education
Lefapha la Thuto la Bokone Bophirima
Noord-Wes Departement van Onderwys
North West Department of Education
NORTH WEST PROVINCE

PROVINCIAL ASSESSMENT

GRADE 12

MATHEMATICS P2

JUNE TEST 2022

MARKS: 150

TIME: 3 hours

This question paper consists of 11 pages,1 information sheet and an answer book of 22 pages.

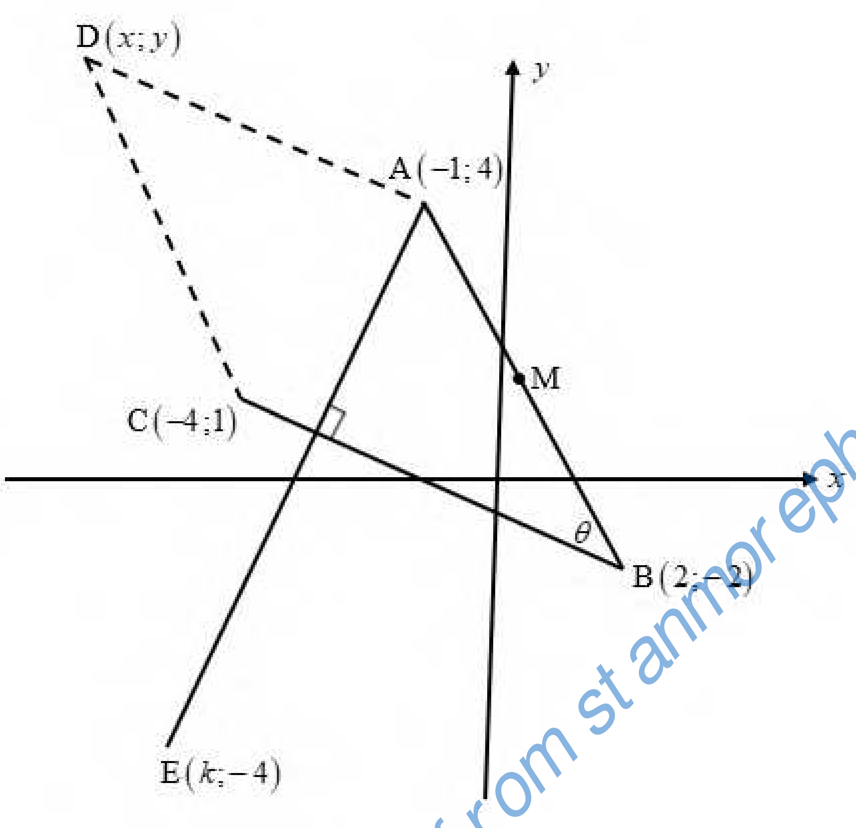
INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 10 questions.
2. Answer ALL the questions in the SPECIAL ANSWER BOOK provided.
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. An information sheet with formulae is included at the end of the question paper.
9. Write neatly and legibly.

QUESTION 1

In the diagram below, $A(-1;4)$, $B(2;-2)$ and $C(-4;1)$ are three points in a Cartesian plane. M is the midpoint of AB. $\angle ABC = \theta$.

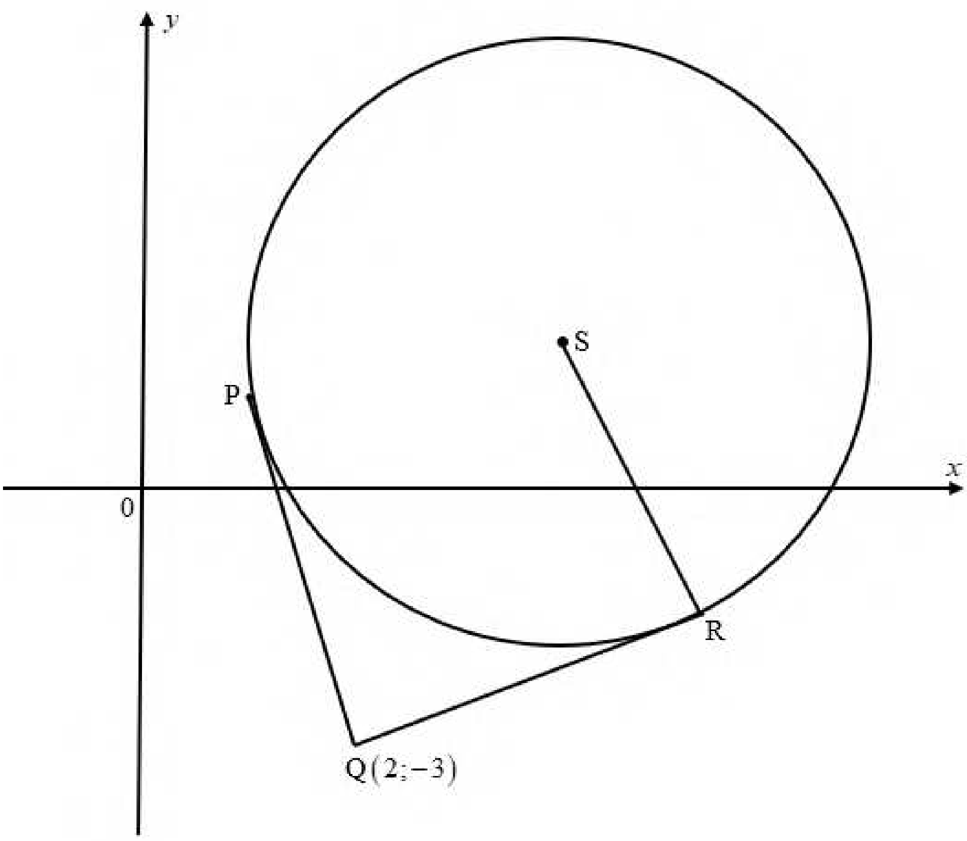


1.1	Determine the coordinates of M.	(2)
1.2	Calculate the length of AB in the simplest surd form.	(2)
1.3	Determine the equation of BC in the form $y = ...$	(3)
1.4	Determine θ correct to one decimal place.	(5)
1.5	Line segment AE is perpendicular to BC. Calculate the value of k.	(3)
1.6	If ABCD is a parallelogram, determine the	
	1.6.1 coordinates of D.	(4)
	1.6.2 Area of ABCD.	(5)

[24]

QUESTION 2

In the diagram, QP and QR are the tangents to the circle from $Q(2;-3)$.
The equation of the circle is given by $x^2+y^2-10x-4y+12=0$.



2.1 Determine:

2.1.1 The coordinates of S, the centre of the circle. (4)

2.1.2 The length of the radius. (1)

2.2 Give a reason why $S\hat{R}Q=90°$ (1)

2.3 Hence show that the equation of circle through SRQ is $x^2+y^2-7x+y+4=0$ (4)

2.4 Show algebraically that the coordinates of R are $(6;-2)$ (6)

2.5 Calculate the length of QR. (2)

2.6 Show that PQRS is a rhombus (3)

[21]

QUESTION 3

3.1 If $\cos 35° = p$, **without using a calculator,** determine the following in terms of *p*.

3.1.1 $\tan 35°$ (3)

3.1.2 $\sin(-145°)$ (3)

3.1.3 $\cos 70°$ (3)

3.2 Simplify the following expression to ONE trigonometric ratio:

$$\frac{\cos^2(90° - A) - \cos^2 A}{\sin(A - 360°).\cos(-A) + \sin(180° + A).\cos(180° - A)}$$ (8)

3.3 **Without using a calculator**, prove that: $\cos 64° + \sin 64°.\tan 32° = 1$ (5)

[22]

