EXAMINATION	NATIONAL SENIOR CERTIFICATE
GRADE	12
DATE	NOVEMBER 2025
SUBJECT	MATHEMATICS
PAPER	2
MARK TOTAL	150
DURATION (HOURS)	3
NUMBER OF PAGES	16

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SOUTH AFRICAN COMPREHENSIVE ASSESSMENT INSTITUTE

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INSTRUCTIONS AND INFORMATION

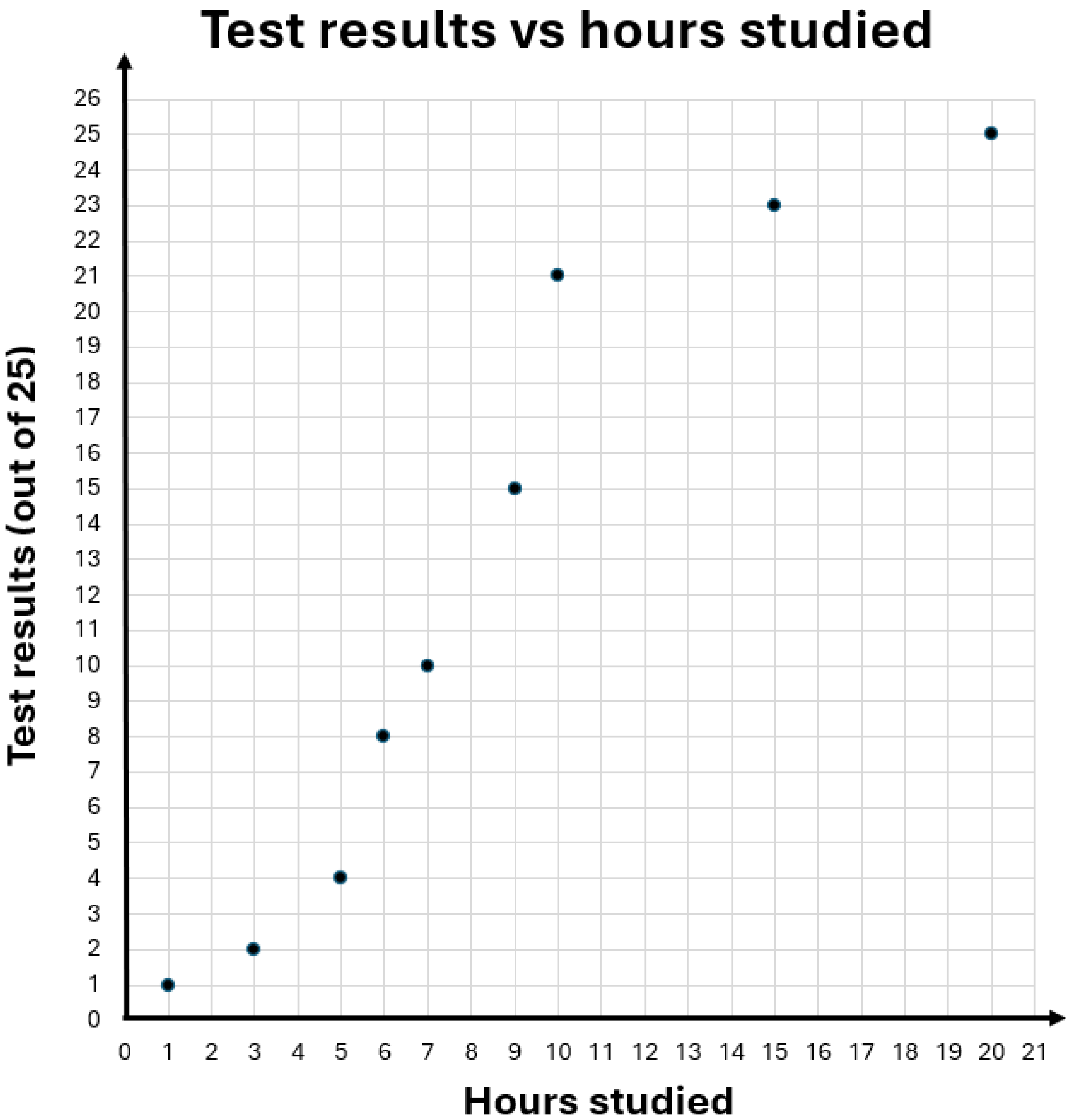
Read the following instructions carefully before answering the questions.

