Province of the
EASTERN CAPE
EDUCATION

Iphondo leMpuma Kapa: Isebe leMfundo
Provinsie van die Oos Kaap: Department van Onderwys
Porafensie Ya Kapa Botjahabela: Lefapha la Thuto

NATIONAL SENIOR CERTIFICATE



GRADE 12

JUNE 2025

MATHEMATICS P2

MARKS: **150**

TIME: **3 hours**

JMATHE2

This question paper consists of 13 pages, including 1 information sheet and an answer book of 23 pages.

INSTRUCTIONS AND INFORMATION

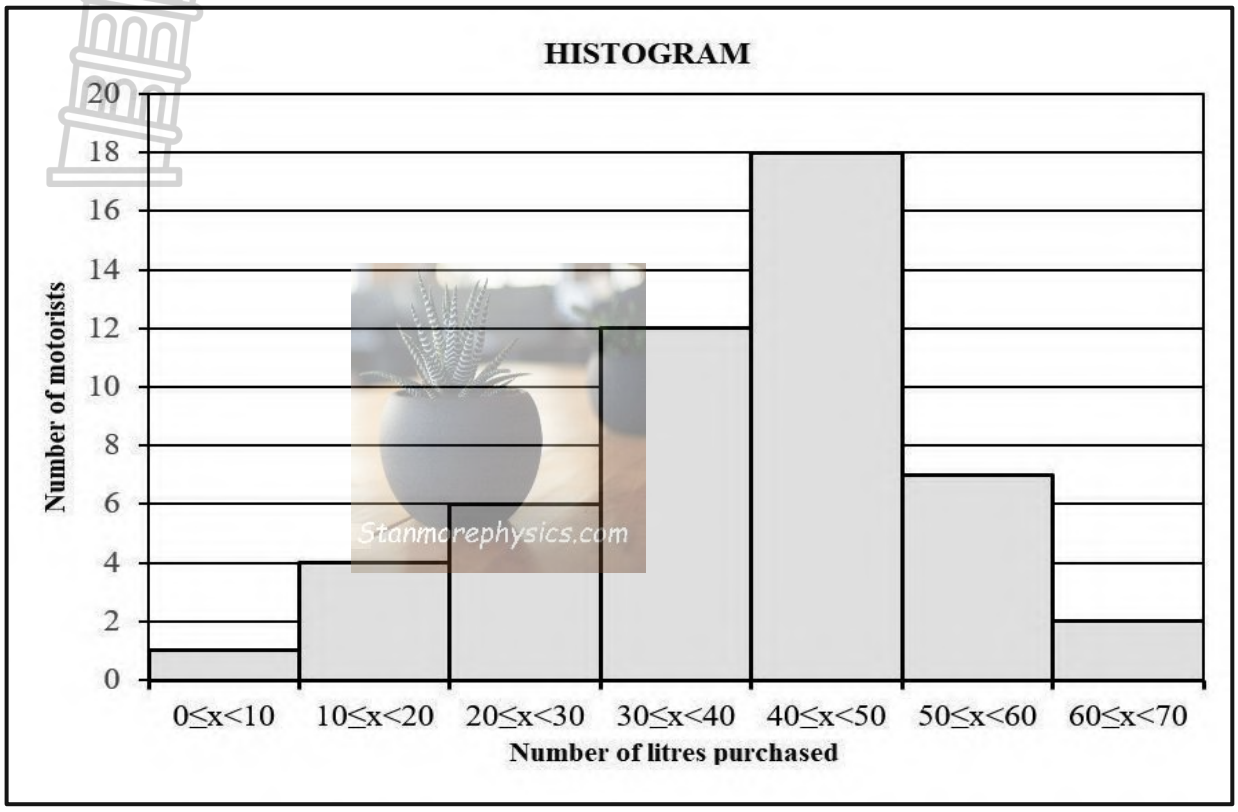
Read the following instructions carefully before answering the questions.

1. This question paper consists of 9 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 the 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 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

A researcher observed the number of litres of fuel purchased by motorists on a certain Saturday. The data collected on that Saturday is represented on the histogram below.



