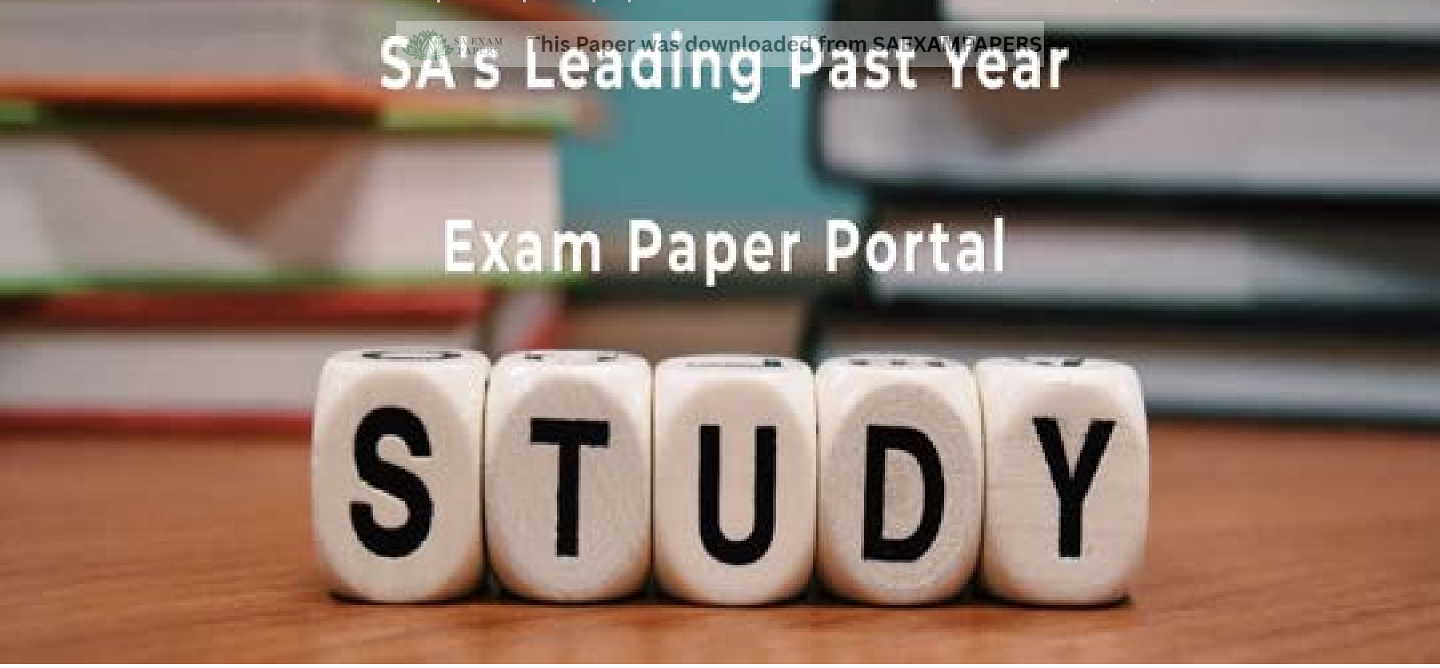
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basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

MATHEMATICS P2

NOVEMBER 2025

MARKS: 150

TIME: 3 hours

This question paper consists of 14 pages, 1 information sheet and an answer book of 27 pages.

INSTRUCTIONS AND INFORMATION

Read the following instructions and information carefully before answering the questions.

1. This question paper consists of 11 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 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 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.

QUESTION 1

There were 11 cars of the same model for sale at a car dealership. The age (in years) of each car and its corresponding selling price (in rands) is provided in the table below.

AGE OF CAR (IN YEARS)	SELLING PRICE OF CAR (IN RAND)
2	293 000
3	265 000
3	256 000
4	219 000
4	241 000
4	246 000
6	226 000
6	176 000
7	154 000
7	180 000
8	148 000

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

1.2 Predict the selling price of a similar car at this car dealership that is 5 years old. (2)

1.3 Use the correlation coefficient to show whether the prediction made in QUESTION 1.2 is valid or not. (2)

1.4 Use the answer to QUESTION 1.1 to write down the estimated average yearly decrease in the selling price of these 11 cars. (1)
[8]

QUESTION 2

2.1 The cumulative frequency table below shows the amount of time that people spent on a particular website on a certain day.