1. This question paper consists of **TEN** questions.
2. Answer **ALL** the questions.
3. Use the provided **ANSWER BOOK** to answer the questions.
4. Clearly show **ALL** calculations, diagrams, graphs, *et cetera* that you have used in determining your answers.
5. Answers only will **NOT** necessarily be awarded full marks.
6. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
7. If necessary, round off answers to **TWO** decimal places, unless stated otherwise.
8. Diagrams are **NOT** necessarily drawn to scale.
9. An information sheet with formulae is included at the end of the question paper.
10. Write neatly and legibly, in **BLUE** ink only.

QUESTION 1

1.1 The following scatter plot shows the hours studied (x) for a Mathematics test and the corresponding test scores (y), out of 25, for nine grade 12 students. The data for the scatter plot is obtained from the following table:

Hours studies (x)	1	3	5	6	7	9	10	15	20
Test Results (/25) (y)	1	2	4	8	10	15	21	23	25



1.1.1 Calculate the mean of the test scores. (1)

1.1.2 Determine the equation of least squares regression line for the data. (2)

1.1.3 Draw the least square regression line on the scatter plot provided in QUESTION 1.1, in the answer sheet. (2)

1.1.4 Predict the test score for a student who studies 14,5 hours per week. (2)

1.1.5 Determine the correlation coefficient for the data and comment on the correlation. (2)

1.1.6 **Calculate** whether there are any outliers in the test scores. (4)

1.1.7 Explain any potential risks or inaccuracies in extrapolating the data beyond the given range. (2)

1.2 The heights of 10 learners in grade 11 is recorded as per the table below:

Heights of students (cm)	150	155	160	165	168	170	172	175	180	185

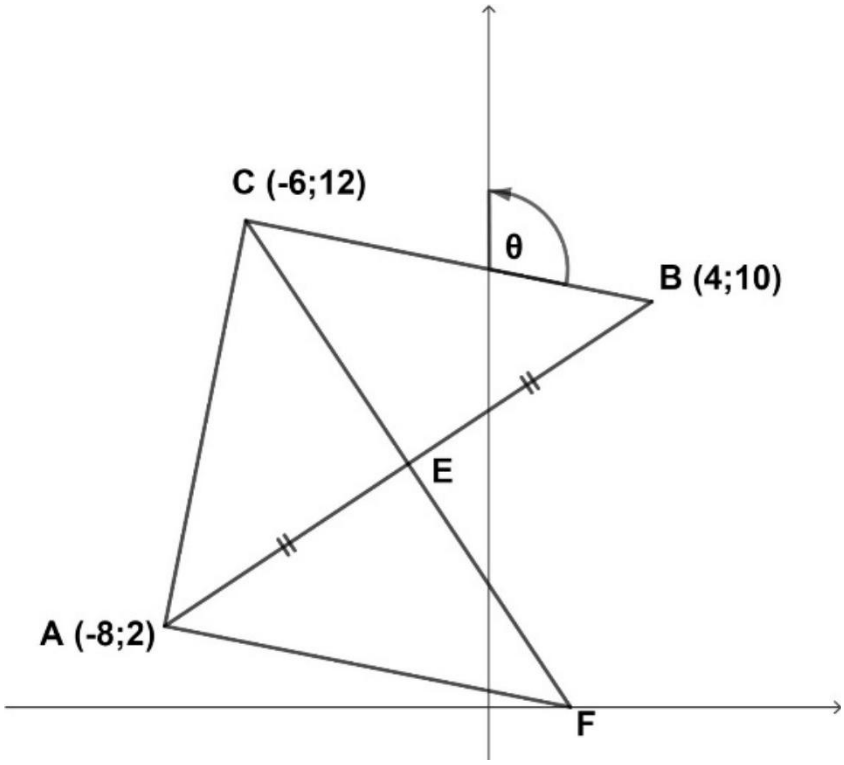
1.2.1 Draw a box-and-whisker diagram of the data. (4)

1.2.2 Comment on the skewness of the data. (1)

[20]

QUESTION 2

In the diagram A(-8;2), B(4;10) and C(-6;12) are given. E is the midpoint of AB.
F is the x-intercept of line CE extended. AF is drawn. The angle between BC and the y-axis equals θ.