1.1 Write down the total number of motorists who purchased fuel on this day. (1)

1.2 Write down the modal class. (1)

1.3 Complete the cumulative frequency table provided in the SPECIAL ANSWER BOOK. (3)

1.4 Draw an ogive on the grid provided in the SPECIAL ANSWER BOOK. (3)

1.5 Estimate the lower quartile. (1)

1.6 Estimate the mean. (3)

1.7 Determine the 75^{th} percentile. (2)

1.8 Determine interquartile range for the data. (2)

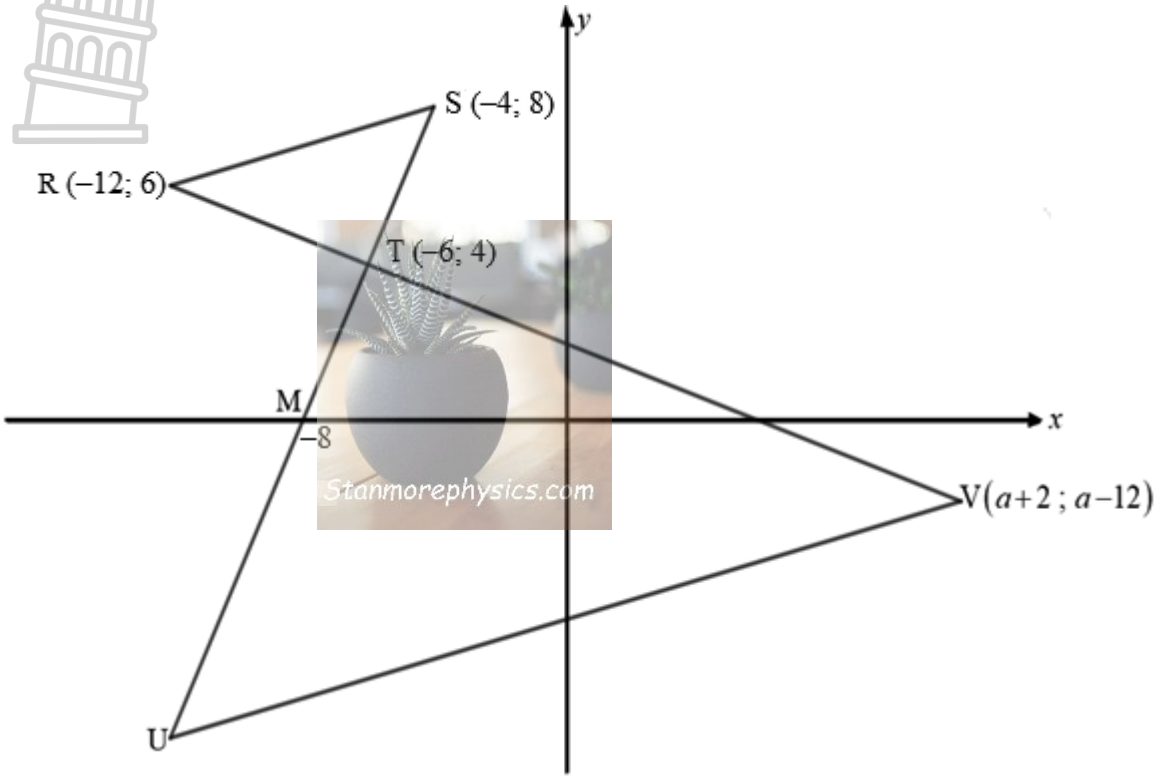
1.9 Determine the number of motorists at 75^{th} percentile or above and calculate the total reward spent by the petrol station if each of these motorists that are at 75^{th} percentile or above bought 60 litres each, with a reward of R0,40 per litre. (2)

[18]

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QUESTION 2

In the diagram below, S (–4 ; 8), T (–6 ; 4), M and U lie on the same straight line. R (–12 ; 6), T (–6 ; 4) and V also lie on another straight line. RV and SU intersect each other at T.
M is the x-intercept of line SMU at $x=-8$. SM = MU.



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2.1 Calculate the gradient of RV. (2)