QUESTION 4

4.1 Prove that: $\sqrt{2}[\sin(x + 45°)] - \sin(90° - x) + \cos 180° = \sin x - 1$ (5)

4.2 Hence, determine the minimum value of $\sqrt{2}[\sin(x + 45°)] - \sin(90° - x) + \cos 180°$ (1)

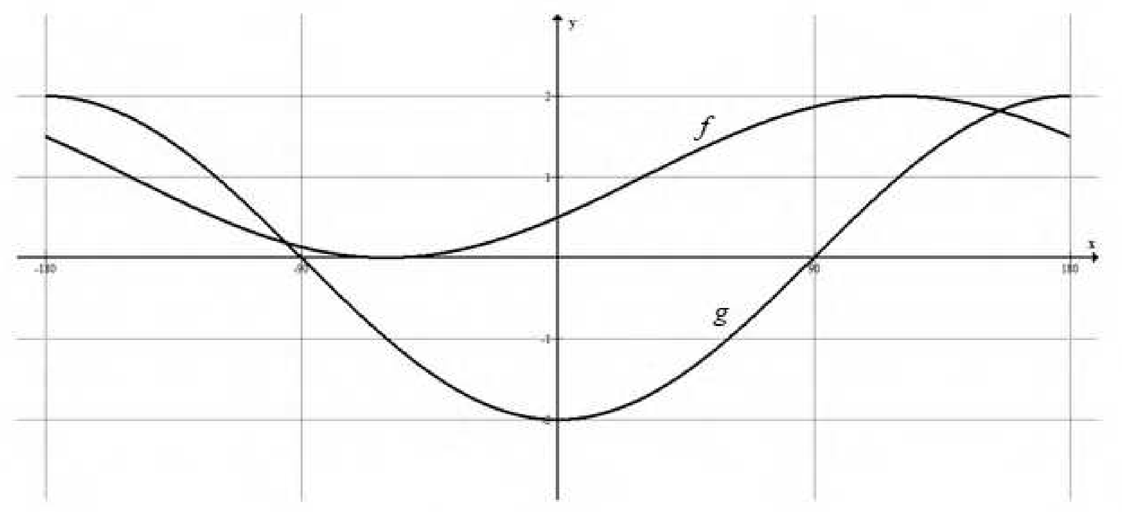
4.3 **Without using a calculator**, evaluate: $\sum_{k=1}^{5} \cos[60°(k - 1) + 60°]$ (4)

4.4 Determine the general solution of: $2\sin^2 x + 5\cos x - 4 = 0$ (6)

[16]

QUESTION 5

In the diagram, the graphs of $f(x)=1+\sin(x-30°)$ and $g(x)=d\cos x$ are drawn for the interval $x\in[-180°;180°]$.



5.1 Determine the value of d. (1)

5.2 Write down the range of f. (2)

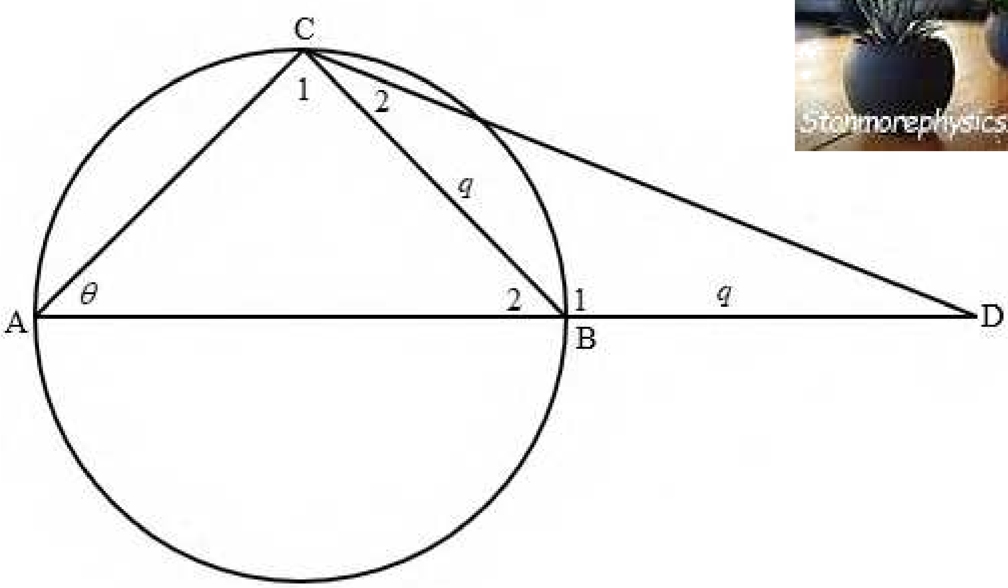
5.3 Determine the period of $g(2x)$. (2)

5.4 Write down the values of x in the interval $x\in[-180°;180°]$ for which both the graph of f and the graph of g are decreasing. (3)

[8]

QUESTION 6

In the diagram, AB is a diameter of circle ABC. AB is produced to a point D so that $BD = BC = q$ units. $B\hat{A}C = \theta$



6.1 Show, giving reasons that $\hat{B}_1 = 90° + \theta$ (3)

6.2 Prove that $DC = q\sqrt{2(1+\sin\theta)}$ (4)

6.3 If $DC = \sqrt{12}$ and $q = 2$, calculate the size of θ. (3)

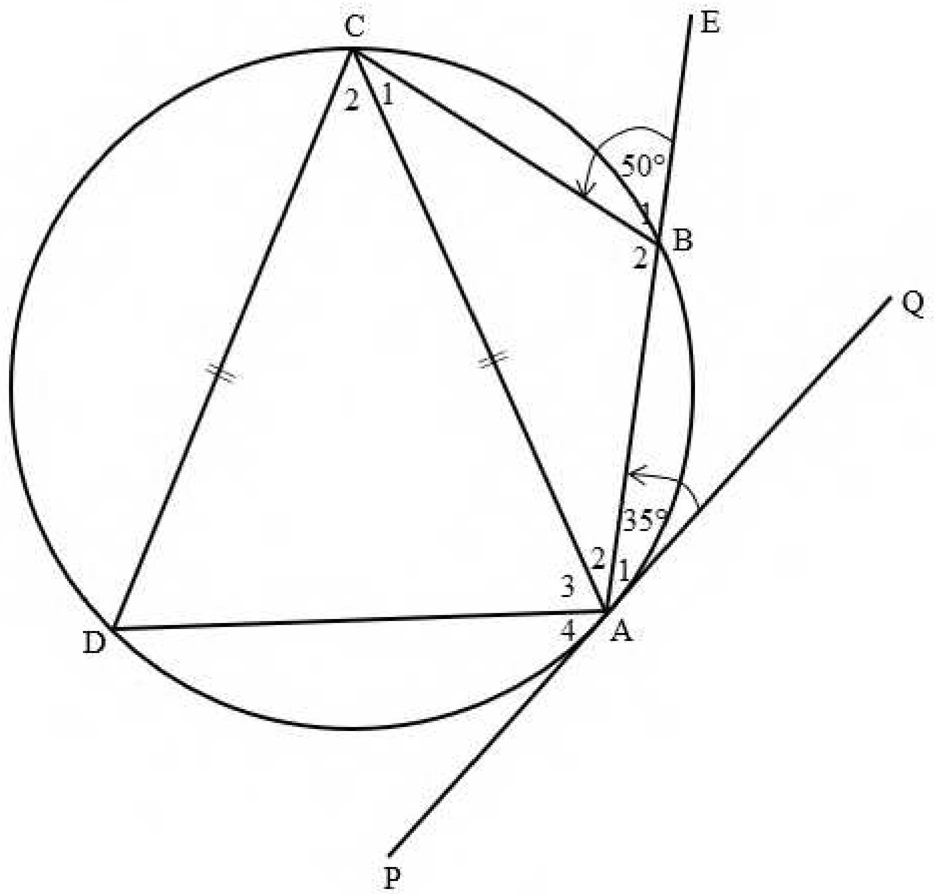
6.4 Hence, show that $AB = 4$ units. (2)

[12]

QUESTION 7

In the diagram, ABCD is a cyclic quadrilateral. PAQ is a tangent to circle at A.
AB is produced to any point E. $DC = AC$.

$\angle A_1 = 35°$ and $\angle B_1 = 50°$.



