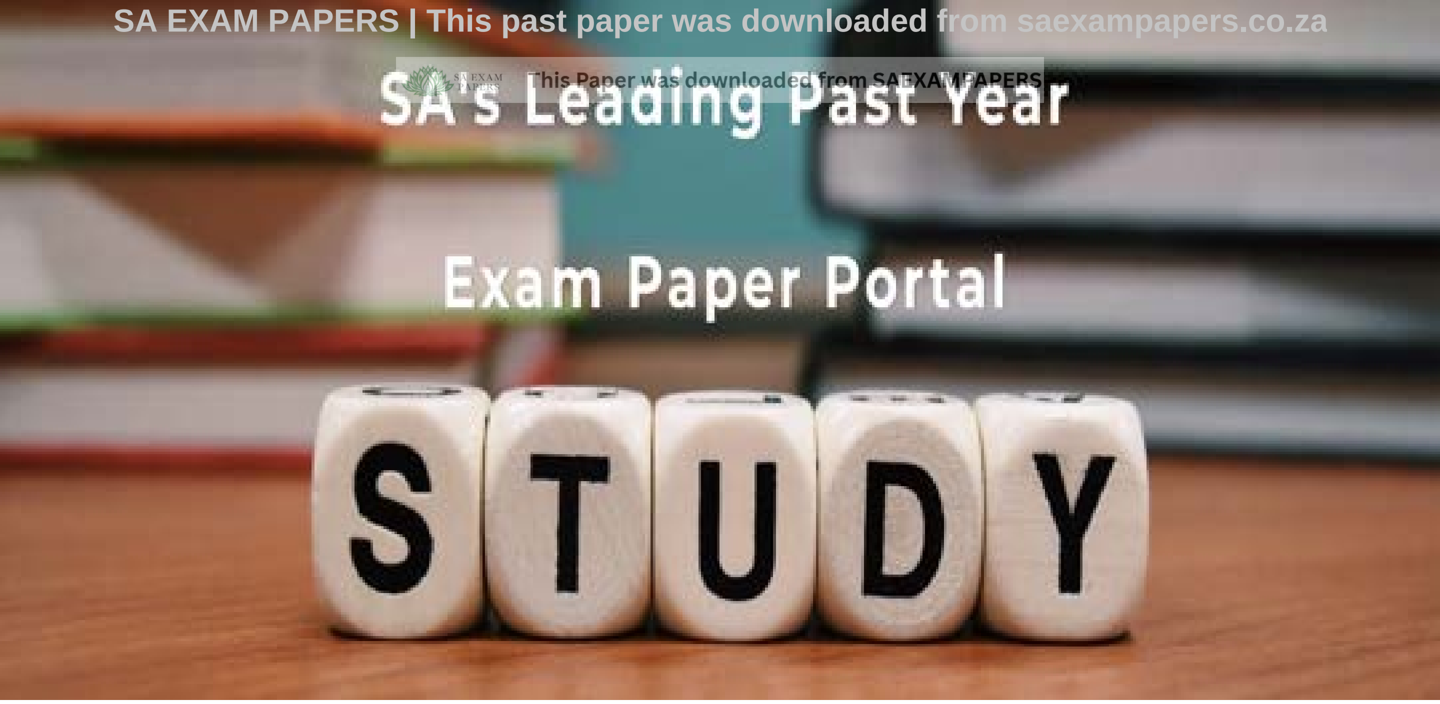

SA's Leading Past Year
Exam Paper Portal
STUDY

LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
EDUCATION

NATIONAL SENIOR CERTIFICATE

GRADE 12

MATHEMATICS PAPER 2
SEPTEMBER 2025

MARKS: 150

TIME: 3 HOURS

EMATHP2

This question paper consists of 14 pages and an information sheet.

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.

3. Clearly show ALL calculations, diagrams, graphs, et cetera that 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 answers off to TWO decimal places, unless stated otherwise.

7. Diagrams are NOT necessarily drawn to scale.

8. Write legibly and present your work neatly.

QUESTION 1

1.1 The table below shows the average weight and standard deviation of packets of chips from different distributors. Independent quality controllers investigated the weight of the packets of chips to see if the distributors are complying to the rules. The packets are all marked to have 130g of chips inside.

