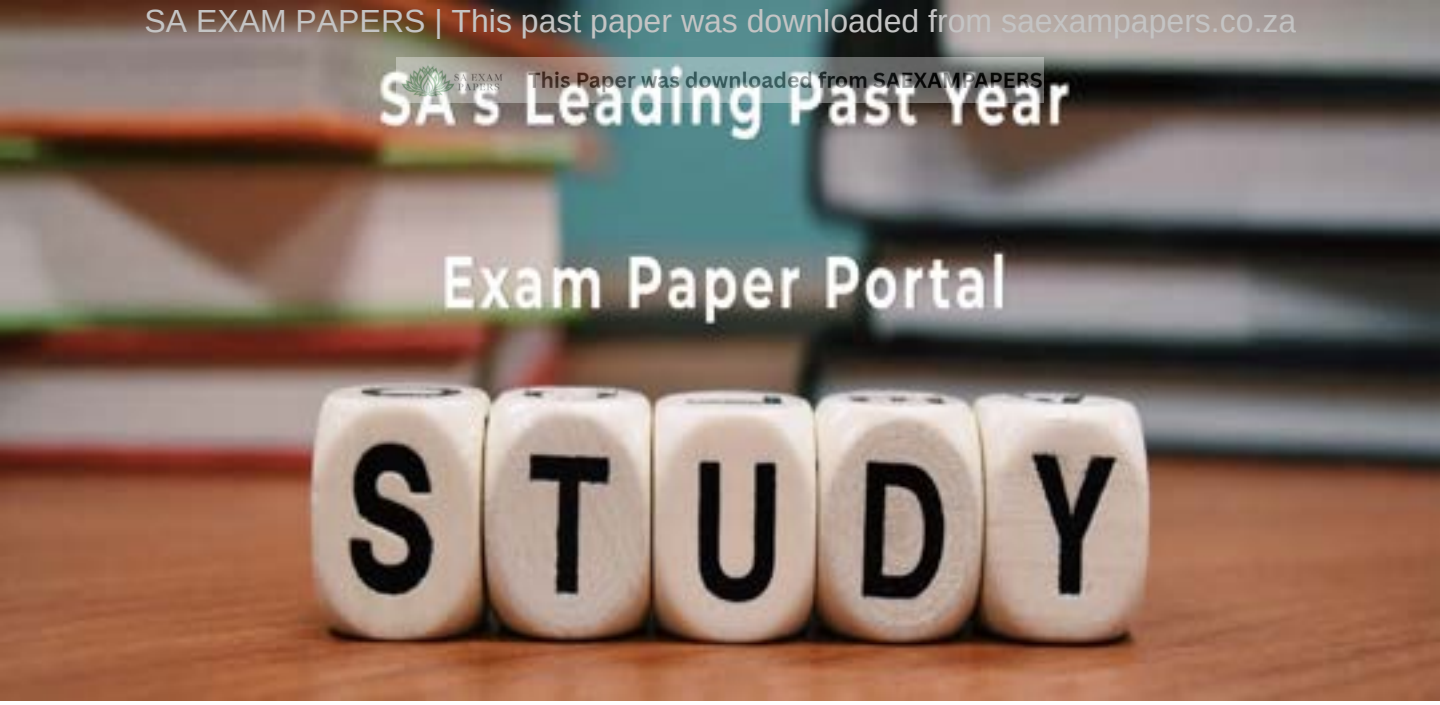


education

Department:
Education
North West Provincial Government
REPUBLIC OF SOUTH AFRICA

PROVINCIAL ASSESSMENT

GRADE 12

MATHEMATICS P2

JUNE 2026

MARKS: 150

TIME: 3 hours

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

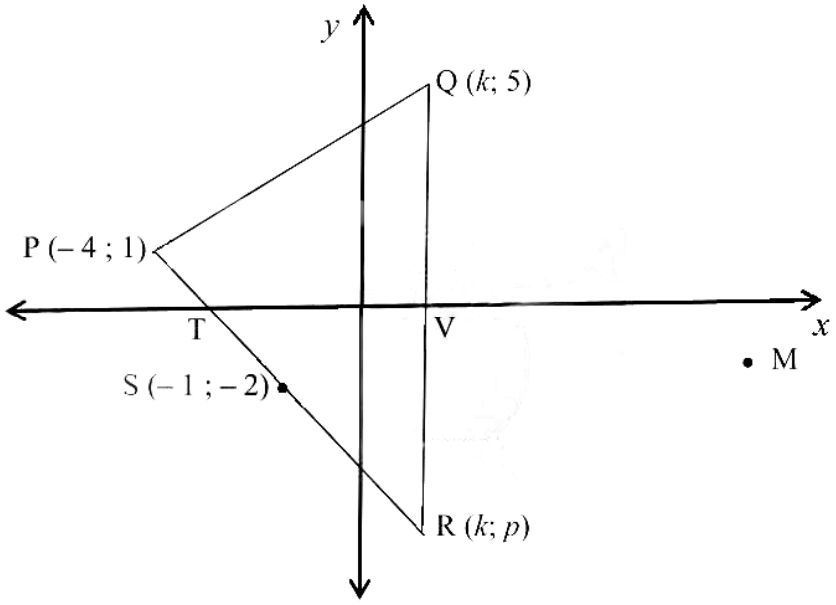
INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 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 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.

QUESTION 1

In the diagram below, P (– 4; 1), Q (k; 5) and R(k; p) are vertices of ΔPQR.
S (– 1; – 2) is a midpoint of PR. T is the x-intercept of PR and V is the x-intercept of QR. QR is perpendicular to the x-axis.



1.1 Show that $k = 2$ and $p = -5$. (2)