Calculate, stating reasons, the magnitude of:

7.1 $\hat{C}_1$ (2)

7.2 $\hat{D}$ (2)

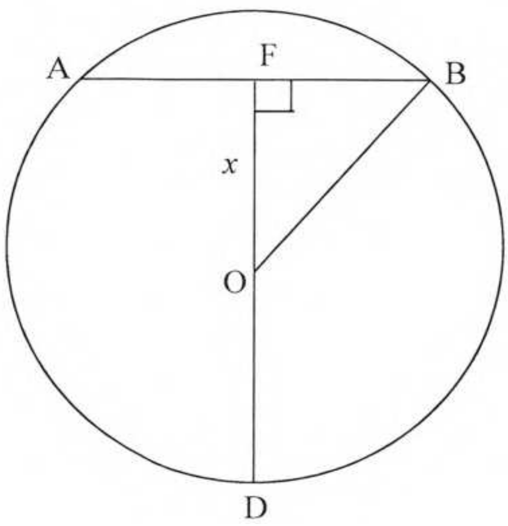
7.3 $\hat{A}_2$ (2)

7.4 $\hat{A}_4$ (3)

[9]

QUESTION 8

8.1 In the diagram, O is the centre of circle ABD. F is a point on chord AB such that $DOF \perp AB$. $AB = FD = 8\text{cm}$ and $OF = x$ cm.

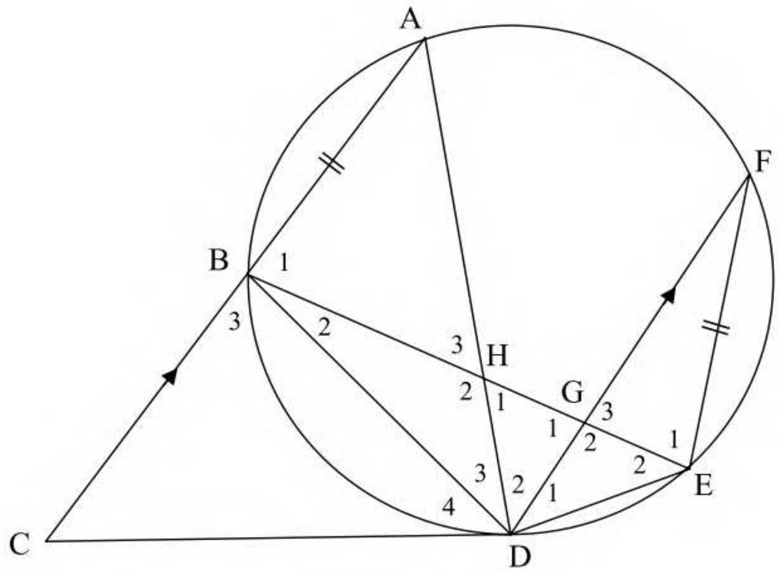


8.1.1 Write down, stating a reason, the length of FB. (2)

8.1.2 Determine the length of OD in terms of x. (1)

8.1.3 Determine the length of the radius of the circle. (4)

8.2 CD is the tangent to circle ABDEF at D. Chord AB is produced to C. Chord BE cuts chord AD at H and chord FD at G. AC||FD and $FE = AB$. Let $\hat{D}_4 = x$.



8.2.1 Determine THREE other angles that are each equal to x. (6)

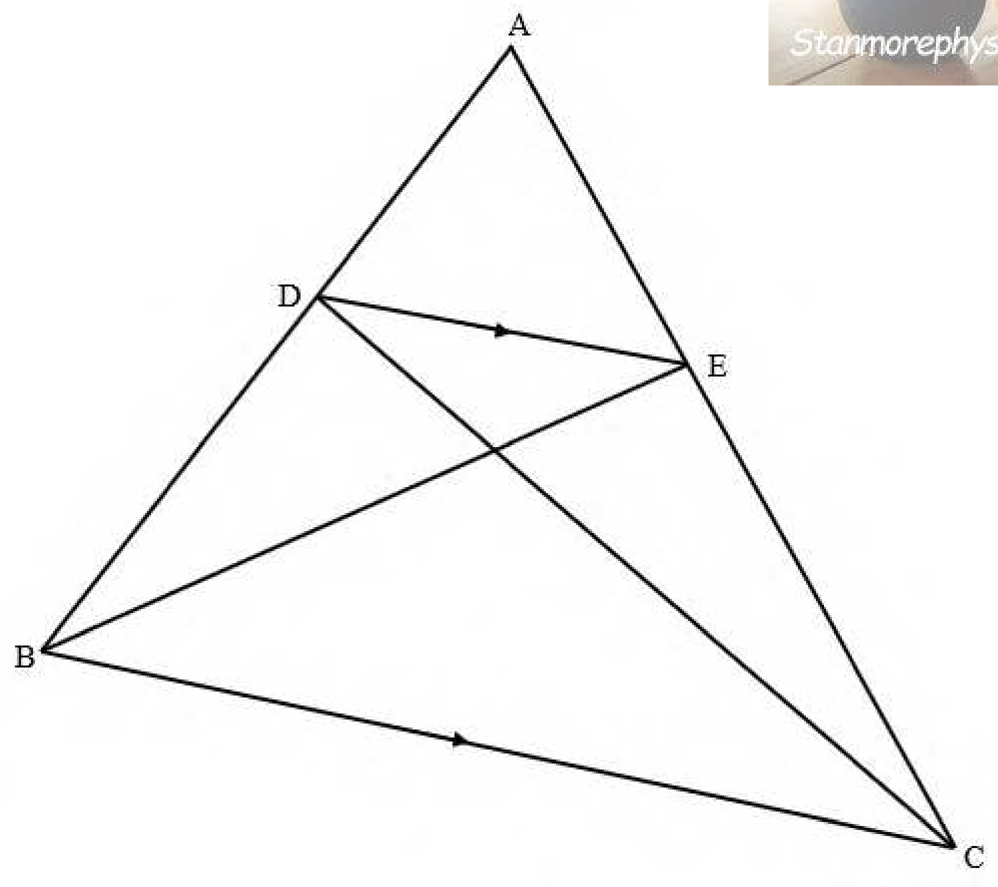
8.2.2 Prove that $\Delta BDH \,|||\, \Delta FDE$ (4)

8.2.3 Hence, or otherwise, prove that AB.BD = FD.BH (3)

[20]

QUESTION 9

In the diagram, ΔABC is drawn. D is a point on AB and E is point on AC such that DE // BC. BE and DC are drawn.