TIME, t (IN MINUTES)	CUMULATIVE FREQUENCY
$0 < t \leq 20$	16
$0 < t \leq 40$	40
$0 < t \leq 60$	59
$0 < t \leq 80$	67
$0 < t \leq 100$	70

2.1.1 How many people visited this website on that day? (1)

2.1.2 How many people spent more than 40 and up to 80 minutes on the website? (2)

2.1.3 Draw a histogram to represent the information provided in the cumulative frequency table. (3)

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

2.2 There are 9 players in a basketball team. The coach calculated that on average, each player scored 12 points during a game. The points scored by 8 of the 9 players from the team is given below:

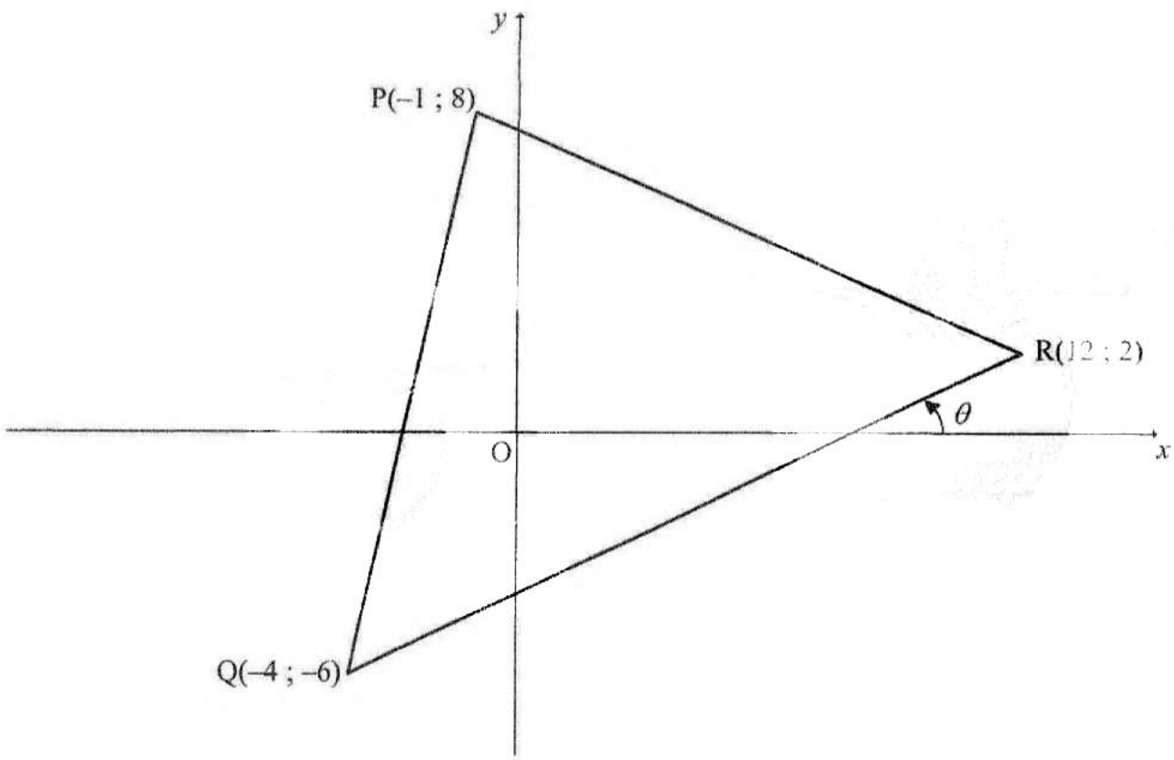
11	14	19	20	8	10	2	14

How many players' points score was outside ONE standard deviation of the mean points score? (5)

[12]

