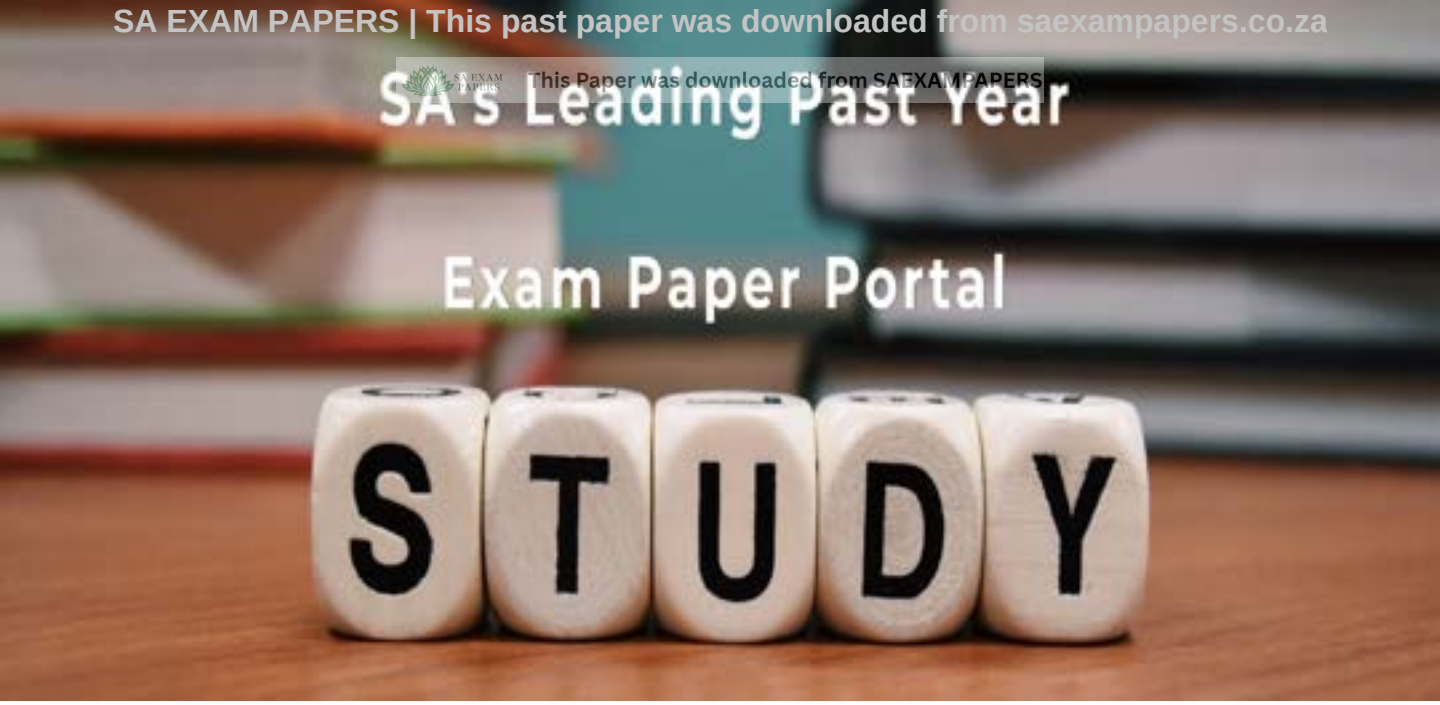


LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
EDUCATION

NATIONAL SENIOR CERTIFICATE

GRADE 12

MATHEMATICS PRE-TRIAL P2
AUGUST 2025

MARKS : 150

DURATION : 3 Hours

This question paper consists of 12 pages, two diagram sheets and information sheet .

Read the following instructions carefully before answering the questions.

