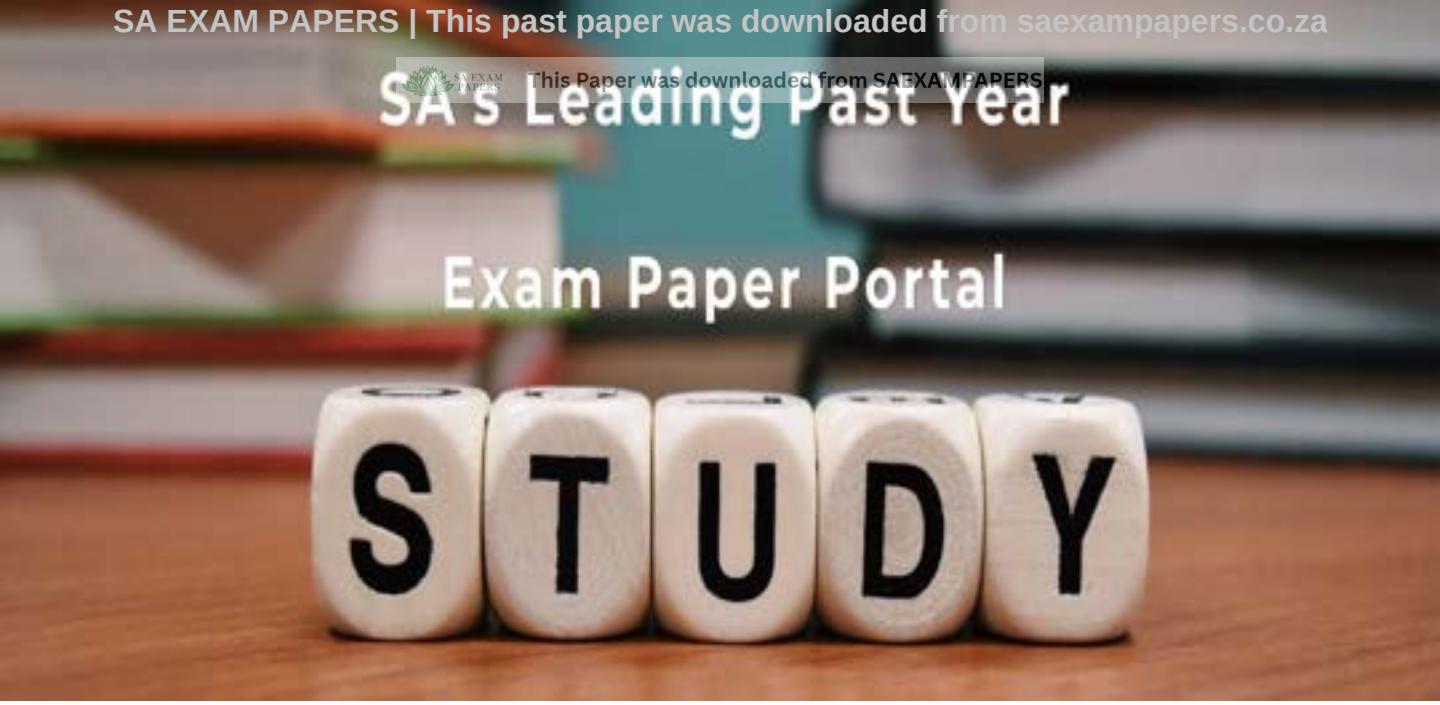


education
MPUMALANGA PROVINCE
REPUBLIC OF SOUTH AFRICA

# NATIONAL SENIOR CERTIFICATE

## GRADE 12

## MATHEMATICS P2

## AUGUST 2025 (PRE TRIAL)

**MARKS: 150**

**TIME: 3 HOURS**

**This question paper consists of 12 pages, 1 information sheet and an answer book.**



**INSTRUCTIONS AND INFORMATION**

Read the following instructions carefully before answering the questions.

1. The question paper consists of 10 questions.
2. Answer ALL the questions in the special ANSWER BOOK.
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. Write neatly and legibly.

