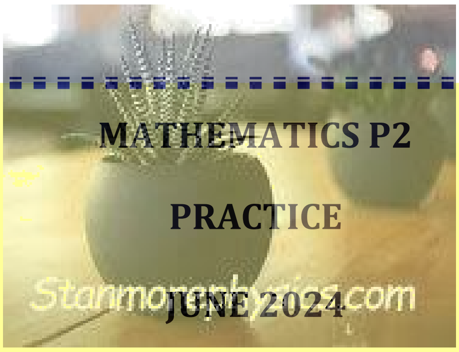
KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12



MATHEMATICS P2

PRACTICE

JUNE 2024

MARKS: 150

TIME: 3 HOURS

This question paper consists of 11 pages. A Diagram Sheet of 4 pages and an Information Sheet.

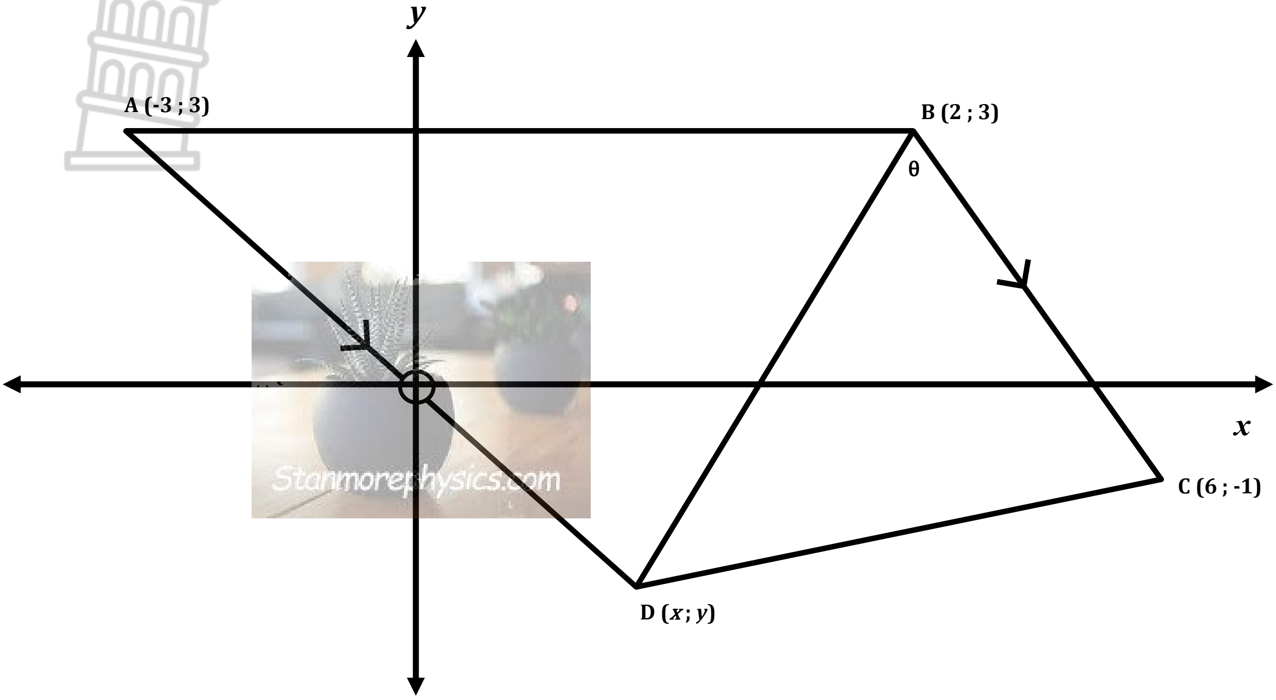
INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of **9** questions.
2. Answers **ALL** questions.
3. Clearly show **ALL** calculations, diagrams, graphs, et cetera that you have used in determining your answers.
4. Answers only will not necessarily be awarded full marks.
5. An approved scientific calculator (non-programmable and non-graphical) may be used, unless stated otherwise.
6. If necessary, answers should be rounded off to TWO decimal places, unless stated otherwise.
7. Diagrams are NOT necessarily drawn to scale.
8. Number the answers correctly according to the numbering system used in this question paper.
9. Write neatly and legibly.

QUESTION 1

A $(-3; 3)$, B $(2; 3)$, C $(6; -1)$ and D $(x ; y)$ are vertices of quadrilateral ABCD in a Cartesian plane.



1.1 Determine the equation of AD. (4)

1.2 Prove that the coordinates of D are $\left(\frac{3}{2} ; -\frac{3}{2}\right)$ if D is equidistant from B and C. (6)

1.3 Hence, or otherwise, determine the gradient of BD. (2)

1.4 Determine the size of θ, the angle between BD and BC, rounded off to one decimal digit. (4)

1.5 Calculate the area of ΔBDC rounded off to the nearest square unit. (5)

[21]

QUESTION 2

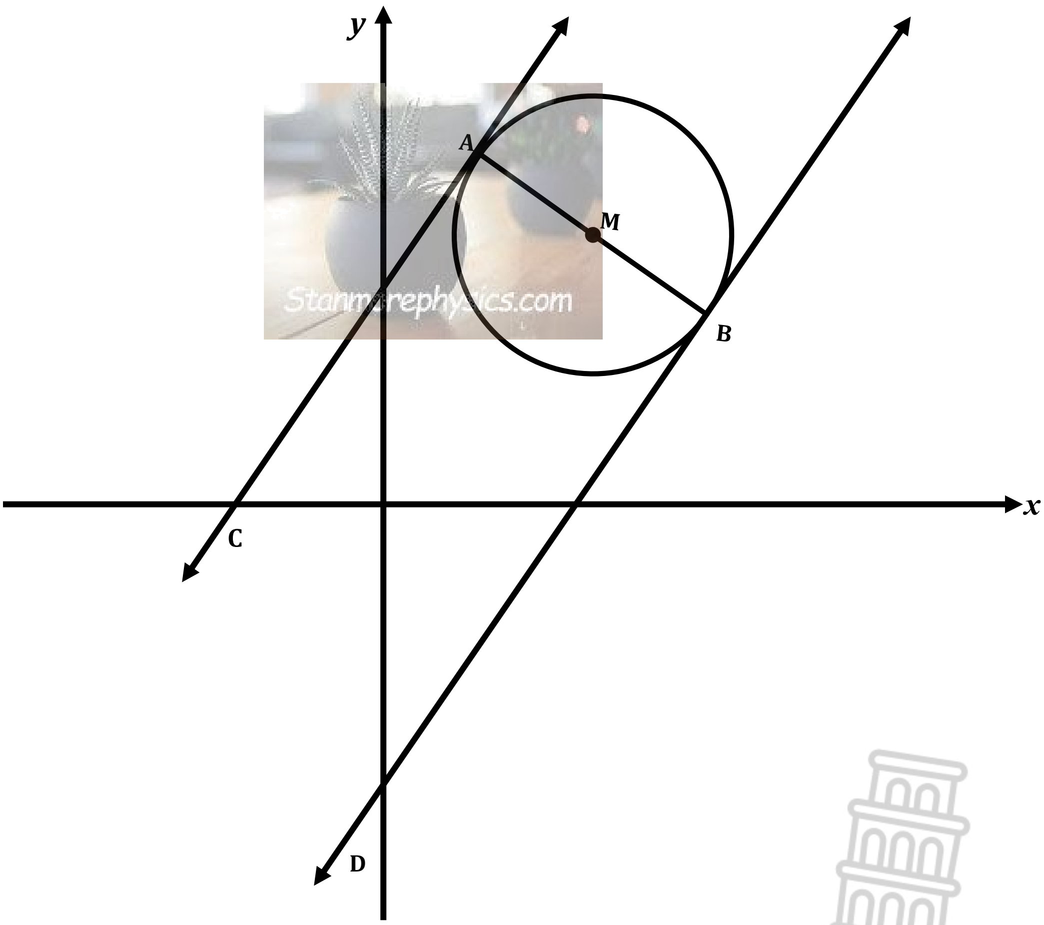
2.1 The equations of two circles O and M are:

O: $(x+1)^2 + (y-3)^2 = 1$ M: $x^2 + y^2 + 8x - 6y + 9 = 0$

2.1.1 Determine the coordinates of the centre of the circle M. (3)

2.1.2 Show, by calculation, that the circles touch each other, internally. (4)

2.2 In the diagram below, the line AC with equation $y - x - 2 = 0$ is a tangent at A to the circle with centre M (4 ; 4) while AB is a diameter of the circle.