QUESTION 3

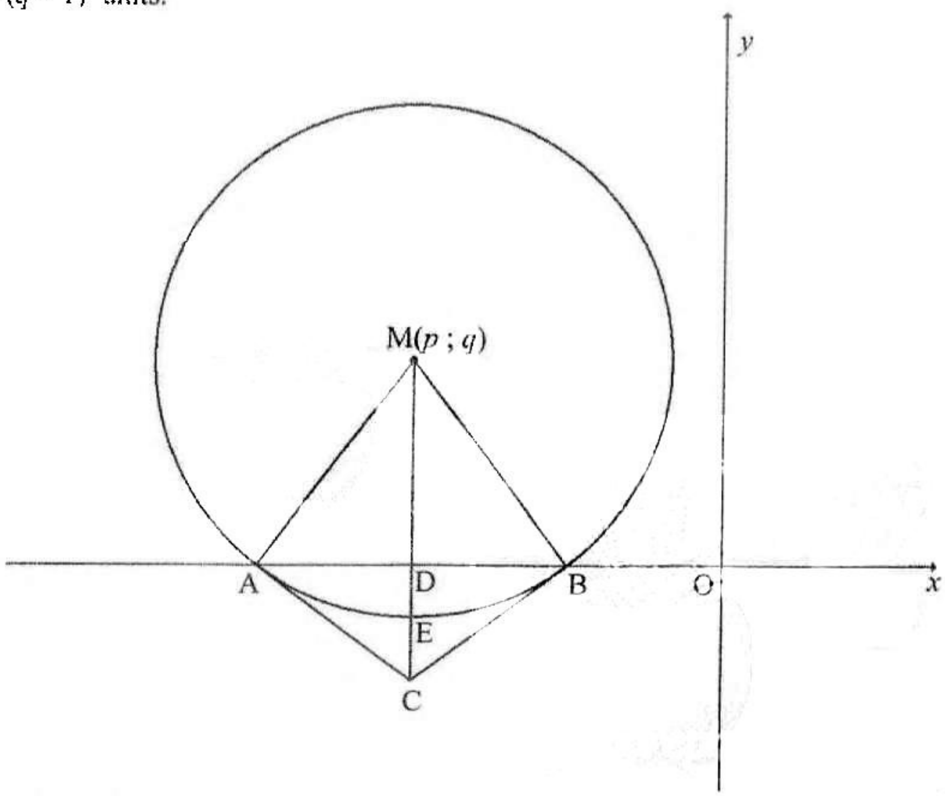
In the diagram, P(–1 ; 8), Q(–4 ; –6) and R(12 ; 2) are the vertices of ΔPQR. The angle of inclination of QR is θ.



3.1	Calculate the length of QR. Leave your answer in simplified surd form.	(2)
3.2	Calculate the gradient of QR.	(2)
3.3	Calculate the size of θ.	(2)
3.4	Determine the equation of QR.	(2)
3.5	PQRS, in that order, is a parallelogram. Write down the coordinates of S.	(2)
3.6	T is a point on QR such that PT $\perp$ QR. Calculate the coordinates of T.	(5)
3.7	Calculate the area of parallelogram PQRS.	(3)
		[18]

QUESTION 4

In the diagram, M(p ; q) is the centre of the circle that intersects the x-axis at A and B. C is a point such that the line drawn from M to C is parallel to the y-axis and intersects the x-axis at D. MC intersects the circle at E(–6 ; –1). Tangents drawn from C touch the circle at A and B. AD = (q – 1) units.



4.1	Write down the value of p.	(1)
4.2	Show that $q = 4$.	(4)
4.3	Determine the equation of the circle in the form $(x-a)^2+(y-b)^2=r^2$.	(2)
4.4	If the circle is translated 2 units to the left, determine the minimum distance between the circle and the y-axis.	(1)
4.5	Calculate the coordinates of A and B.	(3)
4.6	Determine the equation of tangent BC.	(4)
4.7	Write down the coordinates of C.	(2)
4.8	Calculate the size of $A\hat{C}B$.	(4)
		[21]