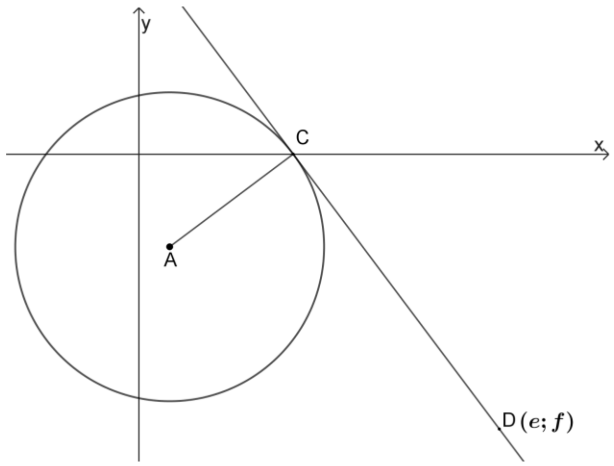


2.1	Determine the coordinates of E, the midpoint of AB.	(2)
2.2	Show that CE ⊥ AB.	(3)
2.3	Determine the equation of CE.	(2)
2.4	Determine the coordinates of F.	(1)
2.5	Show that BE = EF.	(3)
2.6	D is a point in the first quadrant such that BDFE is a square. Determine the coordinates of D.	(3)
2.7	Determine the value of θ.	(5)

[19]

QUESTION 3

3.1 The diagram below shows a circle with centre A and equation $(x-1)^2+(y+3)^2=25$. C is an x-intercept of the circle. A tangent to the circle at C, CD, is drawn with D$(e;f)$.

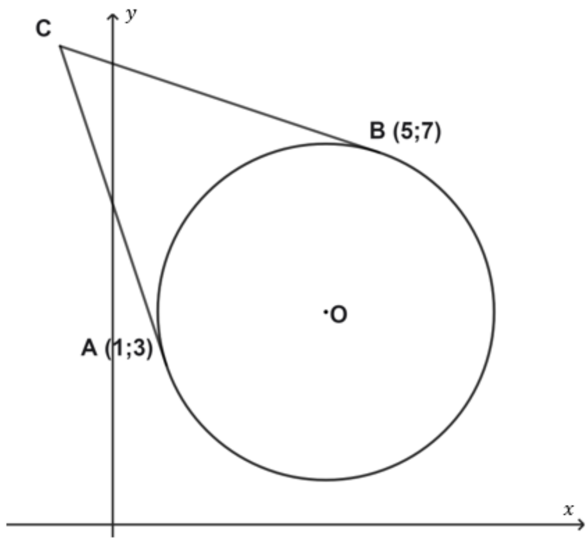


3.1.1 Write down the coordinates of A and the length of AC, the radius of circle A. (2)

3.1.2 Determine the equation of the tangent CD. (4)

3.1.3 The length of CD is $\frac{25}{3}$ units. Calculate the values of e and f. (6)

3.2 A circle, with equation $(x-4)^2+(y-4)^2=10$, passes through the points A$(1;3)$ and B$(5;7)$. Tangent CA and tangent CB are drawn from point C as shown in the diagram.



