MATHEMATICS ALT A PAPER

MARKING SCHEME.

		MRKS	C
1.	Volume of water in a cylinder in 1 second $\left(\frac{22}{7} \times 0.014^2 \times 2\right) 1000 = 1.232$ litres Time $= \frac{18480}{1.232} = 15000$ seconds $\frac{15000}{3600} = \frac{4}{240}$ hours. $= 4\frac{1}{6}$ hours.	M1 M1 A1	Re in F M
		03	
2.	$a = 2 \quad r = 2$ n^{th} term $= ar^{n-1}$ 2^{nd} last term $= ar^{n-2}$ $2 \cdot 2^{n-1} \times 2 \cdot 2^{n-2} = 512$ $4 \cdot 2^{2n-3} = 512$ $2^{2n-3} = 128$ $2^{2n-3} = 2^7 \quad \therefore 2n = 10$ $n = 5.$	M1 M1 A1	Pr an Si ✓
		03	
3.	$(-30)^2 = 4 \times a \times 9$ $36a = 900$ $a = 25.$	M1 A1	Co Mu ✓

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4. $y = \dfrac{bx}{\sqrt{cx^2 - a}}$

$y^2 = \dfrac{b^2x^2}{cx^2 - a}$

$y^2cx^2 - b^2x^2 = y^2a$

$x^2(y^2c - b^2) = y^2a$

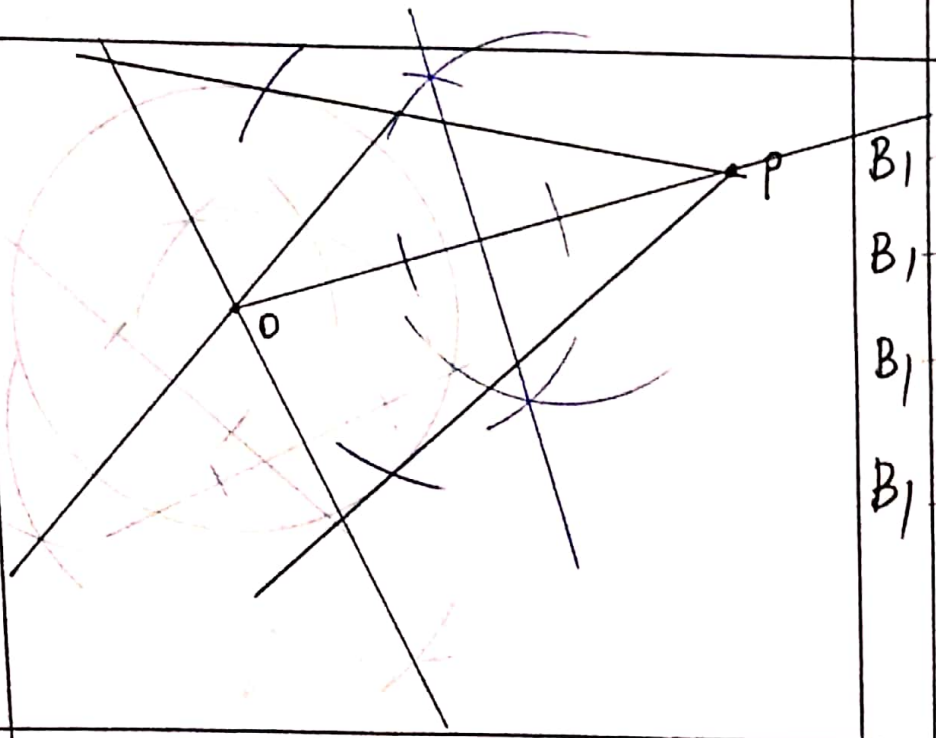
$x^2 = \dfrac{y^2a}{y^2c - b^2}$; $x = \pm\sqrt{\dfrac{y^2a}{y^2c - b^2}}$

M1 – square both sides

M1 – Like terms

A1

5.