1. This question paper consists of 10 questions.
2. Answer ALL the questions.
3. Clearly show ALL calculations, diagrams, and etcetera that you have used in determining your answers.
4. ANSWER ONLY will not necessarily be awarded full marks.
5. You may use an approved scientific calculator (non-programmable and non-graphic), unless stated otherwise.
6. Round off to TWO decimal places unless stated otherwise.
7. Diagrams are not necessarily drawn to scale.
8. Number the answers correctly according to the numbering system in this question paper.
9. Write legibly and present your work neatly.

QUESTION 1

The table below shows the volume of medicine in (milliliters) that was daily taken by a patient for 21 days in July

131	132	140	140	141	144	146	147	149	150	151
159	167	169	169	172	174	175	178	187	189	

1.1 Calculate the mean of the medicine taken by the patient (2)

1.2 Write down the five number summary for this set of data (4)

1.3 Draw the box and whisker diagram for this set of data (2)

1.4 Comment on the skewness of the data (1)

1.5 Calculate the standard deviation of the medicine taken by the patient (2)

1.6 The Doctor discovered that the calibration of the container of medicine Was faulty. The Actual reading on each of the 21 days was p ml more than that which was indicated . Write down in terms of p (if applicable) the:

1.6.1 Actual mean (1)

1.6.2 Actual standard deviation (1)

[13]

QUESTION 2

The table below shows the monthly income (in rands) of 6 different people and the amount in rands that each person spends on the monthly repayment of rental they afford.

MONTHLY INCOME IN RANDS	9 000	13 500	15 000	16 500	17 000	20 000
MONTHLY REPAYMENT IN RANDS	2 000	3 000	3 500	5 200	5 500	6 000

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

2.2 If a person earns R14 000 per month, predict the monthly repayment that the person could make towards rental payment. (3)

2.3 Determine the correlation coefficient between the monthly income and the monthly Repayment of rental (1)

2.4 A person who earns R18 000 per month has to decide whether to spend R 9 000 As a monthly repayment of a rent, or not. If the above information is a true Representation of the population data, which of the following would the person Most likely decide on:

A Spend R 9 000 per month because there is a very weak positive correlation Between the amount earned and the monthly repayment

B Not to spend R 9 000 per month because there is a very weak positive correlation Between the amount earned and the monthly repayment

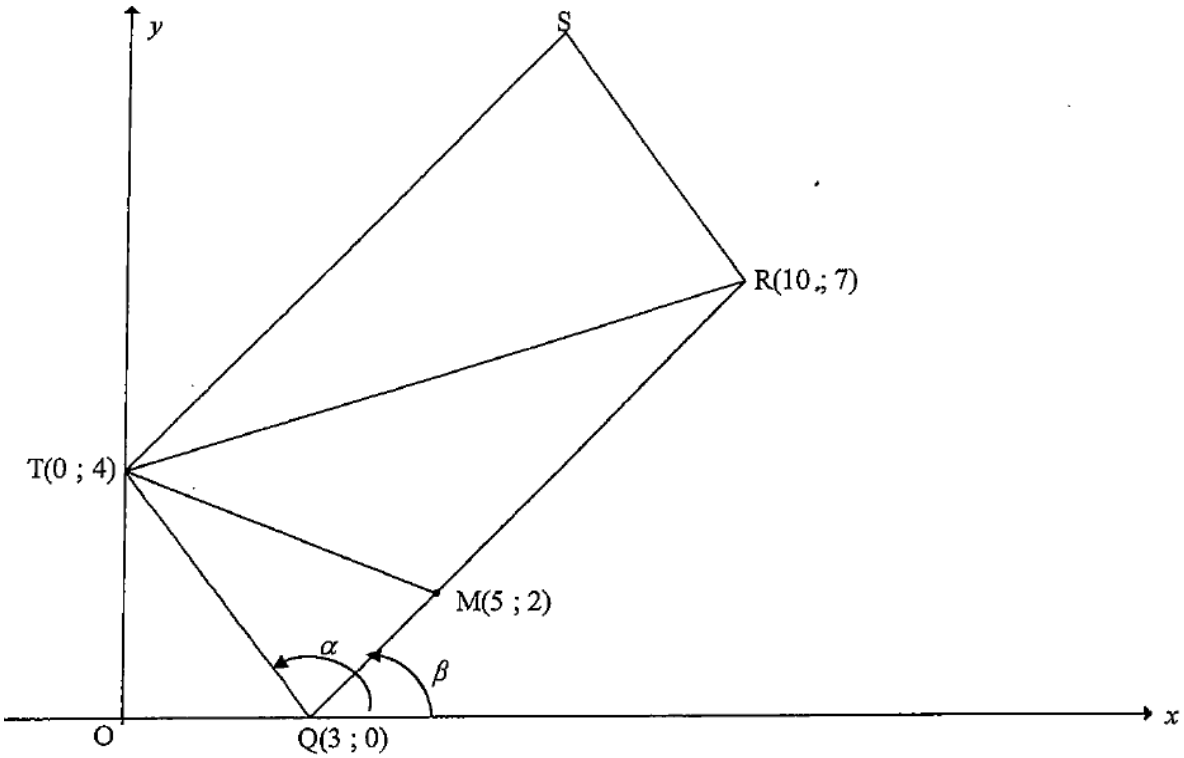
C Spend R 9 000 per month because the point (18 000; 9 000) lies very near to the Least squares regression line