2.2.1 Determine the equation of the diameter AB. (3)

2.2.2 Show that the coordinates of A are (3 ; 5). (2)

2.2.3 Determine the equation of the circle. (4)

2.2.4 Calculate the coordinates of B. (2)

2.2.5 Write down the equation of the tangent BD. (4)
[22]

QUESTION 3

3.1 Given: $\sin\alpha = \frac{8}{17}$ where $90° \leq \alpha \leq 270°$

Calculate the following with the aid of a diagram and without using a calculator:

3.1.1 $3\tan\alpha$ (3)

3.1.2 $\sin(90° + \alpha)$ (2)

3.1.3 $\cos 2\alpha$ (3)

3.2 Given: $\sin\theta\cos\theta = \frac{k}{4}$

Use a diagram to find the value of $\tan 2\theta$ in terms of k if 2θ is an acute angle. (5)

[13]

QUESTION 4

4.1 Simplify, without using a calculator:

$$\frac{2\cos 105°\cos 15°}{\cos(45°-x)\cos x - \sin(45°-x)\sin x}$$ (6)

4.2 Given: $$\frac{1+\sin 2\theta}{\cos 2\theta} = \frac{\cos\theta + \sin\theta}{\cos\theta - \sin\theta}$$

4.2.1 Prove the identity. (5)

4.2.2 Determine the values of θ for which the identity is undefined. (3)

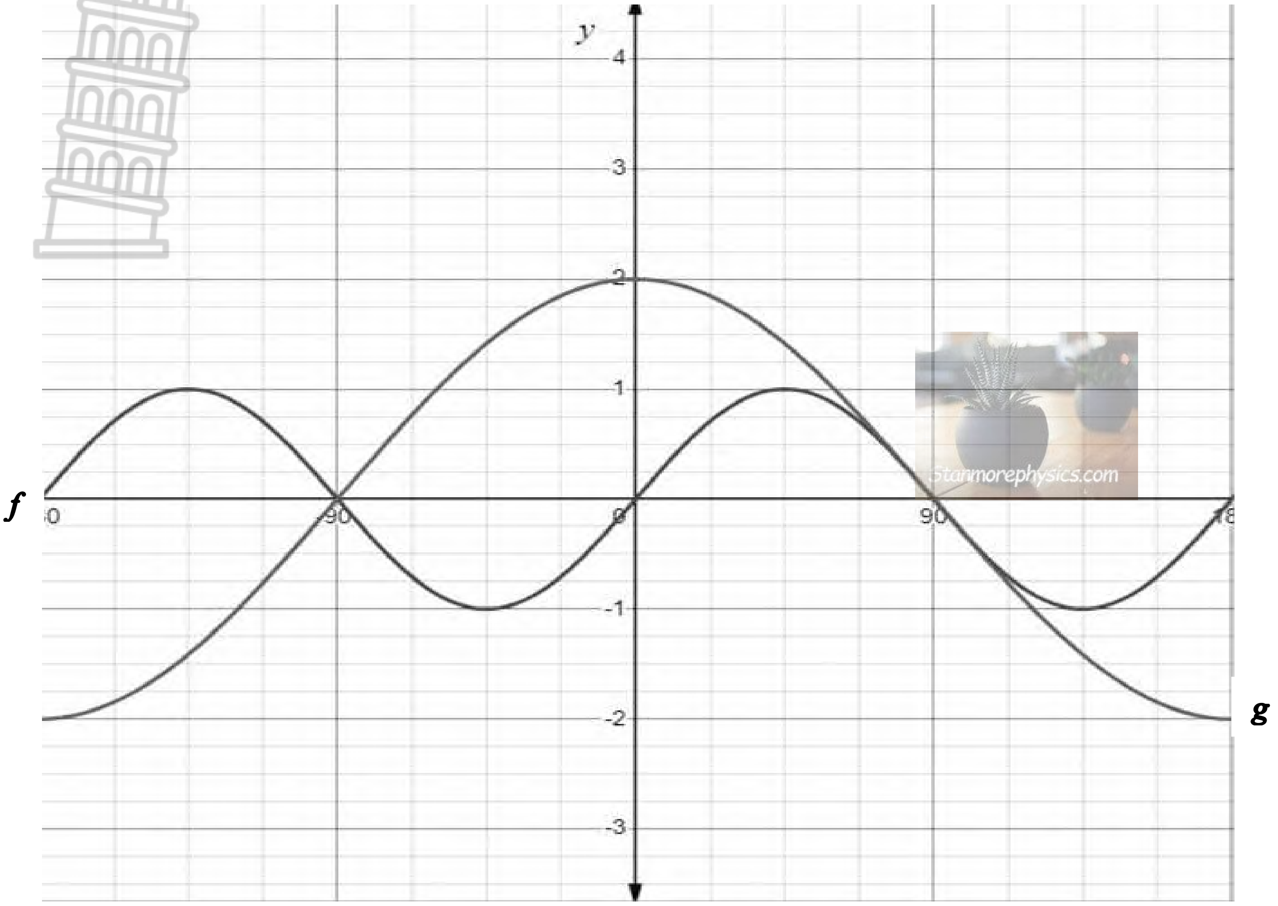
4.2.3 Hence, or otherwise, without the use of a calculator, find the value of:

$$\frac{\cos 15° + \sin 15°}{\cos 15° - \sin 15°}$$ (3)

4.3 Determine the general solution for the equation: $7\cos x - 2\sin^2 x + 5 = 0$ (7)

[24]

QUESTION 5



In the diagram above the graphs of $f(x) = \sin \boldsymbol{a}x$ and $g(x) = \boldsymbol{b}\cos x$ for $x \in [-180°; 180°]$ are drawn.

5.1 Determine the numerical values of ***a*** and ***b***. (2)

5.2 Write down the periods of f and g. (2)

5.3 State the amplitude of f. (1)

5.4 Determine the range of $f(x) + 3$. (2)

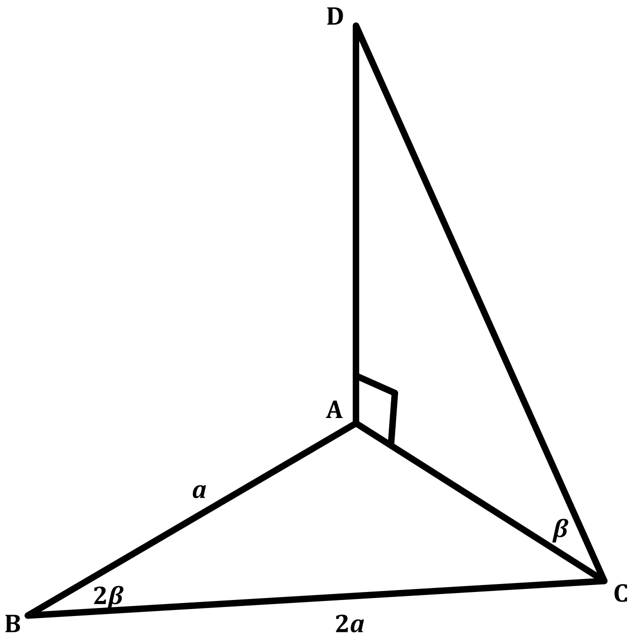
5.5 Determine the value(s) of x, if $f(x).g(x) < 0$, for $x \in [-180°; 180°]$. (3)

5.6 If the curve f is shifted 45° to the left, write down the new function as $h(x) =$.... (2)

5.7 If g is reflected about the x-axis, write down the new function as $k(x) =$... (2)

[14]

QUESTION 6



A, B and C are three points in the same horizontal plane. DA is perpendicular to the horizontal plane at A, and D is joined to C. AB = $\frac{1}{2}$BC = $\boldsymbol{a}$ and $A\hat{C}D = \frac{1}{2}A\hat{B}C = \boldsymbol{\beta}$.