Another circle (not shown) is drawn with centre at point C and radius $\sqrt{10}$. Determine if the two circles will intersect, or not. Justify your answer. (9)

[21]

QUESTION 4

4.1 If $\sin 21°.\cos 21° = p$, determine, **without the use of a calculator**, the following in terms of p.

4.1.1 $\sin 42°$ (2)

4.1.2 $2\sin^2 21° - 1$ (4)

4.2 **Without using a calculator**, simplify the following expression:

$$\frac{\sin 290°}{\tan 215°\,.\,\cos(-35°)\,.\,\sin 55°}$$ (6)

[12]

QUESTION 5

5.1 Prove the following identity:

$$\frac{\cos^3 x - \sin^3 x}{\cos x - \sin x} = 1 + \sin x \cos x$$ (3)

5.2 Hence, determine the general solution of x, if:

$$\frac{\cos^3 x - \sin^3 x}{\cos x - \sin x} = \frac{1}{2}$$ (4)

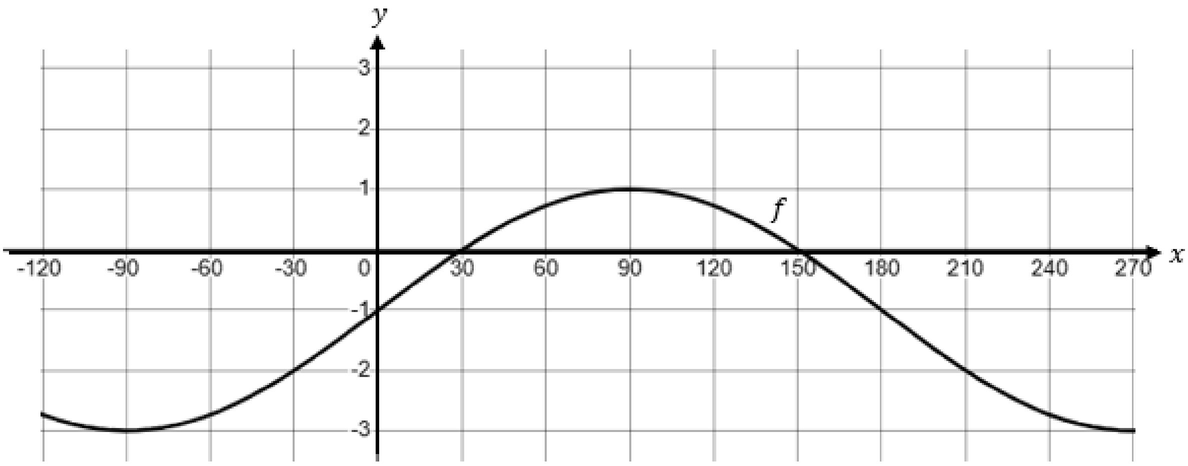
5.3 Simplify completely:

$$2\cos 4x \cos 2x - \cos 6x + 2\sin^2 x$$ (4)

[11]

QUESTION 6

In the diagram below the graph of $f(x) = a\sin x - b$ for $x \in [-120°; 270°]$ is shown.



6.1 Give the values of a and b. (2)

6.2 Sketch the graph of $g(x) = \cos 2x$ **on the same set of axes in QUESTION 6 on your answer book.** Clearly indicate the intercepts with the axes and the turning point(s) on your graph. (4)

6.3 Use your graph and determine the value(s) of x for which:
$f(x) - g(x) = 2$ (1)

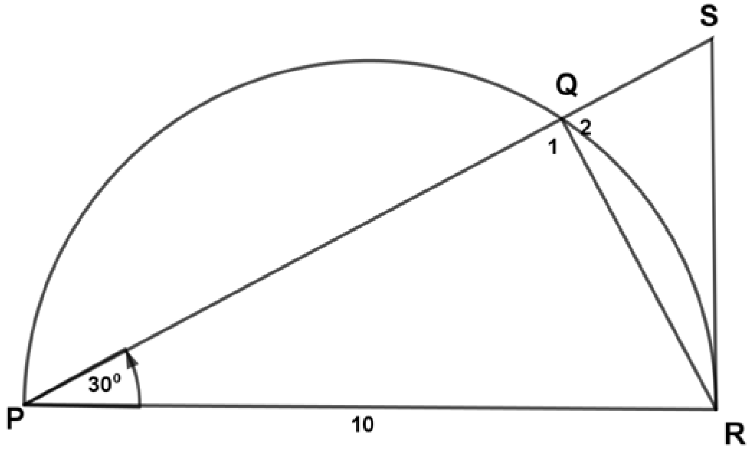
6.4 Write down the period of $f(3x)$. (1)

6.5 Write down the range of k if $k(x) = \frac{1}{2}g(x) + 1$. (2)

[10]