B1 } finding the centre

B1 }

B1 – perpendicular bisector of OP

B1 – Tangent drawn

6. $P = \dfrac{M\sqrt{Q}}{(R-S)^2}$

$Q = \frac{144}{100} = 1.44Q_1$

$R = \frac{90}{100}R = 0.9R$

$S = \frac{90}{100} = 0.9S$

$P_1 = \dfrac{M\sqrt{1.44Q}}{(0.9R - 0.9S)^2}$

$P_1 = \dfrac{1.2M\sqrt{Q}}{0.81(R-S)^2}$

$1\frac{13}{27}\dfrac{M\sqrt{Q}}{(R-S)^2} - \dfrac{M\sqrt{Q}}{(R-S)^2} \times 100\%$

$\dfrac{M\sqrt{Q}}{(R-S)^2}$

$= 48.1\%$

(Increase)

M1 – √ equation

M1 – New P

M1 – % change

Attempt to find the % change

A1 – C.A.O

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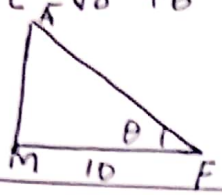
7. Length FH

$\sqrt{11^2 + 6^2} = \sqrt{157}$

Vertical height from A to HE

$= \sqrt{5^2 - 3^2} = 4$ ✓

$AC = \sqrt{8^2 + 6^2} = 10$



$\tan\theta = \frac{4}{10}$

$\theta = \tan^{-1}(\frac{4}{10}) = 21.8°$

B1 – Angle identification

M1 – Finding the angle

A1 – C.A.O.

03

8. $A = 18 \times 900 = 16,200$

$P = 20,000 - 10,000$

$= 10,000$

$n = 18$ months $\times 4$

$A = P(1 + \frac{r}{100})^n$

$16,200 = 10,000(1 + \frac{r}{400})^{72}$

$\sqrt[72]{1.62} = \sqrt[72]{(1 + \frac{r}{400})^{72}}$

$r = 2.689$

$= 2.7\%$.

B1 – Amount and new principal

M1 – ✓ substitution

M1 – solving for r

A1 – ✓ C.A.O

9(a)

P1

C1 – smooth curve

(b) $\frac{1 - 4.6}{4.8 - 1}$ M1

$= \frac{-3.6}{3.8} = -1$

A1

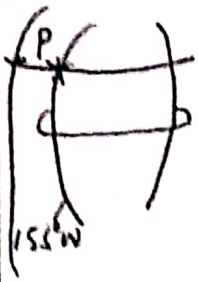
10. $y = 4\sin(ax - 70)$

(a) $\frac{360}{a} = 180^\circ$ — B1

$a = 2$.

(b) Phase angle $= 70^\circ$ — B1

02

11. 

$60\theta\cos\alpha = 2000$ — M1 — Correct substitution

$\theta = \frac{2000}{60\cos 40^\circ}$ — A1 — Angle difference

$= 43.51$

$155 + 43.51 = 198.51$

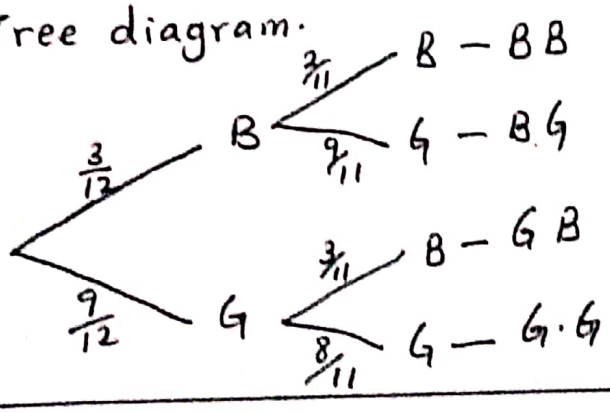
Longitude of Q

$= 198.51 - 180 = 18.51$ — B1 — Longitude of Q

$180 - 19 = 161^\circ E$

03

12. (a) Tree diagram.