2.2 Calculate the length of RT. (2)

2.3 Determine the value of a. (3)

2.4 If SM = MU, determine the coordinates of U. (2)

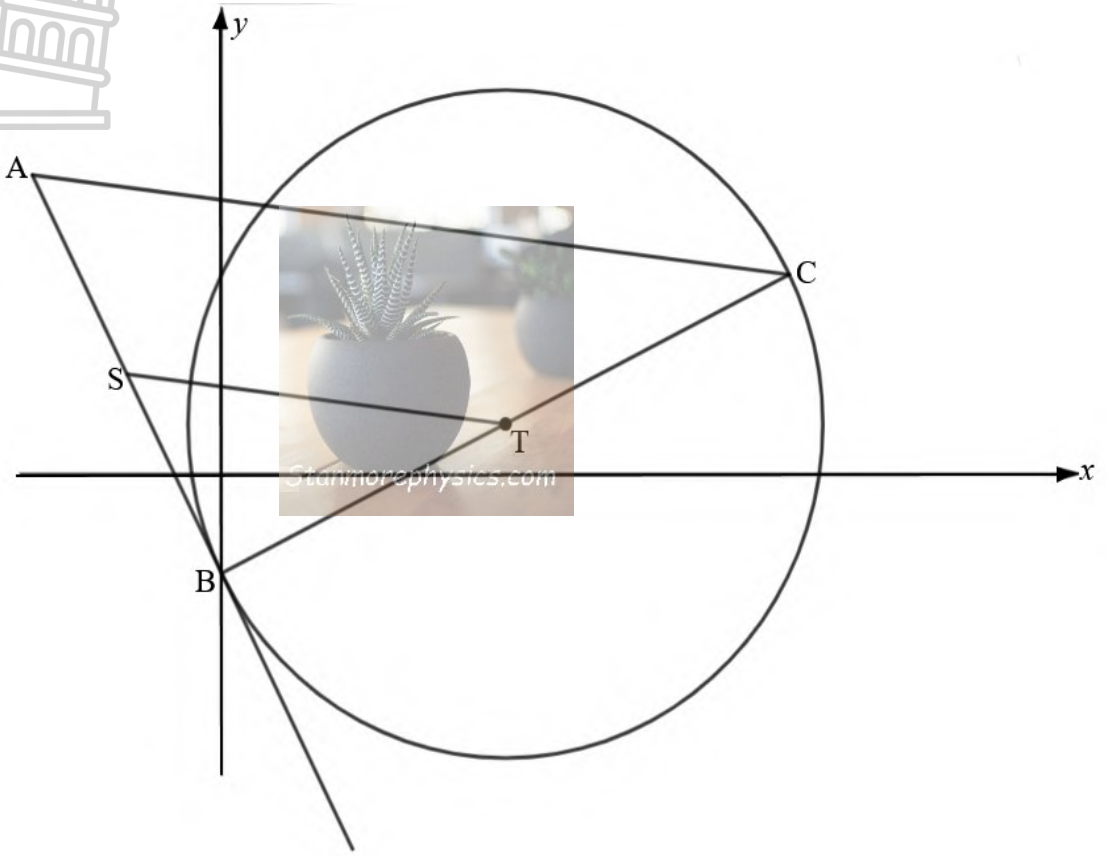
2.5 Determine the equation of line SU. (3)

2.6 Determine the size of $U\hat{T}V$. (4)

2.7 If TV = 4RT, determine the area of ΔTUV. (4)
[20]

QUESTION 3

In the diagram, T is the centre of the circle. $x^2 + y^2 - 12x - 2y - 8 = 0$ is the equation of the circle. BC is the diameter of the circle. AB is the tangent of the circle at point B. S is the point on AB. The equation of line ST is $x + 8y = 7$. Inclination of line AC is $172{,}875°$.



3.1 Determine the coordinates of T. (3)

3.2 Determine the coordinates of B, a y-intercept of the circle. (3)

3.3 Show that ST$\|$AC. **(Round off your answer to 3 decimal places)** (3)

3.4 It is further given that $ST^2 = 65$ and the coordinates of A are (–4 ; k), determine the:

3.4.1 Length of AC (2)

3.4.2 Coordinates of C (2)

3.4.3 Value of k if $k > 4$ (3)

3.4.4 Equation of the circle passing through point A, B and C in the form $(x-a)^2 + (y-b)^2 = r^2$ (4)

[20]

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QUESTION 4

4.1 If $\sin 14° = t$, determine the values of the following in terms of t:

4.1.1 $\cos 14°$ (2)

4.1.2 $\sin 38°$ (3)

4.1.3 $\sin 59°$ (4)

4.2 Simplify to a single trigonometric ratio of A.

$$\sin A.\tan\left(\frac{1}{2}A - 360°\right) + 1$$ (6)