**QUESTION 1**

A group of learners wrote a standardised Mathematics test that was scored out of 60. The results were represented in the table below.

| Marks | Frequency | Cumulative frequency |
|---|---|---|
| $0 < x \leq 10$ | | 20 |
| $10 < x \leq 20$ | | 60 |
| $20 < x \leq 30$ | | 120 |
| $30 < x \leq 40$ | | 170 |
| $40 < x \leq 50$ | | 190 |
| $50 < x \leq 60$ | | 200 |
| | | |

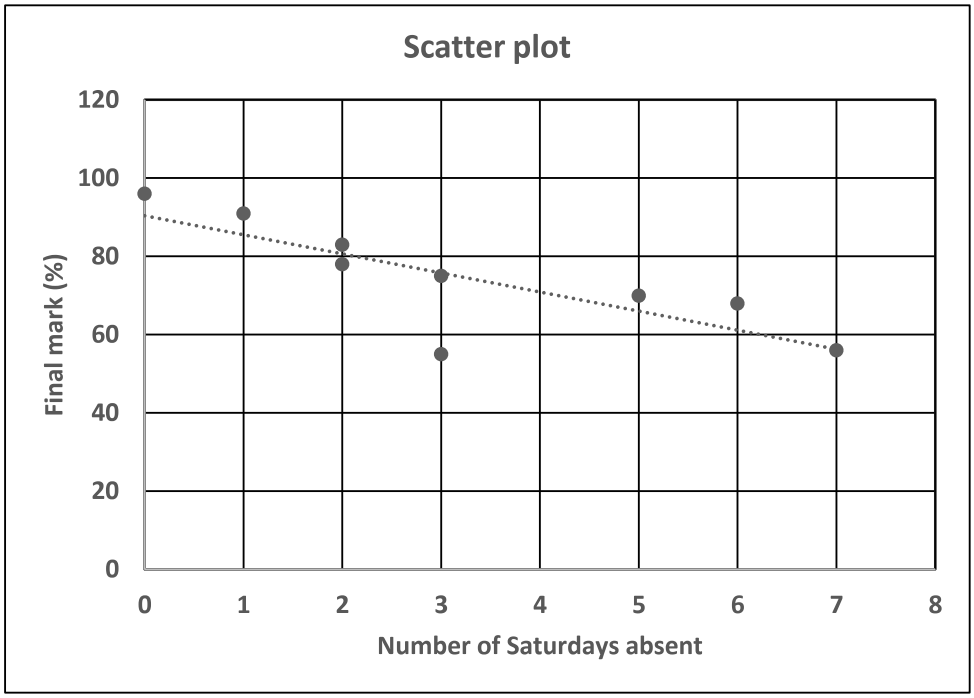
| | | |
|---|---|---|
| 1.1 | Complete the table in answer book. | (2) |
| 1.2 | How many learners wrote the test? | (1) |
| 1.3 | Draw the cumulative frequency curve on graph paper provided in the answer book. | (3) |
| 1.4 | How many learners scored at least 20 out of 60? | (2) |
| 1.5 | Determine the mean estimate. | (3) |
| | | **[11]** |



**QUESTION 2**

A group of 9 students attended a course in Statistics on Saturdays over a period of 10 months. The number of Saturdays on which a student was absent was recorded below and the scatterplot is drawn for the data.

| **Number of Saturdays absent** | **0** | **1** | **2** | **2** | **3** | **3** | **5** | **6** | **7** |
|---|---|---|---|---|---|---|---|---|---|
| **Final mark (%)** | **96** | **91** | **78** | **83** | **75** | **55** | **70** | **68** | **56** |




