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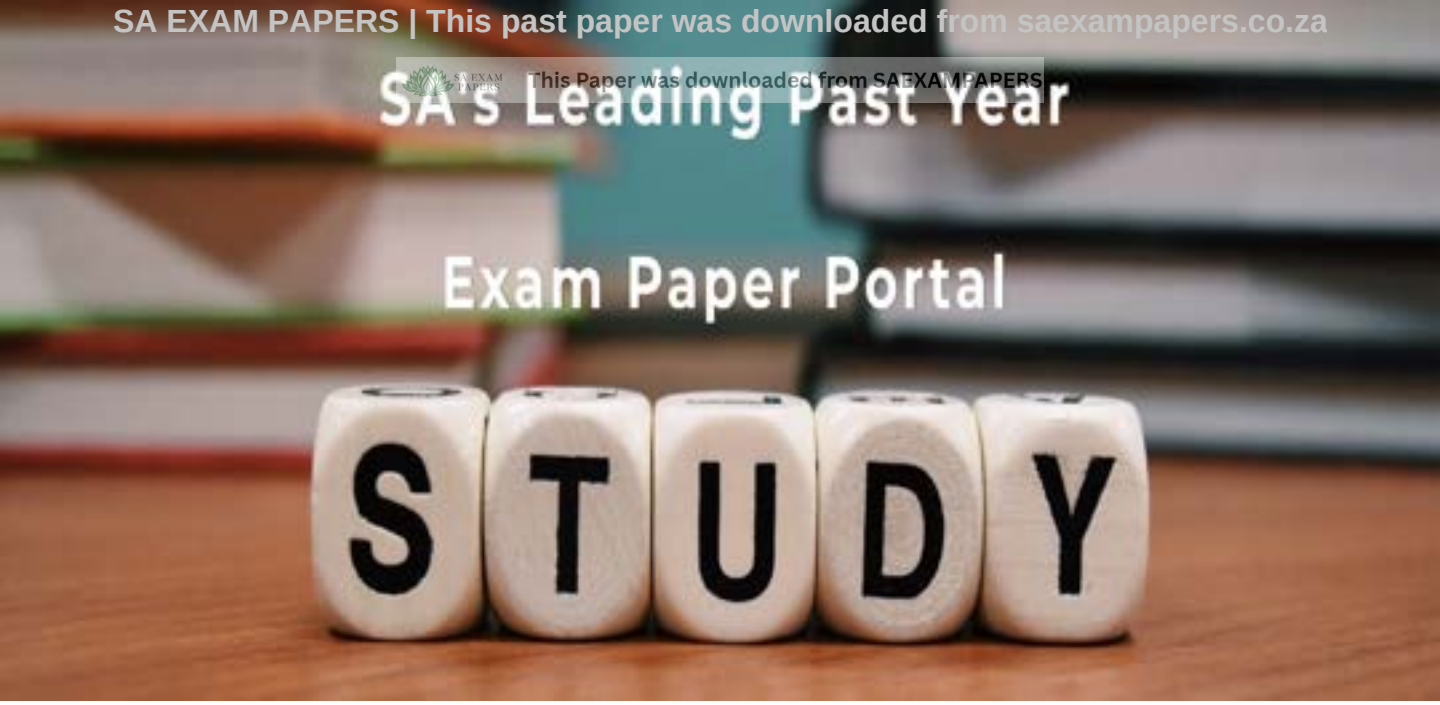

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Western Cape Government
Education
FOR YOU

PLC TRIAL SEPTEMBER 2025

MATHEMATICS PAPER 2

GRADE 12

MARKS: 150

TIME: 3 hours

This question paper consists of 13 pages, 1 information sheet and a 22-page answer book.

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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 to determine 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.

