KWAZULU-NATAL PROVINCE

EDUCATION

REPUBLIC OF SOUTH AFRICA

PROVINCIAL STANDARDISED ASSESSMENT

GRADE 12

MATHEMATICS P2

JUNE 2026

MARKS: **150**

TIME: **3 hours**

This question paper consists of 13 pages and an information sheet.

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INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 11 questions.

2. Answer ALL the questions in the ANSWER BOOK provided.

3. Number the answers correctly according to the numbering system used in this question paper.

4. Clearly show ALL calculations, diagrams, graphs, etc. which 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. Diagrams are NOT necessarily drawn to scale.

8. If necessary, round off answers correct to TWO decimal places, unless stated otherwise.

9. Write neatly and legibly.

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QUESTION 1

Five data values are represented as follows:

$2d$	$d+1$	$d+2$	$d-3$	$2d-2$

1.1 If the mean of the data set is 15, show that $d = 11$. (3)

1.2 Calculate the standard deviation for this data, correct to TWO decimal places. (2)

1.3 If a positive number p is added to each value in the data set, will each of the following increase, decrease or remain the same?

1.3.1 the mean (1)

1.3.2 the standard deviation (1)

[7]

QUESTION 2

The ages of the workers at a textile factory in KwaZulu-Natal are represented in the table below.

AGE	FREQUENCY
$25 < x \leq 30$	6
$30 < x \leq 35$	11
$35 < x \leq 40$	17
$40 < x \leq 45$	25
$45 < x \leq 50$	24
$50 < x \leq 55$	10
$55 < x \leq 60$	7
$60 < x \leq 65$	8

2.1 Complete the cumulative frequency column of the table in your ANSWER BOOK. (2)

2.2 Draw an ogive on the set of axes provided in your ANSWER BOOK to represent the data in the table. (4)

2.3 Use your ogive to sketch a box and whisker diagram if the youngest worker is 26 years old and the oldest worker is 65 years years old. (4)

2.4 A decision was taken by the management team of the factory to put into place measures that will help to address the problem of youth unemployment in the area.

2.4.1 One of the measures was to allow workers to apply for early retirement from the age of 57. Use the ogive to determine what percentage of the workers would qualify for early retirement. (2)

2.4.2 They also decided to appoint 20 more workers between the ages of 25 and 30. What effect will this action have on the distribution of the ages of the workers? Will it cause the distribution to be more skewed to the left, or to the right? (1)

[13]

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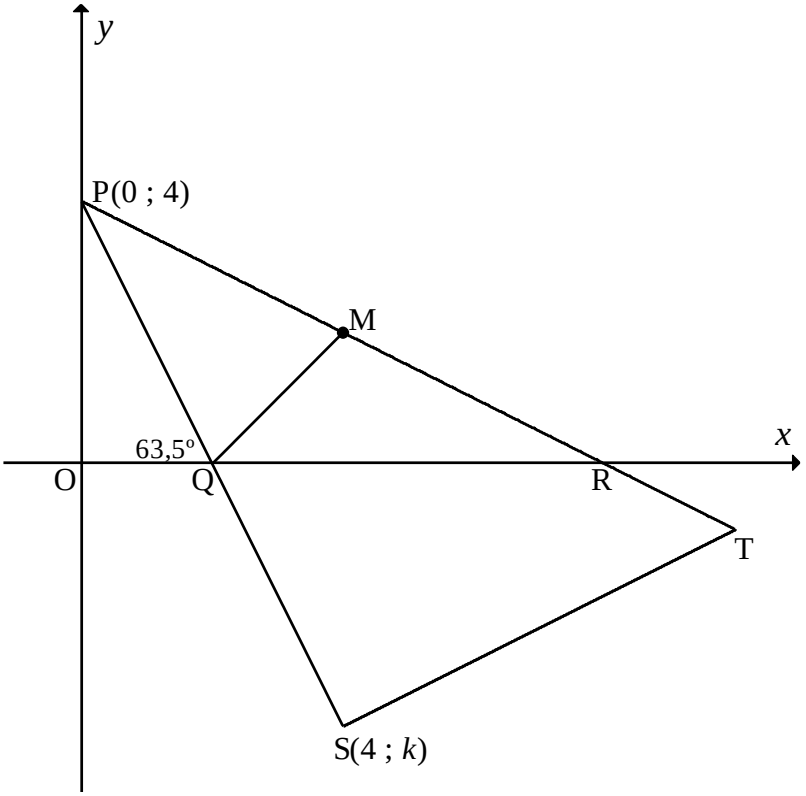
QUESTION 3