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

2.2 Calculate the correlation coefficient. (1)

2.3 Comment on the strength of the correlation. (2)

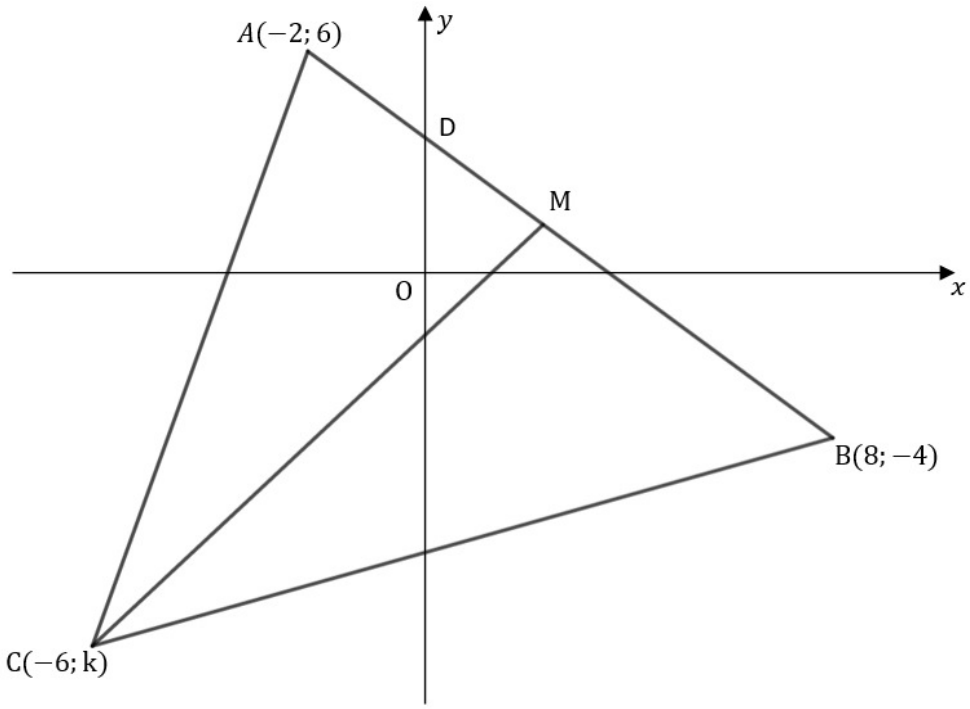
2.4 If a student scored 52%, predict the number of days absent. (2)

2.5 Is the answer calculated in 2.4 reliable? Explain your answer. (2)

**[10]**

**QUESTION 3**

In the diagram below, $A(-2;6), B(8;-4) and\ C(-6;k)$ are three points in the Cartesian plane with point M lying on line AB. $AM = BM$ and $AB = BC$. D is the y-intercept of line AB.




3.1 Determine the coordinates of M. (2)

3.2 Determine the value of $k$. (6)

3.3 Hence, determine the equation of line CM if $k = -6$. (5)

3.4 If AEBC is a parallelogram and $k = -6$, determine the coordinates of E. (2)

3.5 Given that a straight line is defined by $2y - 1 = mx$, determine the value of $m$ if the line has an angle of inclination of $116{,}56°$. (4)

3.6 Calculate the coordinates of D (2)

3.7 Calculate the size of $\hat{B}$ (5)

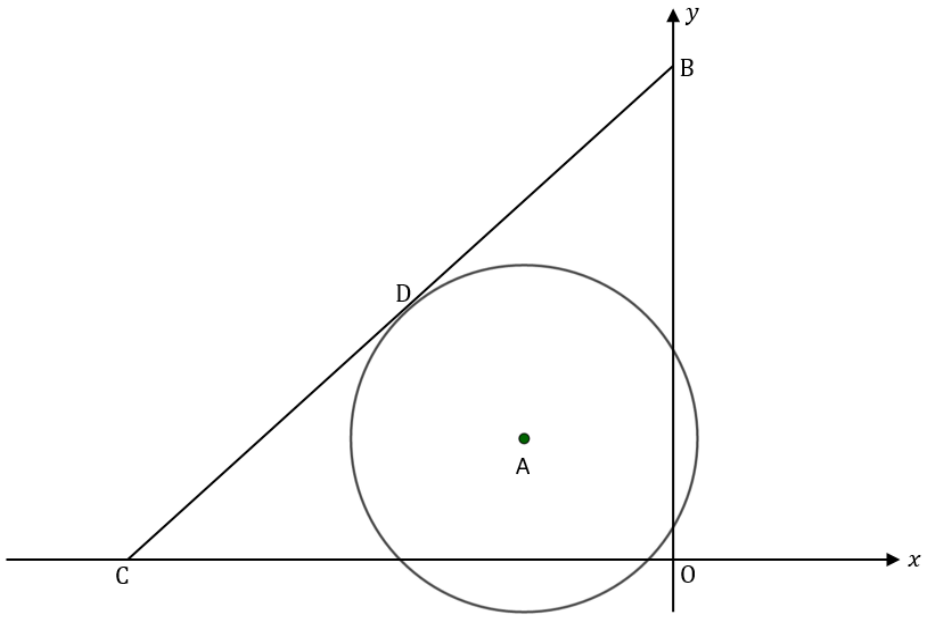
3.8 Calculate the area of $\Delta ABC$ (3)