QUESTION 7

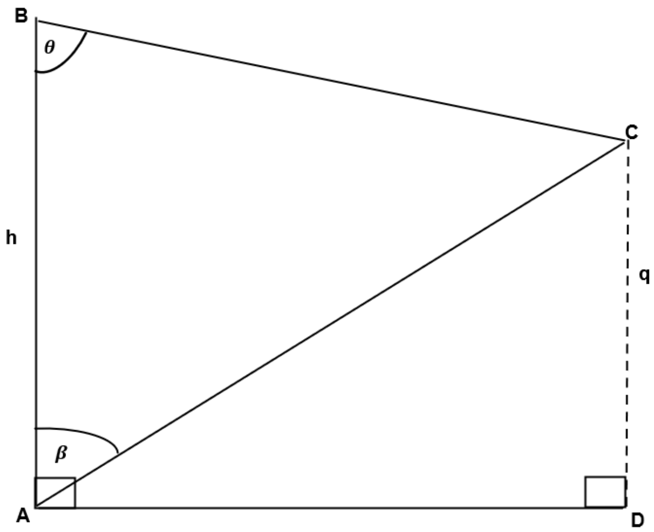
7.1 In the diagram below points P, Q and R lie on the circumference of the semi circle with diameter 10 units. SR is a tangent to the semi circle at R. PQ is produced to S. QR is drawn. $S\hat{P}R = 30°$.



Determine, **without the use of a calculator**, the length of QS. Leave your answer in surd form. (7)

7.2 An engineer is constructing a triangular support structure for a building, consisting of three steel beams as shown in the diagram.

- Point A is located on the ground, with B positioned directly above A at a vertical height of h meters.
- A second beam extends from A to C, where C is at a height of q meters above the ground at point D.
- The angle between beams AB and AC is β and between AB and BC is θ.

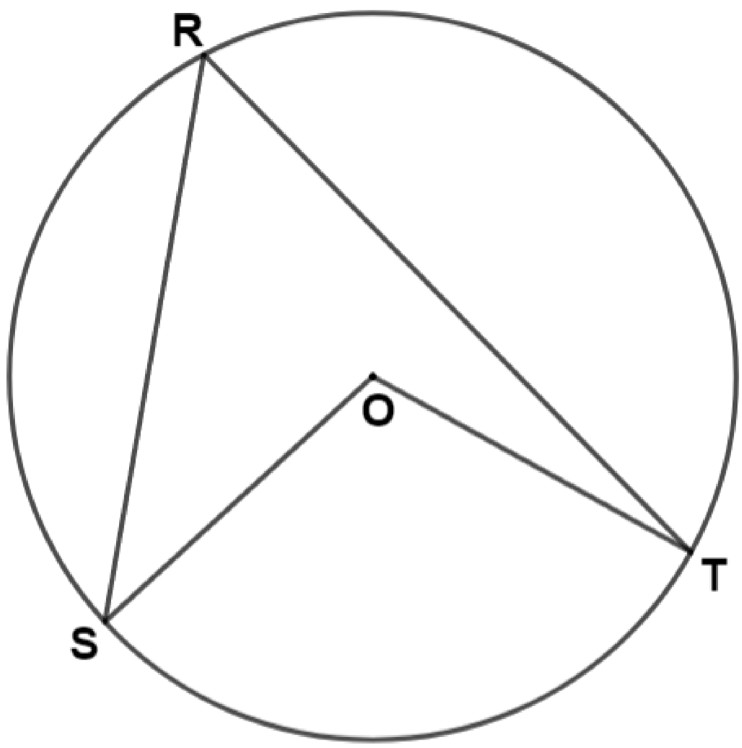


Show that $h = q\left(1 + \frac{\tan\beta}{\tan\theta}\right)$ (8)

[15]

