KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

MATHEMATICS P2

COMMON TEST

JUNE 2022

MARKS: 150

TIME: 3 hours

This question paper consists of 9 pages and 2 diagram sheets and 1 information sheet.

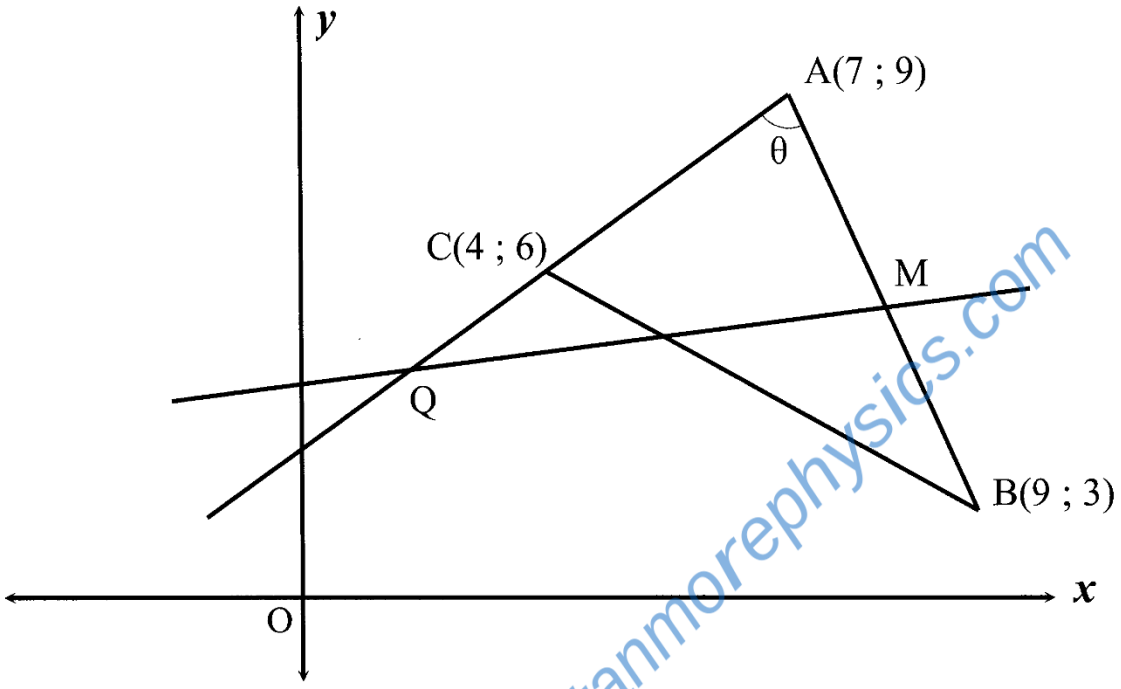
INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of **9** questions.
2. Read the questions carefully.
3. Answer ALL the questions.
4. Number your answers exactly as the questions are numbered.
5. Clearly show ALL calculations, diagrams, graphs, etc. which you have used in determining your answers.
6. Answers only will NOT necessarily be awarded full marks.
7. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
8. If necessary, round off answers correct to TWO decimal places, unless stated otherwise.
9. Diagrams are NOT necessarily drawn to scale.
10. Write neatly and legibly.

QUESTION 1

In the diagram below, $A(7;9)$, $B(9;3)$ and $C(4;6)$ are the vertices of ΔABC.
QM is the perpendicular bisector of AB. Q lies in quadrant 1 on AC produced. $C\hat{A}B = \theta$.



1.1 Write down the gradient of AB. (2)

1.2 Determine the coordinates of M. (2)

1.3 Determine the equation of MQ. (3)

1.4 Calculate the coordinates of Q. (5)

1.5 Show that QA = QB. (3)

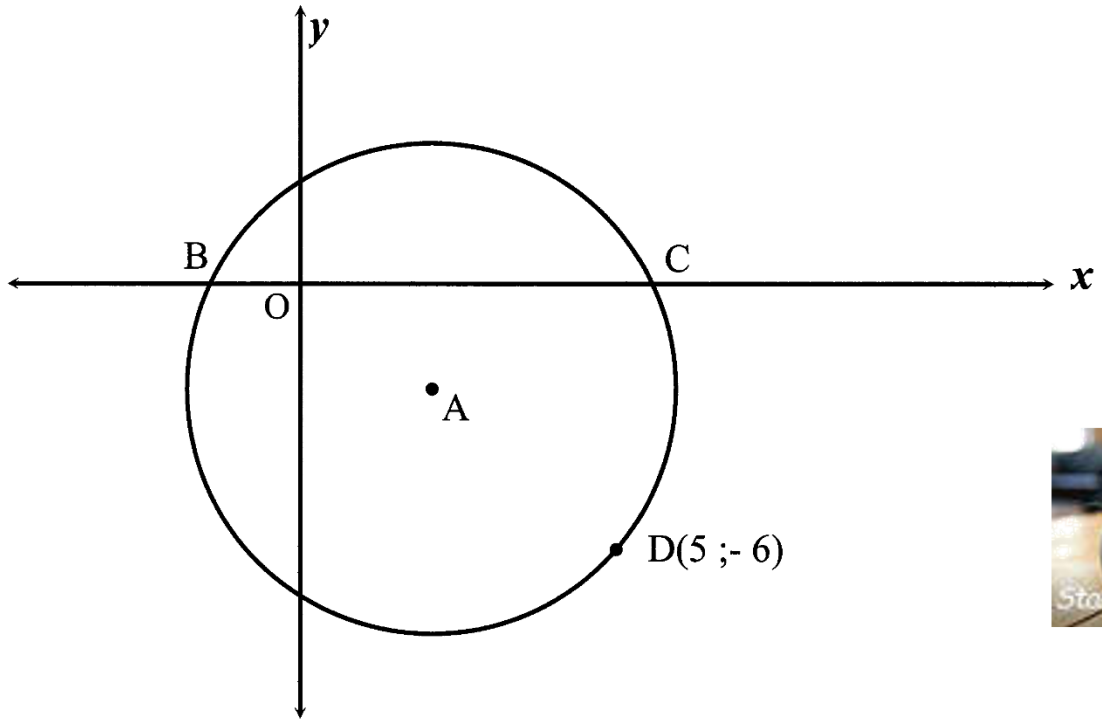
1.6 Calculate the coordinates of D, if ABCD is a parallelogram. (4)

1.7 Calculate the size of θ, correct to 1 decimal place. (5)

[24]

QUESTION 2

In the diagram, the equation of the circle with centre A is $x^2+y^2-2x+6y=15$.
$D(5;-6)$ is a point on the circle. The circle intersects the x-axis at B and C.



2.1 Calculate the coordinates of the centre of the circle, A. (4)

2.2 Determine the coordinates of the x-intercepts of the circle. (4)

2.3 Determine the equation of the tangent to the circle at D. (5)

2.4 Determine the area of ΔABC. (3)

2.5 Given that another circle $(x-1)^2+(y-b)=1$ touches this circle with centre A at one point only, give one possible value of b. (4)

2.6 Does the point P(-1; -7) lie inside or outside the circle centered at A.
Justify your answer. (3)

[23]

QUESTION 3

Given P(a ; –40) , OP = 41 units and $\hat{POX} = \theta$ where $\theta \in [270^\circ; 360^\circ]$. Calculate, **without using a calculator** and with the aid of a sketch, the values of the following (in simplest form):

3.1 $82\cos\theta + \sin(\theta - 180°)$ (6)

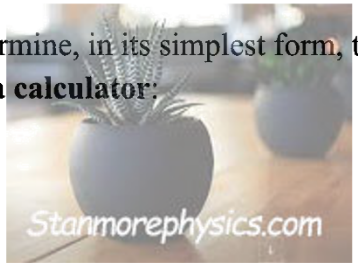
3.2 $27\tan\theta - \cos(90° - \theta)$ (4)

3.3 $\cos 2\theta + 1$ (3)

[13]

QUESTION 4

Given that $\sin\theta\cos\theta = t$ where $2\theta \in [0^\circ; 90^\circ]$, determine, in its simplest form, the value of each of the following in terms of t , **without using a calculator**:



4.1 $\tan 2\theta$ (4)