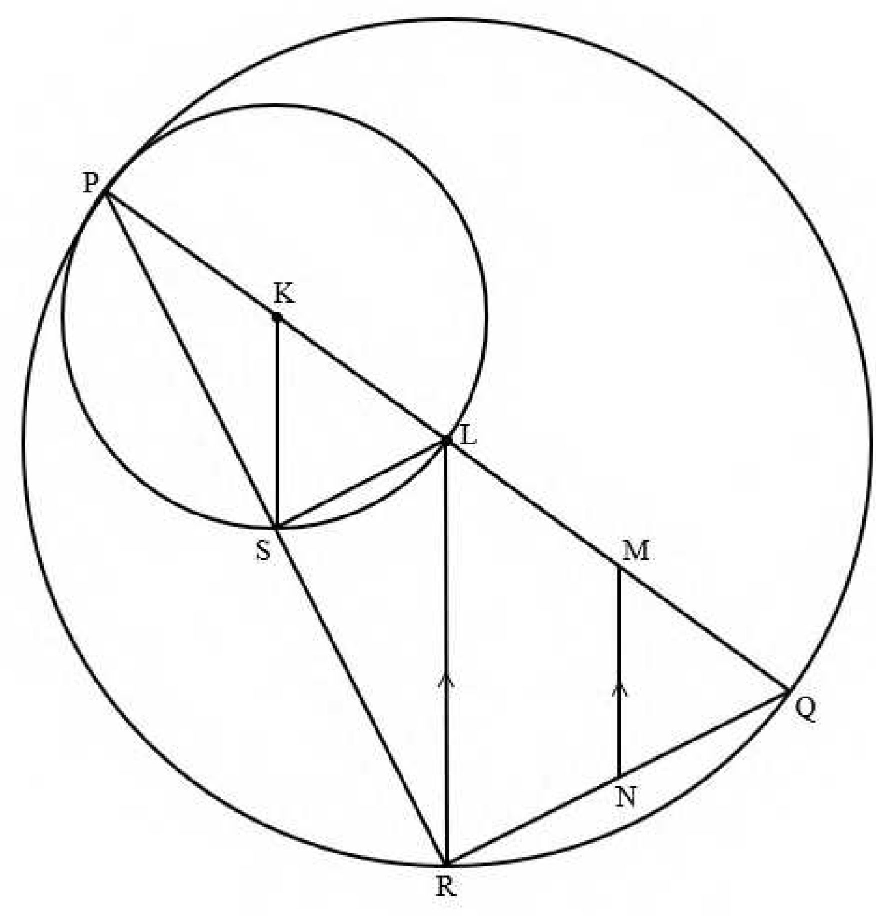


Use the diagram to prove that $\frac{AD}{DB} = \frac{AE}{EC}$. (6)

[6]

QUESTION 10

In the diagram, two circles PSL and PQR touch internally at P. K and L are the centres and PQ is the diameter of the larger circle. PSR is a straight line. MN || LR.



10.1 Determine the size of $P\hat{S}L$ (2)

10.2 Prove that:

10.2.1 SL || RQ (2)

10.2.2 $2KS = LR$ (3)

10.3 Determine the value of $\frac{KL}{PQ}$ (2)

10.4 If it is given that $PQ = 30$ units and $\frac{QN}{NR} = \frac{7}{9}$, determine the length of LM (3)

[12]

TOTAL: 150

INFORMATION SHEET: MATHEMATICS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$\sin 2\alpha = 2\sin\alpha.\sin\alpha$

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

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

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

education

Lefapha la Thuto la Bokone Bophirima
Noord-Wes Departement van Onderwys
North West Department of Education
NORTH WEST PROVINCE

PROVINCIAL ASSESSMENT

GRADE 12

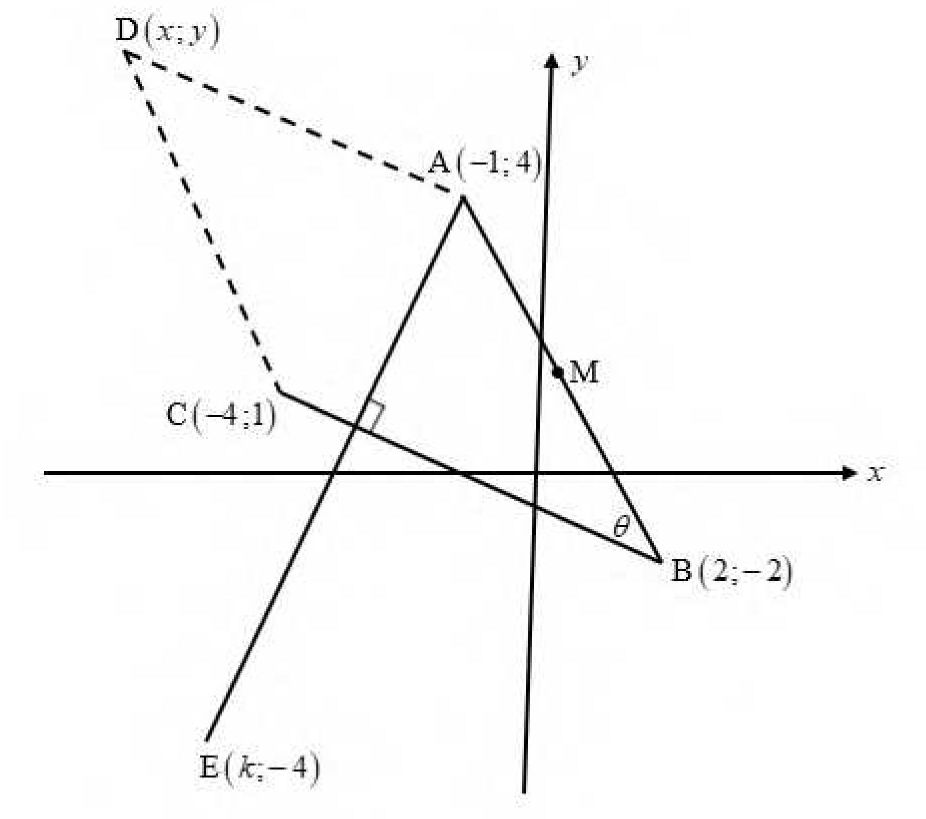
MATHEMATICS P2 MEMO

JUNE TEST 2022

MARKS: 150

This marking guideline consists of 18 pages.

QUESTION 1

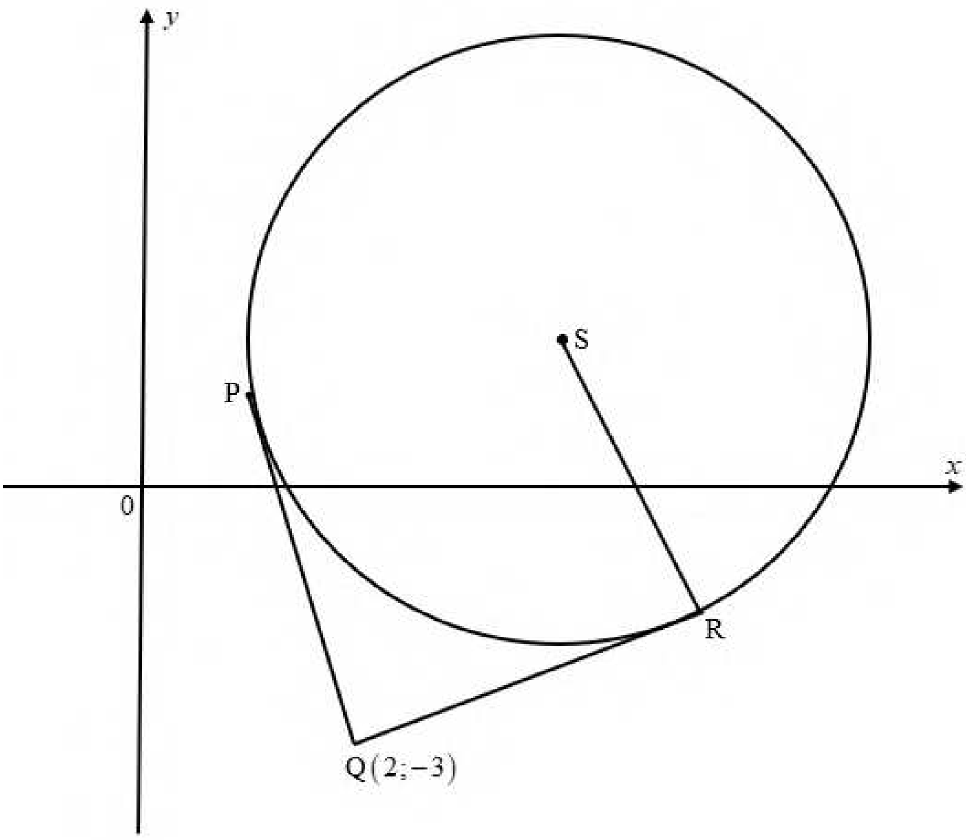


1.1	$M\left(\frac{-1+2}{2};\frac{4-2}{2}\right)$ $= M\left(\frac{1}{2};1\right)$	✓ $x=\frac{1}{2}$ ✓ $y=1$	(2)
1.2	$AB=\sqrt{(2+1)^2+(-2-4)^2}$ $=\sqrt{9+36}$ $=3\sqrt{5}$	✓ substitution ✓ answer	(2)

