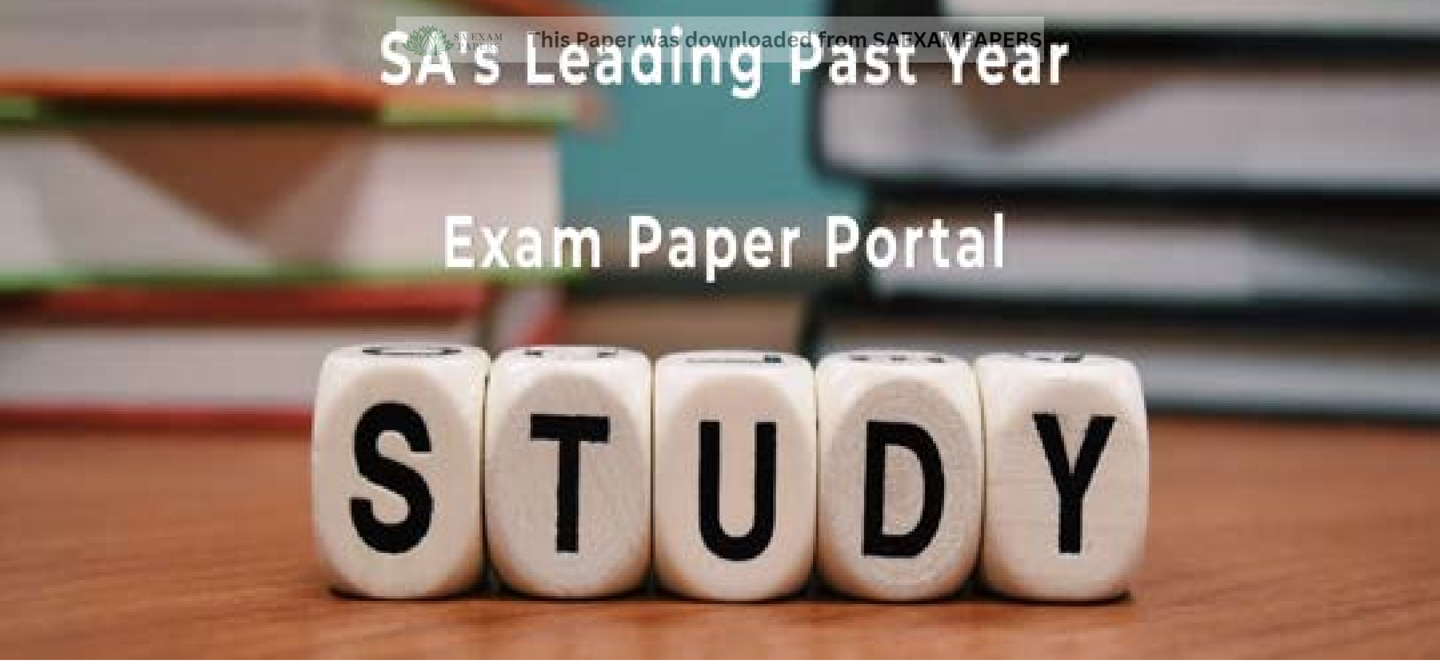
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Exam Paper Portal
STUDY

GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

JUNE EXAMINATION
GRADE 12

2025

MATHEMATICS
(PAPER 2)

SURNAME:										
NAME:										
SCHOOL:										
DATE:	2	0	2	5	-			-		

	MARKER				MODERATOR			
QUESTION	MARKS			MARKER'S INITIALS	MARKS			MODERATOR'S INITIALS
1	0				0			
2	0				0			
3	0				0			
4	0				0			
5	0				0			
6	0				0			
7	0				0			
8	0				0			
9	0				0			
				TOTAL				