4.2 $\sin\theta$ (4)

[8]

QUESTION 5

5.1 Simplify the following, without using a calculator:

5.1.1 $$\frac{\tan 480°.\sin 300°.\cos 14°.\sin(-135°)}{\sin 104°.\cos 225°}$$ (6)

5.1.2 $\cos(90° - 2x).\tan(180° + x) + \sin^2(360° - x)$ (6)

5.2 Shown below are three trigonometric identities which form a pattern:

$$\frac{\sin\theta - \cos\theta}{1 - \tan\theta} = -\cos\theta \quad ; \quad \frac{\sin^2\theta - \cos^2\theta}{1 - \tan^2\theta} = -\cos^2\theta \quad ; \quad \frac{\sin^3\theta - \cos^3\theta}{1 - \tan^3\theta} = -\cos^3\theta$$

5.2.1 Use the pattern to write down the value of: $\dfrac{\sin^{2022}\theta - \cos^{2022}\theta}{1 - \tan^{2022}\theta}$ (2)

5.2.2 For which values of θ are the identities in the pattern undefined, where $\theta \in [0^\circ; 180^\circ]$? (5)

5.2.3 Write down the n^{th} term of the above pattern in terms of the given identities. (2)

5.2.4 Show that: $\dfrac{\sin^n\theta - \cos^n\theta}{1 - \tan^n\theta} = -\cos^n\theta$ (5)

[26]

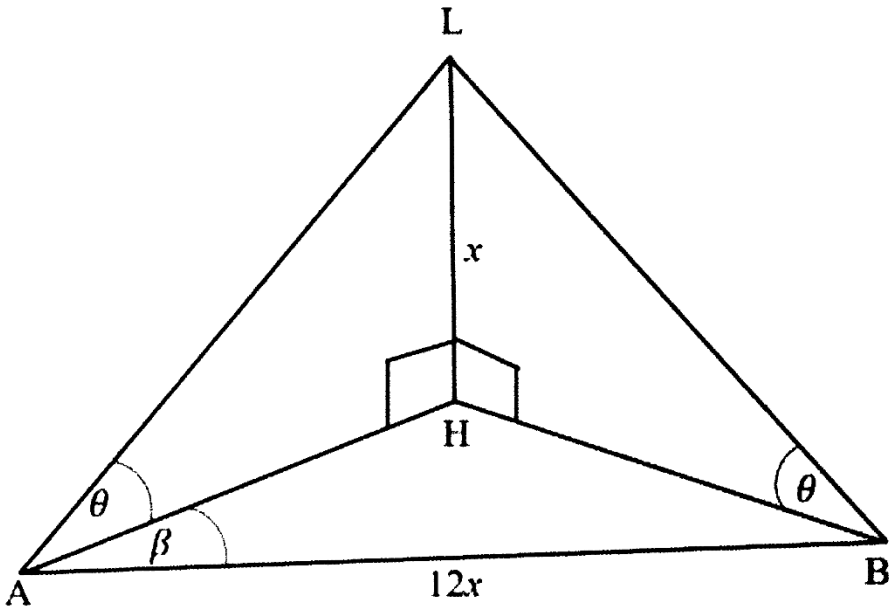
QUESTION 6

The captain of a boat at sea, at point A, notices a lighthouse LH directly north of his position. He determines that the angle of elevation of L, the top of the lighthouse, from A is θ and the height of the lighthouse is x metres.

From point A the captain sails $12x$ metres in a direction β degrees east of north to point B.

From point B, he notices that the angle of elevation of L is also θ.

A, H and B lie in the same horizontal plane.



6.1 Determine AH in terms of x and θ. (2)

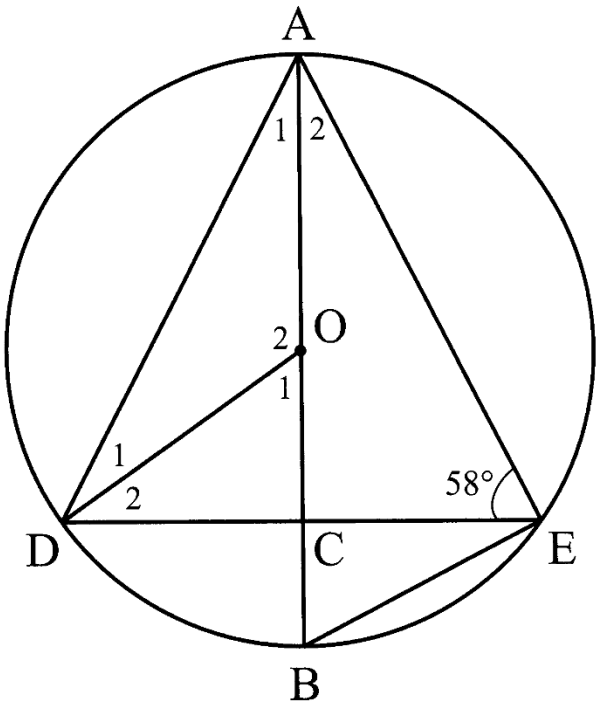
6.2 Prove that $\tan\theta = \dfrac{\cos\beta}{6}$. (5)

6.3 If it is given that AH = 60 m and $\beta = 40^\circ$, then calculate the height of the lighthouse. (4)

[11]

QUESTION 7

In the diagram below, AB is the diameter of a circle centered at O.
AB intersects chord DE at C. Radius DO and chords AD, AE and BE are drawn. $A\hat{E}D = 58°$



Determine, giving reasons, the size of each of the following angles:

7.1 $\hat{O}_2$ (2)

7.2 $D\hat{E}B$ (2)

7.3 $\hat{A}_1$ (2)

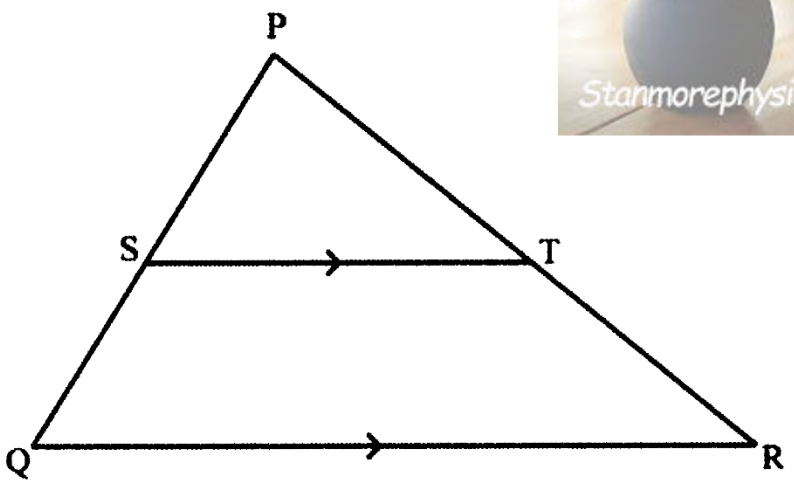
7.4 $A\hat{B}E$, if DC = CE. (3)

7.5 DC in terms of r, if $AC = \frac{3}{2}CB$ and the radius of the circle is r units. (5)

[14]

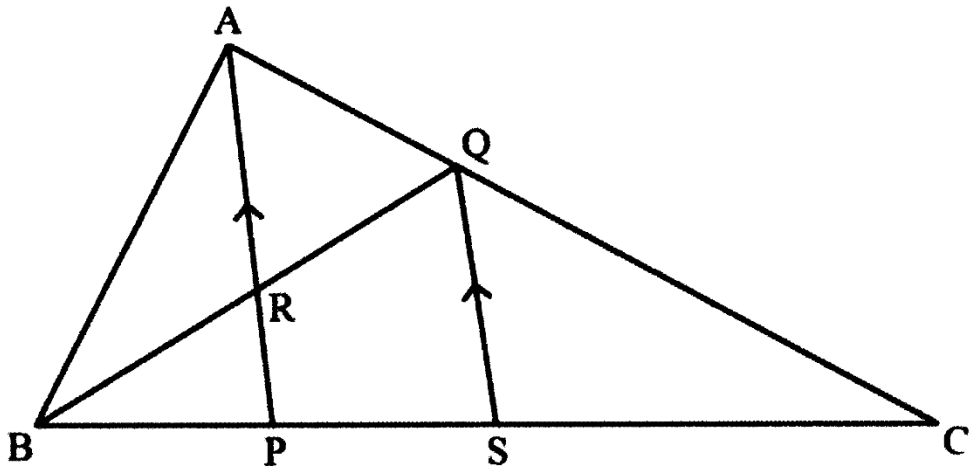
QUESTION 8

8.1 In the diagram, PQR is a triangle with S and T being points on PQ and PR respectively such that ST // QR.



Use the diagram to prove that: $\frac{PS}{SQ} = \frac{PT}{TR}$ (6)