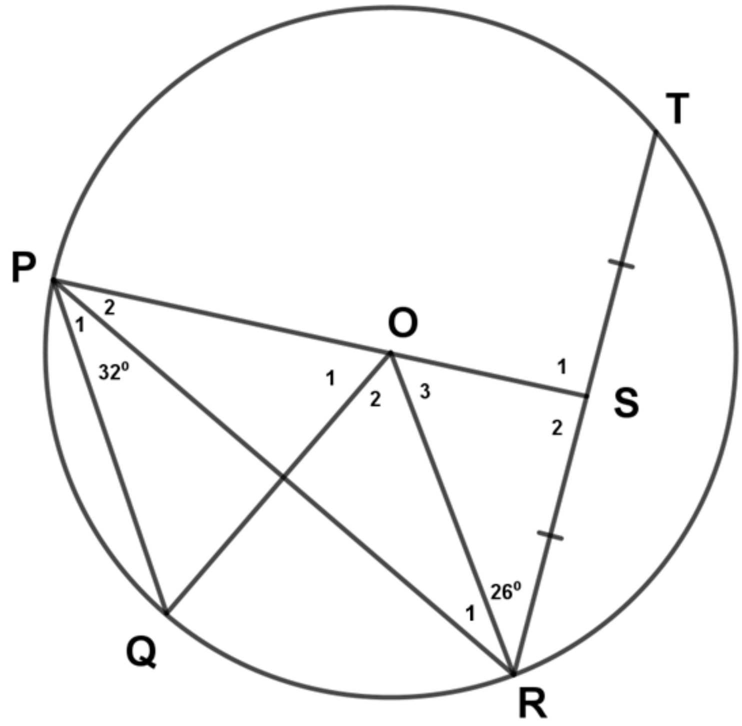
QUESTION 8

8.1 Use the diagram below to prove the theorem that states that if an arc subtends an angle at the centre of a circle and at the circumference, then the angle at the centre is twice the size of the angle at the circumference. (5)



8.2 In the diagram below:

- O is the centre of the circle.
- P, Q, R and T are points on the circumference of the circle.
- POS bisects chord RT.
- $S\hat{R}O = 26°$.
- $R\hat{P}Q = 32°$.



Determine, with reasons, the size of:

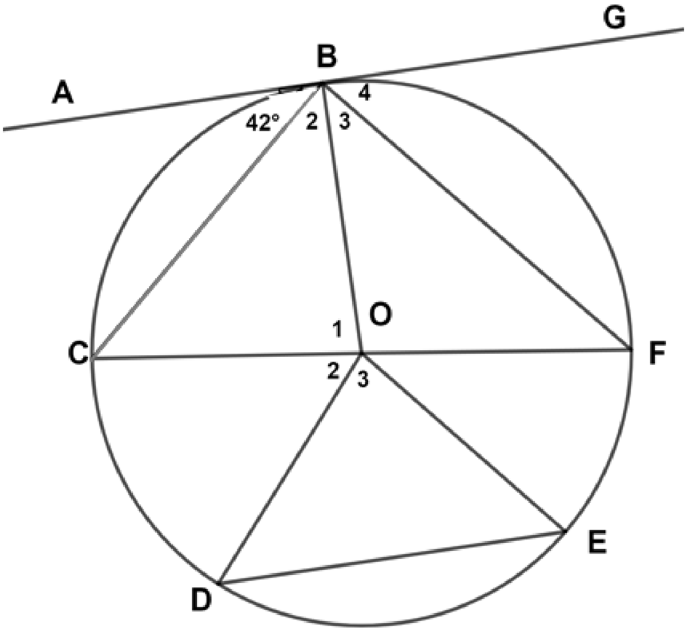
8.2.1 $\hat{O}_2$ (2)

8.2.2 $\hat{O}_1$ (3)

8.2.3 $\hat{P}_2$ (3)

8.3 In the diagram below:

- B, C, D, E and F are points on the circle with centre O.
- ABG is a tangent to the circle at point B.
- $A\hat{B}C = 42°$.