TIME: 3 hours

MARKS: 150

31 pages + 1 information sheet

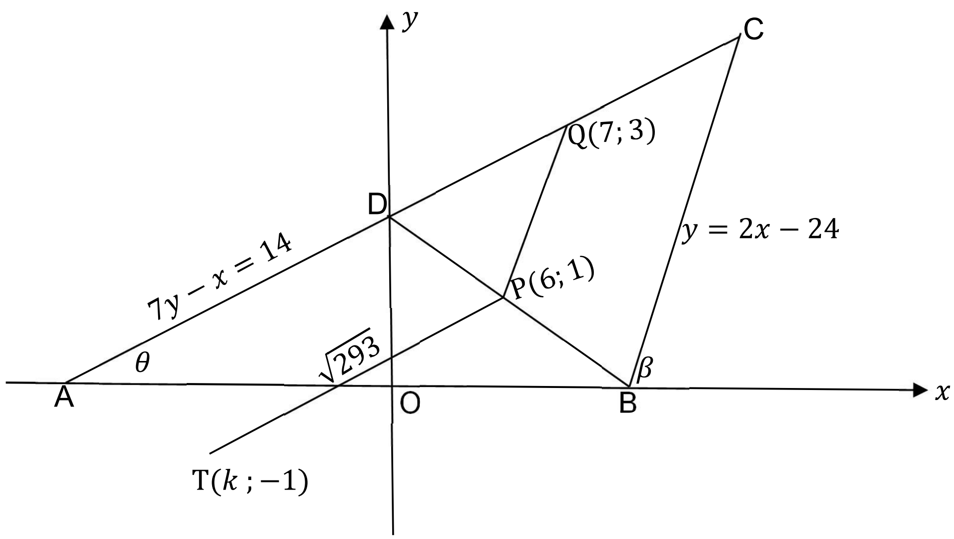
INSTRUCTIONS AND INFORMATION.

Read the following instructions carefully before answering the questions.

1. This question paper consists of 9 questions. Answer ALL questions in the spaces provided.
2. Clearly show ALL calculations, diagrams, graphs, et cetera that you have used in determining your answers.
3. Answers only will NOT necessarily be awarded full marks.
4. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
5. If necessary, round-off answers correct to TWO decimal places, unless stated otherwise.
6. Diagrams are NOT necessarily drawn to scale.
7. An INFORMATION SHEET with formulae is included at the end of the question paper.
8. No pages may be torn from this question paper.
9. Candidates may not retain a question paper or remove it from the examination room. Question papers must be returned to the invigilator at the end of the examination session.
10. Answers must be written in black/blue ink as distinctly as possible. Do not write in the margins.
11. Draw a neat line through any work/rough work that must not be marked.
12. In the event that you use the additional space provided:
    - 12.1 Write down the number of the question.
    - 12.2 Leave a line and rule off after your answer.
13. Write neatly and legibly.

QUESTION 1

In the diagram below, ADQC and DPB are straight lines. D is a point on the *y*-axis. A and B are points on the *x*-axis. The equation of line BC is $y = 2x - 24$ and the equation of line AC is $7y - x = 14$. It is given that P(6 ; 1), Q(7 ; 3), T(k ; −1) and TP $= \sqrt{293}$.



1.1	Calculate the gradient of PQ.	
		(2)
1.2	Give a reason why PQ‖BC.	
		(2)

1.3	If Q is the midpoint of DC, calculate the coordinates of point C.	
		(4)
1.4	Calculate the size of $A\hat{C}B$.	
		(5)