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QUESTION 1

1.1 On June 25, the points of the top 10 Rugby 7s teams on the rankings were as follows:

27	36	50	56	57	65	70	88	96	104

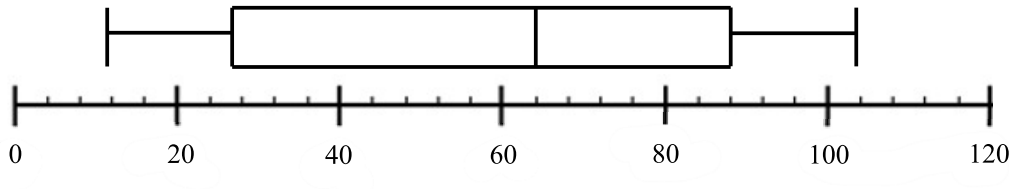
(Source: https://www.svns.com/en/standings#men)

1.1.1 Calculate the average (mean) of the 10 teams' points. (2)

1.1.2 Determine the standard deviation of the points. (2)

1.1.3 Determine the number of teams whose points lie within one standard deviation of the mean. (3)

1.2 If all 12 teams' point totals on the date are taken into account, the average is 59 points per team. The data is represented in the box-and-whisker diagram below:



Points total

1.2.1 Comment on the distribution of the data. Provide a reason for your answer. (2)

[9]

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QUESTION 2

The term latitude refers to how far a location is from the equator. Latitudes in the Northern Hemisphere range from 0° at the equator to 90° N at the North Pole.

Below are the latitudes of several cities in the Northern Hemisphere along with the average maximum temperature for April in degrees Celsius.

CITY	LATITUDE (degrees)	AVERAGE MAXIMUM TEMPERATURES FOR APRIL (°C)
Lagos, Nigeria	6	32
London, England	52	13
Calcutta, India	23	36
Rome, Italië	42	20
Moscow, Russia	56	8
Cairo, Egipt	30	28
San Juan, Puerto Rico	18	29

2.1 Draw a scatter plot for the information above on the diagram provided in the answer book. (2)

2.2 Determine the equation of the least squares regression line. (3)

2.3 The city of Madrid has a latitude of 40 degrees. Determine the estimated average maximum temperature for April for this city. (2)

2.4 Calculate the correlation coefficient of the data and describe the correlation between latitude and the average maximum temperature for April. (3)

[10]

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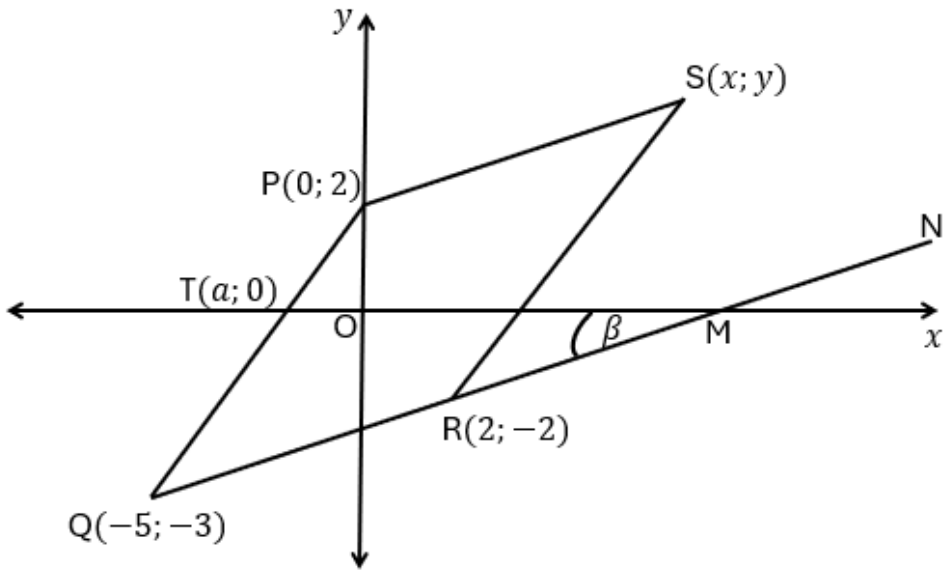
QUESTION 3

In the diagram below, P(0; 2), Q(−5; −3), R(2; −2) and S(x; y) are vertices of a parallelogram PQRS. The x − intercept of PQ is T(a; 0). QN cuts the x − axis at M. $T\widehat{M}Q = \beta$