1.3	$m=\frac{-2-1}{2+4}$ $=-\frac{1}{3}$ $y+2=-\frac{1}{3}(x-2)$ $=-\frac{1}{3}x+\frac{8}{3}$	✓ $m=-\frac{1}{3}$ ✓ substitution ✓ answer	(3)
1.4	$m_{AB}=\frac{-2-4}{2+1}$ $=-2$ inclination of $AB=\tan(-2)+180°$ $=-63,44°+180°$ $=116,56°$ inclination of $BC=\tan\left(-\frac{1}{3}\right)+180°$ $=-18,44°+180°$ $=161,56°$ $\therefore\theta=161,56°-116,56°$ $=45°$	✓ $m_{AB}=-2$ ✓ $63,44°$ or $-63,44°$ ✓ $116,56°$ ✓ $161,56°$ ✓ answer	(5)
1.5	$-\frac{1}{3}\times m_{AE}=-1$ $m_{AE}=3$ $\frac{-4-4}{k+1}=3$ $-8=3k+3$ $k=\frac{-11}{3}$	✓ $m_{AE}=3$ ✓ $\frac{-4-4}{k+1}=3$ ✓ answer	(3)

1.6.1	$\left(\frac{x+2}{2};\frac{y-2}{2}\right)=\left(\frac{-1-4}{2};\frac{4+1}{2}\right)$ $\frac{x+2}{2}=-\frac{5}{2}$ $x+2=-5$ $x=-7$ $\frac{y-2}{2}=\frac{5}{2}$ $y-2=5$ $y=7$ $\therefore \text{D}(-7;7)$	✓ method ✓ $x=-7$ ✓ method ✓ $y=7$	(4)
1.6.2	Area $\Delta\text{ABC}=\frac{1}{2}ac\sin\theta$ $\text{BC}=\sqrt{(2+4)^2+(-2-1)^2}$ $=3\sqrt{5}$ Area $\Delta\text{ABC}=\frac{1}{2}\times 3\sqrt{5}\times 3\sqrt{5}\times\sin 45°$ $=\frac{1}{2}\times\frac{45}{1}\times\frac{\sqrt{2}}{2}$ $=\frac{45\sqrt{2}}{4}$ Area $\Delta\text{ABCD}=2\times$ Area ΔABC $=2\times\frac{45\sqrt{2}}{4}$ $=\frac{45\sqrt{2}}{2}$	✓ $\text{BC}=3\sqrt{5}$ ✓ substitution ✓ $\frac{45\sqrt{2}}{4}$ or $\frac{45}{2\sqrt{2}}$ ✓ method ✓ answer	(5)
			[24]

QUESTION 2



2.1.1	$x^2+y^2-10x-4y+12=0$ $x^2-10x+\left(-10\times\frac{1}{2}\right)^2+y^2-4y+\left(-4\times\frac{1}{2}\right)^2$ $=12+\left(-10\times\frac{1}{2}\right)^2+\left(-4\times\frac{1}{2}\right)^2$ $x^2-10x+(-5)^2+y^2-4y+(-2)^2=-12+25+4$ $(x-5)^2+(y-2)^2=17$ $\therefore S(5;2)$	✓ completing the sq ✓ LHS ✓ RHS ✓ answer	(4)
2.1.2	$r^2=17$ $r=\sqrt{17}$	✓ answer	(1)
2.2	$S\hat{R}Q=90°$ (tangent $\perp$ radius)	✓ Reason	(1)

2.3	$\frac{y-2}{x-5}\times\frac{y+3}{x-2}=-1$ $\frac{y^2+y-6}{x^2-7x+10}=-1$ $y^2+y-6=-\left(x^2-7x+10\right)$ $x^2+y^2-7x+y+4=0$ OR $\angle QRS=90°$ QS is diameter (converse $\angle$ in semi circle) $\left(\frac{2+5}{2};\frac{-3+2}{5}\right)$ $=\left(\frac{7}{2};-\frac{1}{2}\right)$ $\left(x-\frac{7}{2}\right)^2+\left(y+\frac{1}{2}\right)^2=\left(2-\frac{7}{2}\right)^2+\left(-3+\frac{1}{2}\right)^2$ $\left(x-\frac{7}{2}\right)^2+\left(y+\frac{1}{2}\right)^2=\frac{9}{4}+\frac{25}{4}$ $x^2-7x+\frac{49}{4}+y^2+y+\frac{1}{4}=\frac{34}{4}$ $x^2+y^2-7x+y+4=0$	✓ setting equation $m_1\times m_2=-1$ ✓ y^2+y-6 ✓ $x^2-7x+10$ ✓ cross multiplication ✓ QS is diameter ✓ coordinates of centre ✓ $\left(x-\frac{7}{2}\right)^2+\left(y+\frac{1}{2}\right)^2$ ✓ $\frac{34}{4}$	(4)
2.4	$x^2+y^2-10x-4y+12=0$ …………….. (1) $x^2+y^2-7x+y+4=0$ …………….. (2) (1) – (2): $-3x-5y+8=0$ $\therefore y=-\frac{3}{5}x+\frac{8}{3}$ …………… (3)	✓ $-3x-5y+8=0$ ✓ equation (3)	(6)

	Substitute (3) in (2): $x^2+\left(-\frac{3}{5}x+\frac{8}{5}\right)^2-7x+\left(-\frac{3}{5}x+\frac{8}{5}\right)+4=0$ $x^2+\frac{9}{25}x^2-\frac{48}{25}x+\frac{64}{25}-7x-\frac{3}{5}x+\frac{28}{5}=0$ $\frac{34}{25}x^2-\frac{238}{25}x+\frac{204}{25}=0$ $34x^2-238x+204=0$ $x^2-7x+6=0$ $(x-1)(x-6)=0$ $x=1$ or $x=6$ $y=-\frac{3}{5}(1)+\frac{8}{5}$ $\quad y=-\frac{3}{5}(6)+\frac{8}{5}$ $=1$ $\quad =-2$	✓ substitution ✓ std form ✓ factors ✓ values of x	
2.5	$QR=\sqrt{(2-6)^2+(-3+2)^2}$ $=\sqrt{17}$	✓ substitution ✓ answer	(2)
2.6	$SP=SR=\sqrt{17}$ [radii of same circle] $QP=QR=\sqrt{17}$ [tans from same point] $\therefore$ PQRS is a rhombus [All consecutive sides are =]	✓ $SP=SR=\sqrt{17}$ ✓ $QP=QR=\sqrt{17}$ ✓Reason	(3)
			[21]

QUESTION 3

3.1.1	$\cos 35° = \frac{p}{1} = \frac{x}{r}$ $y^2 = 1 - p^2$ $\therefore y = \sqrt{1-p^2}$ $\therefore \tan 35° = \frac{\sqrt{1-p^2}}{p}$	✓ Pythagoras ✓ $y = \sqrt{1-p^2}$ ✓ answer	(3)
3.1.2	$\sin(-145°) = -\sin 145$ $= -\sin(180° - 35°)$ $= -\sin 35°$ $= -\frac{\sqrt{1-p^2}}{1}$ $= -\sqrt{1-p^2}$	✓ $-\sin 145$ ✓ $-\sin 35°$ ✓ answer	(3)

3.1.3	$\cos 70° = \cos 2 \times 35°$ $= 1 - \cos^2 35°$ $= 1 - p^2$	✓ $\cos 2 \times 35°$ ✓expansion ✓answer	(3)
3.2	$\frac{\sin(A - 360°).\cos(-A) + \sin(180° + A).\cos(180° - A)}{\cos^2(90° - A) - \cos^2 A}$ $= \frac{\sin A.\cos A + (-\sin A).(-\cos A)}{\sin^2 A - \cos^2 A}$ $= \frac{\sin A\cos A + \sin A\cos A}{-(\cos^2 A - \sin^2 A)}$ $= \frac{2\sin A\cos A}{-\cos 2A}$ $= \frac{\sin 2A}{-\cos 2A}$ $= -\tan 2A$	✓ sinA ✓ cosA ✓ $-$ sinA ✓ $-$ cosA ✓ $\sin^2 A$ ✓ $-$ cos2A ✓ sin2A ✓answer	(8)