**[29]**



**QUESTION 4**

In the figure below, the circle with centre A has equation $x^2 + y^2 + 6x = -1 + 6y$. Line BC is a tangent to the circle at $D\left(-\frac{28}{5}; \frac{31}{5}\right)$.




4.1 Determine the coordinates of A, the centre of the circle. (4)

4.2 Write down the radius of the circle. (1)

4.3 Determine the equation of the tangent BC. (4)

4.4 Calculate the area of $\triangle BCO$. (4)

4.5 The circle with the equation $x^2 + y^2 + 6x = -1 + 6y$ is reflected about the line $y = 0$. Write down the equation of the new circle. (2)

4.6 Hence calculate the length of the common chord for the two circles above. Write your answer in the simplest surd form. (6)

**[21]**

**QUESTION 5**

5.1 Given: $\cos(A-B) = \cos A \cos B + \sin A \sin B$.

Use the identity for $\cos(A-B)$ to derive an identity for $\sin(A-B)$. (3)

5.2 If $\sin\theta = -\frac{12}{13}$ *and* $\cos\theta > 0$, calculate without using a calculator and with the aid of a diagram the value of:

5.2.1 $\sin 2\theta$ (5)

5.2.2 $\cos(\theta + 30°)$ (3)

5.3 Evaluate without using a calculator:

$(a)$ $\dfrac{\sin 35° \cos 35°}{\tan 225° \cos 200°}$ (5)

$(b)$ $1 - sin^2(22{,}5°)$ (4)

5.4 Consider the equations: $3\sin P + 4\cos Q = 6$ and $4\sin Q + 3\cos P = 1$.

5.4.1 Prove that $\sin(P+Q) = \frac{1}{2}$ (6)

5.4.2 It is further given P, Q and R are the interior angles of a triangle and R is acute.

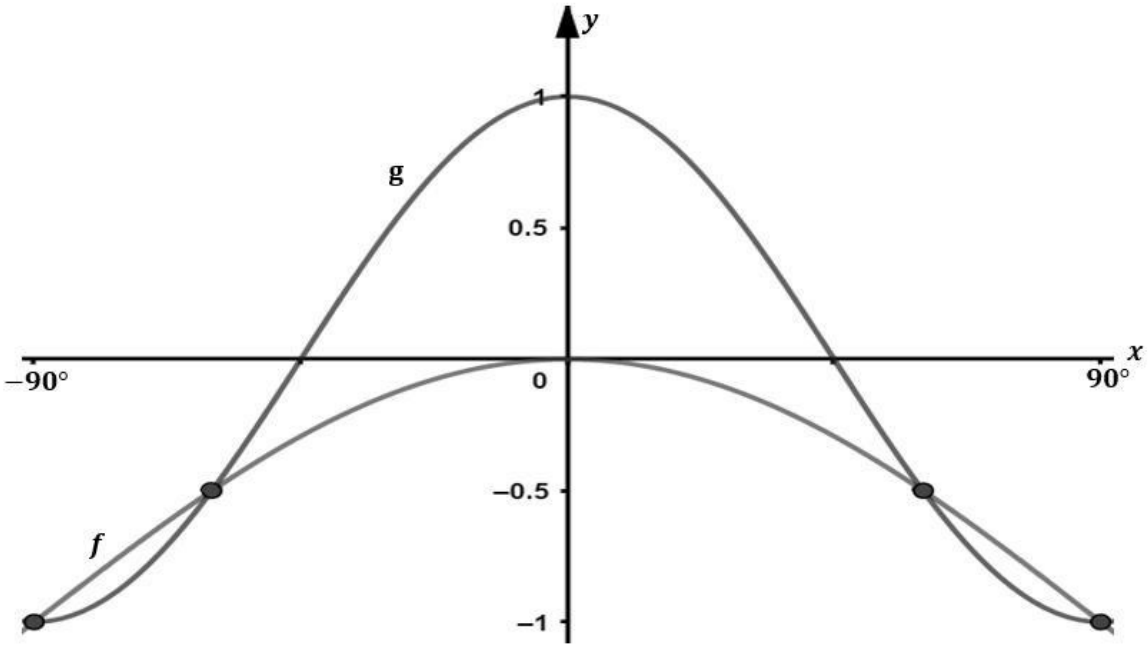
Determine the value of $\hat{R}$ (4)