3.1 Determine the gradient of QR. (2)

3.2 Calculate the size of β. (3)

3.3 Determine the value of a. (4)

3.4 Determine the coordinates of S. (2)

3.5 Show that the diagonals of PQRS bisect each other. (3)

3.6 Show that ΔPQR is an isosceles triangle. (3)

3.7 PSRQ is a parallelogram, but which other type of quadrilateral is it? Give a reason for your answer. (2)

3.8 Calculate the size of $\hat{Q}$. (3)

[22]

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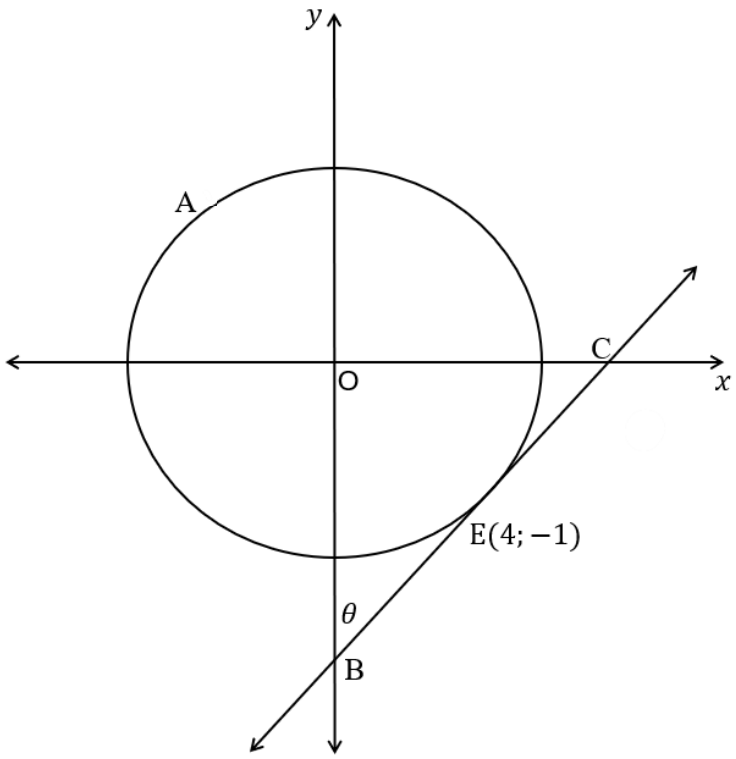
QUESTION 4

In the diagram, a circle with centre O passes through the point A. The tangent to the circle at E$(4;-1)$ cuts the $x-$ and $y-$ axis at C and B respectively. $O\hat{B}C = \theta$



4.1 Determine the equation of the circle. (3)

4.2 O is the midpoint of AE. Determine the coordinates of A. (2)

4.3 Determine the equation of BC in the form $y = mx + c$. (4)

4.4 Determine the equation of the line through the centre of the circle that is parallel to tangent BC. (2)

4.5 The circle with center $S(a;b)$ touches the circle with center O externally at E. BC is a tangent to both circles. If OS $=$ 3OE, determine the coordinates of S. (7)

[18]

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QUESTION 5

5.1 It is given that $q\sin 61° = p$.

Express the following in terms of p and q, **without the use of a calculator** and with the aid of a diagram:

5.1.1 $\cos 151°$ (3)

5.1.2 $\sin 122°$ (3)

5.1.3 $\cos 31°$ (4)

5.2 Simplify to a single trigonometric ratio without using a calculator:

$$\frac{\sin(-x).\sin(180° - x) + \cos(90° + x)}{-\sin(360° - x) - \tan 315°}$$ (6)

5.3 Given:

$$\cos(A + 45°) = \frac{\cos A - \sin A}{\sqrt{2}}$$

5.3.1 Prove the identity. (3)

5.3.2 Hence or otherwise, solve for A if $\cos A - \sin A = \frac{1}{\sqrt{2}}$ and $0° \leq A \leq 90°$. (4)

5.4 Determine the general solution for:

$$2\sin x.\cos x - 0{,}8 = 0$$ (6)

