason Angle Reason Reason Angle Angle Reason NB:Accept Alternative reasons which are correct.
		10	
19.	$a)\frac{x-3}{5}+2\left(\frac{2x}{5}\right)=\frac{9x-15}{5}$ $\frac{x+3}{5}+2\left(\frac{2x}{5}\right)=\frac{9x+15}{5}$ $\left(\frac{9x-15}{5}\right)\left(\frac{9x+15}{5}\right)=315$ $x^2=\frac{8100}{81}$ $9x^2-15^2=7875$ $x^2=100$ $x=\sqrt{100}$ $=10$ b) Dancing floor area = (10-3)(10+3) = 91 Total floor area =15×21=315 Carpeted margin Area =315-91=224m^2 c) 750×224=sh 168,000	M1 M1 M1 M1 A1 M1 M1 A1 M1A1	For the two expressions For equality the two expressions Removal of fractions and forming quadratic equation
		10	

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20.	$(a)\quad \frac{5\times 25+2\times 30+45\times 1}{8}=28.75$ $\text{Pr}ofit \qquad 28.75\frac{\times 20}{100}=sh.5.75$ $(b)\ (i)\quad New\ \text{Pr}ice=\frac{28.75}{100}\times 110\times\frac{115}{100}=36.40$ $(ii)\quad \frac{28.75\times 110}{100}=31.60$ $New\ \text{Pr}ofit\ \frac{45-31.60}{31.60}\times 100$ $=\frac{13.4}{31.60}\times 100$ $=42.41\%$	Ml A1 Ml Al M1 M1 A1 M1 M1 A1	
21.	$(a)(i)\ a=\frac{12-0}{10}m/s^2$ $=\frac{12}{10}$ $=1.2m/s^2$ $(ii)\frac{0-12}{-1.5}=\frac{-12}{-1.5}$ $=8\text{sec}$	M1 A1 M1 A1	

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	(b)	B2	

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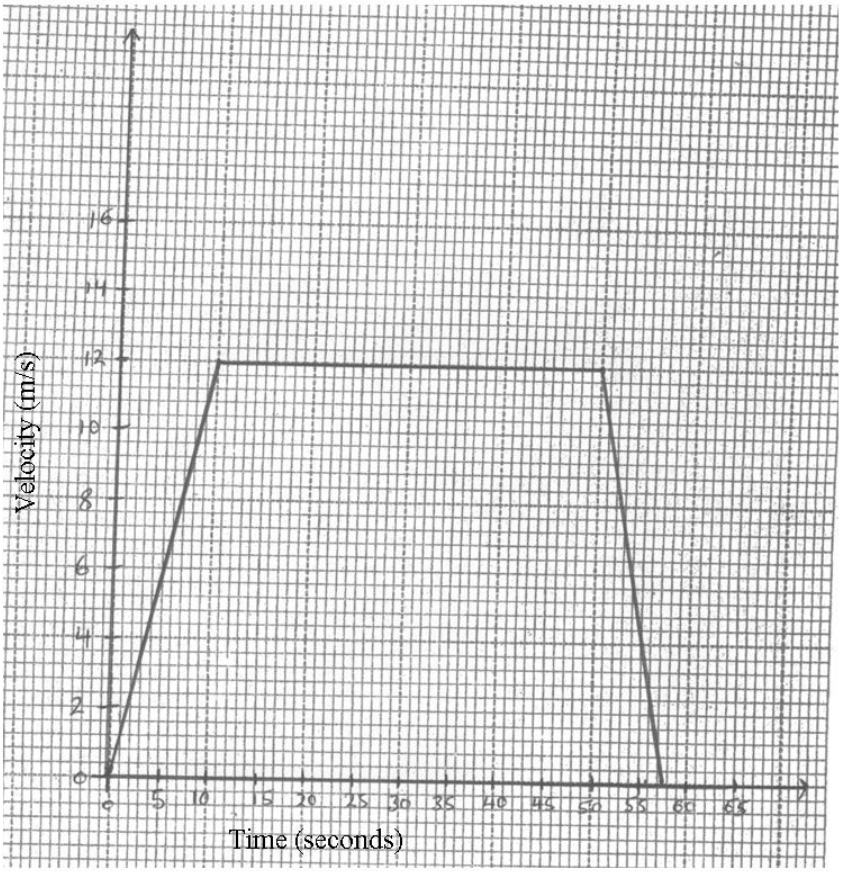

M1
A1

$(i)\ dis\tan ce = \frac{1}{2}\times 12\times(58\times 40)$

$= 588m$

(ii) 1st 15 seconds

M1

$dist = \frac{1}{2}\times 10\times 12 + 5\times 12$

A1

$= 120m$

$\% = \frac{120}{588}\times 100$

$= 20.41\%$

		10	

22.	(a)		