1.2 Calculate the length of PR. (2)

1.3 Determine the gradient of PR. (2)

1.4 Determine the equation of PR, in the form $y = mx + c$. (2)

1.5 Determine whether or not, the point (– 11; 14) lies on the line determined in Question 1.4. (3)

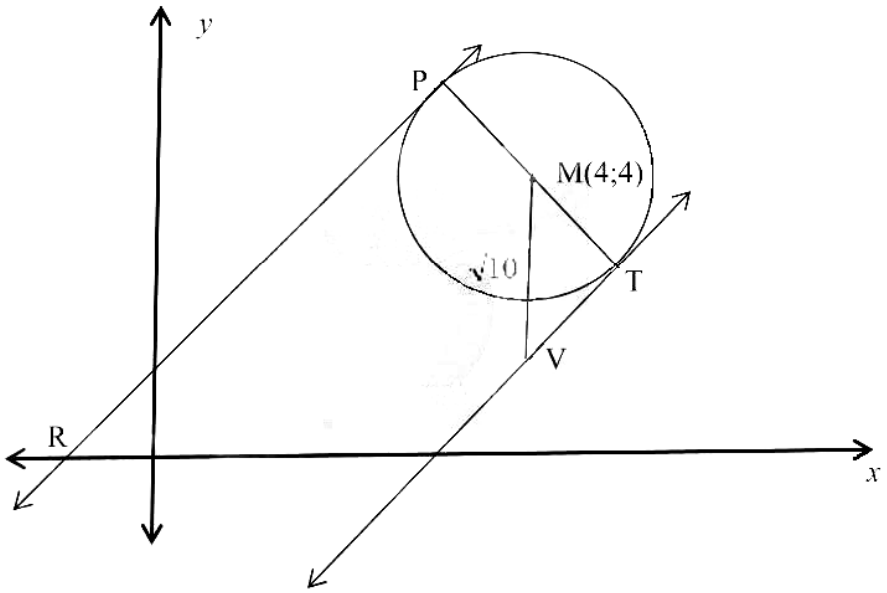
1.6 Determine the equation of the line that passes through point R and is perpendicular to line PR. (3)

1.7 Determine the coordinates of M if PQMR is a parallelogram. (2)

1.8 Calculate the size of $P\hat{R}Q$. (4)
[20]

QUESTION 2

In the diagram below, line PR with equation $y - x - 2 = 0$ is a tangent to the circle with centre M at P. The coordinates of M are (4; 4). PT is the diameter of the circle.
V is a point on the tangent at T such that MV = $\sqrt{10}$ units.