In the diagram below, triangle PST, with vertices $P(0;4)$, $S(4;k)$ and T, is shown.
Q and R are the *x*-intercepts of PS and PT respectively. OQ : OR = 1 : 4.
M is the midpoint of PR.
$O\hat{Q}P = 63,5°$



3.1 Determine the gradient of PS, correct to **the nearest integer**. (2)

3.2 Write down the equation of PS. (1)

3.3 Show that $k = -4$. (1)

3.4 Determine the length of QR. (4)

3.5 Calculate the coordinates of M. (2)

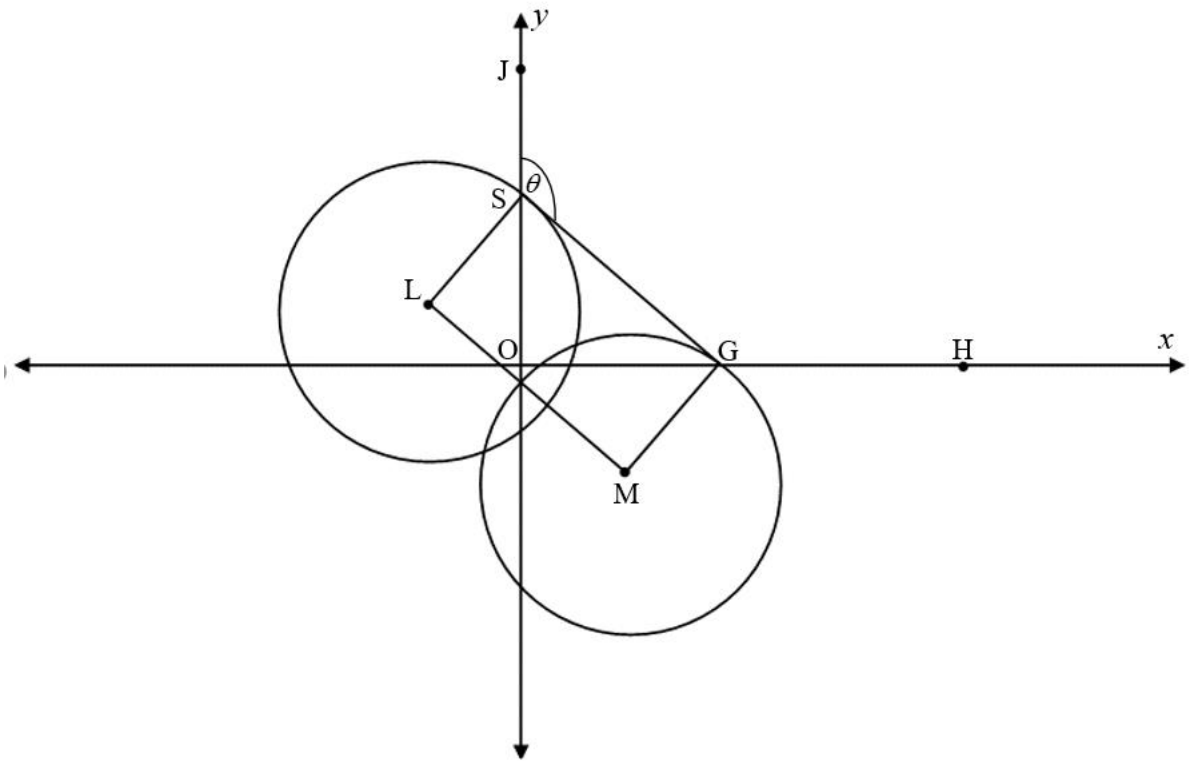
3.6 Prove that QM cannot be the perpendicular bisector of PR. (4)

3.7 Calculate the area of quadrilateral QSTM, if the coordinates of T are $(10;-1)$. (4)

[18]

QUESTION 4

In the diagram below, L and M are the centres of two equal circles.
The equation of the circle centred at L is $x^2+6x+y^2-4y=12$.
GS is a tangent to both circles, at S and G respectively.
G lies on the *x*-axis and S on the *y*-axis.
H is a point on the *x*-axis to the right of G, and J is a point on the *y*-axis above S.