D Not to spend R 9 000 per month because the point (18 000; 9 000) lies very far From the least squares regression line. (1)

[7]

QUESTION 3

In the diagram, ABCD is a quadrilateral having vertices A(7 ; 1), B(-2 ; 9); D(8 ; -11). M is the midpoint of BD.



3.1 Calculate the gradient of TQ. (1)

3.2 Calculate the length of RQ. Leave your answer in surd form. (2)

3.3 F (k,-8) is a point in the Cartesian plane such that T, Q and F are collinear.
Calculate the value of k. (3)

3.4 Calculate the coordinates of S. (4)

3.5 Calculate the size of TSR. (5)

3.6 Calculate in simplest form, the ratio of:

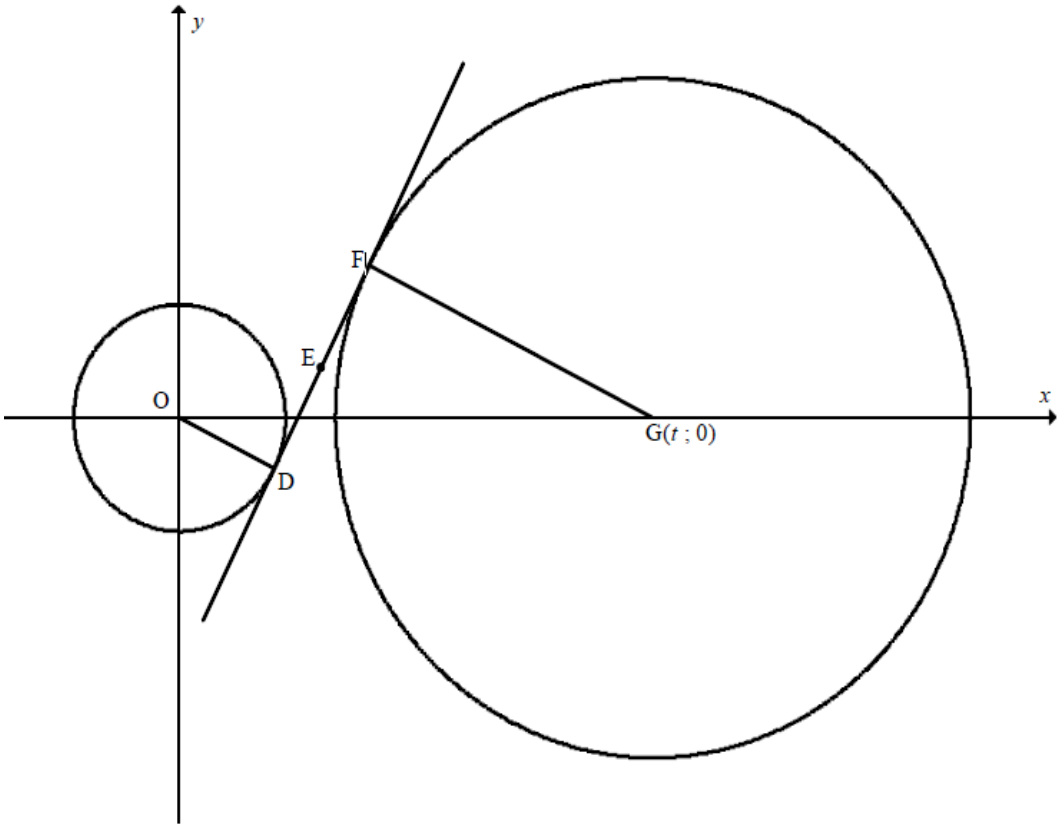
3.6.1 $\frac{MQ}{RQ}$ (3)