2.1 Calculate the gradient of the diameter. (2)

2.2 Determine the equation of the diameter in the form $y = mx + c$. (2)

2.3 Determine the coordinates of P. (3)

2.4 Determine the equation of the circle in the form $(x-a)^2 + (y-b)^2 = r^2$ (3)

2.5 Determine the coordinates of T. (2)

2.6 Calculate the length of VT. (2)

2.7 If the equation of VT is $y = x - 2$, for which values of k will $y = x + k$ NOT be a secant to circle P? (2)

2.8 A second circle with centre S(1; 3) and radius q touches the circle with centre M. Determine the value(s) of q. (3)
[19]

QUESTION 3

3.1 Simplify the expression below to a single trigonometric ratio, **without using a calculator:**

$$\frac{\cos 200^\circ.\cos(90^\circ - x).\tan(x - 180^\circ).\cos(540^\circ + x)}{\sin(360^\circ - x).\sin 110^\circ} \quad (8)$$

3.2 Determine, **without using a calculator**, determine the value of:

$$\frac{-\cos^2 10^\circ + \sin^2 190^\circ}{\cos(-145^\circ).\cos 235^\circ} \quad (9)$$

3.3 If $\cos 40^\circ = \sqrt{1-p^2}$, express the following in terms of p.

3.3.1 $\cos 50^\circ$ (3)

3.3.2 $\cos 70^\circ$ (4)

[24]

QUESTION 4

Given the identity: $\frac{\sin(x+45^\circ)}{\cos(x-45^\circ)} = \frac{\sin 2x + 1}{(\sin x + \cos x)^2}$

4.1 Prove the identity. (7)

4.2 Solve for x, if $x \in [-180^\circ; 180^\circ]$: $\frac{\sin(x+45^\circ)}{\cos(x-45^\circ)} = 1$ (7)

4.3 Given: $\cos 22{,}5^\circ = \frac{a}{c}$ and $a^2 + b^2 = c^2$.

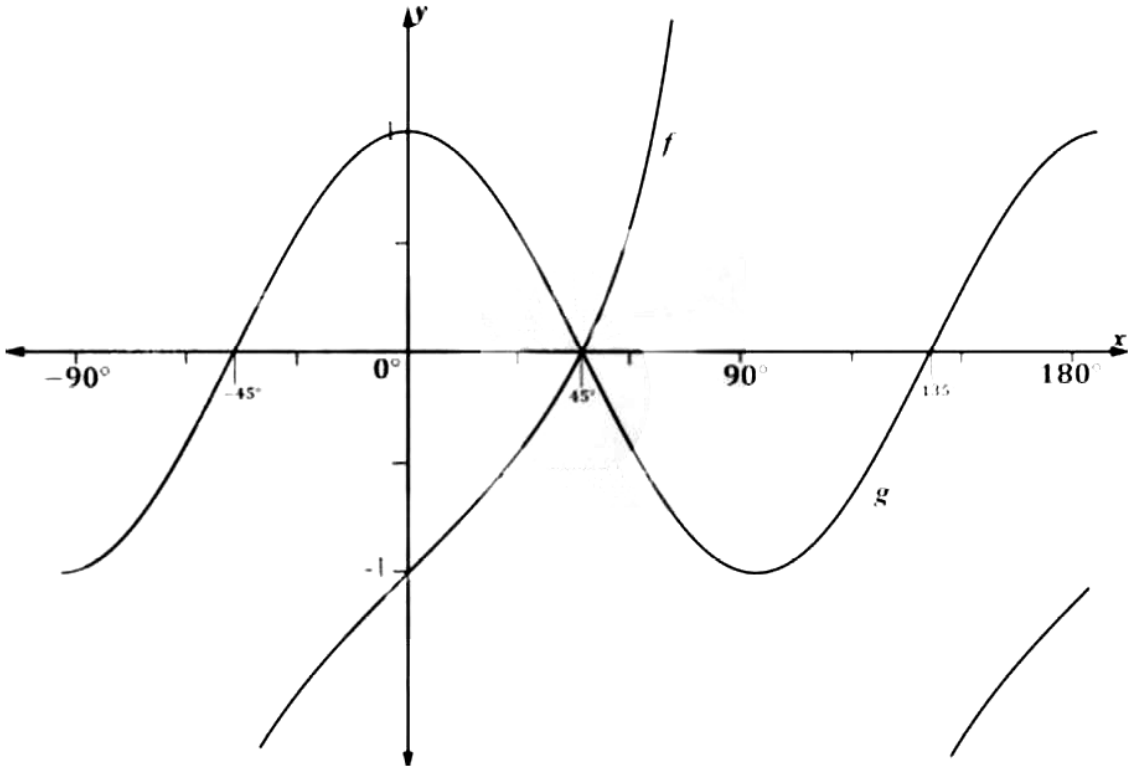
With the aid of a diagram, or otherwise, show that:

$$\frac{2ab}{c^2} = \frac{\sqrt{2}}{2} \quad (5)$$

[19]

QUESTION 5

In the diagram below the graphs of $f(x) = \tan x - 1$ and $g(x) = \cos 2x$ are drawn for the interval $x \in [-90^\circ; 180^\circ]$.



5.1 What is the amplitude of g? (1)

5.2 Write down the period of g. (1)

5.3 Write down the range of g. (1)

5.4 Determine the value(s) of x, in the interval $x \in [-90^\circ; 180^\circ]$, for which:

5.4.1 $g(x) \times f(x) = -1$ (2)

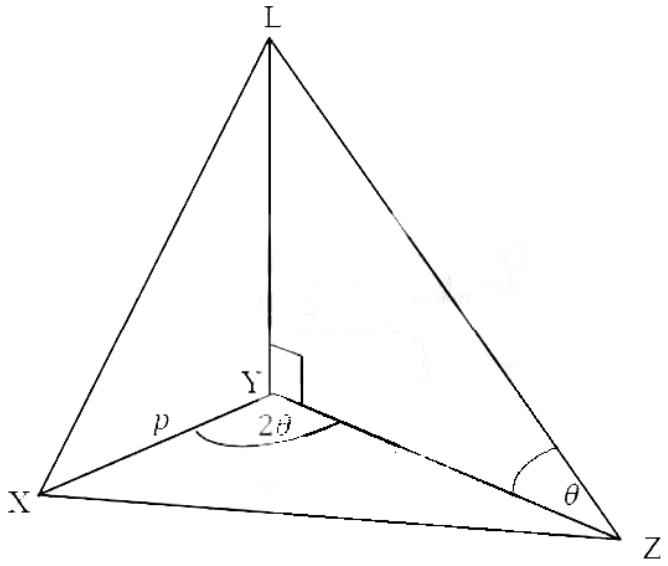
5.4.2 $\tan x = \cos 2x + 1$ (2)

5.4.3 $2 - 2\sin^2 x \leq \tan x$ (4)

[11]

QUESTION 6

In the diagram below, a lamp post LY is placed at the corner of a triangular field XYZ. The area of the field is A m^2 and $X\hat{Y}Z = 2\theta$. $Y\hat{Z}L = \theta$ and XY = p metres.