8.2 In ΔABC, AQ : QC = 1 : 3. AP // QS with P and S on BC and Q on AC. BQ intersects AP in R. $BP = \frac{1}{3}BC$.



Determine, with reasons, the following:

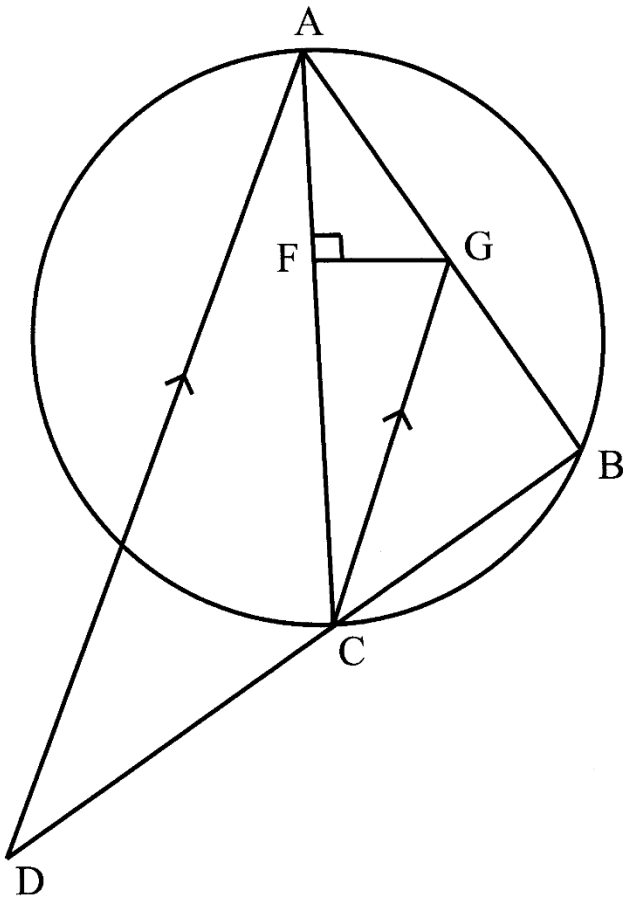
8.2.1 $\frac{BP}{PS}$ (5)

8.2.2 $\frac{BR}{RQ}$ (2)

[13]

QUESTION 9

In the figure AC is a diameter of the circle. CG bisects $A\hat{C}B$ with G on AB. GF ⊥ AC with F on AC. AD // GC.



9.1 Prove that:

9.1.1 ΔCAD is isosceles. (4)

9.1.2 $\frac{BC}{AC} = \frac{BG}{GA}$ (3)

9.1.3 ΔAFG /// ΔABC (3)

9.2 If BC = 12 units and the radius of the circle is 10 units, calculate the length of:

9.2.1 AB (3)

9.2.2 GF (3)

9.2.3 AF (2)

[18]

TOTAL: 150

INFORMATION SHEET: MATHEMATICS

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

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

$$T_n = a + (n-1)d \qquad S_n = \frac{n}{2}\{2a + (n-1)d\}$$

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

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

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

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

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

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

In ΔABC: $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

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

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

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

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

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

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

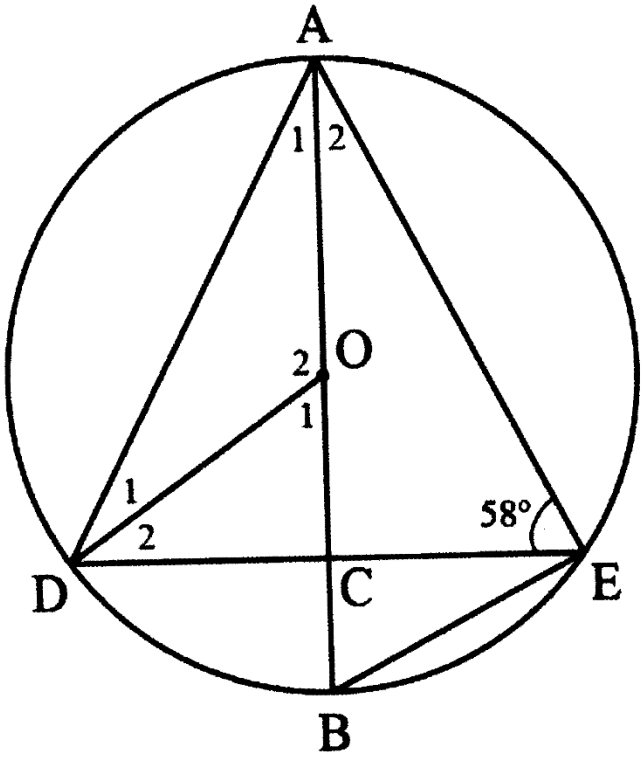
$$P(A) = \frac{n(A)}{n(S)} \qquad P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

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

NAME and SURNAME:

DIAGRAM SHEET 1

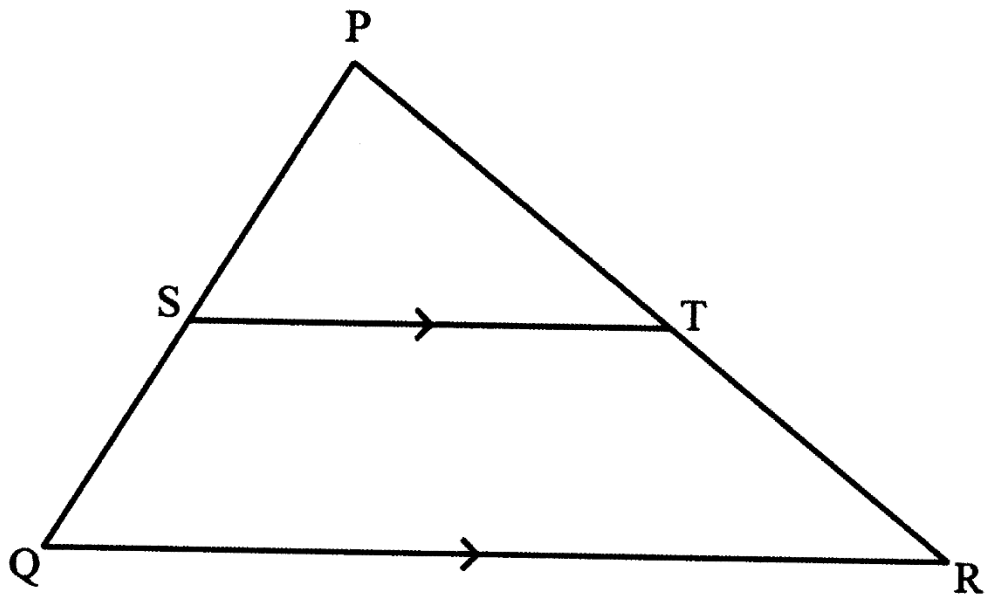
QUESTION 7



Detach and return

QUESTION 8.1

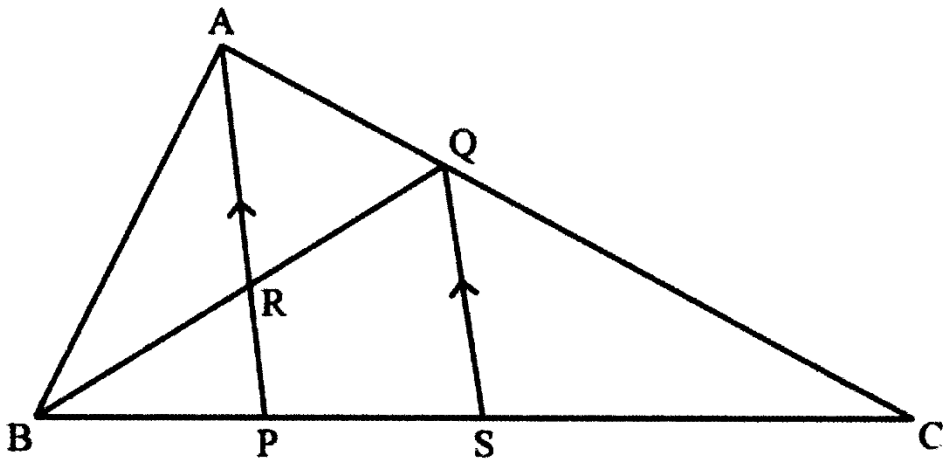
Detach and return



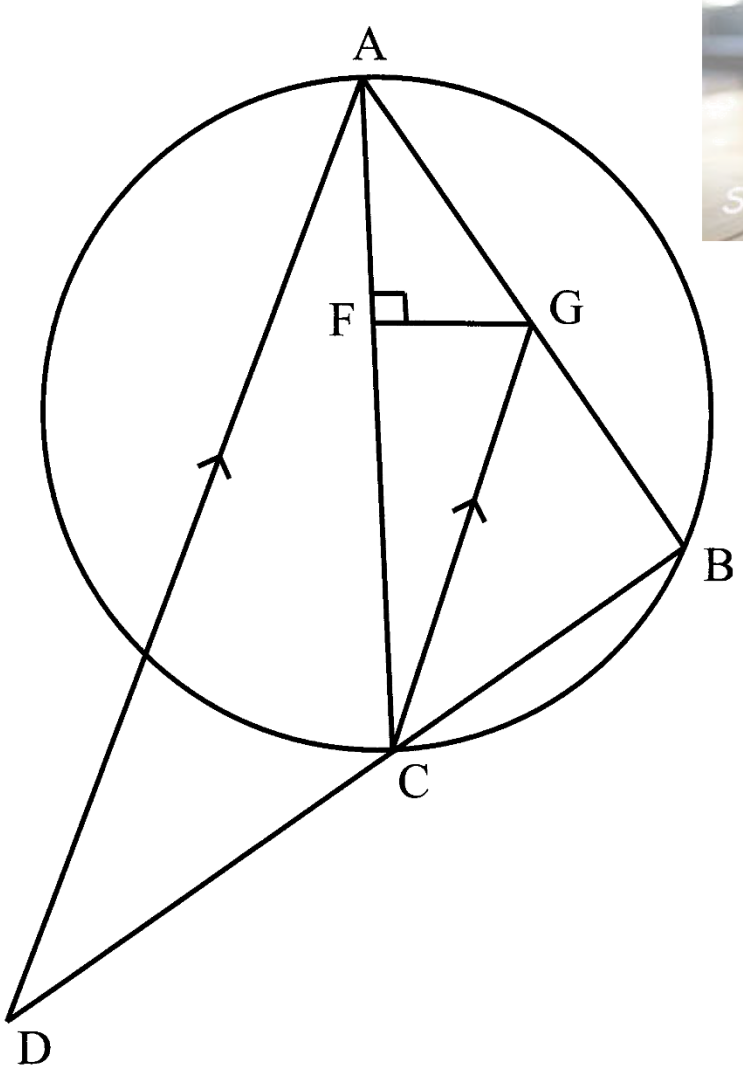
NAME and SURNAME:

DIAGRAM SHEET 2

QUESTION 8.2



QUESTION 9



Detach and return

KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

MATHEMATICS P2

COMMON TEST

JUNE 2022

SPECIAL ANSWER BOOK

NATIONAL SENIOR CERTIFICATE

GRADE 12

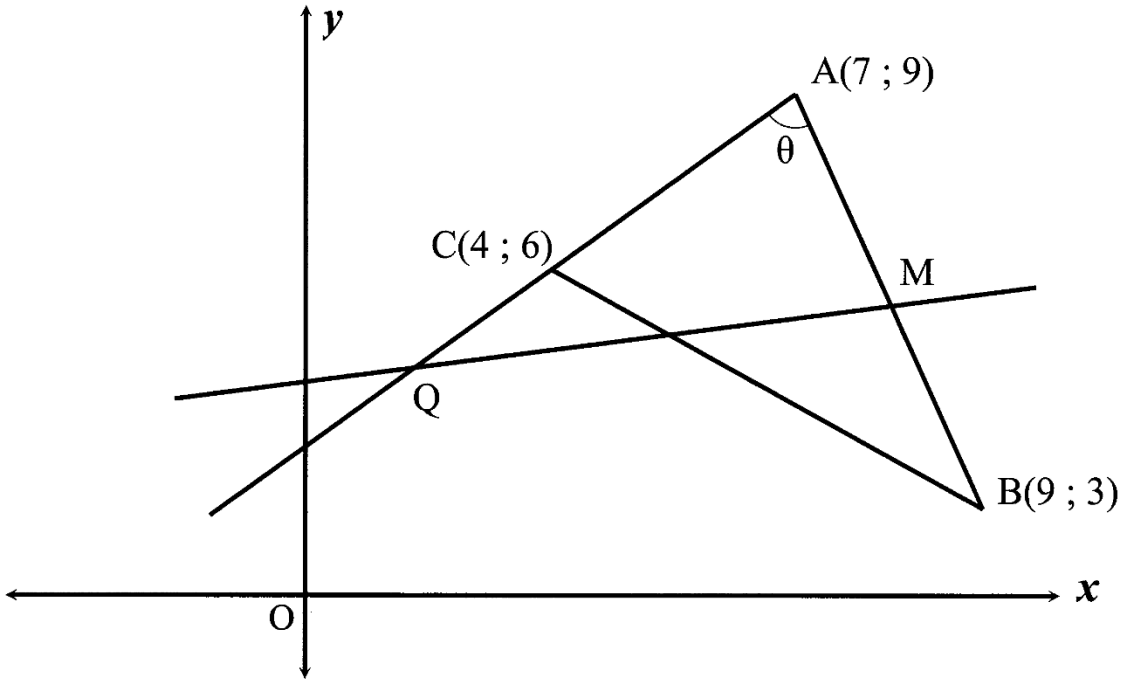
NAME OF CANDIDATE: _____

150

TIME: 3 hours

This answer book consists of 18 pages

QUESTION 1

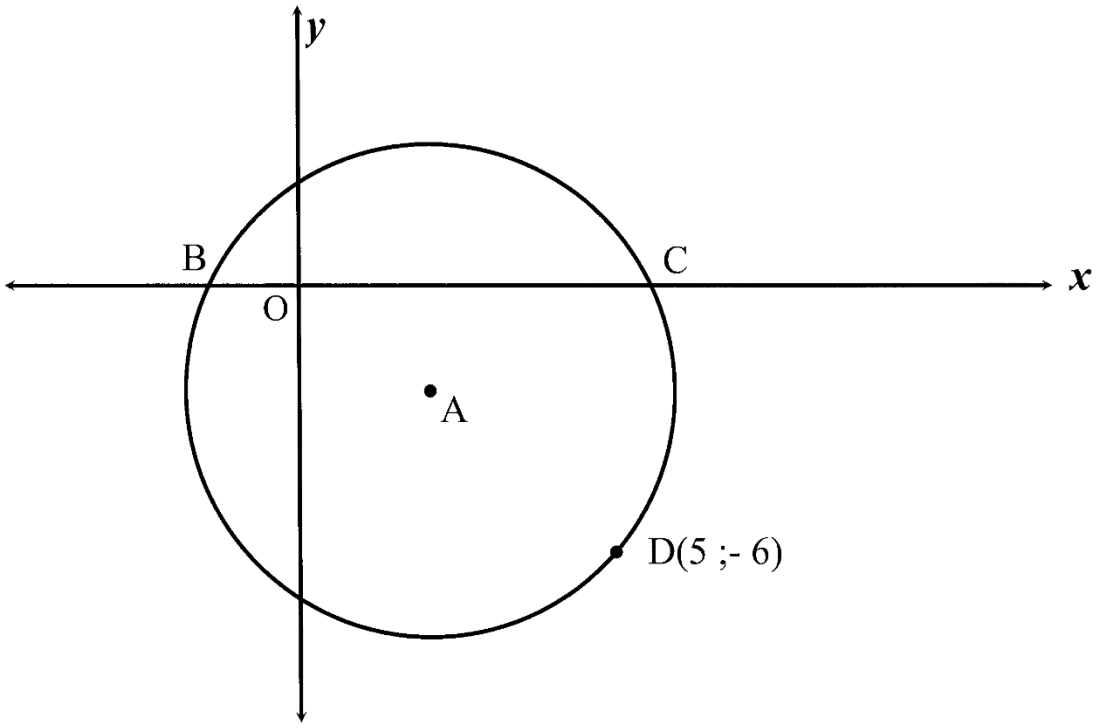


	Solution/*Oplossing*	**Marks/ *Punte***
1.1		(2)
1.2		(2)
1.3		(3)