8.3.1 Calculate, with reasons, the size of $\hat{O}_1$. (4)

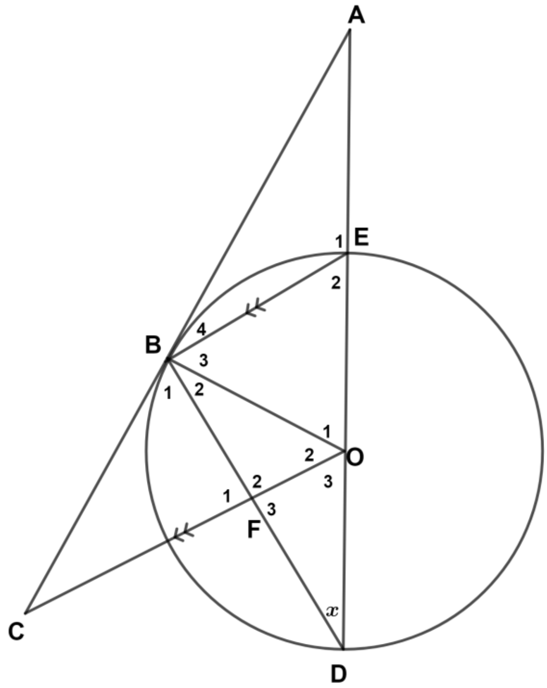
8.3.2 If BC = DE, determine, with reasons, the size of $\hat{O}_3$. (2)

[19]

QUESTION 9

In the diagram:

- ED is the diameter of the circle with centre O.
- AC is a tangent to the circle at B.
- DE is extended to A.
- CO intersects BD at F.
- BE || CO.
- $\widehat{D} = x$.



9.1 Determine, with reasons, three angles equal to x. (3)

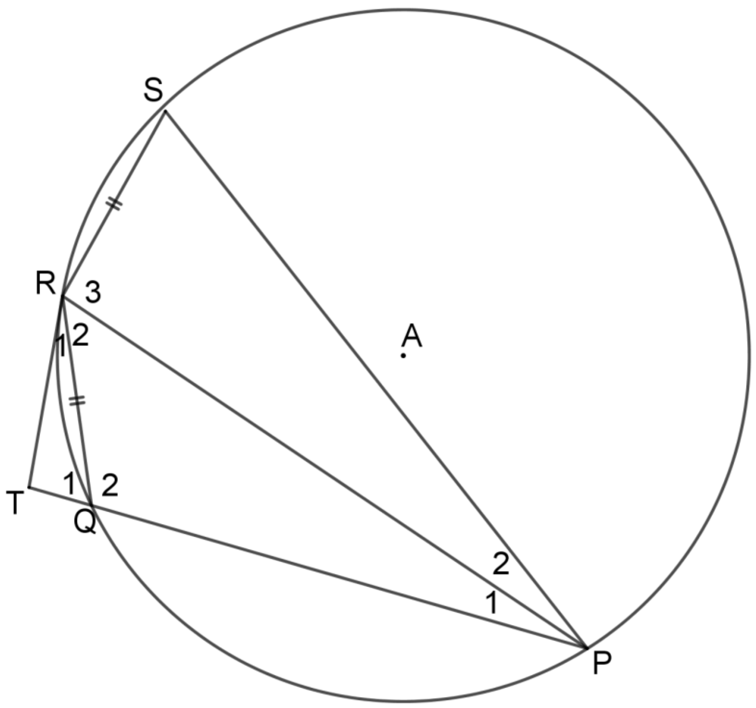
9.2 Prove, with reasons, that BF = FD. (3)

9.3 Prove, with reasons, that $2\,\mathrm{DF}\,.\,\mathrm{AB} = \mathrm{AD}\,.\,\mathrm{BE}$. (5)

[11]

QUESTION 10

In the diagram below circle PQRS with centre A is drawn. QR = RS.
TR is a tangent to the circle at R. Chords PQ, PR, PS, QR and RS are drawn. PQT is a straight line.



10.1 Prove that $\frac{QR}{SP} = \frac{RT}{PR}$ (5)

10.2 Prove that $\frac{PT}{PS} = \frac{RT^2}{QR^2}$ (7)

[12]

GRAND TOTAL: [150]

INFORMATION SHEET: MATHEMATICS

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

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

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

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

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

$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$ $\quad$ $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $\quad$ $M(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2})$

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

In ΔABC: $\quad$ $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ $\quad$ $a^2 = b^2 + c^2 - 2bc\cos A$

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

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

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

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

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

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

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

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