6.1 Determine, YZ in terms of A, p and 2θ. (2)

6.2 Hence, show that the height of the post is given by:

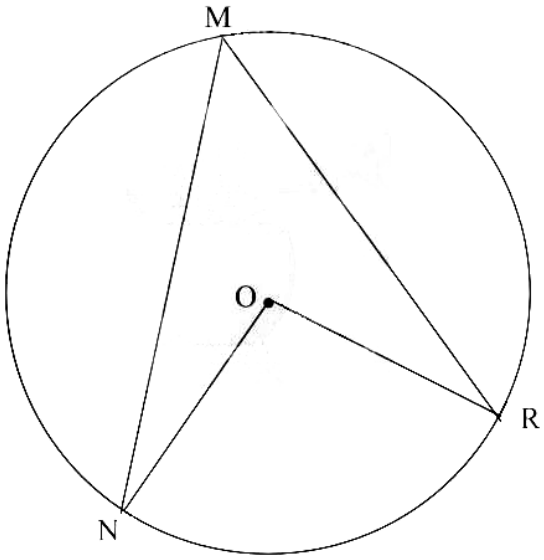
$$LY = \frac{A}{p\cos^2\theta}$$ (4)

6.3 If $p = 15\ m$, YZ = 30 m and $\theta = 60^\circ$, calculate the length of XZ. (2)
[8]

Provide reasons for your statements in Question 7, 8, 9 and 10.

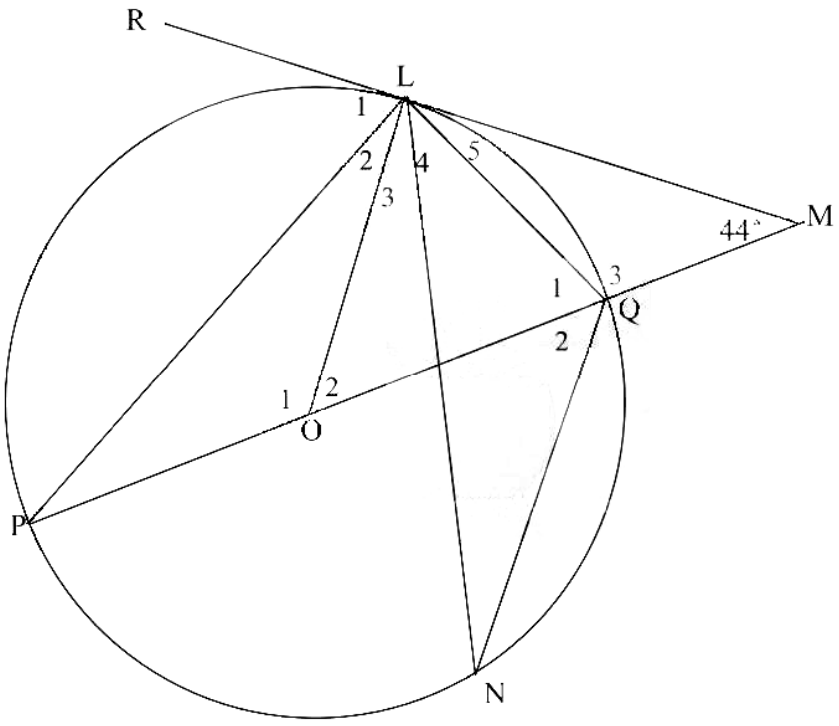
QUESTION 7

7.1 In the diagram below, O is the centre of the circle. M, N and R are points on the circle.



Prove the theorem that states: $N\hat{O}R = 2\hat{M}$ (4)

7.2 In the diagram below, O is the centre of the circle.
L, P, N and Q are points on the circumference of the circle.
LO || QN and $\hat{M} = 44^\circ$. RLM is the tangent to the circle at L.