4.3 Given: $f(x) = \dfrac{2\cos x \cos(90° - x)}{\cos^2 x + \sin(180° + x).\cos(-x).\tan x}$

4.3.1 Prove that $f(x) = \tan 2x$ (6)

4.3.2 Write down the values of x in the interval of $x \in [-90°; 90°]$ where f is undefined. (2)

4.4 Given: $\cos(\theta + 30°) = \dfrac{1}{2}\sin\theta$

4.4.1 Determine the general solution of the above equation. (4)

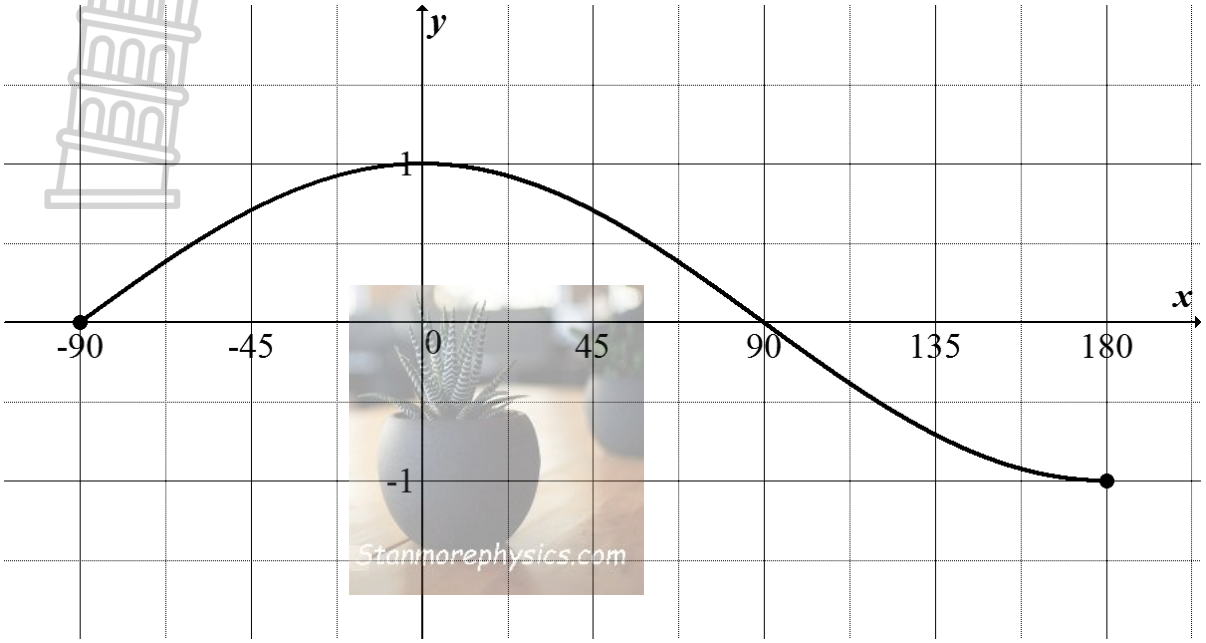
4.4.2 Hence or otherwise, determine the values of θ if $\theta \in [-270°; 180°]$ (2)

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QUESTION 5

The graph of $f(x)=\cos x$ is drawn on the diagram below where $x\in[-90°;180°]$.



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5.1 Write down the period of $f\left(\frac{x}{2}\right)$. (1)