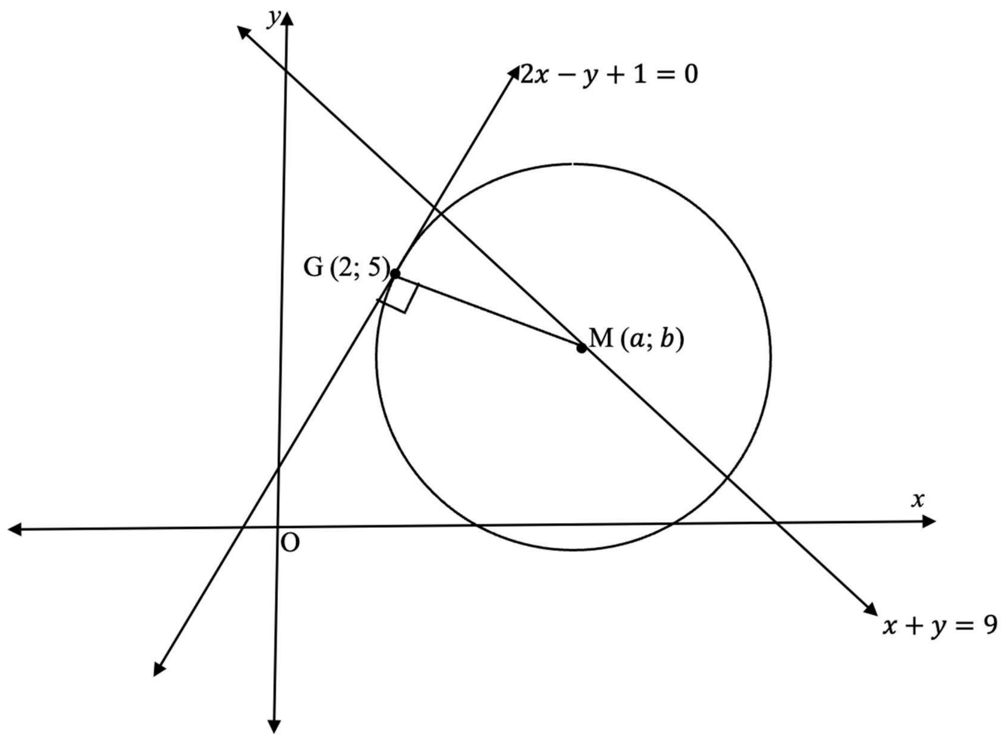
1.5	Calculate the area of quadrilateral BODC.	
		(4)

1.6	If TP $= \sqrt{293}$, determine the value of k.	
		(3)
1.7	E$(a\,;b)$ is a point in the second quadrant, such that ABCE is a parallelogram. Determine the values of a and b.	
		(2)
1.8	Determine the equation of the line which is perpendicular to AC and passes through Q$(7\,;3)$.	
		(3)

[25]

QUESTION 2

2.1 In the figure below, the line $2x - y + 1 = 0$ is a tangent to the circle, with centre M$(a\ ;\ b)$, at G$(2\ ;\ 5)$. The centre of the circle lies on the line $x + y = 9$.



2.1.1	Determine the gradient of GM.	
		(2)
2.1.2	Determine the equation of GM in the form $y = mx + c$.	
		(2)

2.1.3	Calculate the coordinates of M.	
		(4)
2.1.4	Hence, or otherwise, calculate the length of the radius of the circle.	
		(2)
2.1.5	Write down the equation of the circle in the form $x^2 + y^2 + \text{C}x + \text{D}y + \text{E} = 0$.	
		(3)

2.2	Determine the equation of the inverse of the tangent to the circle $x^2 + y^2 - 26x + 12y + 105 = 0$ at (7 ; 2). Give your answer in the form $y = mx + c$.	
		(7)

[20]

QUESTION 3

3.1	$tan\,\beta = \frac{3}{4}$, where $\beta \in [180°; 270°]$ is given. With the aid of a sketch, and **without the use of a calculator**, calculate:		
	3.1.1	$\sin\beta$	
			(3)
	3.1.2	$2 - \sin 2\beta$	
			(3)
	3.1.3	$\cos^2(90° - \beta) - 1$	
			(3)

3.2 Evaluate: $\dfrac{-1+\cos(180°-\theta).\sin(\theta-90°)}{\cos(-\theta).\sin(90°+\theta).\tan^2(540°+\theta)}$

(7)

3.3	Prove the identity: $\frac{(\sin\theta - \cos\theta)^2}{1-\sin^2\theta} = \frac{1}{\cos^2\theta} - 2\tan\theta$	
		(5)

[21]

QUESTION 4

4.1	Given: $\cos(A - B) = \cos A \cos B + \sin A \sin B$.		
	4.1.1	Use the above identity to deduce that $\sin(A + B) = \sin A \cos B + \cos A \sin B$.	
			(3)

	4.1.2	Hence, or otherwise, determine the general solution of the equation $\sin(2x + 50°) - \sin 15° \cos 48° = \sin 48° \cos 15°$.	(4)
4.2	If $\cos(x + 30°) = -2 \sin x$, deduce that $\tan x = -\frac{1}{\sqrt{3}}$.		(5)