Determine, giving reasons, the sizes of:

7.2.1 $\hat{O}_2$ (3)

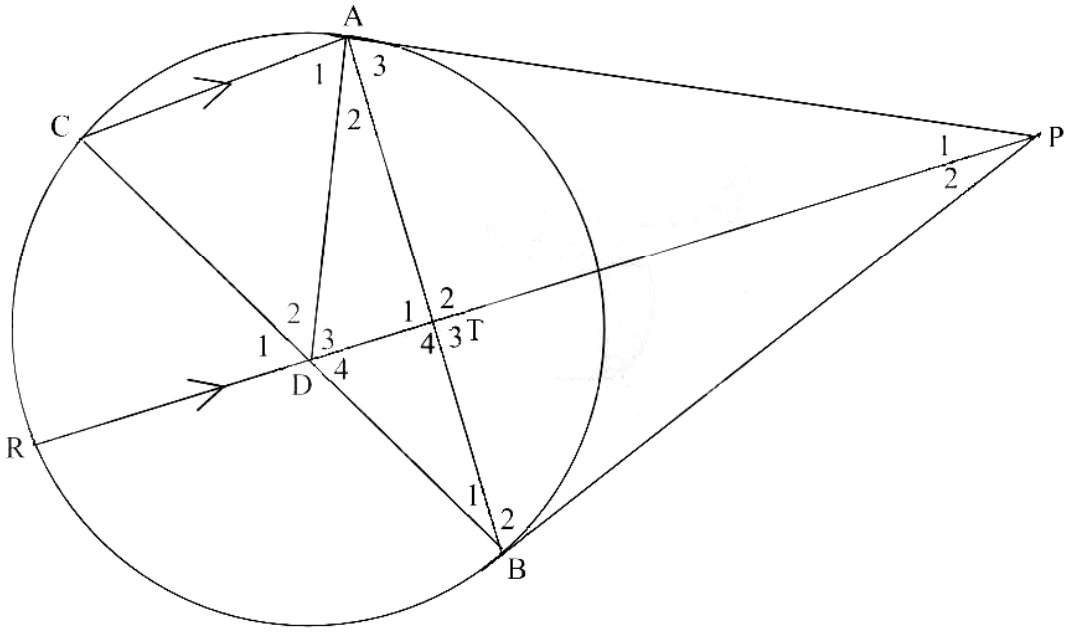
7.2.2 $\hat{L}_2$ (3)

7.2.3 $\hat{Q}_1$ (3)

[13]

QUESTION 8

In the diagram below, PA and PB are tangents to the circle at A and B respectively. PTDR is a straight line. Chord AC is drawn parallel to PR. PR intersects BA and BC at T and D respectively, and AD is drawn. Let $\hat{A}_3 = x$.



8.1 Prove that $\hat{D}_1 = \hat{A}_3$ (2)

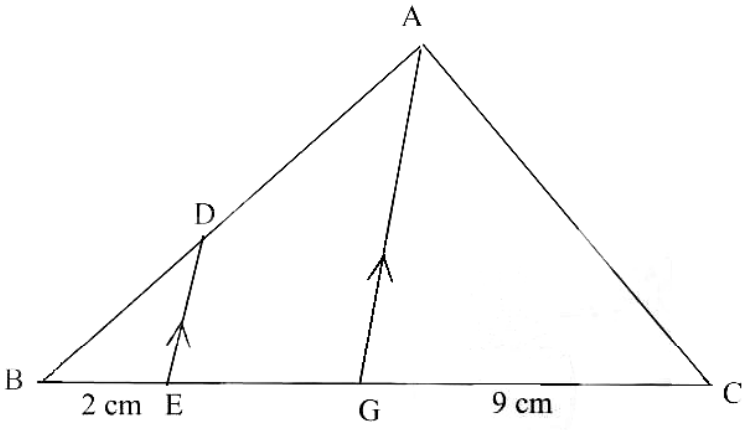
8.2 Hence, prove that PADB is a cyclic quadrilateral. (3)

8.3 Prove that AD = CD. (4)

8.4 Given that AD = DB and $\hat{B}_1 = y$, prove that CB is the diameter of the circle. (5)
[14]

QUESTION 9

The figure below shows ΔABC with DE || AG and EC : GC = 5 : 3.
BE = 2 cm and GC = 9 cm.