3.6.2 $\frac{\text{Area of } \Delta TQM}{\text{Area of parallelogram RQTS}}$ (3)

[23]

QUESTION 4

In the diagram, the circle with centre O has the equation $x^2 + y^2 = 20$. G(t ; 0) is the centre of the larger circle. A common tangent touches the circles at D and F respectively, such that D(p ; - 2) lies in the 4th quadrant.



4.1 Given that $D(p;-2)$ lies on the smaller circle, show that $p = 4$. (2)

4.2 $E(6;2)$ is the midpoint of DF. Determine the coordinates of F. (3)

4.3 Determine the equation of the common tangent, DF, in the form $y = mx + c$. (4)

4.4 Calculate the value of t. Show ALL working. (3)

4.5 Determine the equation of the larger circle in the form $ax^2 + by^2 + cx + dy + e = 0$. (4)

4.6 The smaller circle must be translated by k units along the x-axis to touch the larger circle internally. Calculate the possible values of k. (3)

[20]

QUESTION 5

5.1. If $\cos 42° = t$ WITHOUT using a calculator, write the following expressions in terms of t

5.1.1 $\sin 48°$ (2)

5.1.2 $\cos 84°$ (3)

5.1.3 $\cos 72°$ (5)

5.2 Simplify the following expression fully: without using a calculator

$$\frac{\sin(180° + x) \cdot \tan(x - 180°) \cdot \cos(360° + x)}{\sin^2(180° + x) + \sin^2(90° - x)}$$ (6)

5.3 Determine the value of:

$$\frac{\cos 330° \cdot \tan 150° \cdot \sin 12°}{\tan 675° \cdot \cos 258°}$$ (7)

Without using the calculator.

5.4 Given the identity: $\frac{\cos\alpha + \cos 2\alpha}{\sin 2\alpha - \sin\alpha} = \frac{\cos\alpha + 1}{\sin\alpha}$

5.4.1 Prove the identity. (4)

5.4.2 For which values of α is the identity undefined? (5)

[32]