**[30]**



**QUESTION 6**

The graphs of $f(x) = cos\ x + q$ and $g(x) = cos\ bx$ are sketched below for $x \in [-90°; 90°]$:




6.1 Determine:

6.1.1 the value of $q$ if $f$ touches the $x$-axis at the origin. (1)

6.1.2 the amplitude of $f$. (1)

6.1.3 the value of $b$ if the period of g is half the period of $f$. (1)

6.1.4 the coordinates of the $x$-intercepts of g. (2)

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

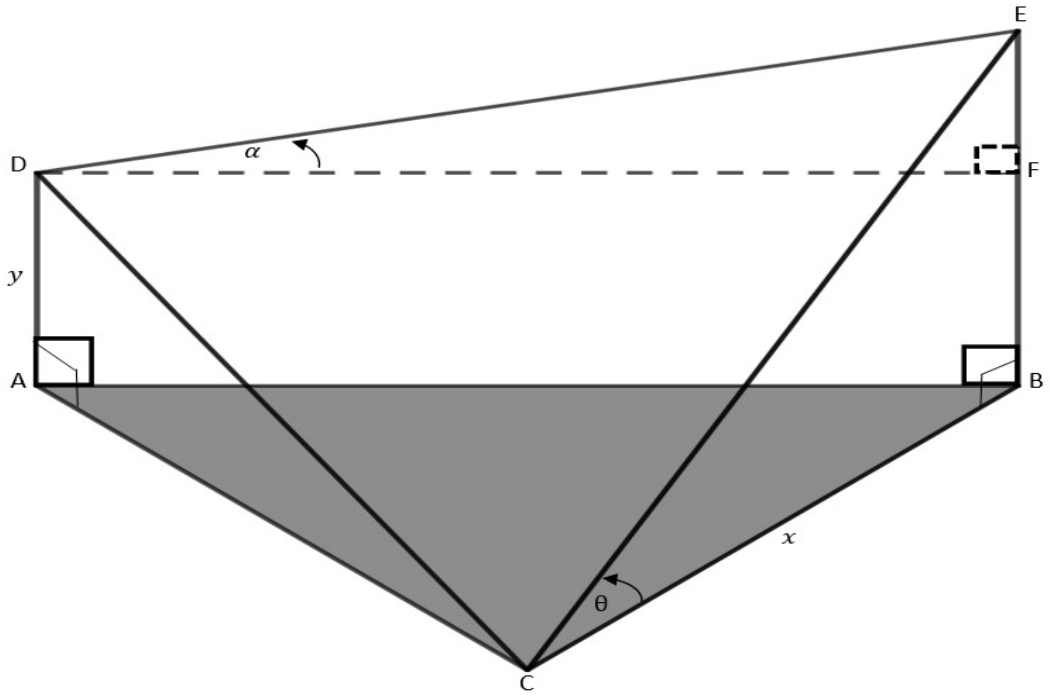
$x.f'(x) < 0$. (3)

**[8]**



**QUESTION 7**

A telephone cable is to be created between 2 cliff sides AD and BE. An engineer stands at point C in the same horizontal plane as the foot of the cliffs. He measures the angle of E from C and D to be $\theta$ and $\alpha$ respectively. Cliff DA is $y$ metres and $x$ metres from the foot of cliff BE.