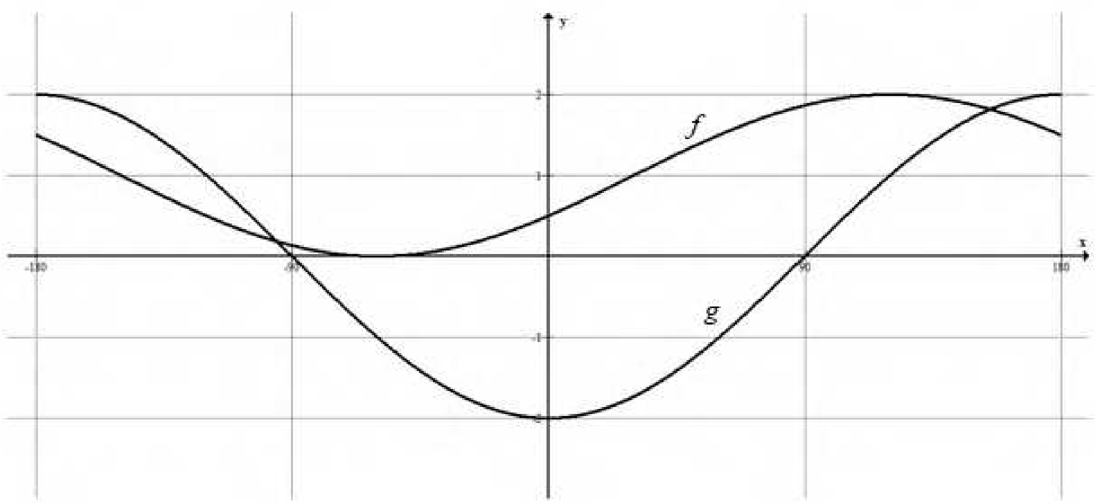
3.2	$LHS = \cos 64° + \sin 64°.\tan 32°$ $= \cos 2(32°) + \sin 2(32°).\tan 32°$ $= 2\cos^2 32° - 1 + 2\sin 32°.\cos 32°\left(\frac{\sin 32°}{\cos 32°}\right)$ $= 2\cos^2 32° - 1 + 2\sin^2 32°$ $= 2(\cos^2 32° + \sin^2 32°) - 1$ $= 2(1) - 1$ $= 1$ $\therefore LHS = RHS$	✓ $\frac{\sin 32°}{\cos 32°}$ ✓ $2\cos^2 32° - 1$ ✓ $2\sin 32°.\cos 32°$ ✓ $2(\cos^2 32° + \sin^2 32°)$ ✓ square identity i.e 1	(5)
			[22]

QUESTION 4

4.1	$\sqrt{2}[\sin(x + 45°)] - \sin(90° - x) + \cos 180° = \sin x - 1$ $LHS = \sqrt{2}(\sin x.\cos 45° + \cos x.\sin 45°) - \cos x - 1$ $= \sqrt{2}(\sin x \times \frac{1}{\sqrt{2}} + \cos x \times \frac{1}{\sqrt{2}}) - \cos x - 1$ $= \sin x + \cos x - \cos x - 1$ $= \sin x - 1$ $= LHS$	✓expansion of compound angle ✓ $\cos x$ ✓ - 1 ✓both $\frac{1}{\sqrt{2}} / \frac{\sqrt{2}}{2}$ ✓simplification	(5)
4.2	minimum value = -2	✓ answer	(1)
4.3	$\sum_{k=1}^{5} \cos[60° + (k-1)60°]$ $= \cos 60° + \cos 120° + \cos 180° + \cos 240° + \cos 300°$ $= \cos 60° - \cos 60° - 1 - \cos 60° + \cos 60°$ $= -1$ OR $\sum_{k=1}^{5} \cos[60° + (k-1)60°]$ $= \cos 60° + \cos 120° + \cos 180° + \cos 240° + \cos 300°$ $= \cos 60° - \sin 30° - 1 - \cos 60° + \cos 60°$ $= \frac{1}{2} - \frac{1}{2} - 1$ $= -1$	✓ $-\cos 60°$ ✓ $-\cos 60°$ ✓ $\cos 60°$ ✓ answer ✓ $-\sin 30°$ ✓ $-\cos 60°$ ✓ $\cos 60°$ ✓ answer	(4)

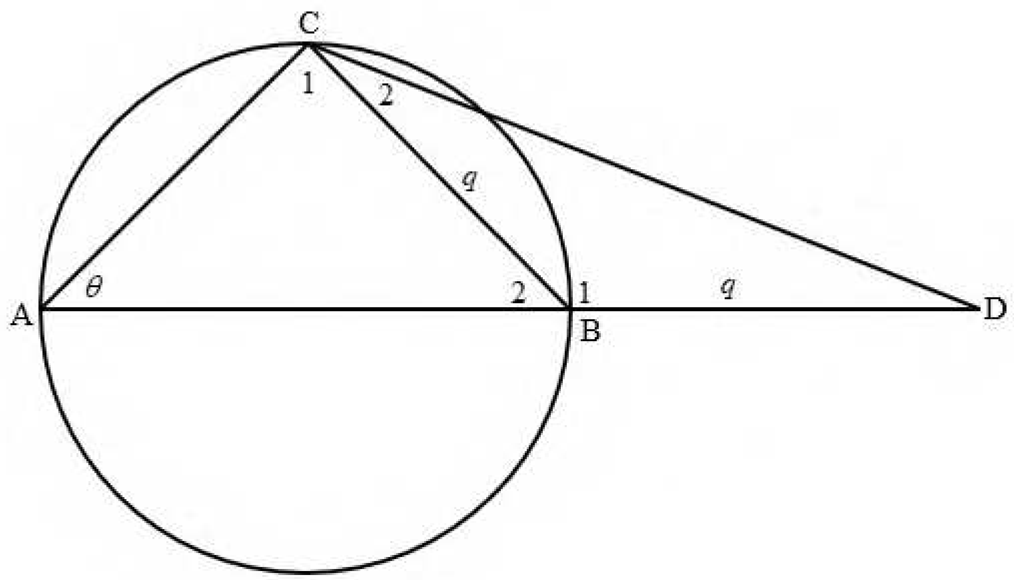
4.4	$2\sin^2 x + 5\cos x - 4 = 0$ $2(1-\cos^2 x) + 5\cos x - 4 = 0$ $2 - 2\cos^2 x + 5\cos x - 4 = 0$ $2\cos^2 x - 5\cos x + 2 = 0$ $(2\cos x - 1)(\cos x - 2) = 0$ $\cos x = \frac{1}{2}$ or $\cos x = 2$ (no solution) $\therefore x = \pm 60° + k.360° \quad k \in Z$ OR $x = 60° + k.360° \quad k \in Z$; or $x = 300° + k.360° \quad k \in Z$	✓ $1-\cos^2 x$ ✓ standard form ✓ factors ✓both solutions ✓ $\pm 60°$ OR($60°$ or $300°$) ✓ $k.360° \quad k \in Z$	(6)
			[16]

QUESTION 5



5.1	$d = -2$	✓ answer	(1)
5.2	$y \in [0;2]$ OR $0 \le y \le 2$	✓ end points ✓ notation	(2)
5.3	$g(2x) = -2\cos 2x$ period $= \frac{360°}{2} = 180°$	✓ $-2\cos 2x$ ✓ answer **Answer only : full marks**	(2)
5.4	$\therefore -180° < x < -60°$	✓✓ end points ✓correct notation	(3)
			[8]