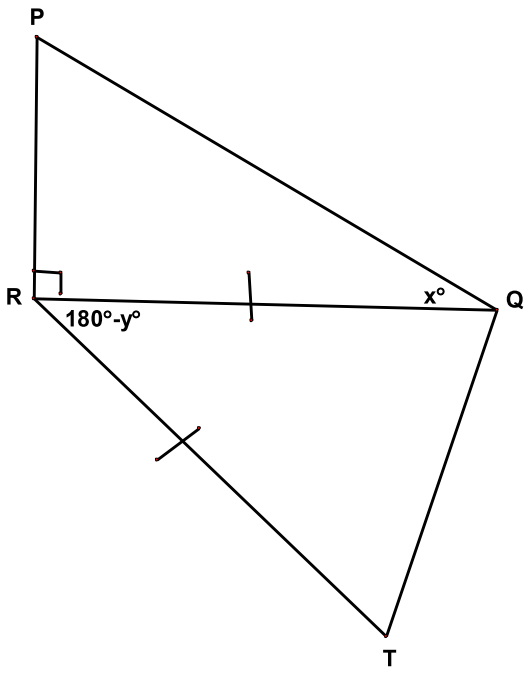
QUESTION 6

6.1 In the sketch below, RQT is a triangular field in a horizontal plane. $RQ = RT$ and $G\hat{R}T = 180 - y$

The angle of elevation from Q to P the top of a vertical tower RP, is $x°$,

$Q\hat{R}T = (180 - y)^{0}$

And $RQ = RT$



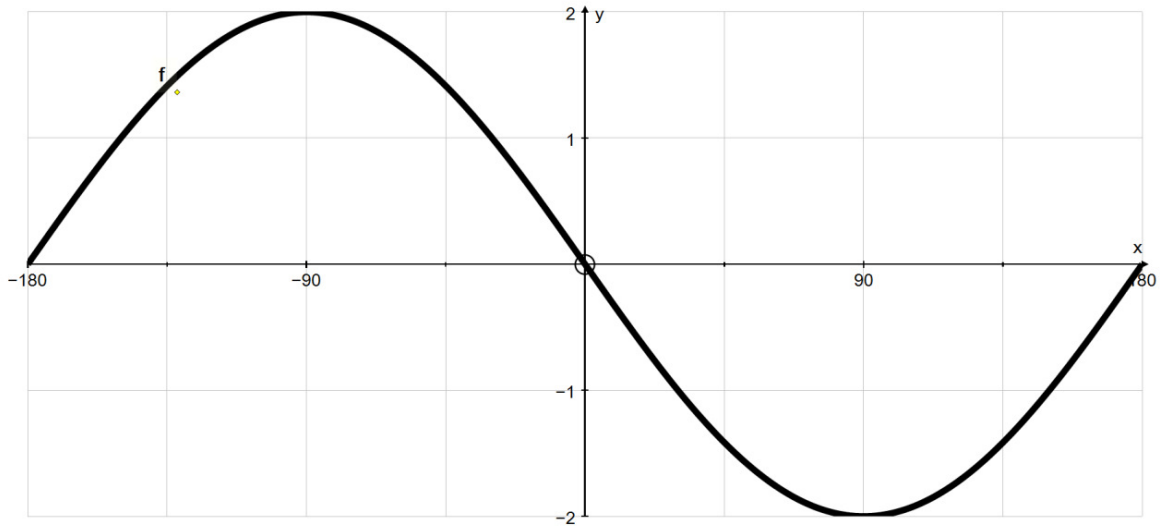
6.1.1 Show that $R\hat{Q}T = \frac{y}{2}$ (3)

6.1.2 Prove that $QT = 2RT\cos\frac{y}{2}$ (6)

[9]

QUESTION 7

7.1. In the diagram below, the graph of $f(x)=-2\sin x$ is drawn for the interval $x\in[-180°;180°]$



7.1.1 On the grid provided, draw the graph of $g(x)=\cos(x-60°)$ for $x\in[-180°;180°]$. Clearly show ALL intercepts with the axes and turning points of the graph (3)

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

7.1.3 Use the graphs to determine the value of x in the interval $x\in[-180°;180°]$ for which $f(x)-g(x)=1$ (1)

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

[7]