5.5 Prove that $\sqrt{-cos^2(90° - M) - \cos M.\cos(-M)}$ is non-real for any real value of M. (4)

[33]

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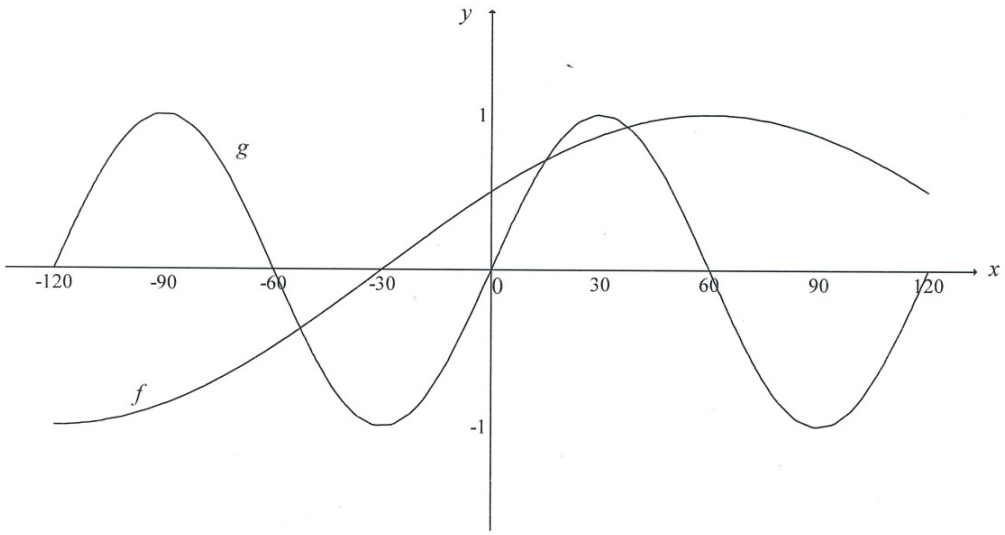
QUESTION 6

In the diagram the functions of $f(x) = \cos(x - 60°)$ and $g(x) = \sin ax$ are given for $x \in [-120°; 120°]$.



6.1 Write down the period of g. (1)

6.2 Determine the value of a. (1)

6.3 Write down the range of $f(x) - 1$. (2)

6.4 If h is obtained by shifting f $30°$ to the right and reflecting it in the x-axis, write down the equation of h in its simplest form. (3)

6.5 For which values of x will $f'(x).f(x) > 0$? (2)

[9]

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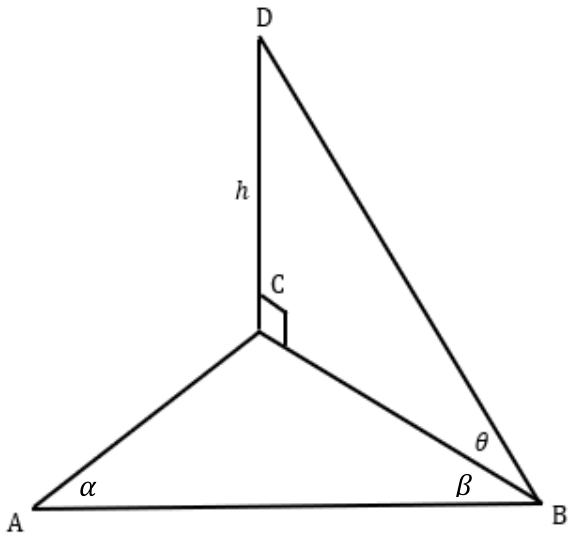
QUESTION 7

In the diagram below, DC is a vertical corner-post on a horizontal plane ABC. The angle of elevation of D (from B), is θ. $\widehat{CAB} = \alpha$, $\widehat{CBA} = \beta$ and the length of DC is h.