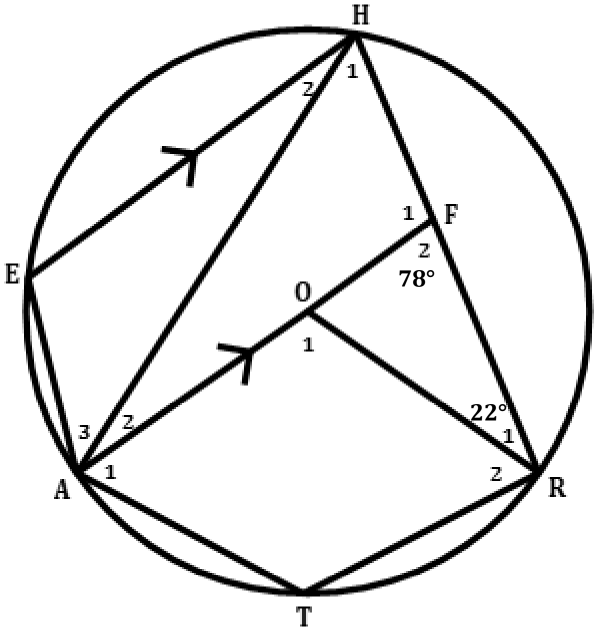
6.1 Determine AC in terms of $\boldsymbol{a}$ and $\mathbf{2}\boldsymbol{\beta}$. (3)

6.2 Hence, show that $AD = \boldsymbol{a}\tan\boldsymbol{\beta}\sqrt{1 + 8\sin^2\boldsymbol{\beta}}$ (4)

[7]

QUESTION 7

7.1 In the diagram O is the centre of circle HEATR. AOF is parallel to EH.
$\hat{F}_2 = 78°$ and $\hat{R}_1 = 22°$.



Calculate, with reasons, the size of:

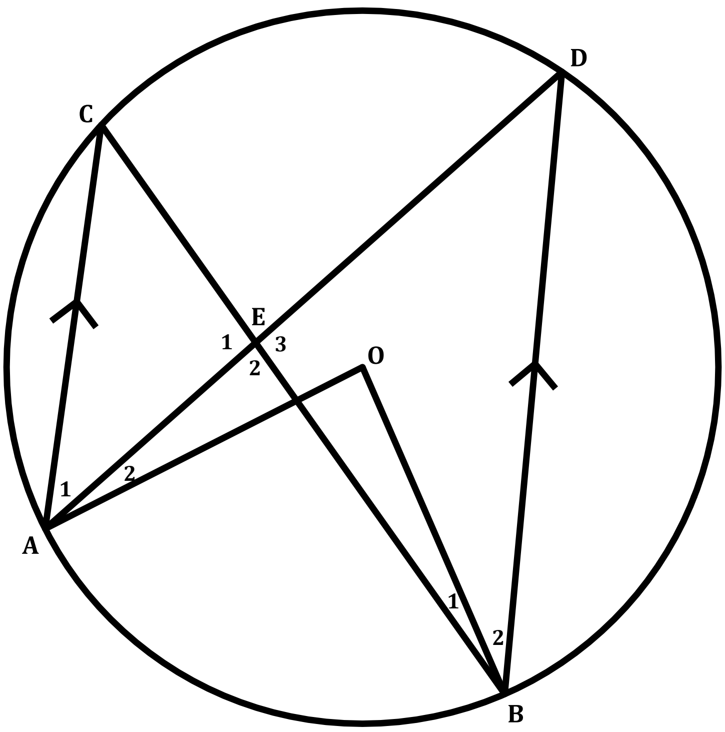
7.1.1 $\hat{O}_1$ (2)

7.1.2 $\hat{H}_1$ (2)

7.1.3 $\hat{T}$ (2)

7.1.4 $\hat{H}_2$ (2)

7.2 In the diagram, O is the centre of the circle. Chords AD and CB intersect at E and AC || BD.

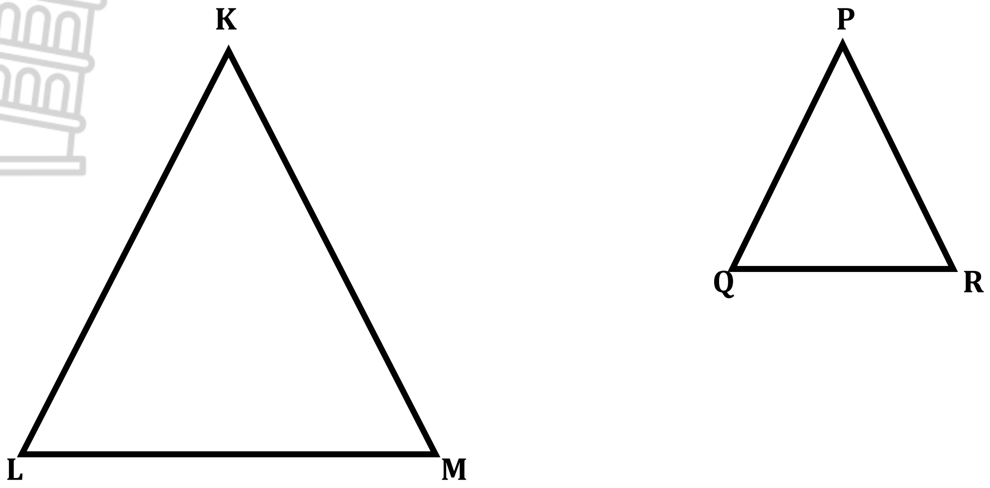


Prove, with reasons, that AEOB is a cyclic quadrilateral. (6)

[14]

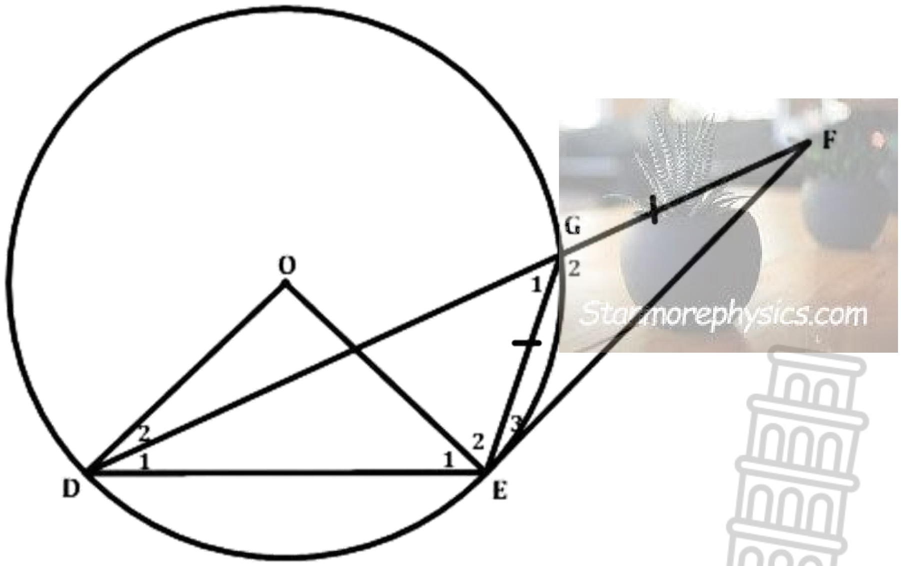
QUESTION 8

8.1 In the diagram, ΔKLM and ΔPQR are two triangles such that $\hat{K} = \hat{P}$, $\hat{L} = \hat{Q}$ and $\hat{M} = \hat{R}$.