	Solution/Oplossing	*Marks/ Punte*
1.4		(5)
1.5		(3)
1.6		(4)

	Solution/Oplossing	*Marks/ Punte*
1.7		(5)
		[24]

QUESTION 2



	Solution/Oplossing	*Marks/ Punte*
2.1		(4)
2.2		(4)

	Solution/Oplossing	*Marks/ Punte*
2.3		(5)
2.4		(3)
2.5		(4)
2.6		(4)
		[23]

QUESTION 3

	Solution/*Oplossing*	**Marks/ *Punte***
3.1		(6)
3.2		(4)
3.3		(3)
		[13]

QUESTION 4

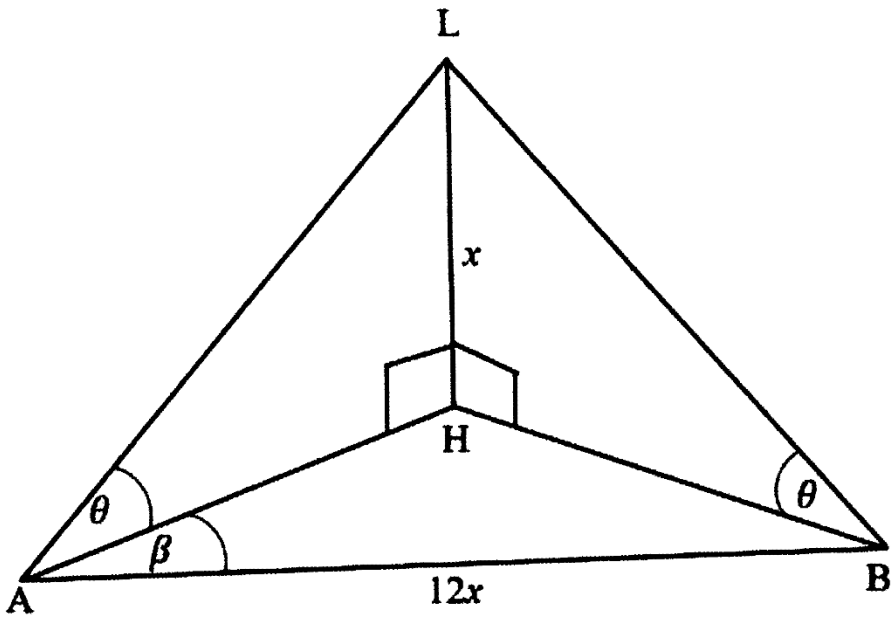
	Solution/*Oplossing*	**Marks/ *Punte***
4.1		(4)
4.2		(4)
		[8]

QUESTION 5

	Solution/Oplossing	*Marks/ Punte*
5.1.1		(6)
5.1.2		(6)
5.2.1		(2)
5.2.2		(5)
5.2.3		(2)

	Solution/Oplossing	*Marks/ Punte*
5.2.4		(5)
		[26]

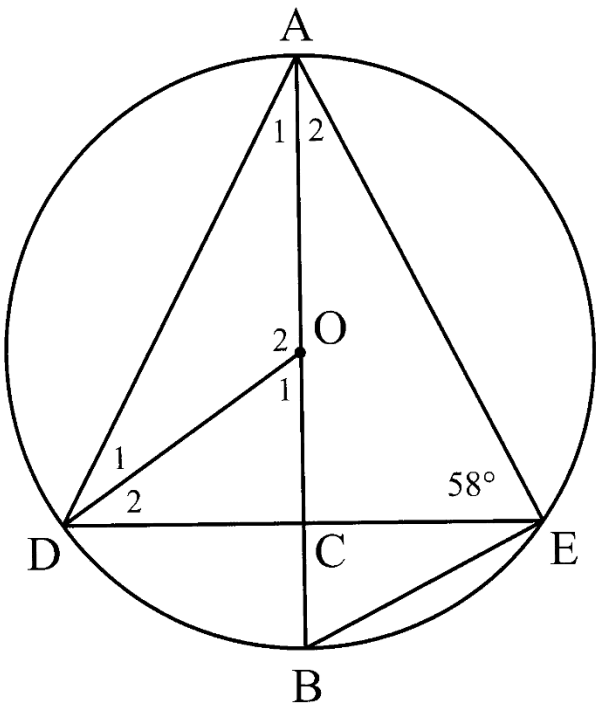
QUESTION 6



	Solution/Oplossing	*Marks/ Punte*
6.1		(2)
6.2		(5)

	Solution/*Oplossing*	Marks/ *Punte*
6.3		(4)
		[11]

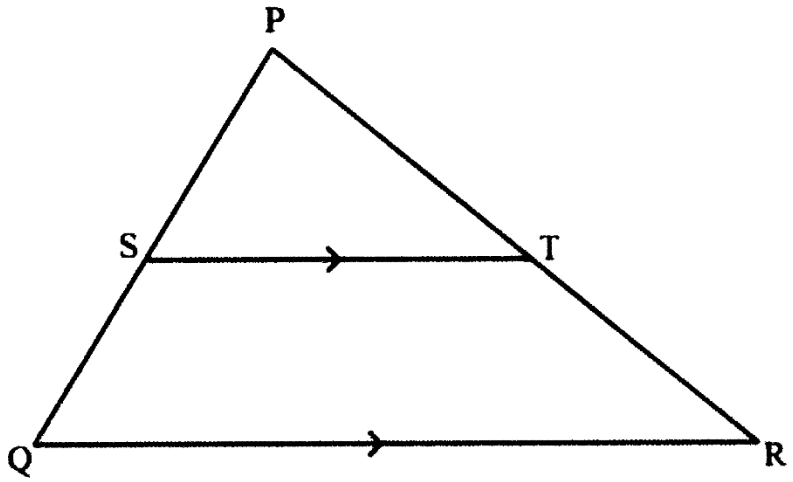
QUESTION 7



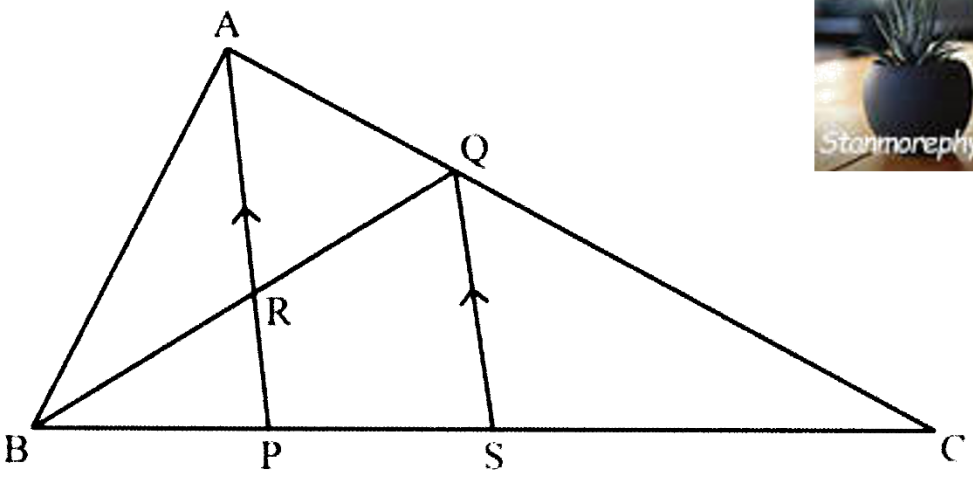
	Solution/Oplossing	*Marks/ Punte*
7.1		(2)
7.2		(2)
7.3		(2)
7.4		(3)