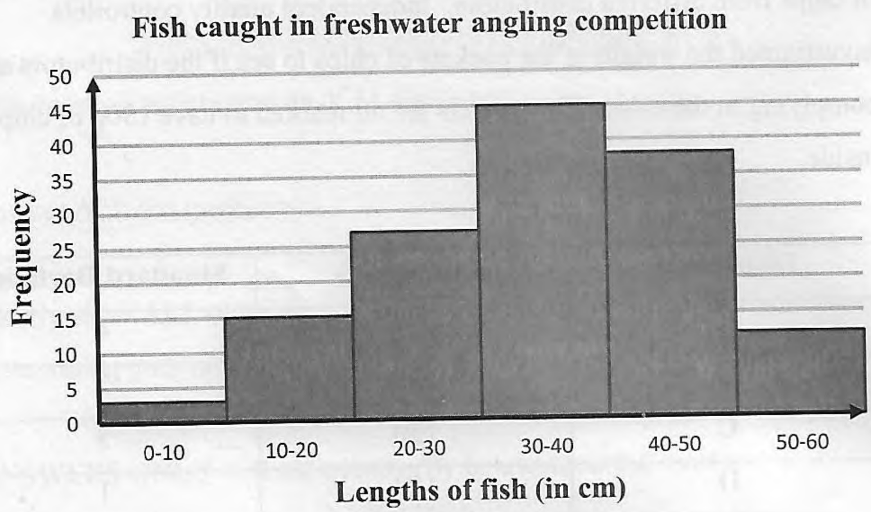
Distributor	Average (g)	Standard Deviation
A	125	4
B	132	2
C	130	5
D	129	1
E	134	3

1.1.1 If 2000 packets of chips were investigated from Distributor C, what was the total weight of chips tested? (1)

1.1.2 Which one of the Distributors is the best to buy from? Give a reason for your answer. (2)

1.1.3 Which one of the Distributors will you rather not buy from? Give a reason for your answer. (2)

1.2 The following histogram represents the lengths and number of fish caught in a freshwater angling competition. The shortest fish was 9cm and the longest one was 58cm.



1.2.1 Determine the range of the lengths of the fish. (1)

1.2.2 Complete the cumulative frequency table in the ANSWER BOOK.

Interval	Frequency	Cumulative frequency
$0 < x \leq 10$	3	
$10 < x \leq 20$	15	
$20 < x \leq 30$	27	
$30 < x \leq 40$	45	
$40 < x \leq 50$	38	
$50 < x \leq 60$	12	

(2)

1.2.3 Draw an ogive in the ANSWER BOOK to represent the data. (3)

1.2.4 60% of the fish are less than x cm long. Use the ogive to determine the value(s) of x. (2)

[13]

QUESTION 2

The top 10 athletes in a certain province took part in the Provincial Biathlon championships. They had to participate in 10 km cycling and 3 km swimming. The following table represents the times for each athlete, for cycling and swimming respectively, recorded in the championship.

Athlete	Cycling (in minutes)	Swimming (in minutes)
1	22	39
2	15	40
3	24	47
4	19	38
5	22	55
6	19	45
7	26	58
8	30	50
9	20	44
10	35	65

2.1 Determine the average cycling time for the 10 athletes. (2)

2.2 Determine the equation for the least squares regression line of the data. (3)

2.3 Calculate the expected time for an athlete to complete the swimming event if he takes 29 minutes to complete the 10km cycling. (2)

[7]

QUESTION 3

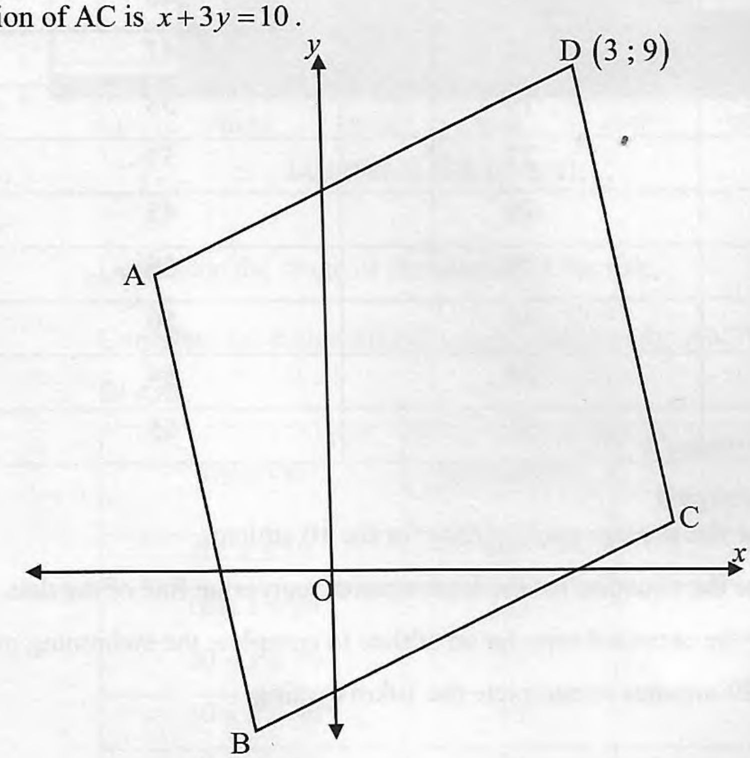
3.1 P(-3 ; 2) and Q(5 ; 8) are two points in a Cartesian plane.