Use the diagram to prove the theorem which states that $\frac{KL}{PQ} = \frac{KM}{PR}$. (6)

8.2 In the figure, FE is a tangent to the circle O. D and F are joined so that EG = GF.



8.2.1 If $\hat{E}_3 = x$, name, with reasons, two other angles each equal to x. (4)

8.2.2 Prove that DE = EF. (2)

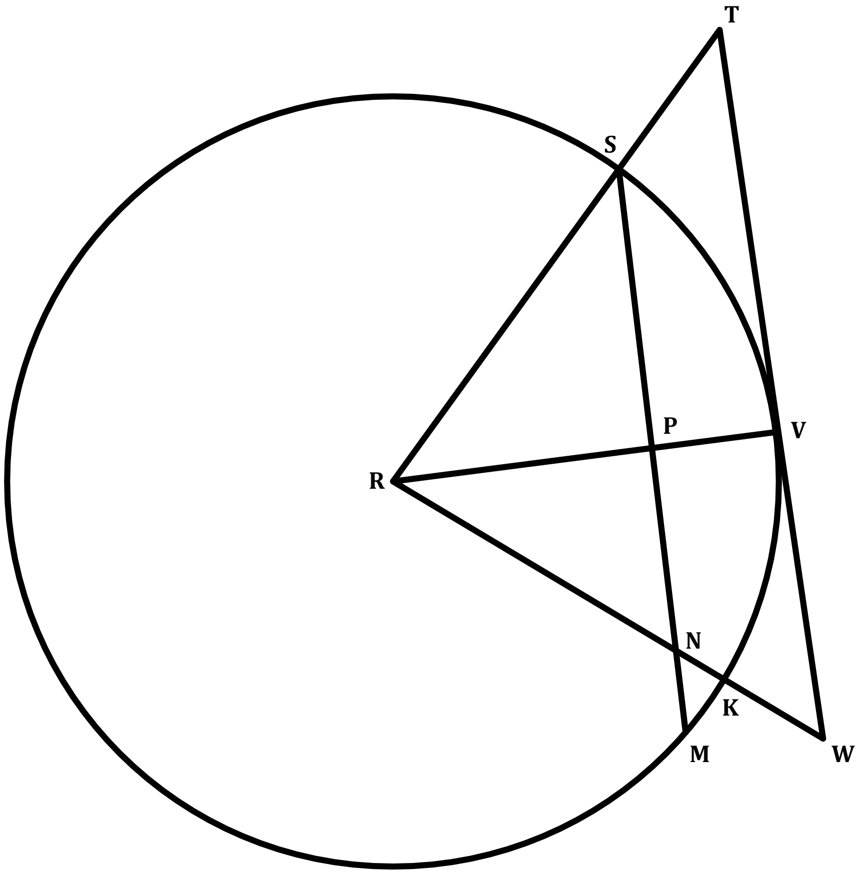
8.2.3 Express $D\hat{O}E$ in terms of x. (4)

8.2.4 Prove that $EF^2 = DF \times GF$. (4)

[20]

QUESTION 9

In the figure below, TW is a tangent to the circle with centre R at point V.
Radius RV intersects chord SM at P such that NP = PS. The circle has a radius of 10 units.
RST and RKW are straight lines. RW intersects the circle at K and chord SM at N.
ST = 7 units and NW = 6 units.



9.1 Prove that TW || SN. (4)

9.2 Determine the length of NK. (5)

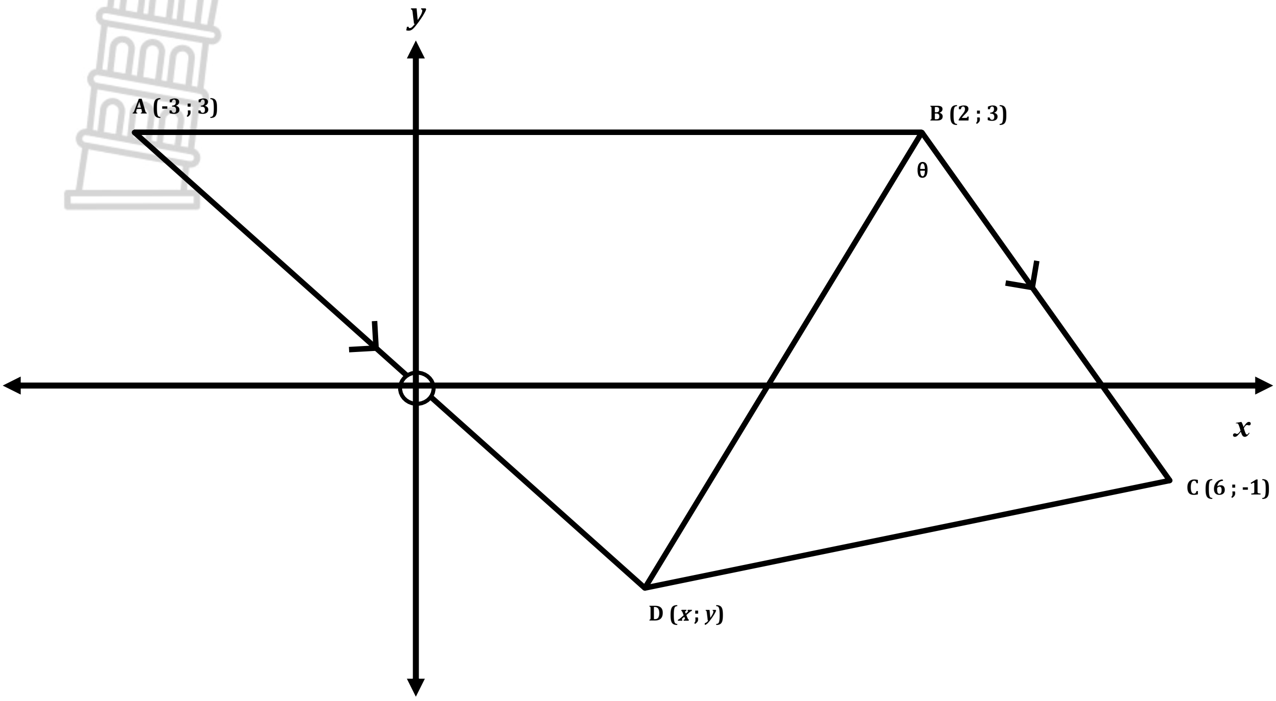
9.3 Calculate the length of PN. (6)

[15]