4.1 Determine the coordinates of L, and the radius of the circle. (4)

4.2 Determine the coordinates of S. (4)

4.3 Determine the coordinates of G. (4)

4.4 Determine the size of θ. (4)

4.5 Show that LMGS is a rectangle. (2)

4.6 Determine the equation of the circle with centre M in the form $(x-a)^2+(y-b)^2=r^2$. (3)

[21]

QUESTION 5

5.1 If $\sin 2\alpha = \frac{\sqrt{5}}{3}$, with $2\alpha \in [90° ; 270°]$, determine WITHOUT the use of a calculator the value of:

5.1.1 $\tan 2\alpha$ (3)

5.1.2 $\sin \alpha$ (4)

5.2 Simplify fully:

$\tan^2(180° - \theta).\sin^2(90° + \theta) - \cos(\theta - 180°).\cos\theta$ (5)

5.3 Given: $\frac{\cos 5x \cos 3x + \sin 3x \sin 5x}{\cos x - \sin x} = \sin x + \cos x$

5.3.1 Prove the identity. (3)

5.3.2 For which value(s) of x, where $x \in [-180° ; 180°]$, is the above identity undefined? (4)

[19]

QUESTION 6

6.1 Determine the general solution of the following equation:

$2\cos 2x - \sin x + 1 = 0$ (7)

6.2 The expression $\sqrt{3}\cos\beta + \sin\beta$ can be rewritten in the form $k\sin(m° + \beta)$.
Determine the values of k and m.
Show all your working details. (4)

[11]

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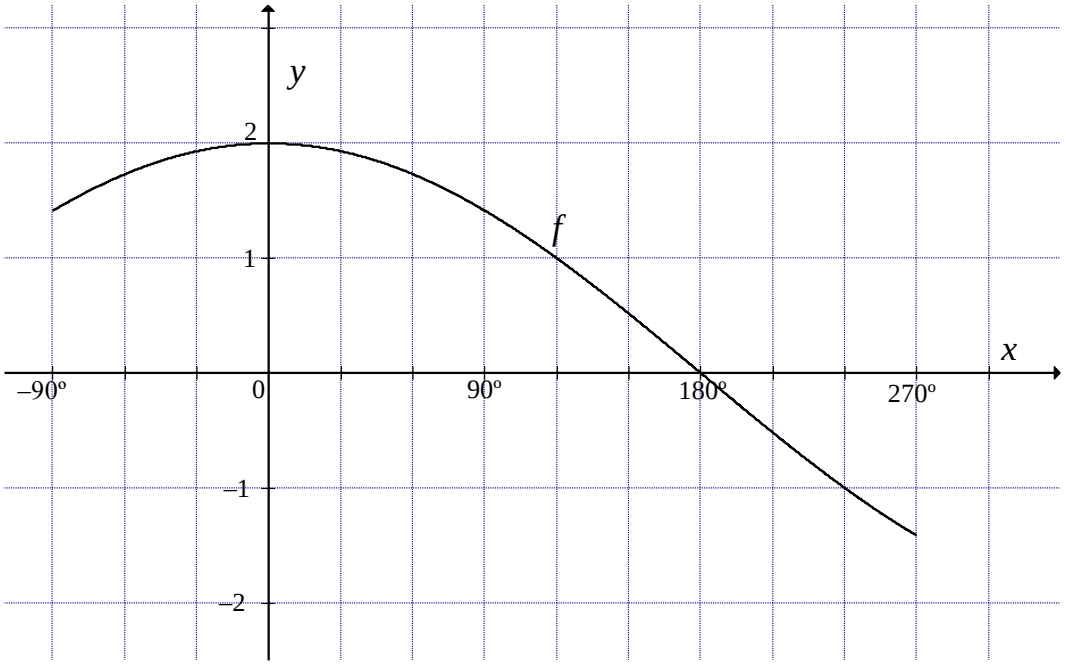
QUESTION 7

Sketched below is the graph of $f(x) = 2\cos\left(\frac{x}{2}\right)$ for the interval $x \in [-90° ; 270°]$.