3.1.1 Calculate the length of PQ. (2)

3.1.2 Calculate the angle that PQ forms with the $x-$axis, rounded of the nearest integer. (3)

3.1.3 Determine the equation of the perpendicular bisector of PQ in the form $y = ...$ (5)

3.2 In the diagram A, B, C and D$(3\ ;9)$ are the vertices of a rhombus. The equation of AC is $x+3y=10$.



3.2.1 Determine the equation of BD. (3)

3.2.2 Calculate the coordinates of K if the diagonals of the rhombus intersect at point K. (4)

3.2.3 Determine the coordinates of B. (2)

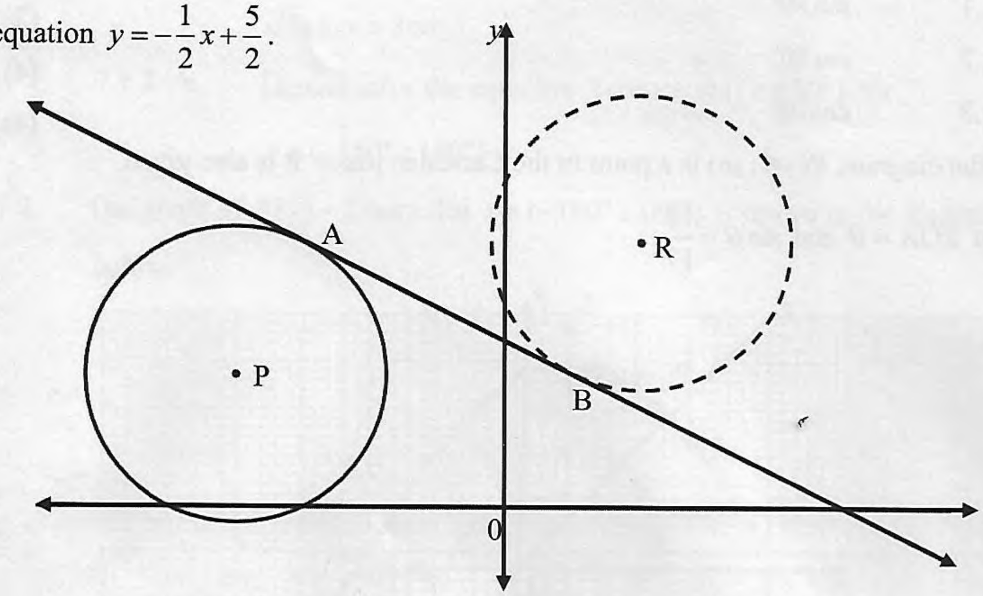
3.2.4 Calculate the coordinates of A and C if AD $=5\sqrt{2}$ units. (7)

3.2.5 If the rhombus is reflected about the line $x=1$, find the coordinates of the image of A. (2)

[28]

QUESTION 4

The diagram shows a circle with centre P $(-4\ ;\ 2)$ and a tangent at A $(a\ ;\ b)$ with equation $y = -\frac{1}{2}x + \frac{5}{2}$.



4.1 Determine the coordinates of A. (5)

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

4.3 It is further given that the circle P is reflected about the line AB and then translated along the line AB to centre R. Circle R has y – intercepts at 3 and 5. Find the coordinates of R. (4)

[12]

QUESTION 5

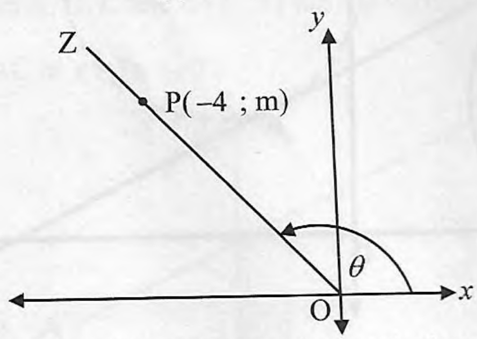
5.1 If it is given that $\tan 20° = t$, express the following in terms of t:

5.1.1 $\tan 70°$ (2)

5.1.2 $\sin 50°$ (4)

5.1.3 $\cos 10°$ (4)

5.2 In the diagram, P(–4 ; m) is a point in the Cartesian plane. It is also given that $Z\hat{O}X = \theta$ and $\sin\theta = \frac{15}{17}$.