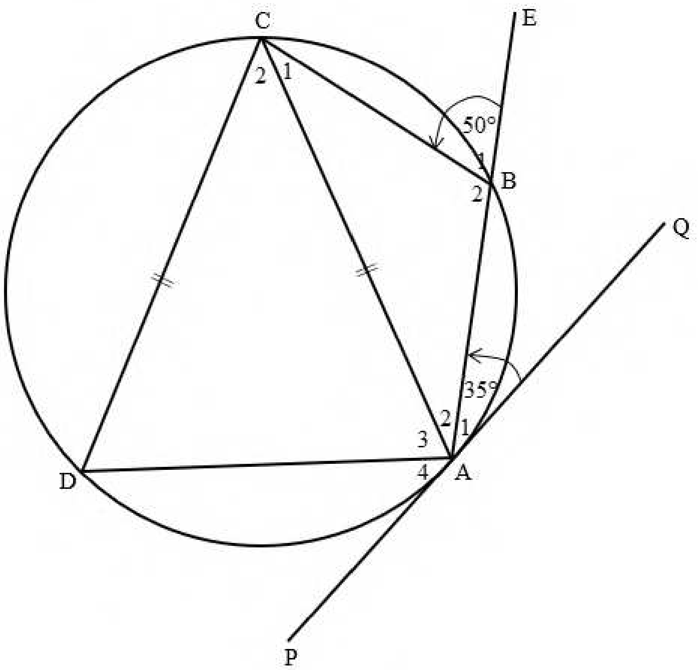
QUESTION 6



6.1	$\hat{C} = 90°$ (∠ in semi circle) $\hat{B} = 90° + \theta$ (Ext ∠ of Δ)	✓ S/ ✓ R ✓ R	(3)
6.2	$DC^2 = BC^2 + BD^2 - 2BC.BD\cos(90° + \theta)$ $= q^2 + q^2 - 2q.q(-\sin\theta)$ $= 2q^2 + 2q^2\sin\theta$ $= 2q^2(1 + \sin\theta)$ $\therefore DC = \sqrt{2q^2(1+\sin\theta)}$ $= q\sqrt{2(1+\sin\theta)}$	✓correct cosine rule ✓ $-\sin\theta$ ✓simplification ✓ factorising	(4)
6.3	$q\sqrt{2(1+\sin\theta)} = DC$ $2\sqrt{2(1+\sin\theta)} = \sqrt{12}$ $8(1+\sin\theta) = 12$ $1 + \sin\theta = \frac{12}{8}$ $\therefore \sin\theta = \frac{1}{2}$ $\therefore \theta = 30°$	✓ $8(1+\sin\theta) = 12$ ✓ $\frac{1}{2}$ ✓ answer	(3)

6.4	$\sin\theta = \dfrac{q}{AB}$ $AB = \dfrac{2}{\sin 30°}$ $= \dfrac{2}{\frac{1}{2}}$ $= 4$ units	✓ $\dfrac{2}{\sin 30°}$ ✓ $\dfrac{2}{\frac{1}{2}}$ or $\dfrac{2}{0,5}$	(2)
			[12]

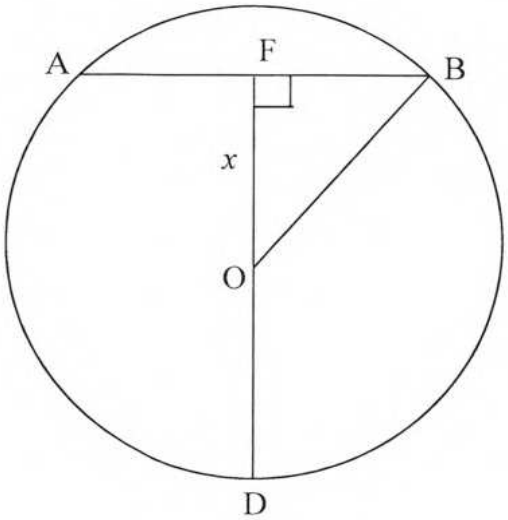
QUESTION 7

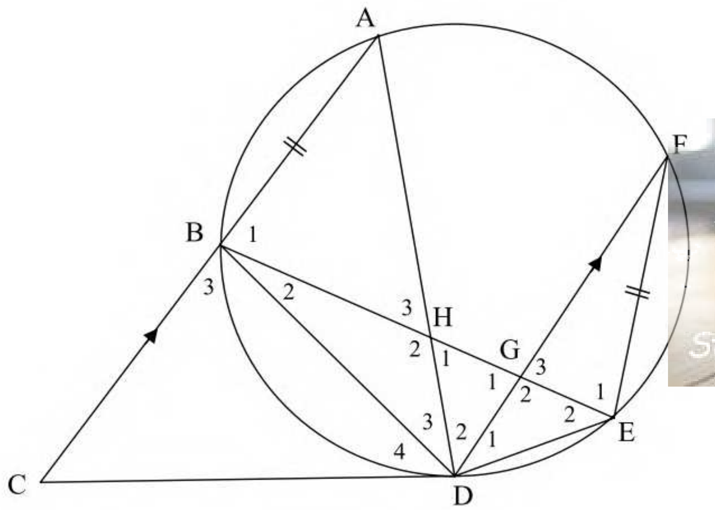


7.1	$\angle C_1 = \angle A_1 = 35°$ (tan chord theorem)	✓ S ✓ R	(2)
7.2	$\angle D = \angle B_1 = 50°$ (ext∠ of cyclic quad)	✓ S ✓ R	(2)
7.3	$\angle B_2 = 130°$ (opp∠s of cyclic quad) $\angle A_2 = 15°$ (∠s in Δ) OR $\angle A_2 = 50° - 35°$ (ext∠ of Δ) $= 15°$ OR $\angle B_2 = 180° - 50°$ (∠s on a str line) $= 130°$ $\angle A_2 = 15°$ (int ∠s of Δ)	✓ S/R ✓answer ✓ S/R ✓answer ✓ S/R ✓answer	(2)

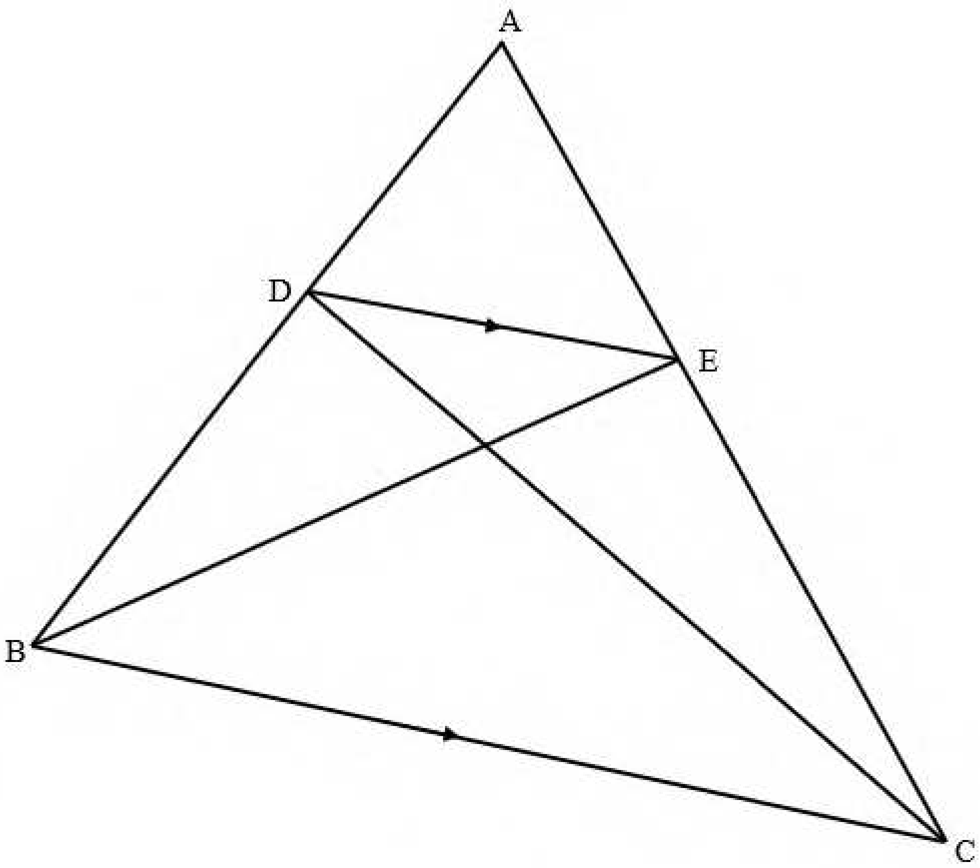
7.4	$\angle A_2 = \angle D = 50°$ (∠s opp equal sides) $\angle C_2 = 80°$ (∠s in Δ) $\angle A_4 = 80°$ (tan chord theorem)	✓ S/R ✓ S/R ✓S/R	(3)
			[9]