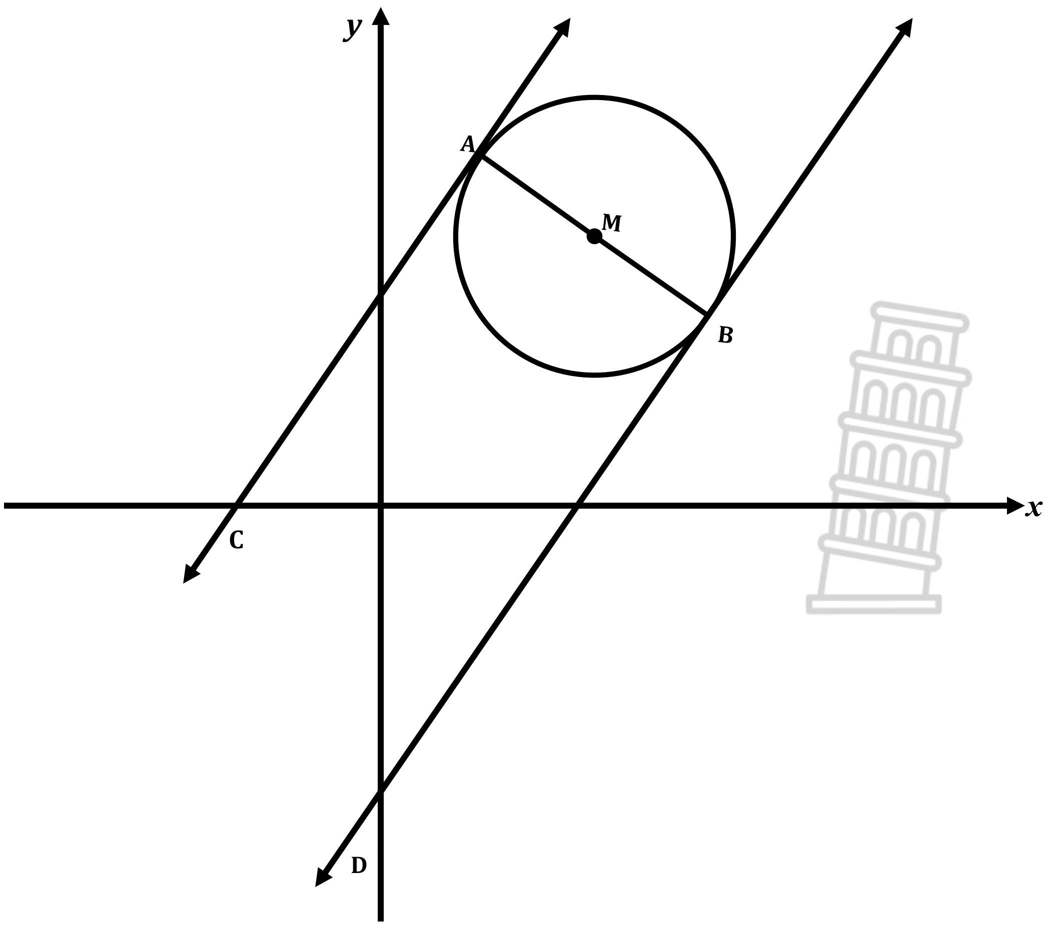
TOTAL MARKS: 150

DIAGRAM SHEET

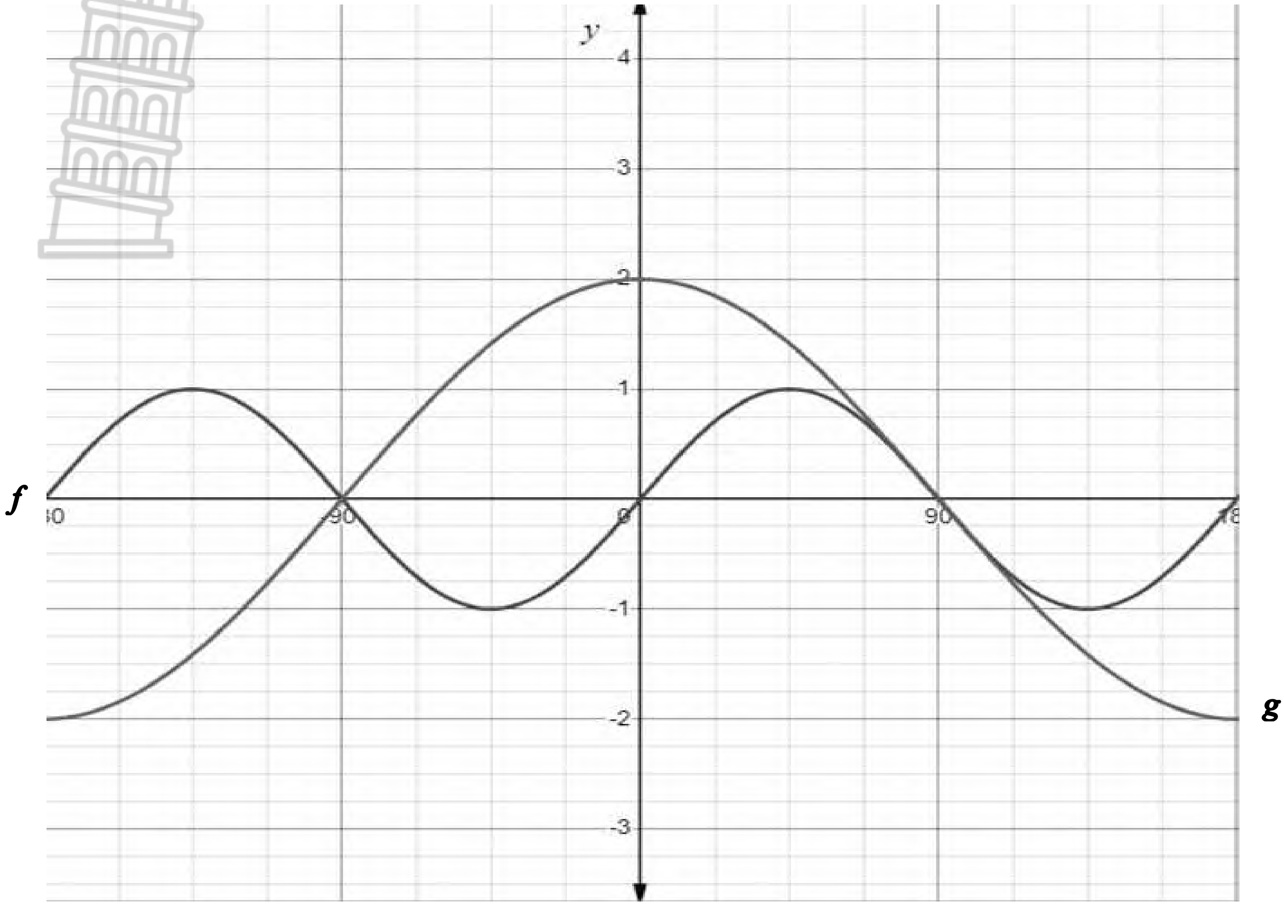
QUESTION 1



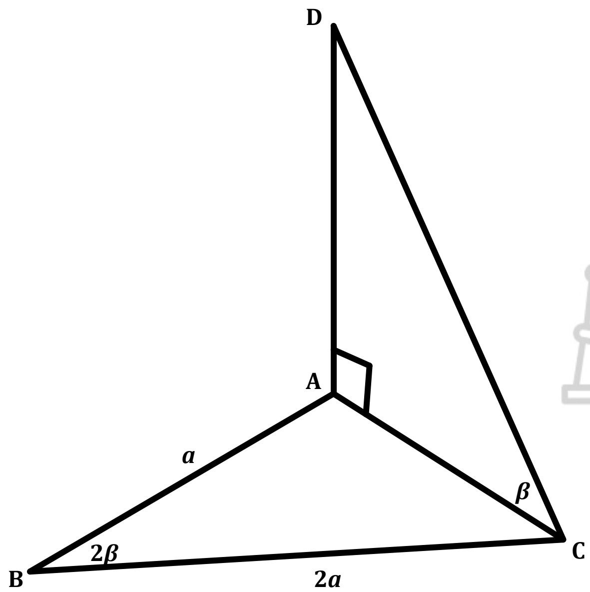
QUESTION 2



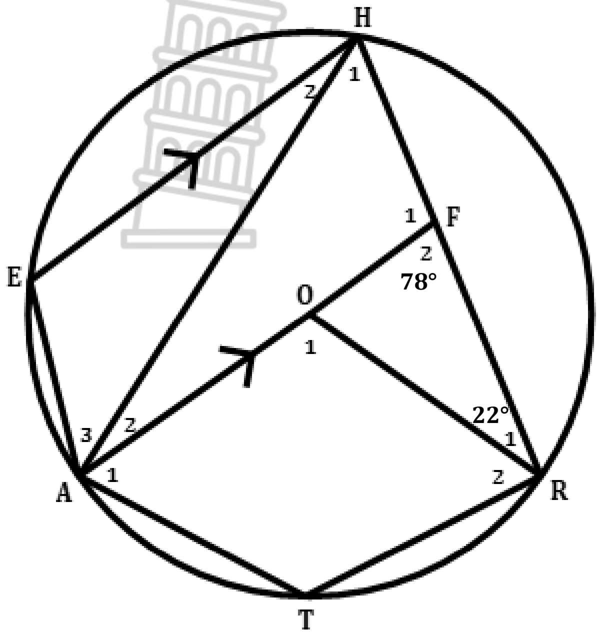
QUESTION 5



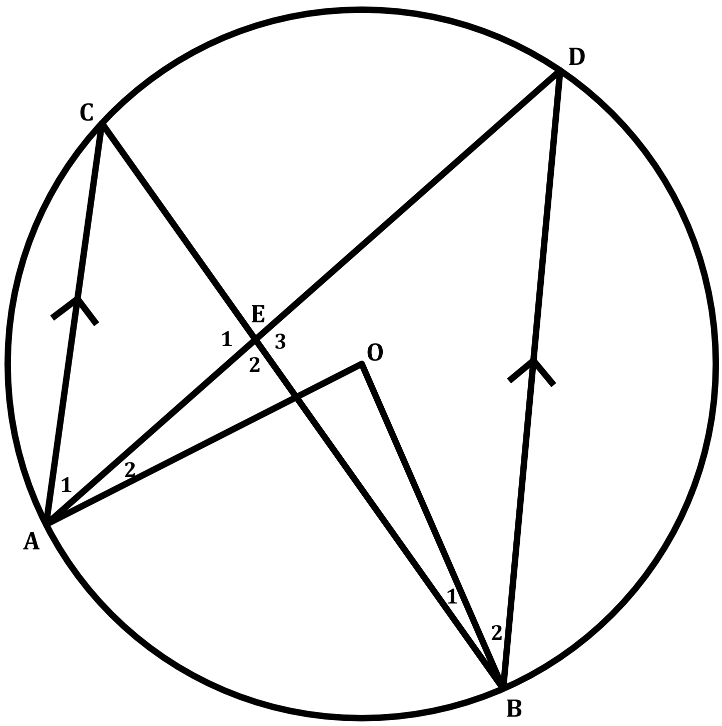
QUESTION 6



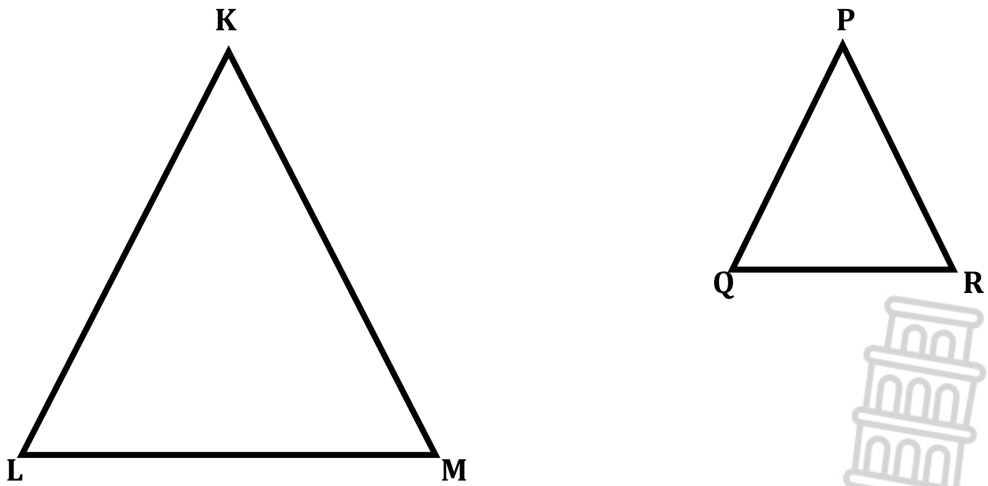
QUESTION 7.1



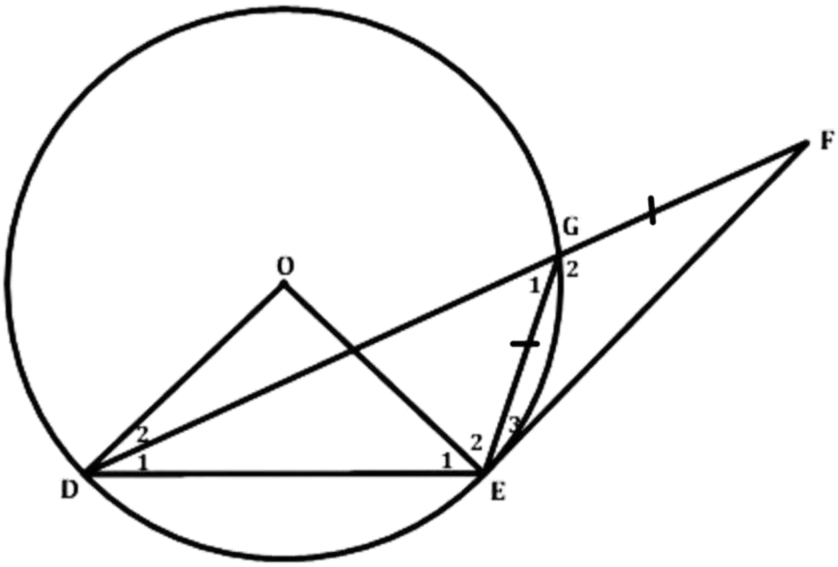
QUESTION 7.2



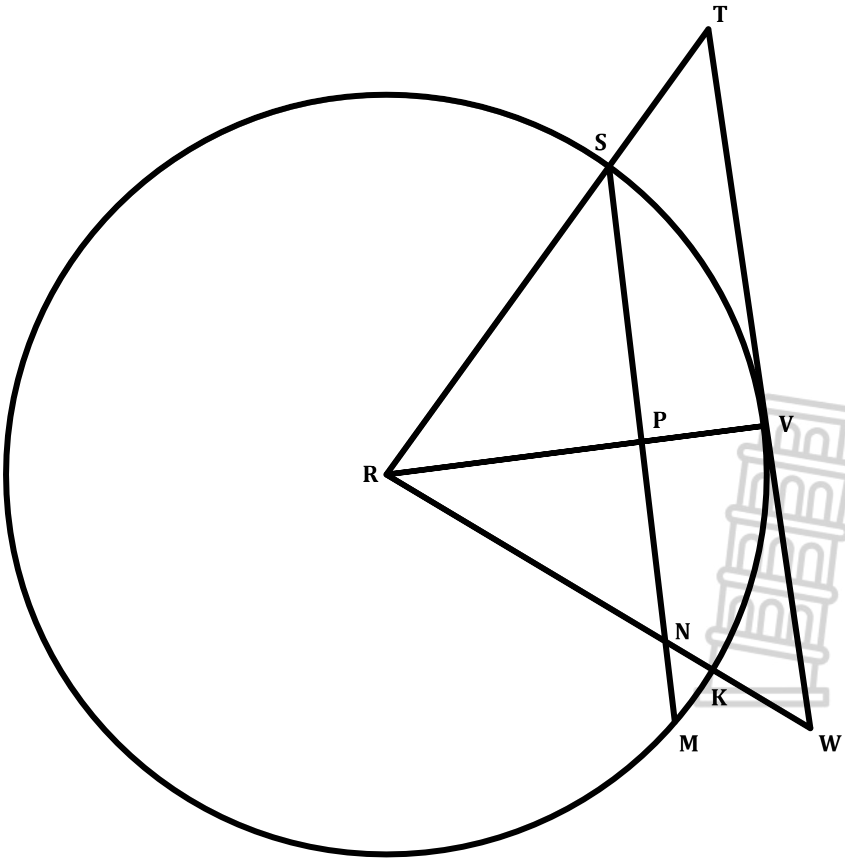
QUESTION 8.1



QUESTION 8.2



QUESTION 9



INFORMATION SHEET

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

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

$\sum_{i=1}^{n} 1 = n$ $\quad \sum_{i=1}^{n} i = \frac{n(n+1)}{2}$ $\quad T_n = a + (n-1)d$ $\quad S_n = \frac{n}{2}\left(2a + (n-1)d\right)$

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

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

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

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

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

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

In ΔABC: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ $\quad a^2 = b^2 + c^2 - 2bc.\cos A$ $\quad area\,\Delta ABC = \frac{1}{2}ab.\sin C$

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

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

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

$$(x\,;\,y) \rightarrow (x\cos\theta - y\sin\theta\,;\,y\cos\theta + x\sin\theta)$$

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

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

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

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JUNE 2024

MARKING GUIDELINE

MARKS: 150

TIME: 3 HOURS

This marking guideline consists of 9 pages.