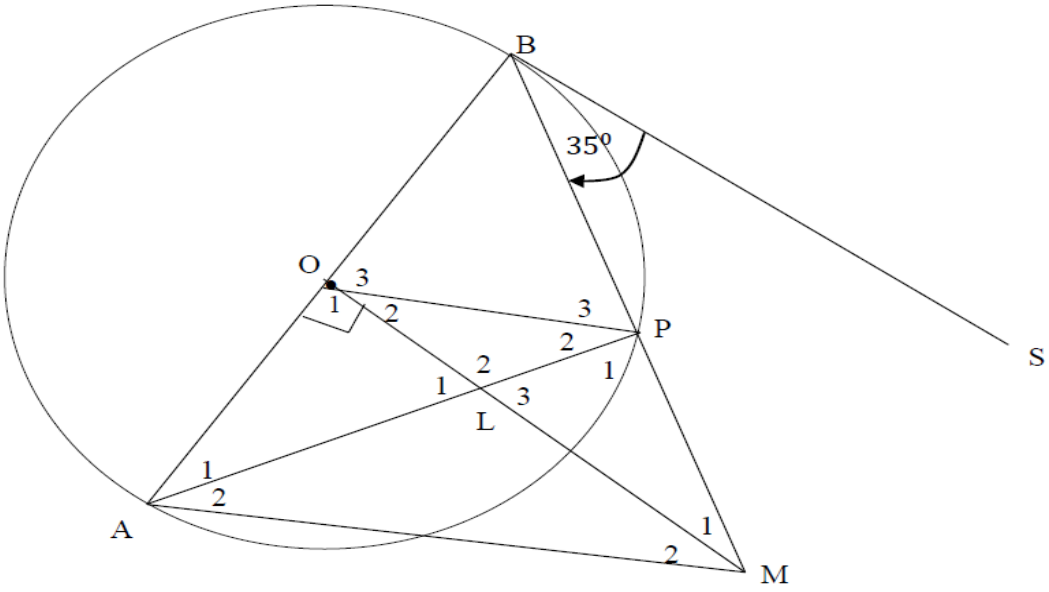
QUESTION 8

8.1 Complete the following theorems:

8.1.1 The angle in the semi-circle is equal to… (1)

8.1.2 The opposite angles of a cyclic quadrilateral are… (1)

8.2 O is the centre of the circle in the diagram. BP is produced to M such that OM ⊥ AB. AP intersects OM at L. BS is a tangent to the circle at B and $M\widehat{B}S = 35°$.



8.2.1 Calculate, with reasons, the size of:

(a) $\widehat{A}_1$ (2)

(b) $\widehat{O}_3$ (2)

(c) $\widehat{P}_3$ (2)

(d) $\widehat{M}_1$ (3)

8.2.2 Prove that:

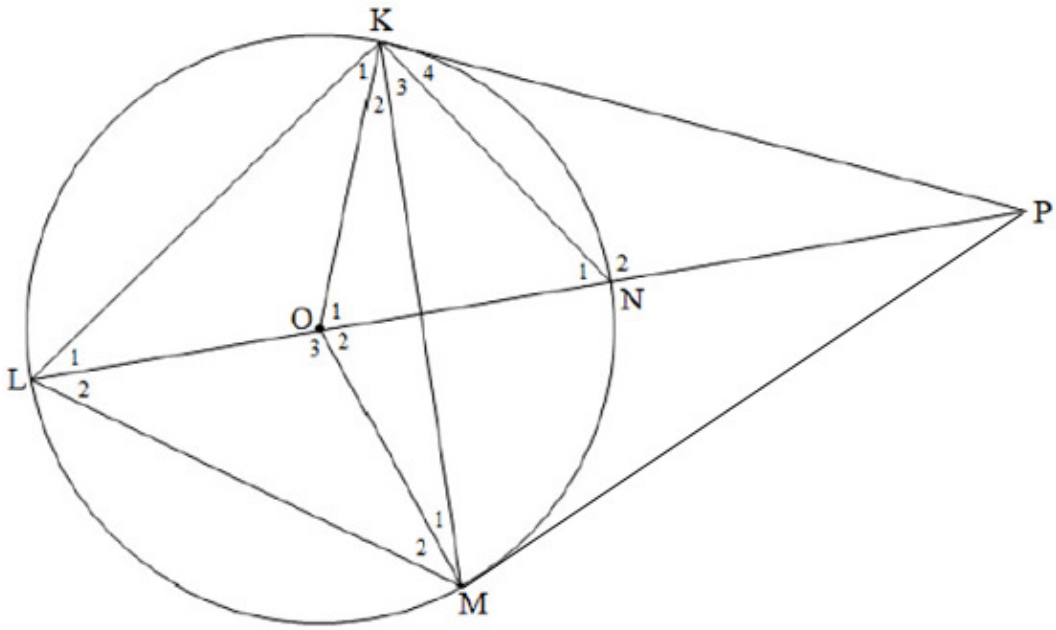
(a) OLPB is a cyclic quadrilateral. (3)