B1 — All branches must be correct

(b) $\left(\frac{3}{12} \times \frac{9}{11}\right) + \left(\frac{9}{12} \times \frac{3}{11}\right)$ — M1 — If one branch is wrong M0

$= \frac{9}{22}$. — A1 — ✓

03

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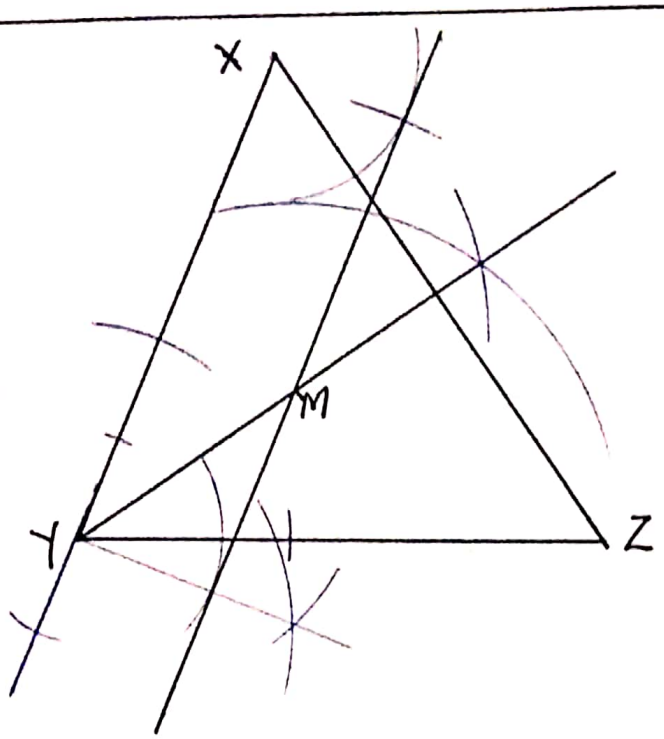
13.



Measure YM.

B1 — Parallel line from X Y

B1 — Bisector of ∠Y.

B1 — length YM

03

14. $PQ = Q - P$

$$\begin{pmatrix}12\\-5\\6\end{pmatrix} - \begin{pmatrix}6\\-2\\3\end{pmatrix} = \begin{pmatrix}6\\-3\\3\end{pmatrix}$$

$QR = R - Q$

$$\begin{pmatrix}8\\-3\\4\end{pmatrix} - \begin{pmatrix}12\\-5\\6\end{pmatrix} = \begin{pmatrix}-4\\2\\-2\end{pmatrix}$$

B1 — Two column vectors

$kPQ = QR$

$6k = -4$

$k = -\frac{2}{3}$

B1 — Value of a scale

$k = \frac{3}{-2} = -1.5$

$-\frac{2}{3}PQ = QR$

$PQ \parallel QR$

Q is a common point.

B1 — Parallelism and common point stated

03

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15. Determinant = $\frac{\text{Image area}}{\text{object area}}$

$3x^2 - 7(x-1) = \frac{13x}{x}$ — M1 – Formation of quadratic equation

$3x^2 - 7x + 7 = 13$

$3x^2 - 7x - 6 = 0$ — M1 – Solving

$x = \frac{7 \pm \sqrt{49+72}}{6}$ (11)

$x = \frac{7 \pm 11}{6} = 3, -\frac{2}{3}$ — A1 – ✓

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

03

16. $y = x^2 + 2x$

$\int_1^3 x^2 + 2x \, dx$ — M1 – Intergration

$\frac{x^3}{3} + x^2 + c \Big|_1^3$ — M1 – substituting the limits

$\left(\frac{3^3}{3} + 3^2 + c\right) - \left(\frac{1}{3} + 1 + c\right)$

$(18 + c) - (1\frac{1}{3} + c)$ — A1 – Must be exact If writtetn 16.67 A0.

$= 16\frac{2}{3}$.

03

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