	Solution/Oplossing	*Marks/ Punte*
7.5		(5)
		[14]

QUESTION 8

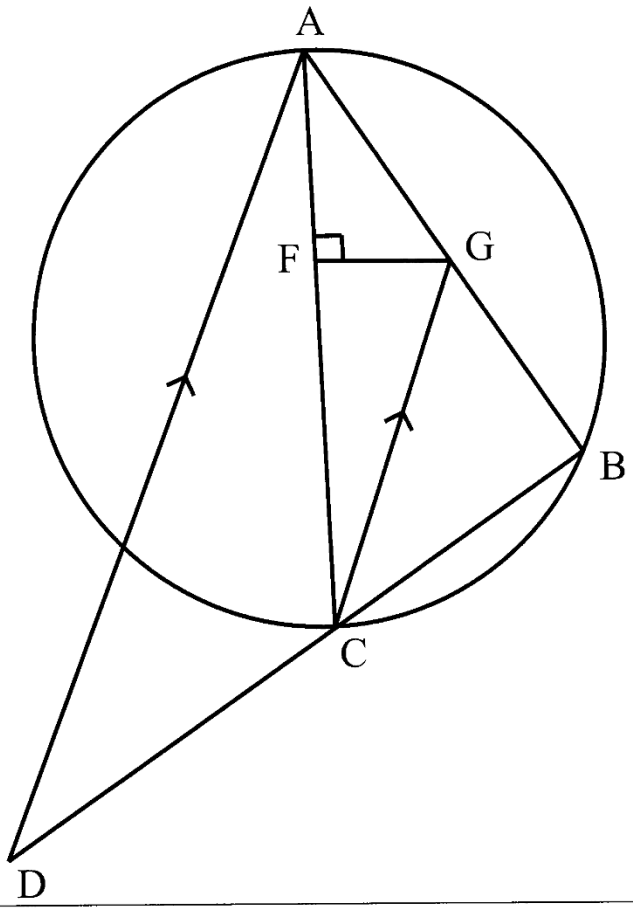


	Solution/Oplossing	*Marks/ Punte*
8.1		(6)



	Solution/*Oplossing*	**Marks/ *Punte***
8.2.1		(5)
8.2.2		(2)
		[13]

QUESTION 9



	Solution/*Oplossing*	**Marks/ *Punte***
9.1.1		(4)
9.1.2		(3)

	Solution/Oplossing	*Marks/ Punte*
9.1.3		(3)
9.2.1		(3)
9.2.2		(3)
9.2.3		(2)
		[18]
	TOTAL	**150**

KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

MATHEMATICS P2

COMMON TEST

JUNE 2022

MARKING GUIDELINE

MARKS: 150

TIME: 3 hours

NOTE:

- If a candidate answered a QUESTION TWICE, mark only the FIRST attempt.
- If a candidate crossed out an answer and did not redo it, mark the crossed-out answer.
- Consistent accuracy applies to ALL aspects of the marking guidelines.
- Assuming values/answer to solve a problem is unacceptable.

This marking guideline consists of 12 pages.

NSC - Memorandum

QUESTION 1

1.1	$m_{AB} = \frac{3-9}{9-7} = -3$	A✓ Subst. into correct formula A✓Answer	(2)
1.2	M(8 ; 6)	A✓ x – value A✓ y – value	(2)
1.3	$m_{MQ} = \frac{1}{3}$ $6 = \frac{1}{3}(8) + c$ $c = \frac{10}{3}$ $y = \frac{1}{3}x + \frac{10}{3}$	CA✓gradient of MQ CA✓Substitution of M and gradient CA✓Equation of line	(3)
1.4	$m_{AQ} = \frac{3}{3} = 1$ $6 = 1(4) + c$ $c = 2$ $y = x + 2$ $x + 2 = \frac{1}{3}x + \frac{10}{3}$ $3x + 6 = x + 10$ $2x = 4$ $x = 2$ $y = 4$ Q(2 ; 4)	A✓gradient of AQ CA✓equation of AQ CA✓Equating CA✓x – value CA✓y – value	(5)
1.5	$AQ = \sqrt{(7-2)^2 + (9-4)^2} = \sqrt{50} = 5\sqrt{2}$ units $QB = \sqrt{(9-2)^2 + (3-4)^2} = \sqrt{50} = 5\sqrt{2}$ units $\therefore AQ = QB$	A ✓Use of distance formula A✓AQ length A✓QB length	(3)
1.6	Midpoint of AC: $\left(\frac{11}{2}; \frac{15}{2}\right)$ Let D$(x\ ;\ y)$ $\left(\frac{x+9}{2}; \frac{y+3}{2}\right) = \left(\frac{11}{2}; \frac{15}{2}\right)$ D(2 ; 12)	A✓Midpoint of AC CA✓$\left(\frac{x+9}{2}; \frac{y+3}{2}\right)$ CA✓Equating to Midpoint of AC CA✓Answer	(4)

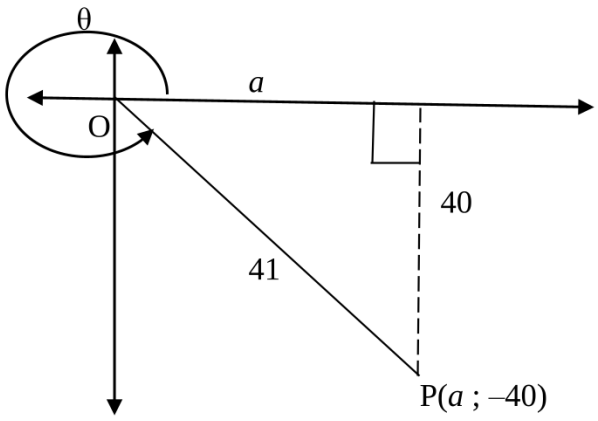
1.7	Inclination of AC: $m = \tan\alpha$ $1 = \tan\alpha$ $\alpha = 45^\circ$ Inclination of AB: $m = \tan\beta$ $-3 = \tan\beta$ $\beta = 108{,}4^\circ$ $\theta = 108{,}4^\circ - 45^\circ = 63{,}4^\circ$	 CA✓ $\tan\alpha = 1$ CA✓Inclination of AC CA✓$\tan\beta = -3$ CA✓Inclination of AB CA✓Answer	 (5)
			[24]

QUESTION 2

2.1	$x^2 + y^2 - 2x + 6y = 15$ $x^2 - 2x + 1 + y^2 + 6y + 9 = 15 + 1 + 9 = 25$ $(x-1)^2 + (y+3)^2 = 25$ Centre $(1\,;-3)$ and Radius : 5 units	A✓Completing the square CA✓Equation in Centre – radius form CA✓Centre CA✓radius	(4)
2.2	Let $y = 0$: $x^2 - 2x - 15 = 0$ $(x+3)(x-5) = 0$ $x = -3 \;\; or \;\; x = 5$ $B(-3;0)$ $C(5;0)$	A✓Letting $y = 0$ CA✓ factors CA✓ CA✓answers	(4)
2.3	$m_{AD} = \frac{-6+3}{5-1} = -\frac{3}{4}$ $m_{tangent} = \frac{4}{3}$ ……..(Radius ⊥ tangent) $-6 = \frac{4}{3}(5) + c$ $c = -\frac{38}{3}$ $y = \frac{4}{3}x - \frac{38}{3}$	CA✓gradient of radius CA✓gradient of tangent CA✓substitution of point D and gradient of tangent CA✓y – intercept value CA✓equation of tangent	(5)

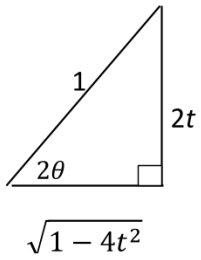
2.4	Height of $\Delta ABC = 3$ units Area of $\Delta ABC = \frac{1}{2}(8)(3)$ $= 12$ square units	CA ✓ height value CA✓base value CA✓Answer	(3)
2.5	**Do not mark this sub – question.** The distance between the centres must equal the sum of the radii. $A(1;-3)$ *and* $E(1;b)$ $AE = \sqrt{(1-1)^2+(b+3)^2} = 5+1$ $\therefore (b+3)^2 = 36$ $\therefore b+3 = \pm 6$ $\therefore b = 3$ *or* $b = -9$	A ✓ Condition CA ✓Subst. into distance formula CA ✓ Simplifying CA ✓ Answer	(4)
2.6	$PB = \sqrt{(-1+3)^2+(-7-0)^2}$ $PB = \sqrt{53} >$ radius Therefore, P lies outside the circle.	CA ✓Use of distance formula CA ✓ $PB = \sqrt{53} >$ radius CA ✓Justification	(3)
	Excluding 2.5 , question 2 will have a maximum of 19 marks.		**[19]**