QUESTION 1

1.1	$m_{AD} = m_{BC} = \frac{3+1}{2-6}$ $= -1$ $y = -x + c$ Sub A(-3 ; 3): $3 = -(-3) + c$ $c = 0$ $\therefore y = -x$	✓substitution ✓ m ✓substitution ✓ equation (4)
1.2	D$(x\ ;\ y) \rightarrow y = -x$ BD = CD → BD² = CD²: $(2-x)^2 + (3-y)^2 = (6-x)^2 + (-1-y)^2$ $(2-x)^2 + (3-(-x))^2 = (6-x)^2 + (-1-(-x))^2$ $4 - 4x + x^2 + 9 + 6x + x^2 = 36 - 12x + x^2 + 1 - 2x + x^2$ $16x = 24$ $x = \frac{24}{16} = \frac{3}{2}$ $y = -\frac{3}{2}$ $\therefore$ D $\left(\frac{3}{2}\ ;\ -\frac{3}{2}\right)$	✓ BD = CD ✓substitution ✓ $y = -x$ ✓simplification ✓ x -value ✓ y -value (6)
1.3	$m_{BC} = \frac{3+\frac{3}{2}}{2-\frac{3}{2}} = 9$	✓substitution ✓ answer (2)
1.4	let ∠ of inclination of BC be α and ∠ of inclination of BD be β $\tan\alpha = m_{BC}$ $\tan\alpha = -1$ $\alpha = 135°$ $\tan\beta = m_{BD}$ $\tan\beta = 9$ $\beta = 83{,}7°$ $\theta = \alpha - \beta$ $= 135° - 83{,}7°$ $= 51{,}3°$	✓ tan = m ✓ angles ✓difference ✓answer (4)
1.5	$BD^2 = CD^2 = \left(2-\left(\frac{3}{2}\right)\right)^2 + \left(3-\left(-\frac{3}{2}\right)\right)^2 = \frac{41}{2}$ $\therefore BD = CD = \frac{\sqrt{82}}{2}$ units $B\hat{D}C = 180° - (51{,}3° \times 2) = 77{,}4°$ $\text{Area}_{\Delta ABC} = \frac{1}{2}\left(\frac{41}{2}\right)\sin 77{,}4° = 10$ square units	✓substitution ✓BD=CD ✓ $B\hat{D}C$ ✓sub in Area Rule ✓answer (5)

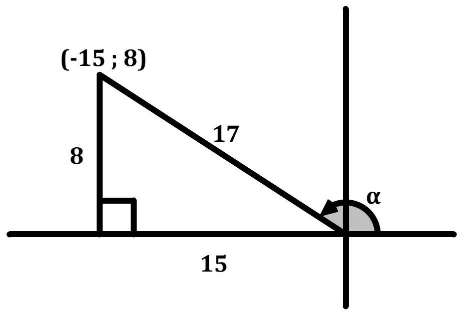
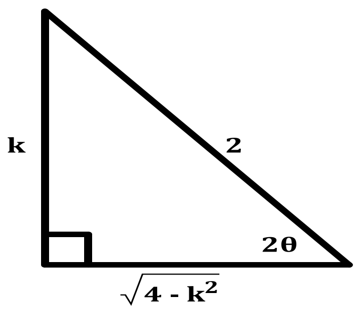
[21]

QUESTION 2

2.1.1	$x^2 + 8x + (4)^2 + y^2 - 6y + (-3)^2 = -9 + (4)^2 + (-3)^2$ $(x + 4)^2 + (y - 3)^2 = 16$ $\therefore$ centre $(-4\,;3)$	✓substitution ✓ centre-radius form ✓answer (3)
2.1.2	Circle O: $r_O = 1$ unit O (-1 ; 3) Circle M: $r_M = 4$ units OM = 3 units Since: OM = $r_M - r_O$ $\therefore$ circles touch internally	✓ r_O ✓r_M ✓ OM ✓conclusion (4)
2.2.1	$y = x + 2$ $\therefore m_{AC} = 1$ $\Rightarrow m_{AB} = -1$ tan ⊥ rad sub M(4 ; 4) 4 = – (4) + c c = 8 $\therefore y = -x + 8$	✓ S/R ✓substitution ✓eqn (3)
2.2.2	At A: $x + 2 = -x + 8$ $2x = 6$ $x = 3$ y= (3) + 2 = 5 $\therefore$ A (3 ; 5)	✓equating ✓ x-val (2)
2.2.3	$(x - 4)^2 + (y - 4)^2 = r^2$ sub A (3 ; 5): $r^2 = (3 - 4)^2 + (5 - 4)^2 = 2$ $\therefore (x - 4)^2 + (y - 4)^2 = 2$	✓$(x - 4)$ $(y - 4)$ ✓sub ✓r ✓eqn (4)
2.2.4	$\frac{x_B + 3}{2} = 4$ $\frac{y_B + 5}{2} = 4$ $x_B + 3 = 8$ $y_B + 5 = 8$ $x_B = 5$ $y_B = 3$ $\therefore$ B(5 ; 3)	✓ x_B ✓ y_B Answer Only: full marks (2)
2.2.5	AC || BD (co-int ∠s =) $m_{AC} = m_{BD} = 1$ sub B(5 ; 3): $3 = 5 + c$ $c = -2$ $\therefore y = x - 2$	✓ S/R ✓ $= m$ ✓substitution ✓eqn (4)

[22]

QUESTION 3

3.1	$\sin\alpha = \frac{8}{17}$ $x = \sqrt{(17)^2 - (8)^2}$ $x = -15$  	✓diagram
3.1.1	$= 3\left(\frac{8}{-15}\right) = -\frac{8}{5}$	✓x-val ✓answer (3)
3.1.2	$= \cos\alpha$ $= -\frac{15}{17}$	✓$\cos\alpha$ ✓answer (2)
3.1.3	$= \cos^2\alpha - \sin^2\alpha$ $= \left(-\frac{15}{17}\right)^2 - \left(\frac{8}{17}\right)^2$ $= \frac{161}{289}$	✓expansion ✓substitution ✓answer (3)
3.2	$\sin\theta\cos\theta = \frac{k}{4}$ $(\times 2): 2\sin\theta\cos\theta = \frac{k}{2}$ $\sin 2\theta = \frac{k}{2}$ $\therefore \tan 2\theta = \frac{k}{\sqrt{4-k^2}}$  	✓× 2 ✓$\sin 2\theta$ ✓diagram ✓ x-val / adj ✓answer (5)

[13]

QUESTION 4

4.1	$=\dfrac{2\cos(90°+15°)\cos 15°}{\cos(45°-x+x)}$ $=\dfrac{2\sin 15°\cos 15°}{\cos 45°}$ $=\dfrac{\sin 30°}{\cos 45°}=\dfrac{\frac{1}{2}}{\frac{1}{\sqrt{2}}}$ $=\dfrac{1}{\sqrt{2}}$ or $\dfrac{\sqrt{2}}{2}$	✓$\cos(45°-x+x)$ ✓ $\sin 15°$ ✓ $\cos 45°$ ✓ $\cos 30°$ ✓ $\dfrac{\frac{1}{2}}{\frac{1}{\sqrt{2}}}$ ✓answer (6)
4.2.1	$\text{RHS}=\dfrac{\cos\theta+\sin\theta}{\cos\theta-\sin\theta}\times\dfrac{\cos\theta+\sin\theta}{\cos\theta+\sin\theta}$ $=\dfrac{(\cos\theta+\sin\theta)^2}{\cos^2\theta-\sin^2\theta}$ $=\dfrac{\cos^2\theta+2\sin\theta\cos\theta+\sin^2\theta}{\cos 2\theta}$ $=\dfrac{1+\sin 2\theta}{\cos 2\theta}=\text{LHS}$ **OR**	✓ ×conjugate ✓$\cos^2\theta-\sin^2\theta$ ✓expansion ✓ $\cos 2\theta$ ✓ 1 (5)
	$\text{LHS}=\dfrac{\cos^2\theta+2\sin\theta\cos\theta+\sin^2\theta}{\cos^2\theta-\sin^2\theta}$ $=\dfrac{(\cos\theta+\sin\theta)^2}{(\cos\theta+\sin\theta)(\cos\theta-\sin\theta)}$ $=\dfrac{\cos\theta+\sin\theta}{\cos\theta-\sin\theta}=\text{RHS}$	✓expansion ✓$2\sin\theta\cos\theta$ ✓$\cos^2\theta-\sin^2\theta$ ✓square ✓factors (5)
4.2.2	$\cos 2\theta=0 \quad ref\,\angle=90°$ $2\theta=90°+k.360°$ $\theta=45°+k.180°\,;k\in\mathbb{Z}$	✓ $\cos 2\theta=0$ ✓ $45°+k.180°$ ✓ $k\in\mathbb{Z}$ (3)
4.2.3	$=\dfrac{1+\sin 30°}{\cos 30}$ $=\dfrac{1+\frac{1}{2}}{\frac{\sqrt{3}}{2}}$ $=\sqrt{3}$	✓ ✓ substitution ✓answer (3)
4.3	$7\cos x-2(1-\cos^2 x)+5=0$ $7\cos x-2+2\cos^2 x+5=0$ $2\cos^2 x+7\cos x+3=0$ $(2\cos x+1)(\cos x+3)=0$ $\cos x=-\frac{1}{2}$ or $\underline{\cos x=-3}$ $x=120°+k.360°$ $\therefore$ n/a $x=240°+k.360°\,;k\in\mathbb{Z}$	✓expansion ✓std form ✓factors ✓$\cos x=-\frac{1}{2}$ ✓$\cos x=-3$ ✓✓answers (7)