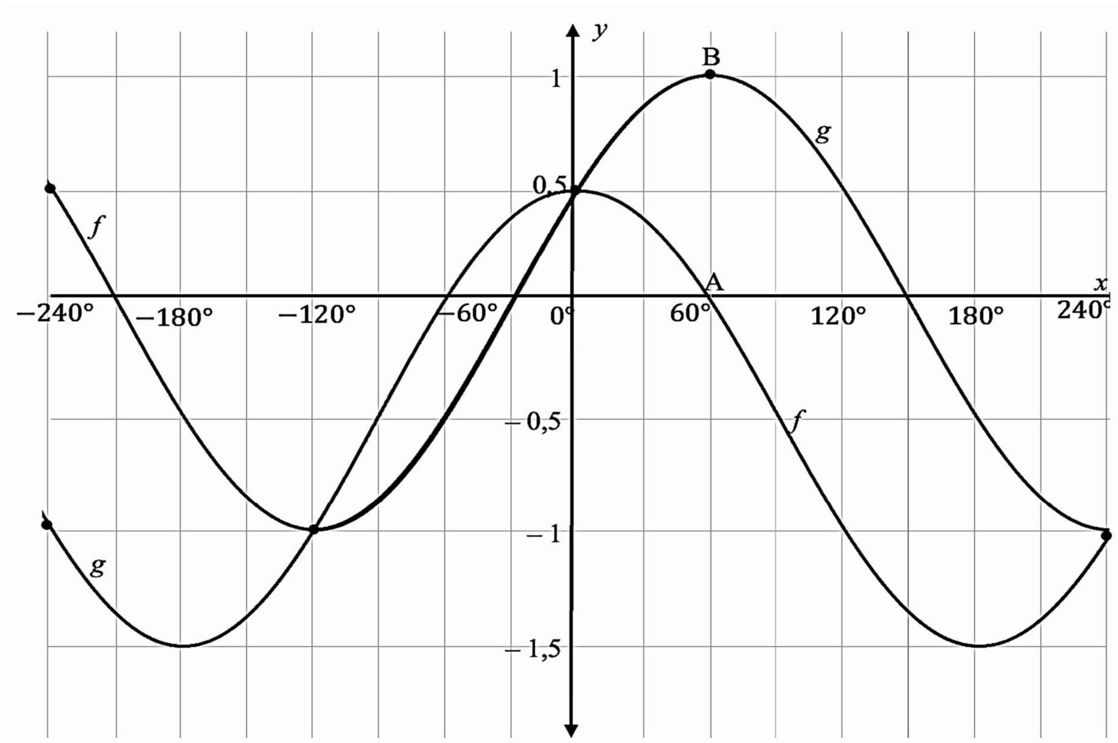
4.3	Given the expression: $\frac{4\sin x\cos x}{2\sin^2 x-1}$		
	4.3.1	Simplify the above expression to a single trigonometric ratio.	
			(3)
	4.3.2	For which value(s) of x in the interval $-90° < x < 90°$ will the above expression be undefined?	
			(3)

	4.3.3	Without using a calculator, determine the value of $\frac{4\sin 15° \cos 15°}{2\sin^2 15° - 1}$	
			(2)

[20]

QUESTION 5

In the diagram below, the graphs of $f(x) = \cos x + m$ and $g(x) = \sin(x + n)$ are drawn on the same set of axes for $x \in [-240°; 240°]$. A is the x-intercept of f and has coordinates (60°; 0). B is the turning point of g and has coordinates (60° ; 1).



5.1 Determine the values of m and n. (2)

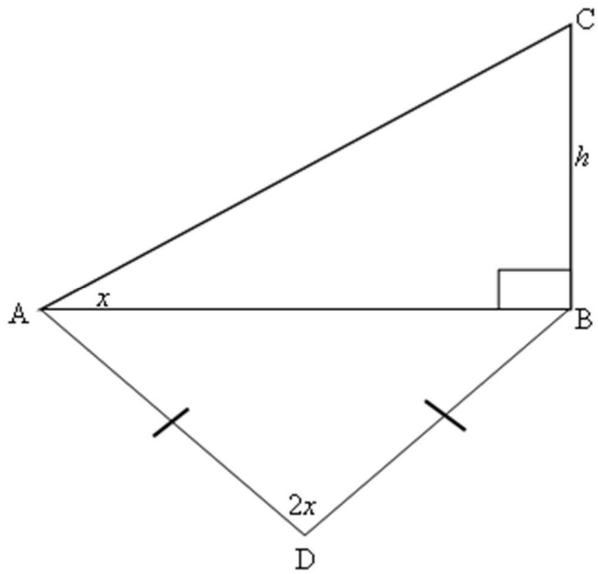
5.2 Write down the amplitude of f. (1)