5.2 Write down the range of $f\left(\frac{x}{2}\right)-1$. (2)

5.3 Draw the graph of $g(x)=\frac{1}{2}\sin 2x$ on the same set of axes. (3)

5.4 Write down the minimum value of $g(x-25°)$ (1)

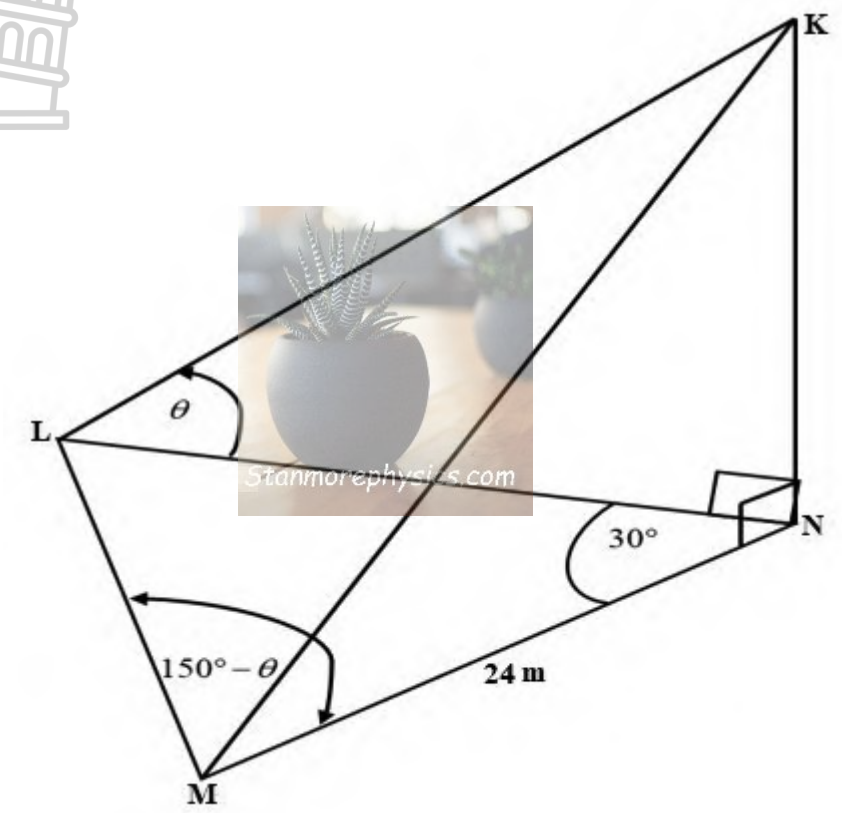
5.5 Use the graph to determine the values of x when:

$\sin x\cos x-\cos x=0$ (3)

[10]

QUESTION 6

In the diagram below, KN is a vertical tower. L, N and M are points in the same horizontal plane. The angle of elevation to the top of the tower, K from L is θ. $L\hat{N}M = 30°$, $L\hat{M}N = 150° - \theta$ and MN = 24 m.



6.1 Write down the size of $M\hat{L}N$. (1)

6.2 Determine LN in terms of $\sin\theta$ and $\cos\theta$. (4)

6.3 Hence or otherwise, show that the height of a vertical tower can be written as $KN = 12 + 12\sqrt{3}\tan\theta$. (3)

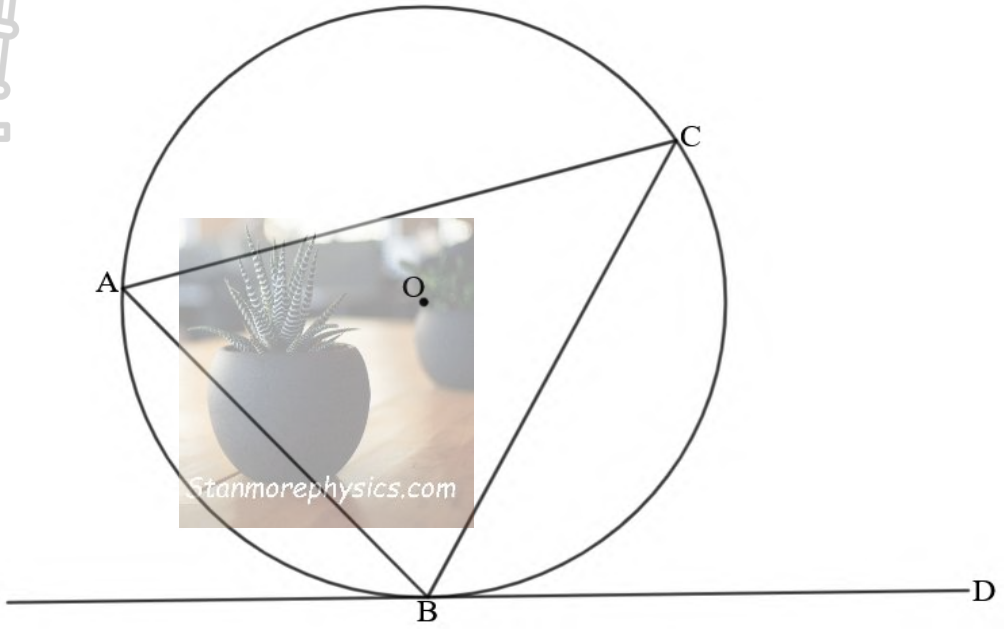
6.4 Calculate the size of θ, angle of elevation of K from L, if KN = 46 m. (3)

[11]