QUESTION 8

8.1			
8.1.1	FB = 4cm (line from centre of circle perpendicular to chord)	✓S✓R	(2)
8.1.2	OD = 8 - x	✓ answer	(1)
8.1.3	$OB^2 = OF^2 + FB^2$ $(8-x)^2 = x^2 + 4^2$ $64 - 16x + x^2 = x^2 + 16$ $48 = 16x$ $\therefore x = 3$ $\therefore r = 4 + 3 = 7$ cm	✓substitution in Pythagoras ✓simplification ✓value of x ✓answer	(4)

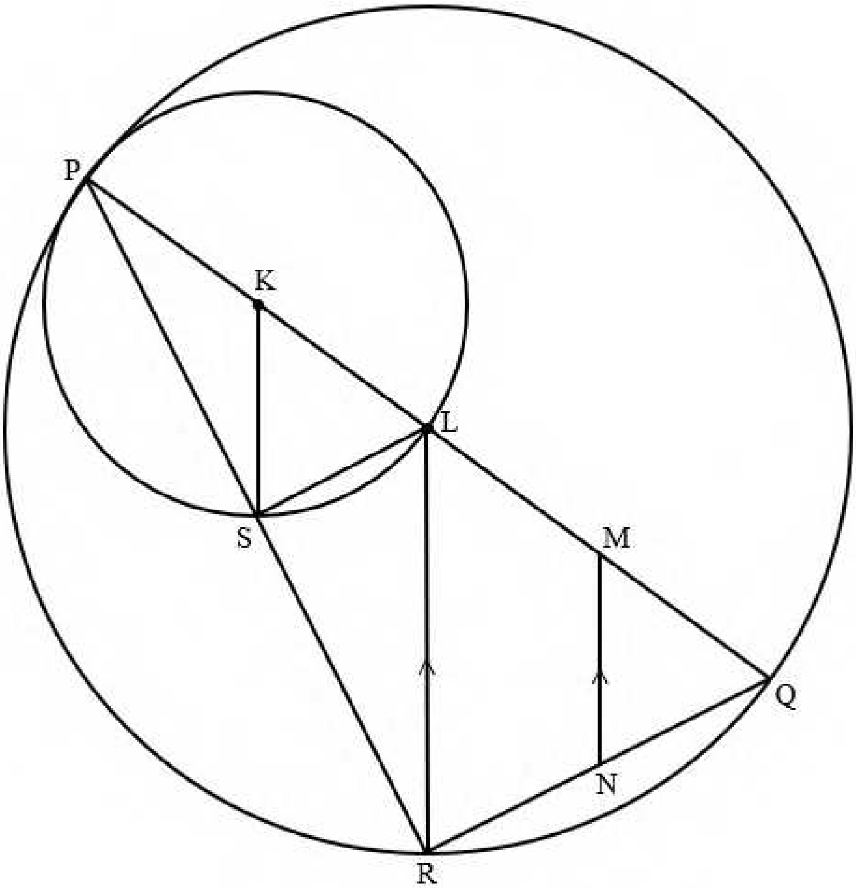
			
8.2.1	$\hat{A} = x$ (tan chord theorem) $\hat{E} = x$ (tan chrod theorem OR ∠s on same segment) $\hat{D}_2 = x$ (Alt ∠s; AC ∥ FD)	✓S✓R ✓S✓R ✓S✓R	(6)
8.2.2	In ΔBDH and ΔFDE $\hat{B}_2 = \hat{F}$ (∠s on same segment) $\hat{D}_3 = \hat{D}_1$ (equal chords subtend equal ∠s) $\therefore \hat{H}_2 = F\hat{D}E$ (3rd ∠ of Δ) ΔBHD ||| ΔFDE OR In ΔBDH and ΔFDE $\hat{B}_2 = \hat{F}$ (∠s on same segment) $\hat{D}_3 = \hat{D}_1$ (equal chords subtend equal ∠s) ΔBHD ||| ΔFDE (∠∠∠)	✓S/R ✓S✓R ✓S ✓S ✓S✓R ✓R	(4)
8.2.3	$\frac{BD}{FD} = \frac{BH}{FE}$ (||| Δ^s) $\therefore \frac{BD}{FD} = \frac{BH}{AB}$ $\therefore$ AB.BD = FD.BH	✓S✓R ✓replacing FE by AB	(3)
			[20]

QUESTION 9



	$\frac{\text{Area } \Delta ADE}{\text{Area } \Delta BDE} = \frac{AD}{DB}$ (same height) $\frac{\text{Area } \Delta ADE}{\text{Area } \Delta CDE} = \frac{AE}{EC}$ (same height) Area ΔBDE = Area ΔCDE $(DE \parallel BC)$ $\therefore \frac{\text{Area } \Delta ADE}{\text{Area } \Delta BDE} = \frac{\text{Area } \Delta ADE}{\text{Area } \Delta CDE}$ $\therefore \frac{AD}{DB} = \frac{AE}{EC}$	✓ S ✓ R ✓ S/R ✓ S ✓ R ✓ S	(6)
			[6]

QUESTION 9



10.1	$P\hat{S}L = 90°$ ($\angle$ in semi circle)	✓S✓R	(2)
10.2.1	$P\hat{R}Q = 90°$ ($\angle$ in semi circle) $\therefore SL \parallel RQ$ (corrsp $\angle^s$ are $=$)	✓ S/R ✓ R	(2)
10.2.2	$LP = 2KS$ (diameter $= 2r$) $LR = LP$ (radii of same circle) $\therefore 2KS = LR$ OR $\angle KSL = \angle KLS$ ($\angle$s opp equal sides (radii) $\angle Q = \angle KLS$ (corresp$\angle$s, $SL \parallel RQ$) $\angle Q = \angle LRQ$ ($\angle$s opp equal sides (radii) $\angle LRQ = \angle SLR$ (alt$\angle$s, $SL \parallel RQ$) $\therefore KS \parallel LR$ (alt $\angle$s equal)	✓ S/R ✓ S ✓ R ✓ S/R ✓ S/R ✓ R	(3)

	$\therefore \text{LR} = 2\text{KS}$ (line through midpoint // to 2nd side)		

10.3	$\text{PQ} = 2\text{PL}$ (diameter $= 2r$) $\text{PQ} = 2(2\text{KL})$ (diameter $= 2r$) $= 4\text{KL}$ $\frac{\text{KL}}{\text{PQ}} = \frac{1}{4}$ OR $\frac{\text{PL}}{\text{PQ}} = \frac{\text{PL}}{2\text{PL}}$ (diameter $= 2r$) $\frac{2\text{KL}}{\text{PQ}} = \frac{1}{2}$ (diameter $= 2r$) $\frac{\text{KL}}{\text{PQ}} = \frac{1}{4}$	✓ S/R ✓ S/R ✓ S/R ✓S/R	(2)
10.4	$\frac{\text{LM}}{\text{LQ}} = \frac{\text{NR}}{\text{RQ}}$ (prop theorem, $\text{MN} \parallel \text{LR}$) $\frac{\text{LM}}{\frac{1}{2}\text{PQ}} = \frac{9}{16}$ $\frac{\text{LM}}{15} = \frac{9}{16}$ $\text{LM} = 8{,}44$	✓ S/R ✓ S ✓ S	(3)
			[12]

		TOTAL:	**150**