7.1 Write down the period of f. (1)

7.2 Sketch the graph of g if $g(x) = \sin(x - 60°)$ on the grid in your ANSWER BOOK for the interval $x \in [-90° ; 270°]$.
Clearly indicate all intercepts with the axes, turning points and end points. (4)

7.3 Describe the transformation from g to h, if $h(x) = -\cos x$. (2)

7.4 Use the graphs to determine the values of x in the interval $x \in [-90° ; 270°]$ for which:

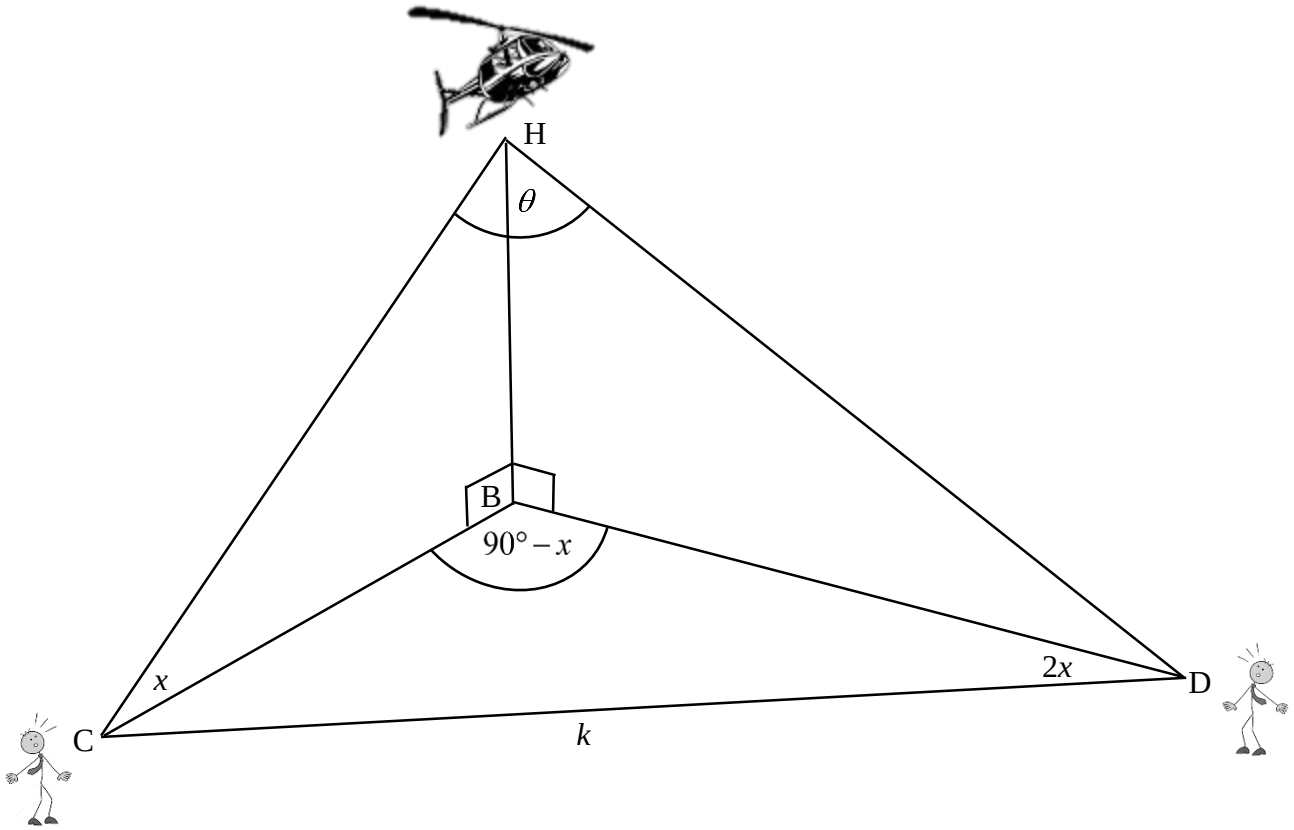
7.4.1 $2\cos\left(\frac{x}{2}\right) \geq 0$? (2)