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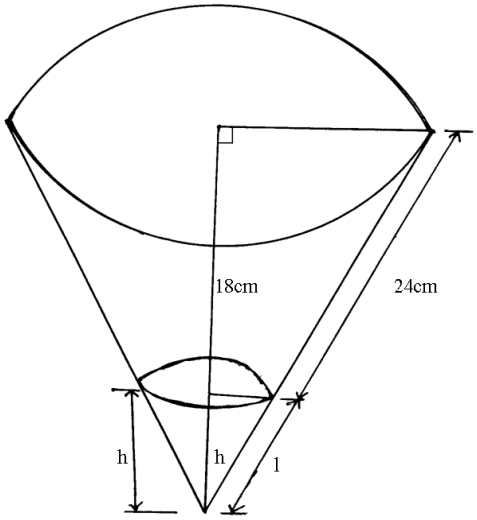
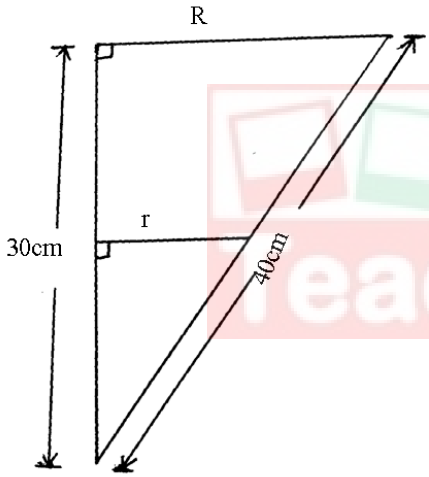


$$\frac{h}{h+18}=\frac{2}{5}$$

$L=12cm$ B1

$$\frac{l}{l+24}=\frac{2}{5}$$

$l=16cm$ B1



$R^2=40^2-30^2$

$R=\sqrt{700}$

$=26.46cm$

$r=\frac{2}{5}\times 26.46cm$ B1

$=10.584cm$ M1

$Volume=\frac{1}{3}\times 3.142\times 26.46^2\times 30-\frac{1}{3}\times 3.142\times 10.584\times 12$ A1

$=(21998.1-1407.9)cm^3$ M1

$=20,590.2cm^3$ A1

	(b) Curved surface area		

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	= 3.142×26.46×40-3.142×10.584×16 =(3325.5-532.08)cm^2 = 2793.42cm^2	M1M1 A1	
		10	
23.	(a) -(x^2-2xy+y^2) -(x^2-xy-xy+y^2) -x(x-y)-y(x-y) -(x-y)(x-y) -$(x-y)^2$ = -$(3)^2$ = -9 (b) $9x^2$+3xy+3xy+y^2 3x(3x+y)+y(3x+y) (3x+y)(3x+y) = $(3x+y)^2$ = 17^2 = 289 (c) $3x^2$-3xy+xy-y^2 3x(x-y)+y(x-y) (x-y)(3x+y) = 3(17) =51 (d) numerator $3x^2$-3xy-xy+y^2 3x(x-y)-y(x-y) (x-y)(3x-y) Denominator : (3x+y)(3x-y) $\frac{(x-y)(3x-y)}{(3x+y)(3x-y)}$ $=\frac{x-y}{3x+y}$ $=\frac{3}{17}$	M1 M1 A1 M1 M1 A1 M1 M1 M1 A1	
		10	

24.	(a)		

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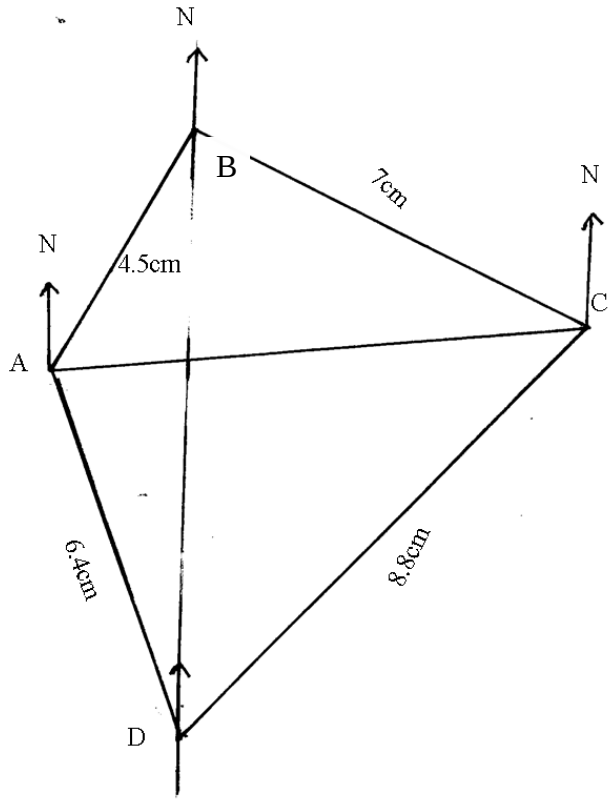

B1

B1

B1

B1

(b) (i) $N20^0W$ B1

(ii) 542^0W B1

B1

(c) (i) 6.4×100km=640km B1

(ii) 8.8×100km=880km

(d) (i) 300^0 B1

(ii) 268^0 B1

10

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