7.1 Show that the length of the telephone cable is given by:

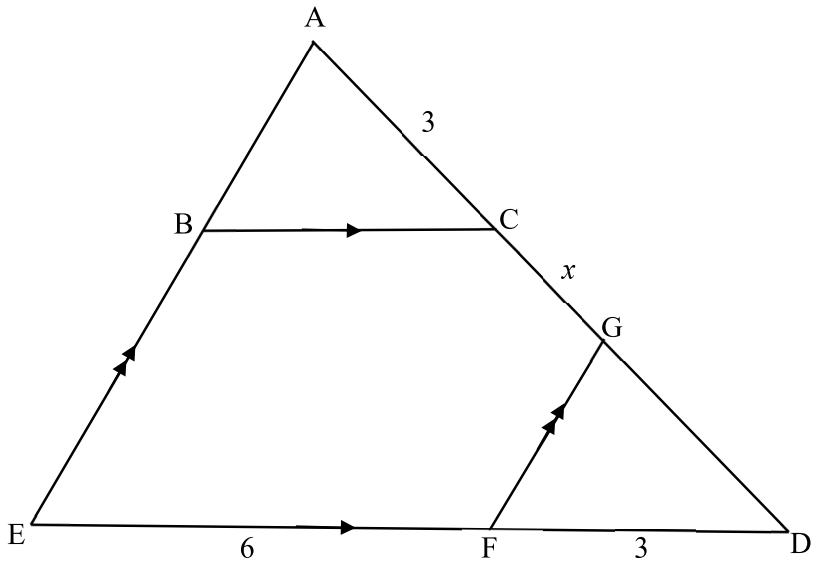
$$\frac{x\tan\theta - y}{\sin\alpha}$$ (5)

7.2 If $x = 1000m, y = 250m$ *and* $\theta = \alpha = 45°$, what is the distance between the cliffs? (3)

**[8]**

**QUESTION 8**

In the diagram, ADE is a triangle having BC ||ED and AE ||GF. It is also that $AB:BE = 1:3$, $AC = 3\ units, EF = 6\ units\ and\ CG = x\ units$.




Calculate, giving reasons:

8.1 The length of CD. (3)

8.2 The value of $x$. (4)

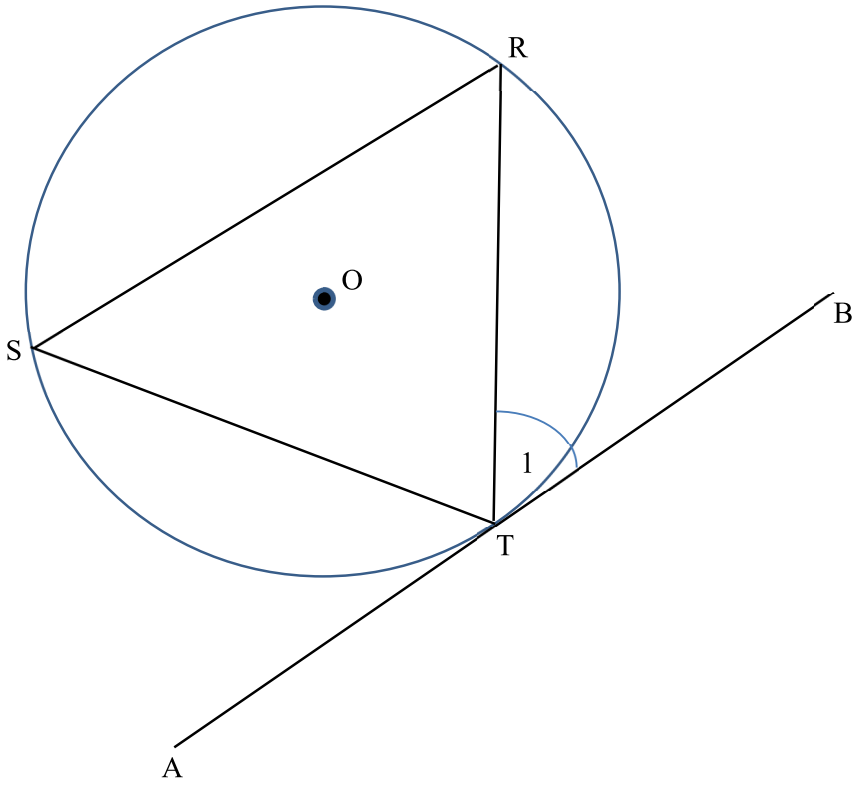
8.3 The length of BC. (5)