7.4.2 $f(x).g(x) > 0$ (3)

[12]

QUESTION 8

A helicopter H is hovering directly above point B on the ground. Two people, standing at point C and point D look up to view the helicopter. B, C and D are in the same horizontal plane.
The angle of elevation from C to H is x. $C\hat{B}D = 90° - x$, $C\hat{D}B = 2x$ and $C\hat{H}D = \theta$.
The distance between C and D is k metres.



8.1 Show that $CB = 2k\sin x$ (3)

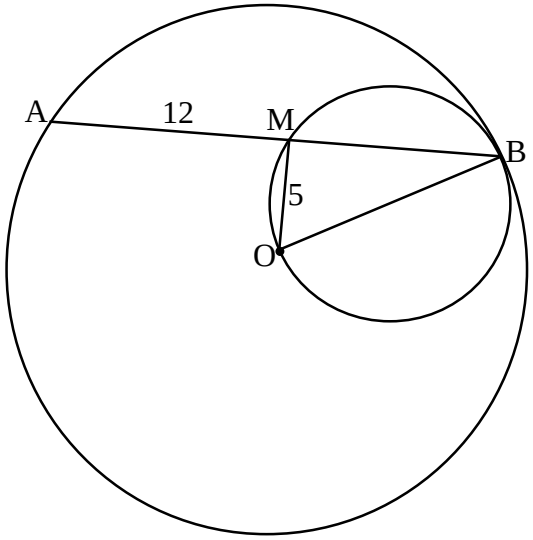
8.2 Hence, show that HC is $2k\tan x$ (2)

8.3 If $k = 40$ m, $x = 23°$ and $HD = 30$ m, calculate the size of angle θ, correct to two decimal places. (4)

[9]

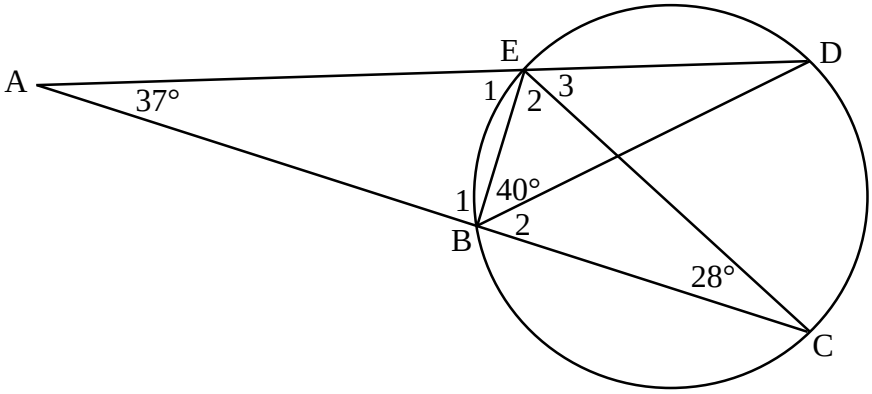
QUESTION 9

9.1 In the diagram below, the two circles touch internally at B. The smaller circle passes through O, the centre of the larger circle. Chord AB of the larger circle cuts the smaller circle at M. OM and OB are drawn. OB is the diameter of the smaller circle. $AM = 12$ units and $OM = 5$ units.



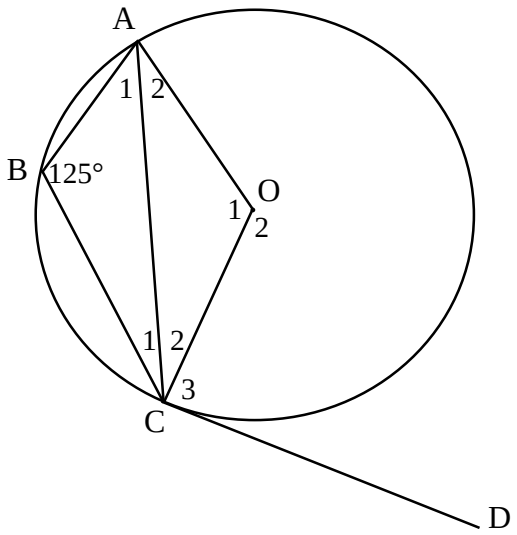
Calculate, with reasons, the length of the radius of the larger circle. (4)

9.2 In the diagram below, AED and ABC are two straight lines. B, C, D and E lie on the circumference of the circle. BE, EC and BD are drawn.