5.3	If $h(x) = g(2x)$, write down the period of h.	
		(1)
5.4	For which values of x will $f(x) \cdot g(x) \leq 0$ in the interval $x \in [0°; 240°]$?	
		(2)
5.5	Describe the transformations that the graph of g has to undergo to form the graph of p, where $p(x) = -\cos x$.	
		(2)

[8]

QUESTION 6

In the diagram below, ABD is a horizontal plane, and BC is a vertical pole. The angle of elevation from A to the top of the pole is equal to x. It is given that $A\hat{D}B = 2x$, $C\hat{B}D = 90°$ and $AD = BD$.



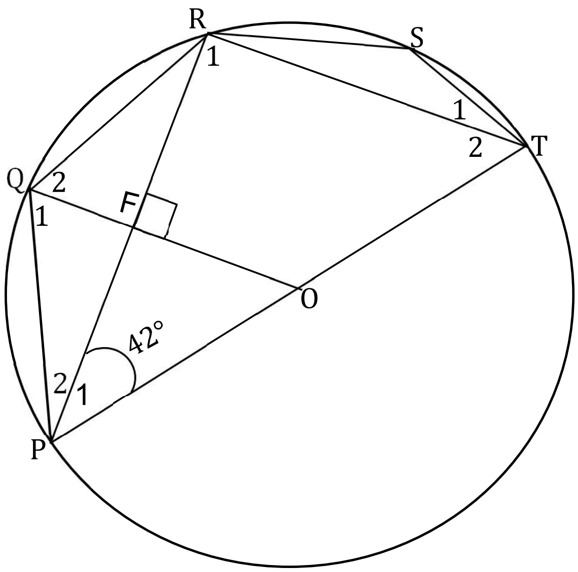
Prove: $AD = \dfrac{h}{2\sin x \tan x}$

(6)

[6]

QUESTION 7

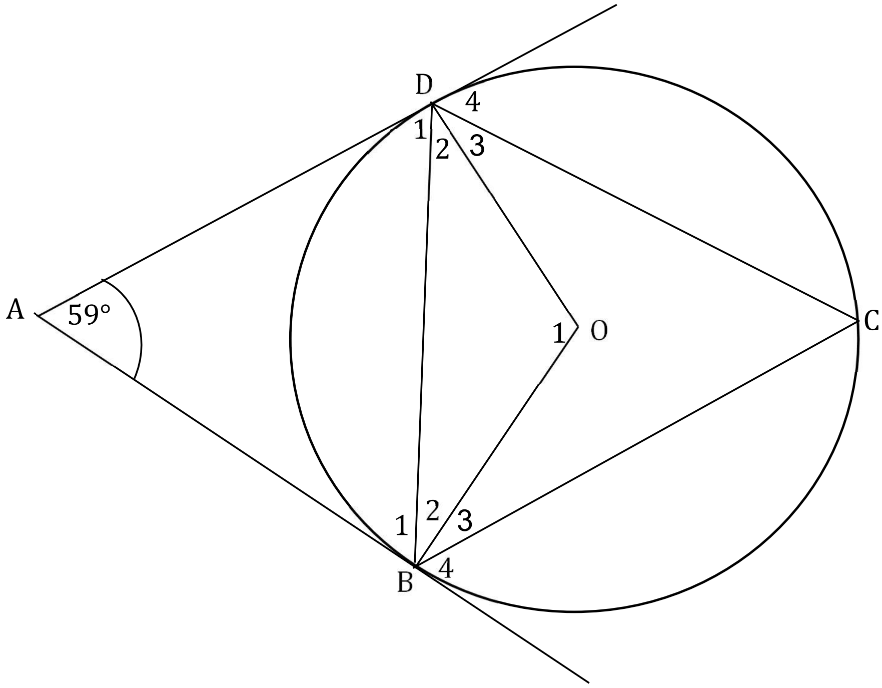
7.1 P, Q, R, S and T lie on the circle with centre O. PR is perpendicular to OQ and these two lines intersect at F. POT is a straight line. $\hat{P}_1 = 42°$.