7.1 Determine the length of CB in terms of h and θ. (2)

7.2 Prove that $AB = \frac{h\sin(\alpha+\beta)}{\tan\theta.\sin\alpha}$ (4)

7.3 Calculate the value of AB if, $h = 31{,}2$m, $\alpha = 52{,}2°$, $\beta = 23{,}5°$ and $\theta = 42{,}3°$. (2)

[8]

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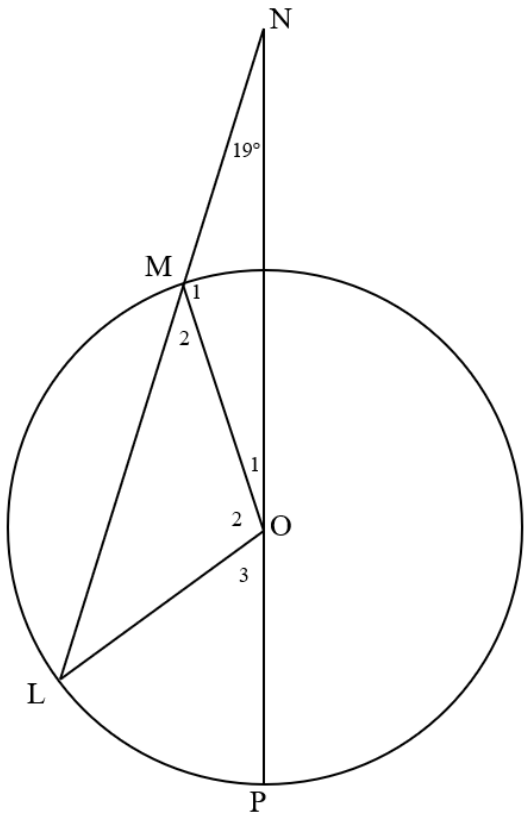
QUESTION 8

O is the centre of the circle. LM produced and PO produced meet at N.
$MN = OL$ and $L\hat{N}O = 19°$.



Calculate, with reasons, the size of $L\hat{O}P$. (5)

[5]

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QUESTION 9

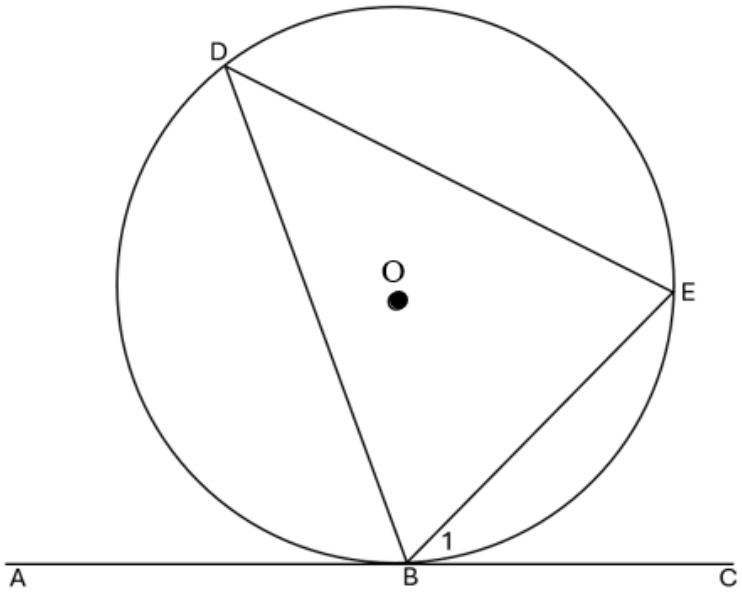
9.1 Complete the following statement so that it is true:

The exterior angle of a cyclic quadrilateral is equal to … (1)

9.2 In the diagram below O is the centre of the circle. AC is a tangent to the circle at B.

D and E are points on the circumference of the circle.

DE, DB and BE are joined.