QUESTION 3

3.1	 $82\cos\theta + \sin(\theta - 180^\circ)$ $= 82\cos\theta - \sin\theta$ $= 82\left(\frac{9}{41}\right) - \left(\frac{-40}{41}\right)$ $= 18\frac{40}{41}$ **If Answer is given in terms of *a*, Max 4/6 marks.**	A ✓diagram in correct quadrant A ✓ a – value = 9 A ✓reduction CACA ✓✓substitution CA ✓Answer	(6)

3.2	$27\tan\theta - \cos(90^\circ - \theta)$ $= 27\tan\theta - \sin\theta$ $= 27\left(\frac{-40}{9}\right) - \left(\frac{-40}{41}\right)$ $= \frac{-4880}{41}$ 	A ✓reduction CACA ✓✓substitution CA ✓Answer	(4)
3.3	$\cos 2\theta + 1$ $= 2\cos^2\theta - 1 + 1$ $= 2\left(\frac{9}{41}\right)^2$ $= \frac{162}{1681}$	A ✓double angle substitution CA✓substitution CA ✓Answer	(3)
			[13]

QUESTION 4

4.1	$\sin\theta\cos\theta = t$ $2\sin\theta\cos\theta = 2t$ $\sin 2\theta = 2t$ $\sin^2 2\theta + \cos^2 2\theta = 1$ $\cos 2\theta = \sqrt{1-4t^2}$ $\therefore \tan 2\theta = \frac{2t}{\sqrt{1-4t^2}}$ 	A ✓$\sin 2\theta = 2t$ A ✓$\sin^2 2\theta + \cos^2 2\theta = 1$ A ✓$\cos 2\theta = \sqrt{1-4t^2}$ A ✓Answer	(4)
4.2	$\cos 2\theta = 1 - 2\sin^2\theta$ $\sin^2\theta = \frac{1-\cos 2\theta}{2}$ $\sin\theta = \sqrt{\frac{1-\cos 2\theta}{2}}$ $\sin\theta = \sqrt{\frac{1-\sqrt{1-4t^2}}{2}}$	A ✓Identity or $\sin^2\theta = \frac{1-\cos 2\theta}{2}$ A ✓Making sin θ the subject A ✓quadrant CA ✓Answer	(4)
			[8]

QUESTION 5

5.1.1	$\frac{\tan 480^\circ.\sin 300^\circ.\cos 14^\circ.\sin(-135^\circ)}{\sin 104^\circ.\cos 225^\circ}$ $=\frac{(-\tan 60^\circ)(-\sin 60^\circ)(\cos 14^\circ)(-\sin 45^\circ)}{(\sin 76^\circ)(-\cos 45^\circ)}$ $=\frac{\left(\frac{\sqrt{3}}{1}\right)\left(\frac{\sqrt{3}}{2}\right)(\cos 14^\circ)\left(\frac{\sqrt{2}}{2}\right)}{(\cos 14^\circ)\left(\frac{\sqrt{2}}{2}\right)}$ $=\frac{3}{2}$	A ✓Reduction in numerator A ✓Reduction in denominator CACA ✓✓ Numerator CA✓Denominator CA ✓Answer	(6)
5.1.2	$\cos(90^\circ-2x).\tan(180^\circ+x)+\sin^2(360^\circ-x)$ $=\sin 2x.\tan x+\sin^2 x$ $=2\cos x\sin x.\frac{\sin x}{\cos x}+\sin^2 x$ $=2\sin^2 x+\sin^2 x$ $=3\sin^2 x$	A A A ✓✓✓Reduction A ✓double angle expansion A ✓$\frac{\sin x}{\cos x}$ CA ✓Answer	(6)
5.2.1	$-\cos^{2022}\theta$	AA ✓✓Answer	(2)
5.2.2	$1-\tan^2\theta=0$ $\tan\theta=\pm 1$ $\theta=45^\circ\ or\ 135^\circ\ or\ 90^\circ$	A ✓$1-\tan^2\theta=0$ A ✓$\tan\theta=\pm 1$ A ✓ 45° A ✓ 135° A ✓ 90°	(5)
5.2.3	$\frac{\sin^n\theta-\cos^n\theta}{1-\tan^n\theta}=-\cos^n\theta$	AA✓✓Answer	(2)
5.2.4	$LHS=\frac{\sin^n\theta-\cos^n\theta}{1-\tan^n\theta}$ $=\frac{\sin^n\theta-\cos^n\theta}{1-\frac{\sin^n\theta}{\cos^n\theta}}$ $=\frac{\sin^n\theta-\cos^n\theta}{\frac{\cos^n\theta-\sin^n\theta}{\cos^n\theta}}$ $=\frac{-(\cos^n\theta-\sin^n\theta)}{1}\times\frac{\cos^n\theta}{\cos^n\theta-\sin^n\theta}$ $=-\cos^n\theta=RHS$	A ✓$\frac{\sin\theta}{\cos\theta}$ A✓$\sin^n\theta-\cos^n\theta$ A ✓$\cos^n\theta$ A ✓changing sign of numerator A ✓Inverting and multiplying	(5)
			[26]

QUESTION 6

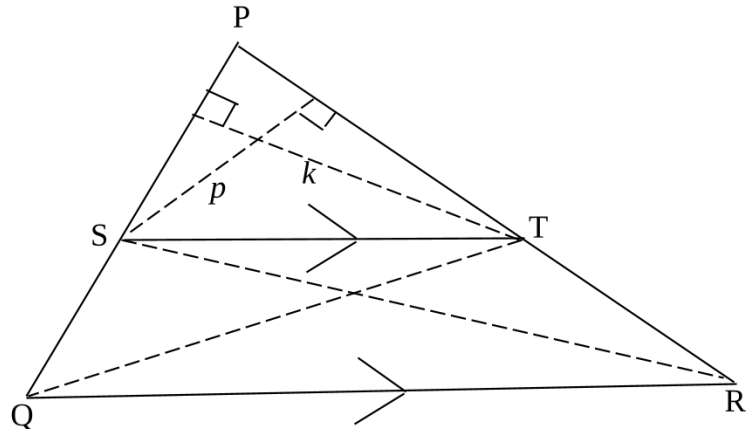
6.1	$\frac{x}{\text{AH}} = \tan\theta$ $\text{AH} = \frac{x}{\tan\theta}$	A✓trig ratio CA✓AH in terms of x and θ	(2)
6.2	$\text{H}\hat{\text{B}}\text{A} = \beta$ ... ... (AH = HB) $\text{A}\hat{\text{H}}\text{B} = 180^\circ - 2\beta$ ... ... (A's of Δ) $\frac{12x}{\sin(180^\circ - 2\beta)} = \frac{\frac{x}{\tan\theta}}{\sin\beta}$ $\frac{12}{\sin 2\beta} = \frac{\frac{1}{\tan\theta}}{\sin\beta}$ $12\tan\theta.\sin\beta = 2\sin\beta\cos\beta$ $\tan\theta = \frac{\cos\beta}{6}$	A✓ $\text{A}\hat{\text{H}}\text{B} = 180^\circ - 2\beta$ A✓ sine rule for ΔAHB A✓Simplification A✓ Simplification LHS A✓ expansion of $\sin 2\beta$	(5)
6.3	$\tan\theta = \frac{\cos\beta}{6}$ $\tan\theta = \frac{\cos 40^\circ}{6}$ $x = AH\tan\theta$ $x = (60)\left(\frac{\cos 40^\circ}{6}\right)$ $x = 10\cos 40^\circ = 7.66\,m$ - Height of lighthouse	A✓ substitution of β A✓Making x subject A✓ substitution of AH CA✓ Answer	(4)
			[11]