QUESTION 5

5.1 It is given that $\tan 50^\circ = k$. Express EACH of the following in terms of k:

5.1.1 $\cos 40^\circ$ (2)

5.1.2 $\dfrac{2\sin 25^\circ.\cos 25^\circ}{-2+4\sin^2 25^\circ}$ (5)

5.1.3 $\sin 10^\circ$ (4)

5.2 Given: $\dfrac{\sin(540^\circ+x).\cos(90^\circ+x)}{\sin(-x)}$

5.2.1 Simplify the expression above fully to a single trigonometric ratio. (4)

5.2.2 Hence, determine the values of x in the interval $x \in [0^\circ;360^\circ]$ for which $\sqrt{\dfrac{\sin(540^\circ+x).\cos(90^\circ+x)}{\sin(-x)}}$ will be real. (2)

[17]

QUESTION 6

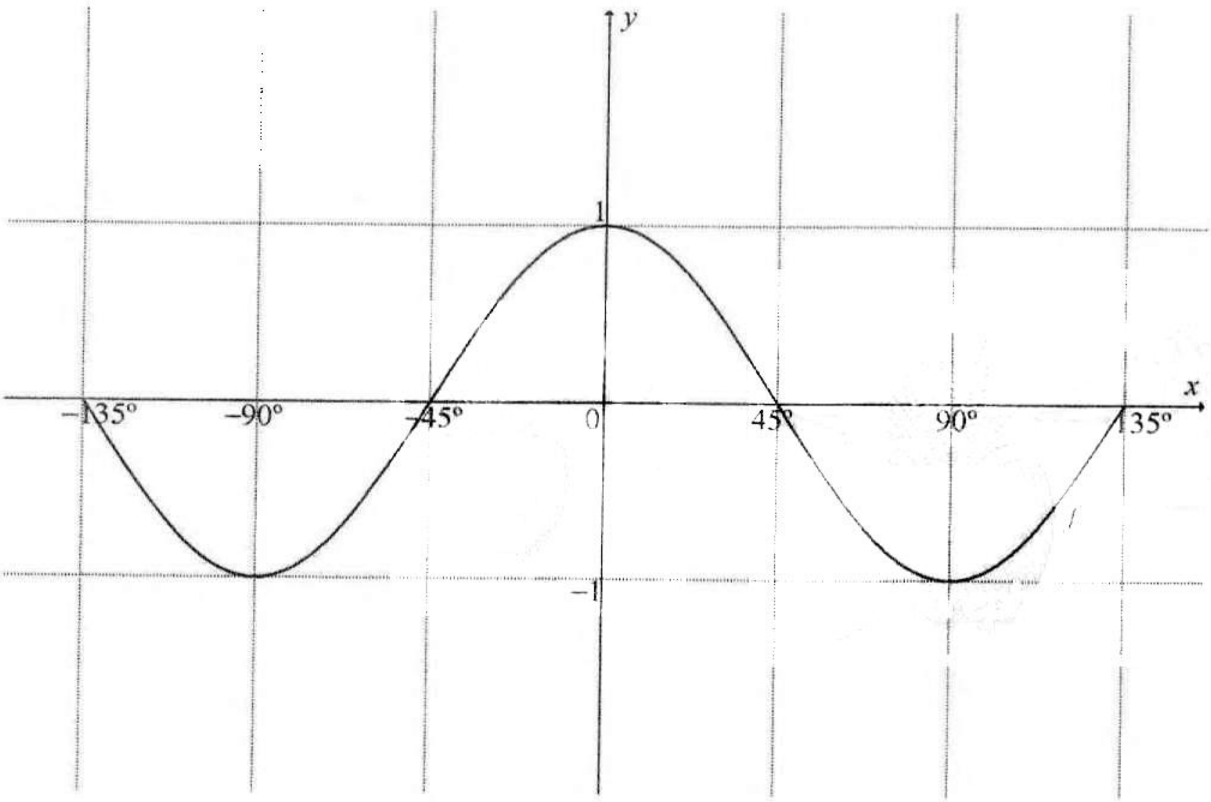
6.1 Prove that: $[\tan(180^\circ - x)](1-\cos^2 x)+\cos^2 x = \dfrac{(\sin x - \cos x)(1+\sin x.\cos x)}{-\cos x}$ (6)

6.2 It is given that $\sin^2 x$; $\cos^2 x$ and $\dfrac{1}{2}\sin 2x$ are the first three terms of an arithmetic sequence. The constant difference of the arithmetic sequence is NOT zero.
Determine the general solution for x. (7)

[13]

QUESTION 7

In the diagram, the graph of $f(x) = \cos 2x$ is drawn for $x \in [-135° ; 135°]$.