Prove the theorem that states $E\widehat{B}C = \widehat{D}$. (5)

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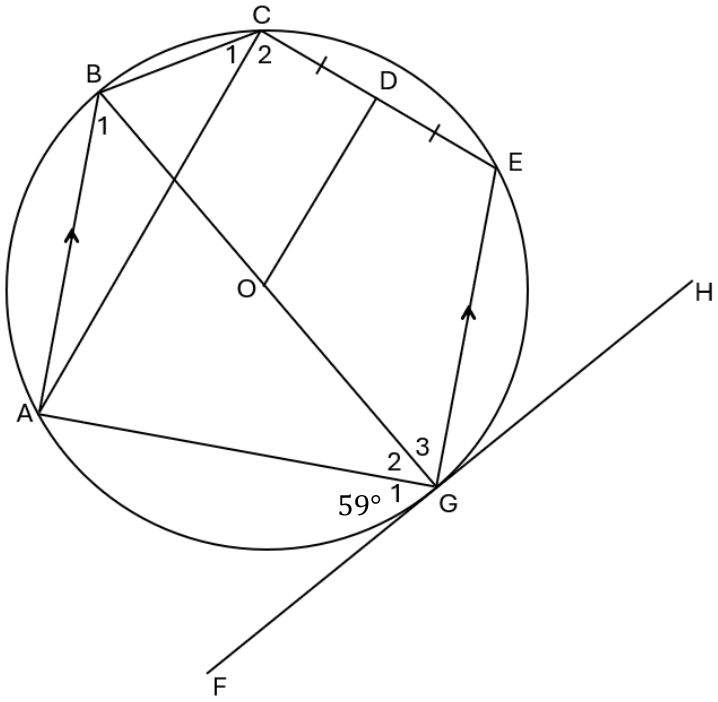
9.3 In the diagram below, FGH is a tangent to the circle with centre O. BOG is a diameter, AB||EG and $\hat{G}_1 = 59°$. CD = DE.



Determine, with reasons the size of:

9.3.1 $C\hat{D}O$ (2)

9.3.2 $\hat{B}_1$ (2)

9.3.3 $\hat{G}_2$ (4)

9.3.4 $\hat{G}_3$ (2)

9.3.5 $\hat{C}_1$ (2)

9.4 Prove that AC||OD (3)

[21]

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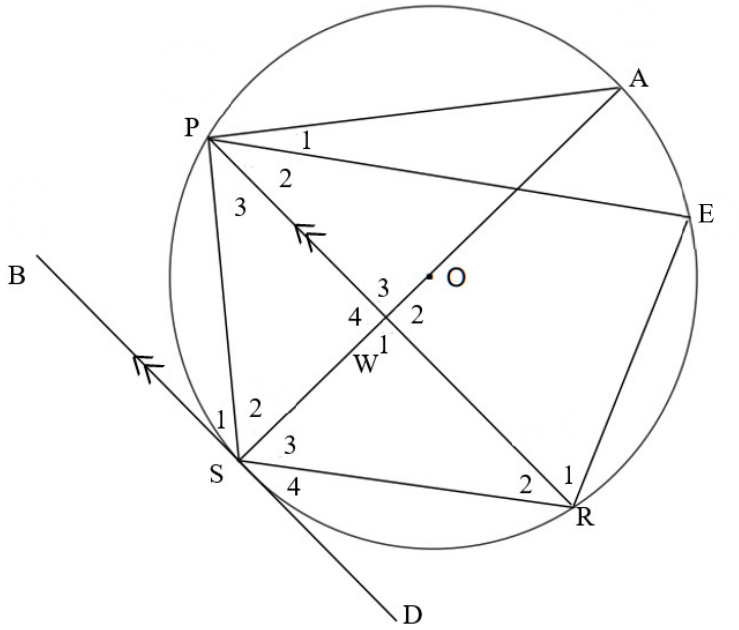
QUESTION 10

In the diagram below P, A, E, R and S are points on the circumference of the circle with centre O. DSB is a tangent to the circle at S. AOWS and RWP are straight lines. PR∥BS.



Prove, with reasons, the following:

10.1 PW=WR (4)

10.2 ΔAPS|||ΔRWS (5)

10.3 $RS^2 = WS.AS$ (6)

[15]

TOTAL: 150

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INFORMATION SHEET

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

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

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

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

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

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

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

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

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

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

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

$$Area\ of\ \Delta ABC = \frac{1}{2}ab.sin\,C$$

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

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

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

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

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

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

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

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