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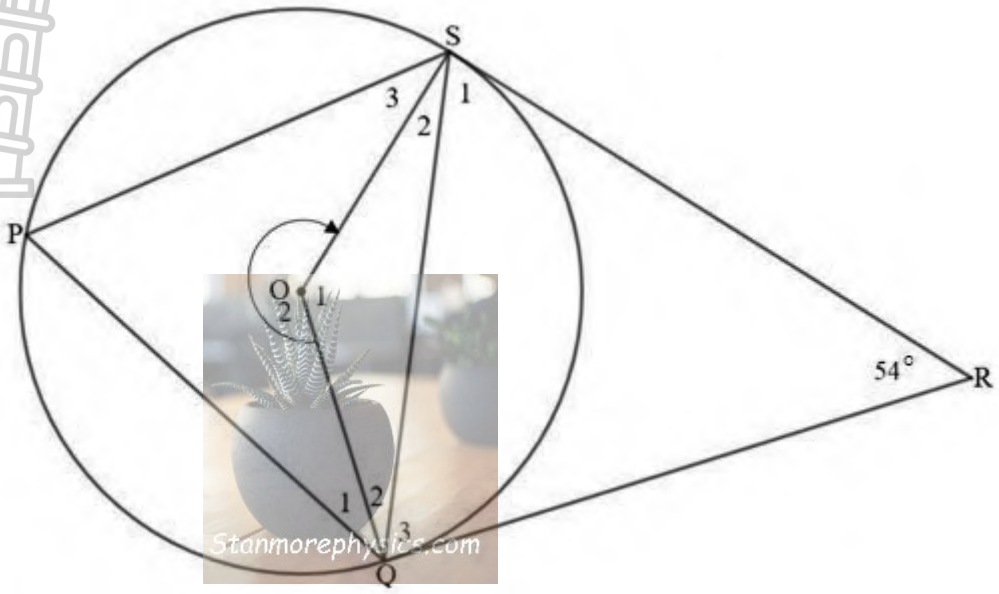
QUESTION 7

7.1 In the diagram, O is the centre of the circle which passes through A, B and C. BD is a tangent to the circle at B.



Prove the theorem which states that the angle between the tangent BD and the chord BC is equal to the angle in the alternate segment, that is prove that $C\hat{B}D = \hat{A}$. (5)

7.2 In the diagram below, O is the centre of the circle. P, S and Q are points on the circumference of the circle. $S\hat{R}Q = 54°$. SR and QR are tangents of the circle at S and Q respectively.



Determine the size of:

7.2.1 $\hat{Q}_3$ (4)

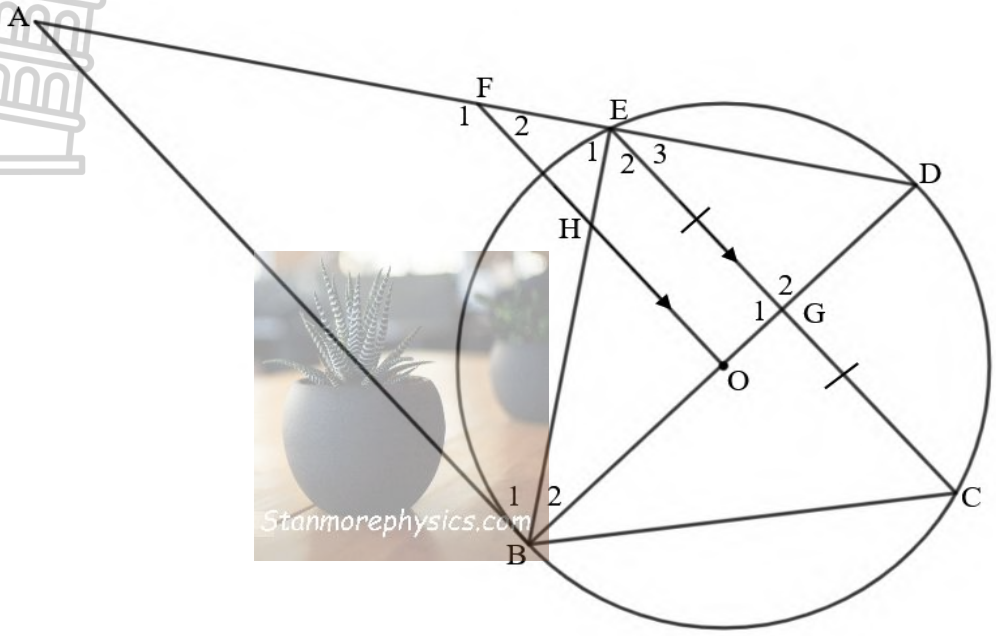
7.2.2 $\hat{P}$ (2)

7.2.3 $\hat{O}_1$ (2)

[13]

QUESTION 8

In the diagram O is the centre of the circle. BCDE is a cyclic quadrilateral. G is the midpoint of chord EC. AB is a tangent to the circle at B. GD : OG = 3 : 2, ED = 2 units.