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

9.3 In the diagram below, O is the centre of the circle and A, B and C are points on the circle. CD is a tangent to the circle at C. $\hat{B} = 125°$.

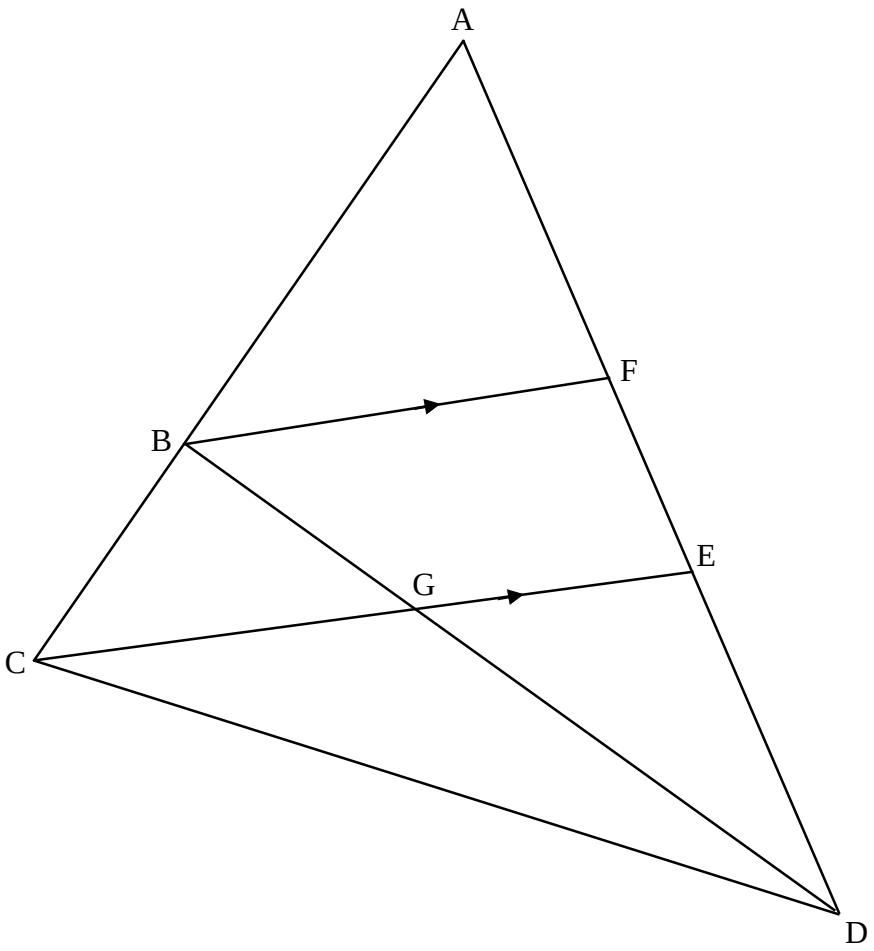


Calculate, with reasons, the size of $\hat{C}_2$. (4)

[12]

QUESTION 10

In the diagram, B is a point on AC. F and E are points on AD of ΔACD. BF, CE and BD are drawn. BD intersects CE in G. BF||CE, $BC = \frac{3}{8}AC$ and $\frac{AE}{ED} = 4:3$.