	7.1.1	Determine, **giving reasons**, the sizes of each of the following angles:	
	(a)	$\hat{R}_1$	
			(2)
	(b)	$\hat{S}$	
			(2)

	(c)	$P\hat{Q}R$	
			(3)
	7.1.2	If PR = 7 cm and QR = 4 cm, determine the length of QF.	
			(3)

7.2 In the diagram below, B, D and C lie on the circle with centre O. AB and AD are tangents to the circle at B and D respectively. $B\hat{A}D = 59°$.



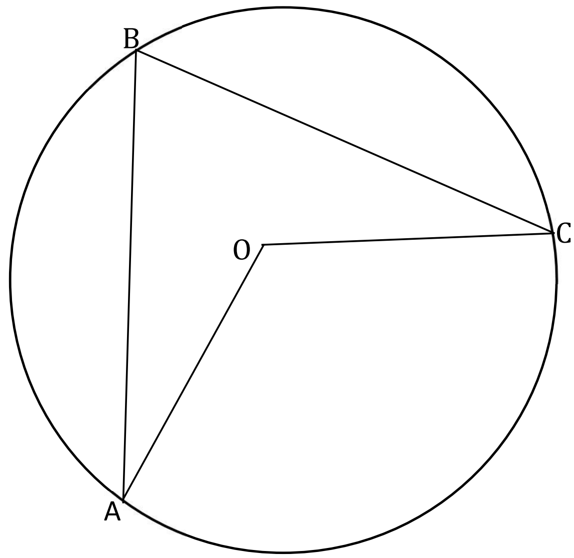
Determine, **giving reasons**, the sizes of each of the following angles:			
	7.2.1	$\hat{B}_1$	
			(4)

	7.2.2	$\hat{O}_1$	
			(4)

[18]

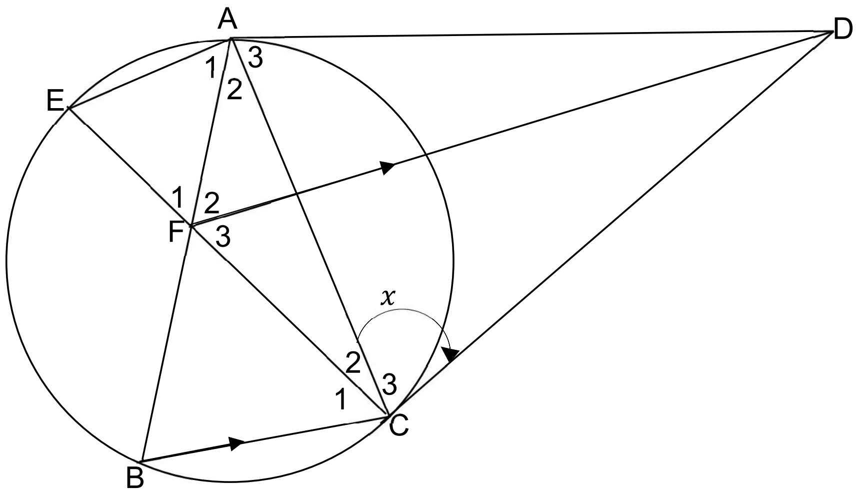
QUESTION 8

8.1 In the diagram below, A, B and C are points on the circle with centre O.



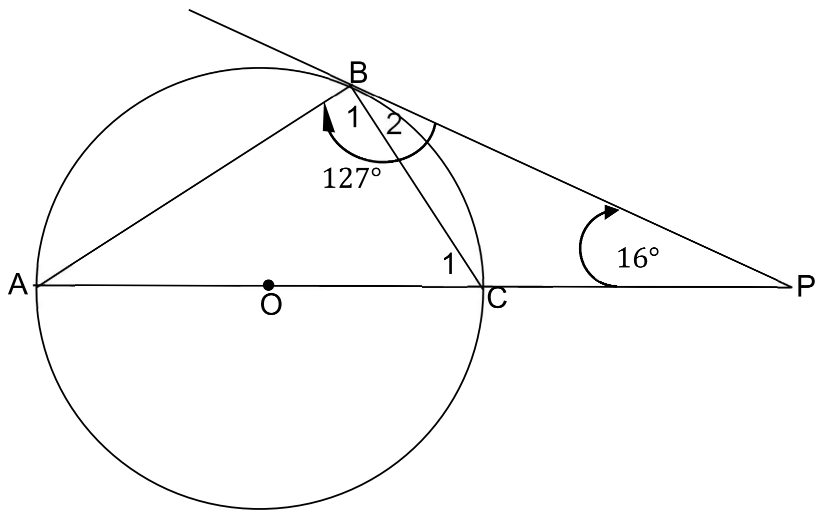
	Prove the theorem which states that $A\hat{O}C = 2\hat{B}$.	
		(5)