7.1 Write down the period of f. (1)

7.2 On the set of axes provided in the ANSWER BOOK, draw the graph of $g(x) = \tan 2x - 1$ for $x \in [-135° ; 135°]$. (3)

7.3 Graph f is translated $45°$ to the left to form graph h. Determine the equation of h in its simplest form. (1)

7.4 Write down the range of h. (1)

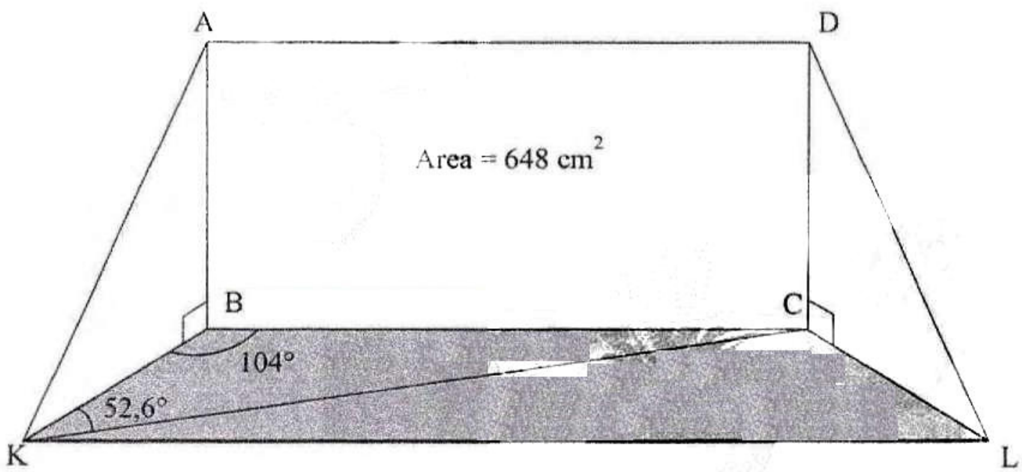
7.5 Determine the values of x for which $(1 - \tan 2x)(\cos 2x) \geq 0$ in the interval $x \in [0° ; 135°]$. (4)

[10]

QUESTION 8

As part of a school project, learners are required to design a portable stage for a puppet show, as shown in the diagram below. The design must fulfil the following requirements:

- BKLC is a horizontal base having $K\hat{B}C = 104°$ and $B\hat{K}C = 52,6°$.
- The rectangular backdrop, ABCD, is vertical to the horizontal base and must have an area of $648\ cm^2$.
- The sides of ABCD must be in the ratio AB : BC = 1 : 2.
- The stage must be partly enclosed with triangular sides ABK and DCL.

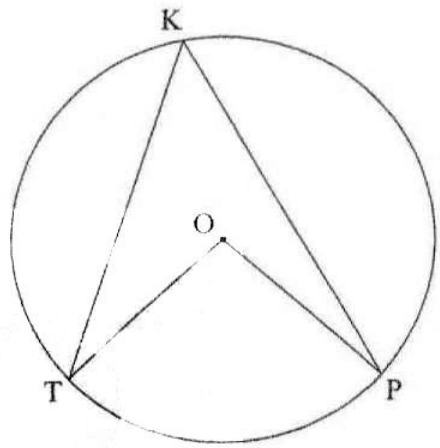


8.1	Show that AB = 18 cm.	(2)
8.2	Calculate the length of AC.	(2)
8.3	Calculate the length of diagonal KC.	(2)
8.4	If AB = BK, calculate the size of $K\hat{A}C$.	(4)
		[10]

Provide reasons for your statements in QUESTIONS 9, 10 and 11.