(b) BS ∥ OM (2)

[16]

QUESTION 9

In the diagram below, O is the centre of the circle and KP is a tangent to the circle. LN, the diameter of the circle, is extended to meet KP at P. Straight lines OK, OM, KM and KN are drawn.



9.1 Write down two angles equal to 90°. (2)

9.2 If $\hat{K}_4 = x$, write down the following angles in terms of x,giving reasons.

9.2.1 $\hat{L}_1$ (2)

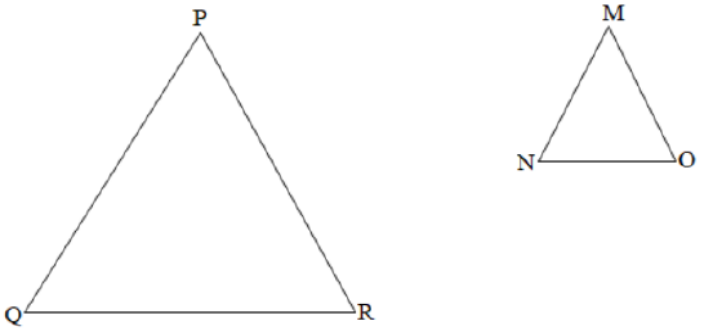
9.2.2 $\hat{K}_1$ (2)

9.2.3 $O\hat{P}K$ (2)

[8]

QUESTION 10

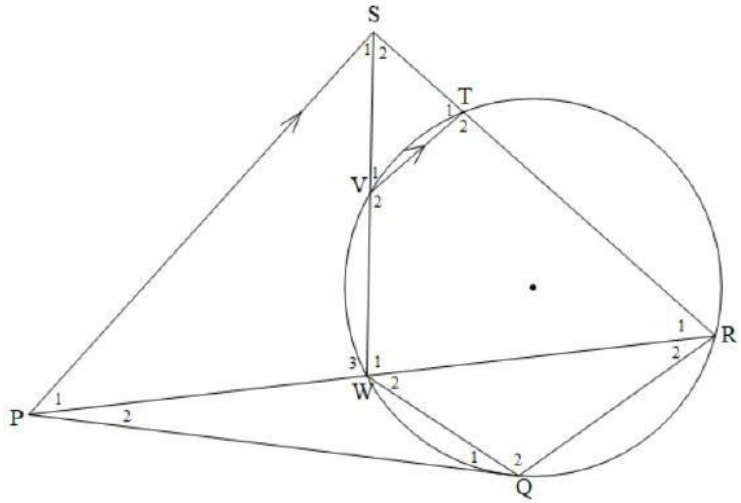
10.1 In the diagram below, ΔPQR and ΔMNO are given with $\hat{P} = \hat{M}$, $\hat{Q} = \hat{N}$ and $\hat{R} = \hat{O}$.



Use the diagram sheet provided to prove the theorem which states that:

$$\frac{MN}{PQ} = \frac{MO}{PR} \qquad (5)$$

10.2 In the diagram below, PQ is a tangent to the circle at Q. R is a point on the circle and S lie outside the circle. PR cuts the circle in W and RS cuts the circle in T. SW cuts the circle in V. VT ‖ PS.