8.2 In the diagram below, BC||FD and $\hat{C}_3 = x$. AFB and EFC are straight lines.



	8.2.1	Determine, **giving reasons,** FOUR other angles equal to x.	
			(5)
	8.2.2	Prove that AFCD is a cyclic quadrilateral.	
			(2)

8.3 In the diagram below, AC is the diameter of the circle with centre O. AC is produced to P.
$\widehat{B}_1 + \widehat{B}_2 = 127°$ and $\widehat{P} = 16°$.

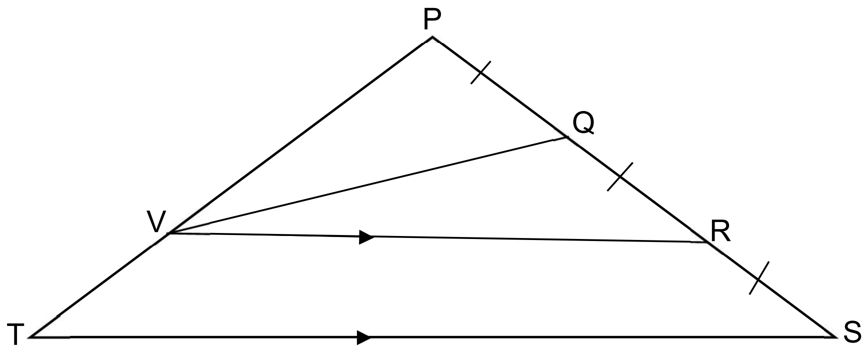


	Show, giving **reasons,** that BP is a tangent to the circle at B.	
		(5)

[17]

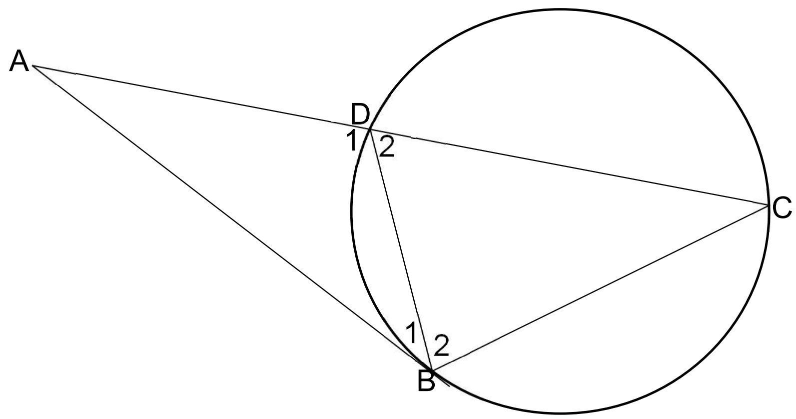
QUESTION 9

9.1 In the diagram below, PQ = QR = RS and VR||TS.



	9.1.1	Determine the value of $\frac{TV}{VP}$	
			(2)
	9.1.2	Determine the value of $\frac{\text{area of }\Delta PQV}{\text{area of }\Delta PST}$	
			(5)

9.2 In the diagram below, B, C and D are points on the circle and ADC is a straight line. AB is a tangent to the circle at B.



Prove, giving **reasons,** that:		
9.2.1	$\Delta CBA \mid\mid\mid \Delta BDA$	(4)

	9.2.2	$AD.DC = AB^2 - AD^2$	
			(4)

[15]

ADDITIONAL SPACE

ADDITIONAL SPACE

ADDITIONAL SPACE

TOTAL: 150

INFORMATION SHEET

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$\hat{y} = a + bx$

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MATHEMATICS
(PAPER 2)

MATHEMATICS P2

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