Calculate, with reasons, the value of:

10.1 $\frac{AF}{FE}$ (2)

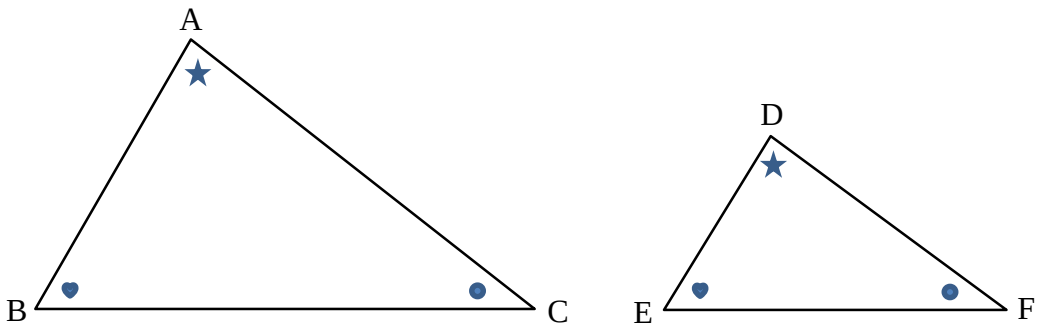
10.2 $DG:GB$ (3)

10.3 $\frac{\text{Area of } \Delta BCG}{\text{Area of } \Delta DGC}$ (2)

[7]

QUESTION 11

11.1 In the diagram, ΔABC and ΔDEF are drawn such that $\hat{A} = \hat{D}$, $\hat{B} = \hat{E}$ and $\hat{C} = \hat{F}$.

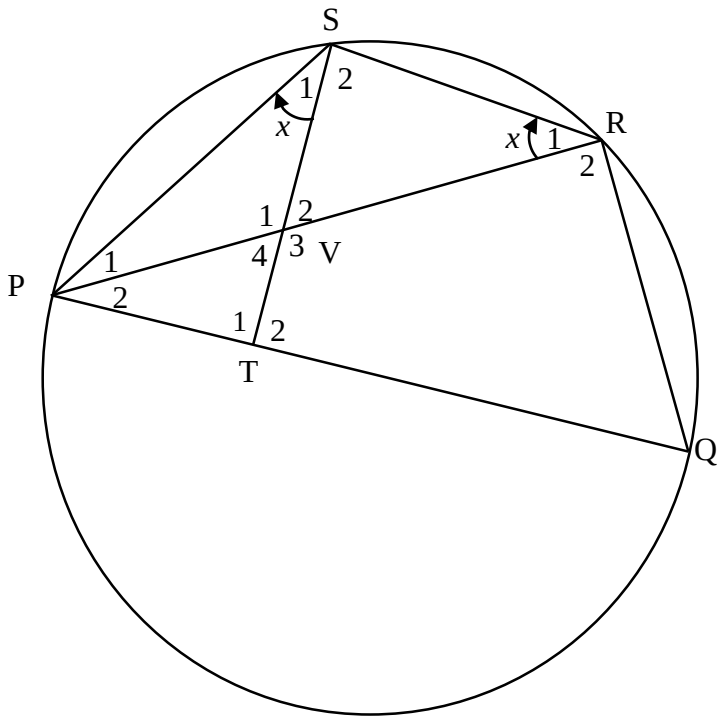


Use the diagram in the ANSWER BOOK to prove the theorem which states that if two triangles are equiangular, then the corresponding sides are in proportion, that is:

$\frac{DE}{AB} = \frac{DF}{AC}$. (6)

11.2 In the diagram below:

- P, Q, R and S are points on the circumference of the circle.
- PQ is the diameter.
- PR is drawn.
- ST is drawn, where T is a point on PQ.
- V is the point of intersection between ST and PR.
- $\hat{S}_1 = \hat{R}_1 = x$.



11.2.1 Prove that $\Delta PSV \text{ ||| } \Delta PRS$. (3)

11.2.2 Prove that VTQR is a cyclic quadrilateral. (4)

11.2.3 Prove that $\Delta PRQ \text{ ||| } \Delta PTV$. (3)

11.2.4 Hence, prove that $ST^2 = PT(PQ - PT)$. (5)

[21]

TOTAL: 150

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INFORMATION SHEET: MATHEMATICS

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

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

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

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

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

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

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

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

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

In ΔABC:

$$\frac{a}{\sin \mathrm{A}} = \frac{b}{\sin \mathrm{B}} = \frac{c}{\sin \mathrm{C}}$$

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

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

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

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

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

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

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

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

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