Prove that:

10.2.1 $\hat{S}_1 = \hat{R}_1$ (3)

10.2.2 ΔPWS ||| ΔPSR (3)

10.2.3 $PQ^2 = PW.PR$ (5)

[16]

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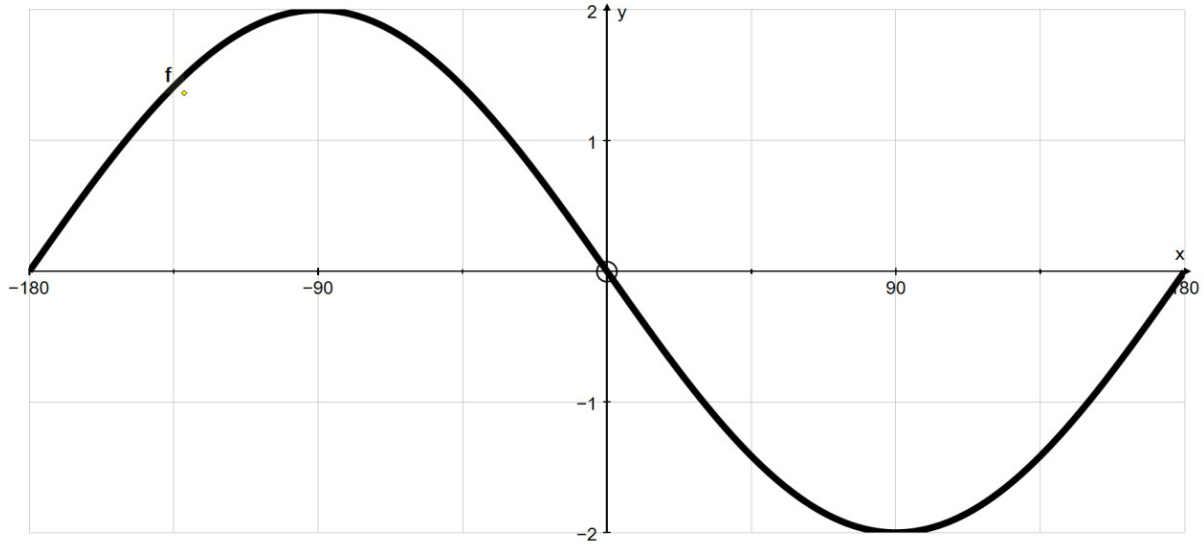
7.1.1.



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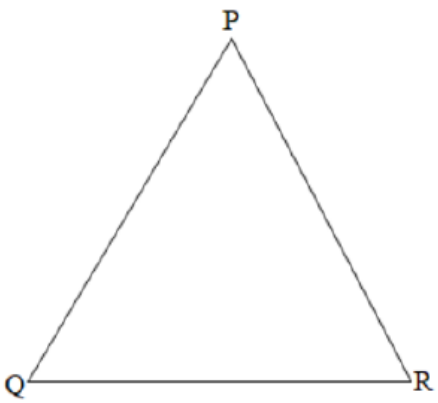
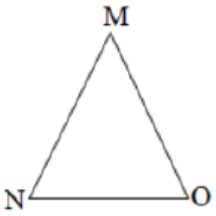
10.1





INFORMATION SHEET: MATHEMATICS

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \qquad A = P(1+ni) \qquad A = P(1-ni) \qquad A = P(1-i)^n$$

$$A = P(1+i)^n \qquad \sum_{i=1}^{n} 1 = n \qquad \sum_{i=1}^{n} i = \frac{n(n+1)}{2} \qquad T_n = a + (n-1)d$$

$$S_n = \frac{n}{2}\left(2a + (n-1)d\right) \quad T_n = ar^{n-1} \quad S_n = \frac{a\left(r^n - 1\right)}{r-1} \quad ; \quad r \neq 1 \quad S_\infty = \frac{a}{1-r} \; ; \; -1 < r < 1$$

$$F = \frac{x\left[(1+i)^n - 1\right]}{i} \qquad P = \frac{x[1-(1+i)^{-n}]}{i} \qquad f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

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

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

$$(x-a)^2 + (y-b)^2 = r^2 \quad In\ \Delta ABC: \qquad \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \qquad a^2 = b^2 + c^2 - 2bc.\cos A$$

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

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

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

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

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

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

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