Calculate the value of:

9.1 EG (2)

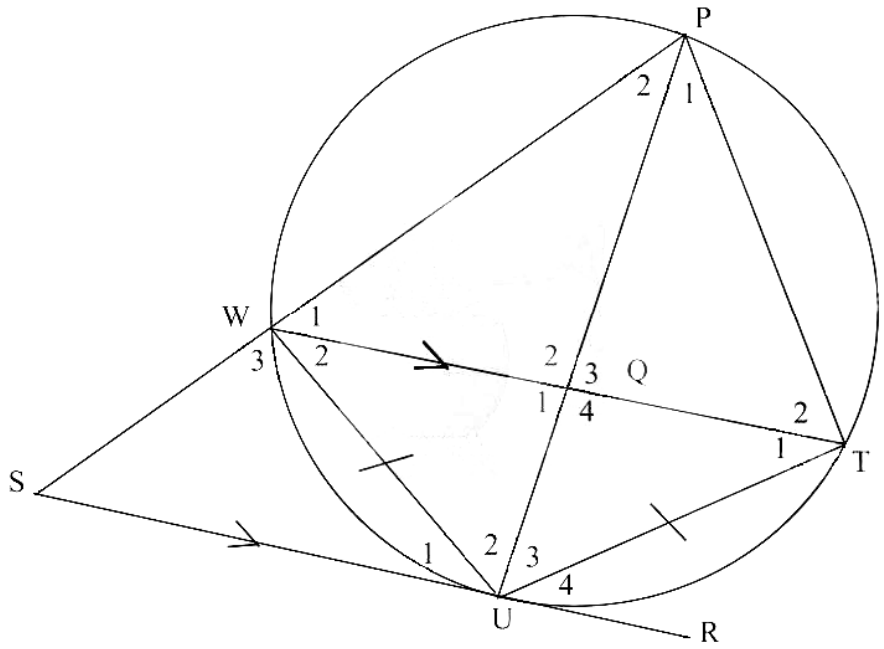
9.2 $\frac{AB}{AD}$ (2)

9.3 The ratio of $\frac{\text{Area of } \Delta ABC}{\text{Area of quadrilateral ADEC}}$, given that AD = 12cm. (6)

[10]

QUESTION 10

10.1 In the figure below, PWUT is a cyclic quadrilateral with WU = TU. Chords WT and PU intersect at Q. PW is extended to S such that WT || SR.

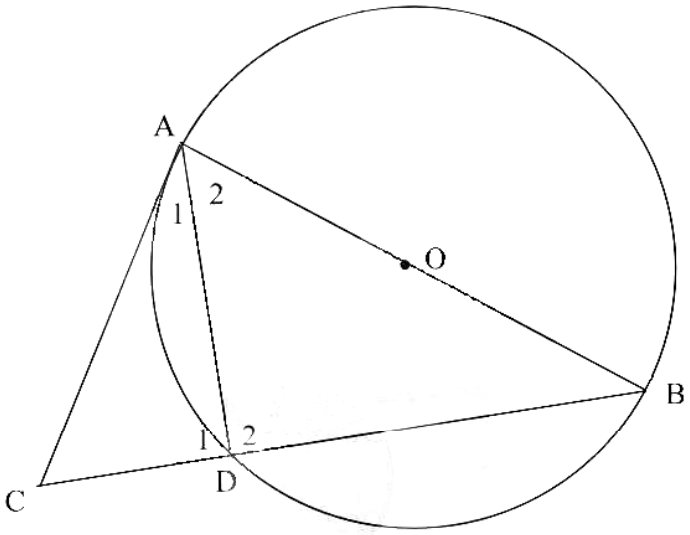


Prove that:

10.1.1 US is a tangent to circle PWUT at U (3)

10.1.2 ΔSPU ||| ΔSUW (3)

10.2 In the figure below, O is the centre of the circle passing through A, B and D.
AC is a tangent and BD produced meets the tangent at C.
CD : CB = 1 : 4.



If CD = x, prove that $AD^2 = 3x^2$ (6)
[12]

TOTAL : 150

INFORMATION SHEET

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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