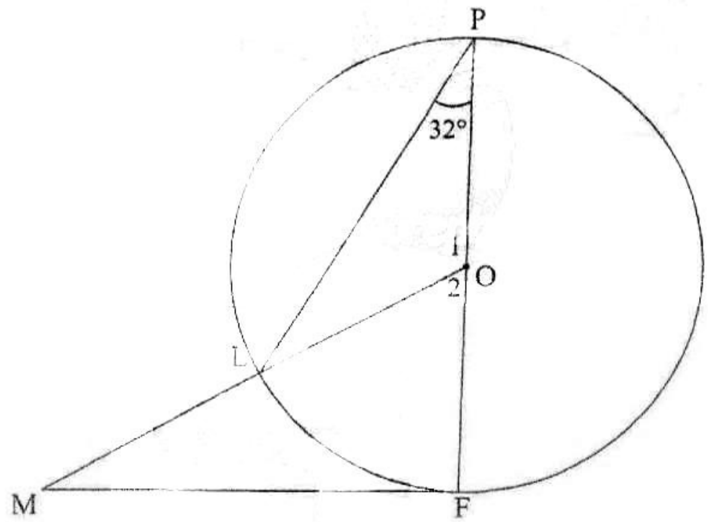
QUESTION 9

9.1 In the diagram, O is the centre of the circle. K, T and P lie on the circle.



Use the diagram above to prove the theorem which states that the angle subtended by a chord (or arc) at the centre of the circle is equal to twice the angle subtended by the same chord (or arc) at the circumference, that is prove that $T\hat{O}P = 2\,T\hat{K}P$. (5)

9.2 In the diagram, O is the centre of the circle. POF is the diameter of the circle and MF is a tangent to the circle at F. OM cuts the circle at L. $\hat{P} = 32°$.



Calculate, with reasons, the size of:

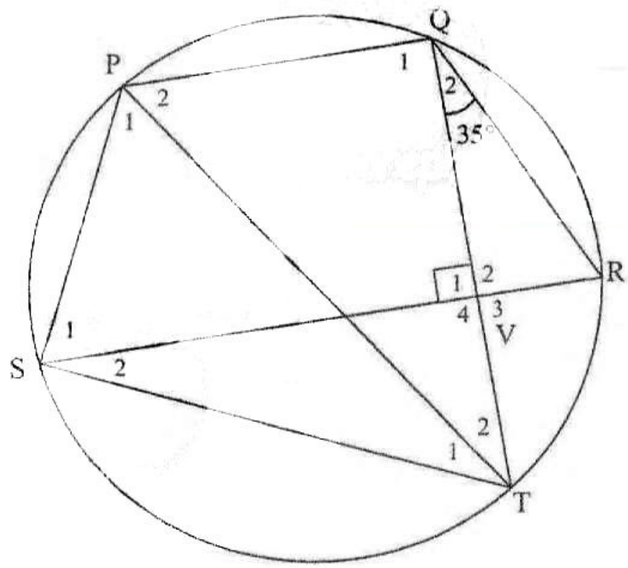
9.2.1 $\hat{O}_2$ (2)

9.2.2 $\hat{M}$ (3)

[10]