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8.1 Prove that $AB \parallel EC$. (4)

8.2 Prove that BE = BC. (4)

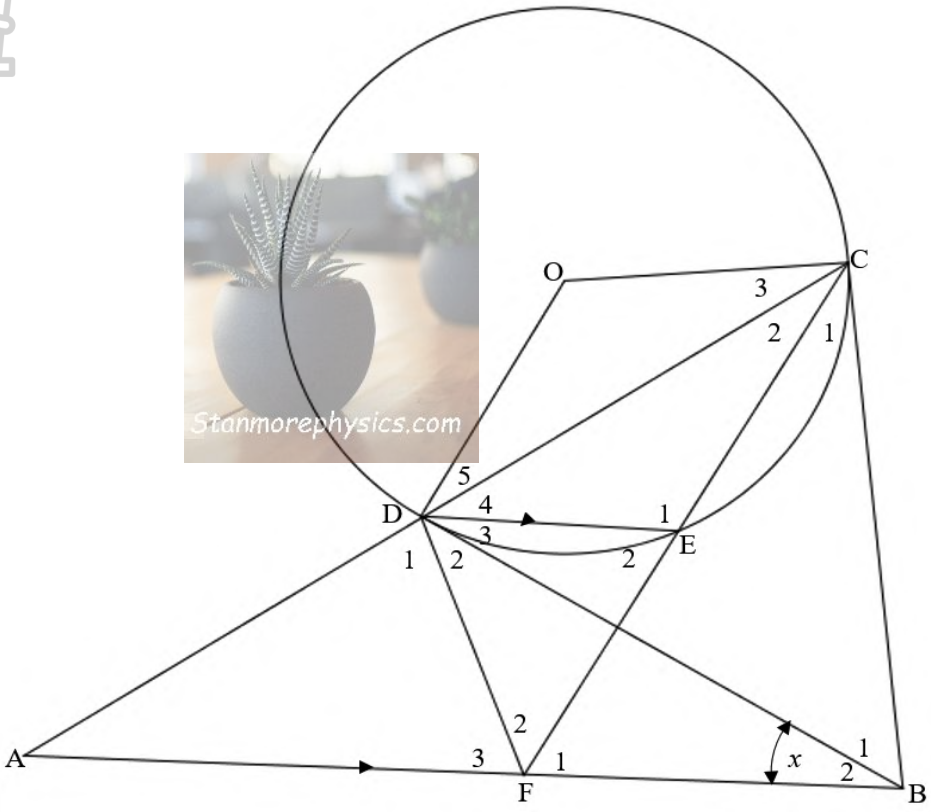
8.3 If it is further given that $FO \parallel EC$, determine the ratio of EF : FA. (3)

8.4 Determine the length of BC if the length of the diameter BD is 20 units. (3)

[14]

QUESTION 9

In the diagram below, O is the centre of the circle. D, E and C are points on the circumference. BC is a tangent at point C and DB is also a tangent at point D. Chord CD is extended to point A and CE is also extended to point F. DF is drawn. $\hat{B}_2 = x$ and $DE \parallel AB$. DE bisects $C\hat{D}B$.



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Prove that:

9.1 CDFB is a cyclic quadrilateral (4)

9.2 $\Delta ADF \,|||\, \Delta CBF$ (4)

9.3 $AD = \dfrac{DF.CB}{BF}$ (4)

9.4 $\dfrac{AC.FE}{CF} = \dfrac{DF.CB}{BF}$ (3)

[15]

TOTAL: 150

INFORMATION SHEET

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

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

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

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

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

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

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

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

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

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

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

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

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

$$\bar{x} = \frac{\sum x}{n} \qquad \sigma^2 = \frac{\sum_{i=1}^{n}\left(x_i - \bar{x}\right)^2}{n} \qquad P(A) = \frac{n(A)}{n(S)} \qquad P\ (A \text{ or } B) = P(A) + P(B) - P\ (A \text{ and } B)$$

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

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