8.4 The value of $\dfrac{\text{Area } \Delta ABC}{\text{Area } \Delta GFD}$ (5)

**[17]**

**QUESTION 9**

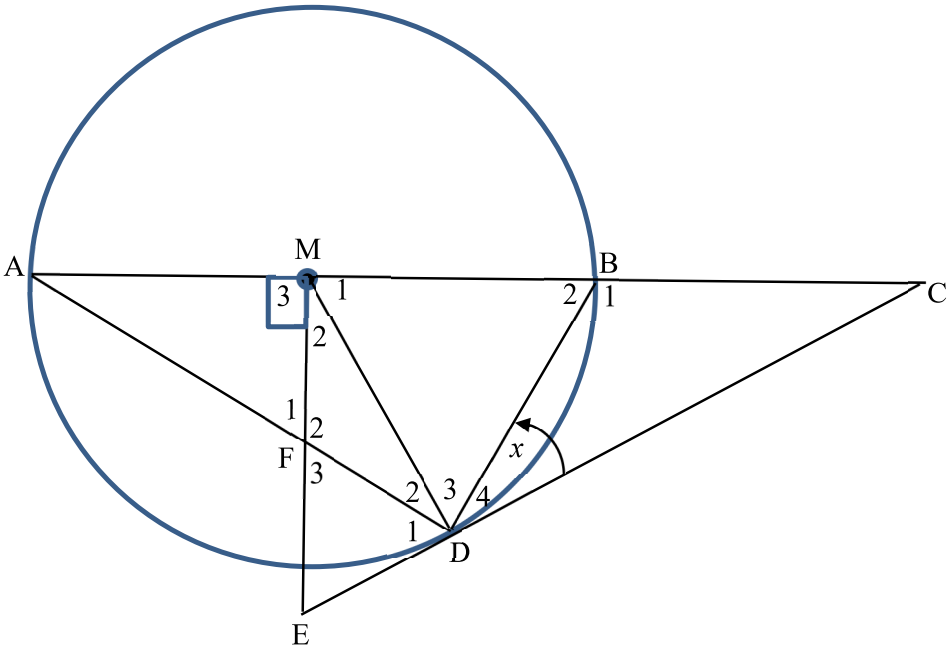
In the diagram below, ATB is a tangent to the circle at T. The chords TR, RS and ST are drawn. O is the centre of the circle.




Prove the theorem which states that: $\hat{T}_1 = T\hat{S}R$ **[5]**

**QUESTION 10**

In the diagram, M is the centre of the circle and diameter AB is produced to C. ME is drawn perpendicular to AC such that CDE is a tangent to the circle at D. ME and chord AD intersect at F. $MB = 2BC$.




10.1 If $\widehat{D}_4 = x$, write down, with reasons, TWO other angles equal to $x$. (3)

10.2 Prove that CM is a tangent at M to the circle passing through M, E and D. (4)

10.3 Prove that FMBD is a cyclic quadrilateral. (3)

10.4 Prove that $DC^2 = 5BC^2$ (3)

10.5 Prove that $\Delta DBC \;|||\; \Delta DFM$ (4)

10.6 Hence, determine the value of $\frac{DM}{FM}$ (2)

**[19]**

**TOTAL: 150**



## INFORMATION SHEET

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

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

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

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

$S_\infty = \frac{a}{1 - r}\ ; -1 < r < 1$

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

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

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

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

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

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

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

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

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

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

$\cos 2\alpha = cos^2\alpha - sin^2\alpha$ $\sin 2\alpha = 2\sin\alpha\cos\alpha$

$= 1 - 2sin^2\alpha$

$= 2cos^2\alpha - 1$

$\bar{x} = \frac{\sum fx}{n}$ $\sigma^2 = \frac{\sum_{i=1}^{n}(x_1 - x)^2}{n}$

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

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