QUESTION 10

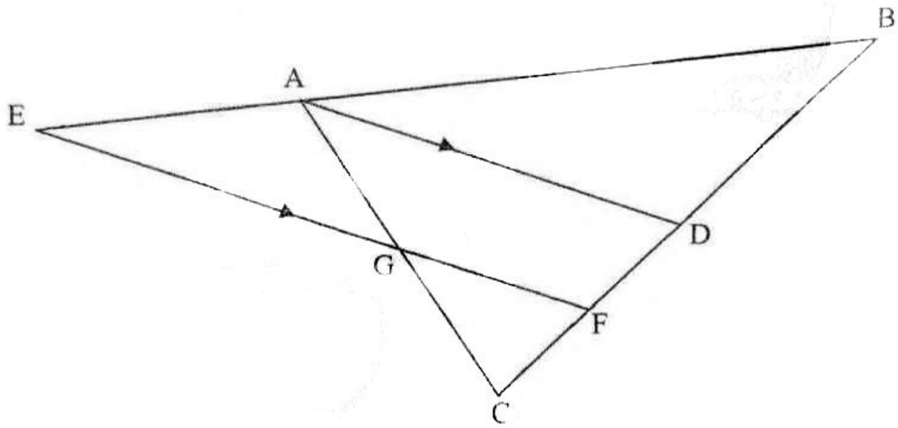
In the diagram, PQRS is a cyclic quadrilateral. T is a point on the circle such that QT is perpendicular to SR at V. PT and ST are drawn. $\hat{Q}_2 = 35°$ and $\hat{R} = \hat{S}_1$.



10.1	Calculate, with reasons, the size of $Q\hat{T}S$.	(3)
10.2	Prove that PQ ∥ SR.	(3)
10.3	Prove that PT is a diameter of the circle.	(2)
		[8]

QUESTION 11

11.1 In the diagram, ΔABC is drawn. BA is produced to E. F and D are points on BC such that AD || EF. AC and EF intersect at G. $\frac{CF}{FB}=\frac{2}{5}$ and $\frac{CG}{GA}=\frac{3}{2}$.



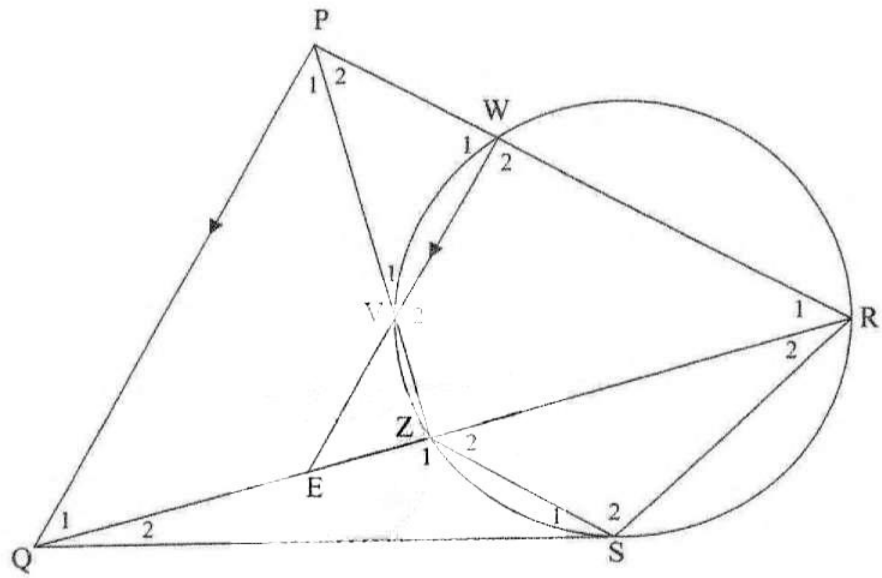
Calculate, with reasons, the value of:

11.1.1 $\frac{FD}{CF}$ (2)

11.1.2 $\frac{BA}{EA}$ (4)

11.1.3 $\frac{\text{Area of } \Delta GCF}{\text{Area of GFDA}}$ (4)

11.2 In the diagram, WVZR is a cyclic quadrilateral. RZ is produced to Q. A tangent is drawn from Q to touch the circle at S. WV is produced to E, a point on ZQ. RW produced meets ZV produced in P. PQ || WE. RS and ZS are drawn.



Prove, with reasons, that:

11.2.1 $PR = \frac{PW.QR}{QE}$ (2)

11.2.2 If $\Delta PQZ \,|||\, \Delta RQP$, then $PQ^2 = RQ.QZ$ (1)

11.2.3 $\Delta QSZ \,|||\, \Delta QRS$ (3)

11.2.4 $PQ = QS$ (3)

11.2.5 $PW = \frac{QE.PZ}{\sqrt{QR.QZ}}$ (4)

[23]

TOTAL: 150

INFORMATION SHEET

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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