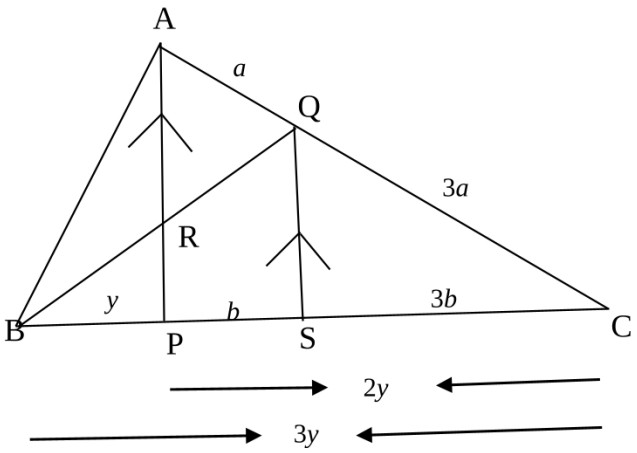
GEOMETRY	
S	**A mark for a correct statement** **(A statement mark is independent of a reason.)**
R	**A mark for a correct reason** **(A reason mark may only be awarded if the statement is correct.)**
S/R	**Award a mark if the statement AND reason are both correct.**

QUESTION 7

7.1	$\hat{O}_2 = 116^\circ$……(A at centre = 2A at circumference)	A✓ S A✓ R	(2)
7.2	$D\hat{E}B = 32^\circ$……(A in a semi circle)	A✓ S A✓ R	(2)
7.3	$\hat{A}_1 = \frac{180^\circ - 116^\circ}{2} = 32^\circ$……(A of isosceles Δ…radii)	CA✓ S A✓ R	(2)
7.4	OC ⊥ DE ……(Line from Centre bisecting chord) $A\hat{B}E = 58^\circ$……(A's of Δ)	A✓ S A✓ R CA✓S	(3)
7.5	Let CB = x , then AC = $\frac{3}{2}x$ AB = $\frac{5}{2}x$ Now $\frac{5}{2}x = 2r$ $x = \frac{4}{5}r$ OC = $\frac{1}{5}r$ $DC^2 = r^2 - \left(\frac{1}{5}r\right)^2$…….(Pythagoras) $DC^2 = \frac{24}{25}r^2$ DC = $\frac{\sqrt{24}}{5}r = \frac{2\sqrt{6}}{5}r$ units	A✓ $\frac{5}{2}x = 2r$ A✓ $x = \frac{4}{5}r$ A✓ OC = $\frac{1}{5}r$ CA✓S CA✓ Answer	(5)
			[14]

QUESTION 8

8.1		**N.B.** **No Construction – Award 0 marks**	
	Construction: Draw SR, QT and heights p and k.	A✓S Construction	
	$\frac{\text{Area of } \Delta \text{ PST}}{\text{Area of } \Delta \text{ QTS}} = \frac{\frac{1}{2}.\text{PS}.k}{\frac{1}{2}.\text{SQ}.k} = \frac{\text{PS}}{\text{SQ}}$	A✓S	
	$\frac{\text{Area of } \Delta \text{ PST}}{\text{Area of } \Delta \text{ RST}} = \frac{\frac{1}{2}.\text{PT}.p}{\frac{1}{2}.\text{TR}.p} = \frac{\text{PT}}{\text{TR}}$	A✓S	
	$\text{Area of } \Delta \text{ QTS} = \text{Area of } \Delta \text{ RST}$ ...(Same base and // lines)	A✓S A✓ R	
	$\frac{\text{Area of } \Delta \text{ PST}}{\text{Area of } \Delta \text{ QTS}} = \frac{\text{Area of } \Delta \text{ PST}}{\text{Area of } \Delta \text{ RST}}$	A✓S	
	$\frac{\text{PS}}{\text{SQ}} = \frac{\text{PT}}{\text{TR}}$		(6)

8.2			
8.2.1	Let AQ = a and QC = $3a$ $\frac{PS}{SC} = \frac{AQ}{QC} = \frac{a}{3a} = \frac{1}{3}$ …..(Prop. Thm.;AP // QS) Let PS = b and SC = $3b$ and Let BP = y and BC = $3y$ Therefore PC = $2y$ Now $2y = 4b$ Therefore $y = 2b$ $\frac{BP}{PS} = \frac{2b}{b} = \frac{2}{1}$	A✓S A✓R A✓S PC = $2y$ A✓S $2y = 4b$ A✓S Answer	(5)
8.2.2	$\frac{BR}{RQ} = \frac{BP}{PS} = 2$ …..(Prop. Thm.; AP // QS)	A✓S A✓R	(2)
			[13]

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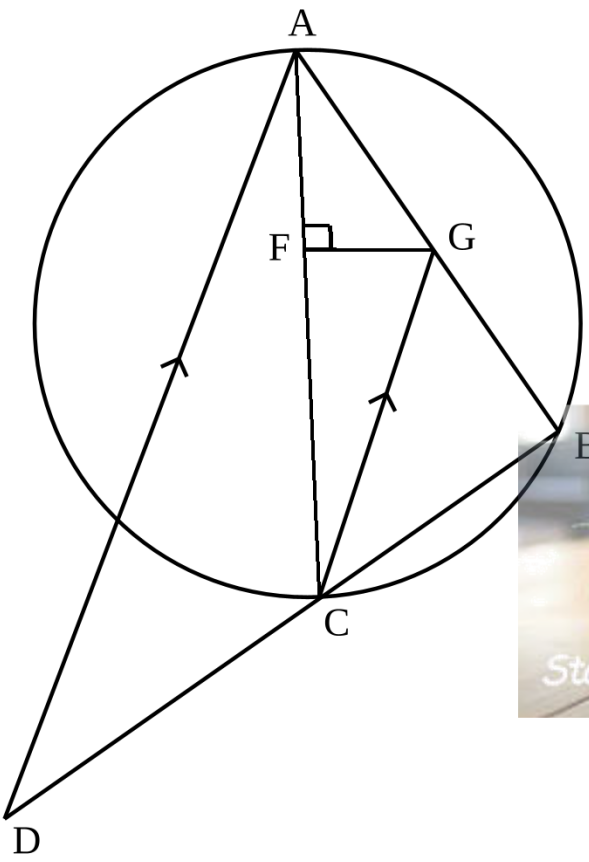
QUESTION 9



9.1.1	Let $A\hat{C}G = G\hat{C}B = x$
	$D\hat{A}C = A\hat{C}G = x$ ….(Alt. A's ; AD // GC)
	$A\hat{D}C = G\hat{C}B = x$ ….(Corresp. A's ; AD // GC)
	DC = AC …(Sides opposite equal angles)
	ΔCAD is isosceles …..(Base angles are equal)
		A✓ S/ R
		A✓ S A✓ R
		A✓ R
			(4)

9.1.2	$\frac{BC}{CD} = \frac{BG}{GA}$ ……(Prop. Thm. ; AD // GC) But AC = CD …… (Proved in 9.1.1) $\frac{BC}{AC} = \frac{BG}{GA}$	A✓ S A✓ R A✓ S	(3)
9.1.3	In ΔAFG and ΔABC 1] $C\hat{A}B$ is common 2] $A\hat{F}G = A\hat{B}C = 90^{\circ}$ …(Angle in semi circle) 3] $A\hat{G}F = A\hat{C}B$ …(Remaining Angles) ΔAFG /// ΔABC ….(AAA)	A✓ S A✓ S/R A✓ R	(3)

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9.2.1	$AB^2 = 20^2 - 12^2$ ……..(Pythagoras) $AB^2 = 256$ AB = 16 units	A✓ S A✓ S Simplifying CA✓ S Answer	(3)
9.2.2	$\frac{BC}{AC} = \frac{BG}{GA}$ ……(From 9.1.2) $\frac{12}{20} = \frac{6}{GA}$ AG = 10 units $\frac{GF}{BC} = \frac{AG}{AC}$ ……(from 9.1.3) $\frac{GF}{12} = \frac{10}{20}$ GF = 6 units	A✓ S/ R CA✓ S AG = 10 units CA✓ S GF = 6 units	(3)
9.2.3	$\frac{AF}{16} = \frac{10}{20}$ ……(from 9.1.3) AF = 8 units	CA✓ S CA✓ S	(2)
			[18]
		TOTAL	**150**