[24]

QUESTION 5

5.1	a = 2 b = 2	✓ ✓ (2)
5.2	f: 180° g: 360°	✓ ✓ (2)
5.3	amplitude: 1	✓ (1)
5.4	$y \in [2\,;\,4]$	✓ end points ✓ notation (2)
5.5	$-180° < x < 0° \quad ; \quad x \neq -90°$ **OR**	✓end points ✓notation ✓ $x \neq -90°$ (3)
	$x \in (-180°\,;90°) \cup (90°\,;0°)$	✓✓end points ✓notation (3)
5.6	$h(x) = \sin(2x + 45°)$	✓ ✓ (2)
5.7	$k(x) = -2\cos x$	✓ ✓ (2)

[14]

QUESTION 6

6.1	$AC^2 = AB^2 + BC^2 - 2.AB.BC.\cos A\hat{B}C$ $= a^2 + 4a^2 - 2(a)(2a).\cos 2\beta$ $\therefore AC = \sqrt{5a^2 - 4a^2\cos 2\beta}$ $= \sqrt{a^2(5 - 4\cos 2\beta)}$ $= a\sqrt{5 - 4\cos 2\beta}$	✓cosine rule ✓substitution ✓answer (3)
6.2	In ΔADC: $\tan\beta = \dfrac{AD}{a\sqrt{5 - 4\cos 2\beta}}$ $AD = \tan\beta \cdot a\sqrt{5 - 4\cos 2\beta}$ $= a\tan\beta\sqrt{5 - 4(1 - 2\sin^2\beta)}$ $= a\tan\beta\sqrt{5 - 4 + 8\sin^2\beta}$ $= a\tan\beta\sqrt{1 + 8\sin^2\beta}$	✓ trig ratio ✓substitution ✓ $1 - 2\sin^2\beta$ ✓simplification (4)

[7]

QUESTION 7

7.1.1	100°	ext ∠ of Δ	✓S ✓R (2)
7.1.2	50°	∠ at cent = 2∠ at CFCE	✓S ✓R (2)
7.1.3	130°	opp ∠s of cyclic quad = 180°	✓S ✓R (2)
7.1.4	$78° - 50° = 28°$	corres ∠s ; AOF || EH	✓S ✓R (2)
7.2	Let $\hat{C} = x$ $\therefore\ A\hat{D}B = x$ & $A\hat{O}B = 2x$ $\hat{A}_1 = A\hat{D}B = x$ $\therefore\ \hat{E}_1 = 180° - 2x$ $\therefore\ \hat{E}_2 = 2x$ $\hat{E}_2 = A\hat{O}B = 2x$ $\Rightarrow$ AEOB is a cyclic quadrilateral	 ∠s in same segment ∠ at cent = 2∠ at CFCE alt ∠s; AC || BD sum of ∠s in Δ ∠s on a str. line converse ∠s in same segment	 ✓S/R ✓S/R ✓S/R ✓S/R ✓S/R ✓R (6)

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QUESTION 8

8.1	Construction: Draw KS = PQ and KT = PR. Join ST In ΔKST and ΔPQR: 1. KS = PQ (constr) 2. $\hat{K} = \hat{P}$ (given) 3. KT = PR (constr) $\therefore$ ΔKST ≡ ΔPQR (S; A; S) $\Rightarrow \hat{S}_1 = \hat{Q}$ (ΔKST ≡ ΔPQR) & $\hat{Q} = \hat{L}$ $\therefore\ \hat{S}_1 = \hat{L}$ $\therefore$ ST || LM (corres ∠s =) $\therefore\ \frac{KL}{KS} = \frac{KM}{KT}$ (Prop. Int. Theorem; ST || LM) but KS = PQ & KT = PR $\therefore\ \frac{KL}{PQ} = \frac{KM}{PR}$	✓construction ✓S/R ✓S/R ✓R ✓S/R ✓S (6)

8.2.1	$\hat{F}$ $\hat{D}_1$	∠s opp = sides = tan-chord theorem	✓S ✓R ✓S ✓R (4)
8.2.2	$\hat{F} = \hat{D}_1$ ∴ DE = EF	above sides opp = ∠s =	✓S ✓R (2)
8.2.3	$\hat{G}_2 = 180° - 2x$ $\therefore \hat{G}_1 = 2x$ $\therefore D\hat{O}E = 4x$	sum of ∠s in Δ ∠s on a str. line ∠ at cent = 2∠ at CFCE	✓S ✓R ✓S/R ✓S/R (4)
8.2.4	In ΔFDE and ΔFEG: 1. $\hat{F}$ is common 2. $\hat{D}_1 = \hat{E}_3$ ∴ ΔFDE ||| ΔFEG $\therefore \frac{FD}{FE} = \frac{FE}{FG}$ $\Rightarrow FE^2 = FD \times FG$	 above (∠; ∠; ∠) ΔFDE ||| ΔFEG	 ✓S ✓S ✓R ✓S (4)

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QUESTION 9

9.1	$R\hat{V}W = 90°$ $R\hat{P}N = 90°$ ∴ TW || SN	tan ⊥ radius line from cent to midpt of ch ⊥ ch corres ∠s =	✓S ✓R ✓S/R ✓R (4)
9.2	$\frac{RS}{ST} = \frac{RN}{NW}$ $\frac{10}{7} = \frac{RN}{6}$ $RN = \frac{60}{7}$ NK = RK – RN $= 10 - \frac{60}{7}$ $= \frac{10}{7}$ units	(Prop. Int. Theorem; SN || TW)	✓S ✓R ✓ RN ✓ ✓ (5)

9.3	$WV^2 = RW^2 - RV^2$ (Pythag) $= \left(\frac{60}{7} + 6\right)^2 - (10)^2$ WV = 10,598211 $\frac{PN}{WV} = \frac{RN}{RW}$ (ΔRPN ||| ΔRVW) $\frac{PN}{10,598211} = \frac{\frac{60}{7}}{\frac{60}{7}+6}$ PN = 6,23 units	✓R ✓substitution ✓WV ✓S/R ✓substitution ✓PN (6)
	OR	
	$\frac{RP}{RV} = \frac{RS}{RT}$ (Prop. Int. Th; TW || SN) $\frac{RP}{10} = \frac{10}{17}$ RP = $\frac{100}{17}$ $PN^2 = RN^2 - RP^2$ (Pythag) $= \left(\frac{60}{7}\right)^2 - \left(\frac{100}{17}\right)^2$ = 6,23 units	✓S ✓R ✓RP ✓R ✓substitution ✓PN (6)

[15]

TOTAL MARKS: 150