Determine the value of m, without using a calculator. (6)

[16]

QUESTION 6

6.1 Simplify the following without using a calculator:

$$\frac{2\cos 105°\cos 15°}{\cos(45°-x)\cos x - \sin(45°-x)\sin x}$$

(5)

6.2 Determine the general solution of $1-\tan x = \cos 2x$ if $\sin x \neq \cos x$. (6)

6.3 Determine the value of θ if $\cos 90°$, $\sin 30°$, $\tan\theta$ are three consecutive terms of an arithmetic sequence and $0° \leq \theta \leq 90°$ (4)

[15]

QUESTION 7

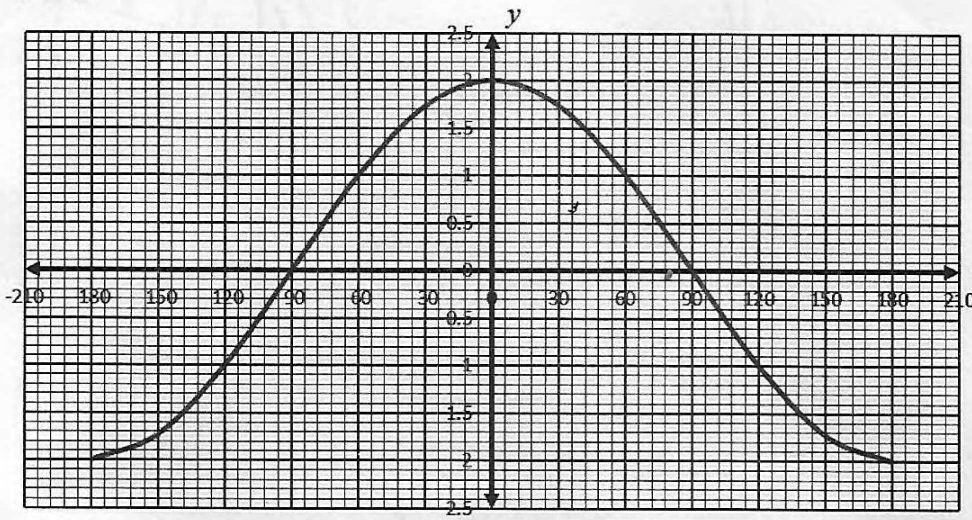
7.1 7.1.1 Show that $2\cos x = \sin(x + 30°)$ can be written as

$\sqrt{3}\sin x = 3\cos x$ (3)

7.1.2 Hence, solve the equation $2\cos x = \sin(x + 30°)$ for

$x \in (-180° ; 180°]$ (4)

7.2 The graph of $f(x) = 2\cos x$ for $x \in (-180° ; 180°]$ is drawn in the diagram below.



7.2.1 Draw the graph of $y = \sin(x + 30°)$ for $x \in (-180° ; 180°]$ on the same set of axes in the ANSWER BOOK. Clearly indicate the intercepts and turning points. (3)

7.2.2 Use the graph and the information you have, to solve the following:

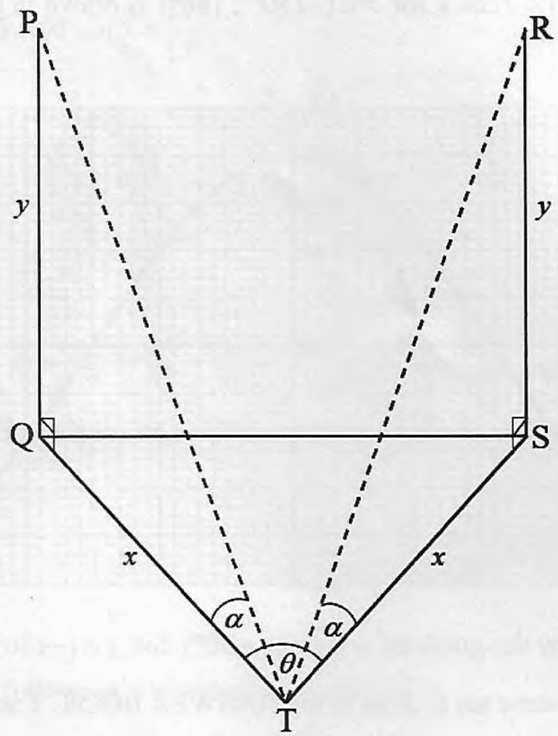
(a) $2\cos x > \sin(x + 30°)$, $x \in (-180° ; 180°]$ (2)

(b) $\dfrac{2\cos x}{\sin(x + 30°)} \geq 0$, $x \in (-180° ; 0°]$ (3)

[15]

QUESTION 8

Two poles, PQ and RS with equal lengths of y meters, stand with their lower points Q and S in the same horizontal plane as the point T. They are also equidistant from T, distance equal to x. The angles of elevation of the top of the poles are both α. QS subtend an angle θ at T.



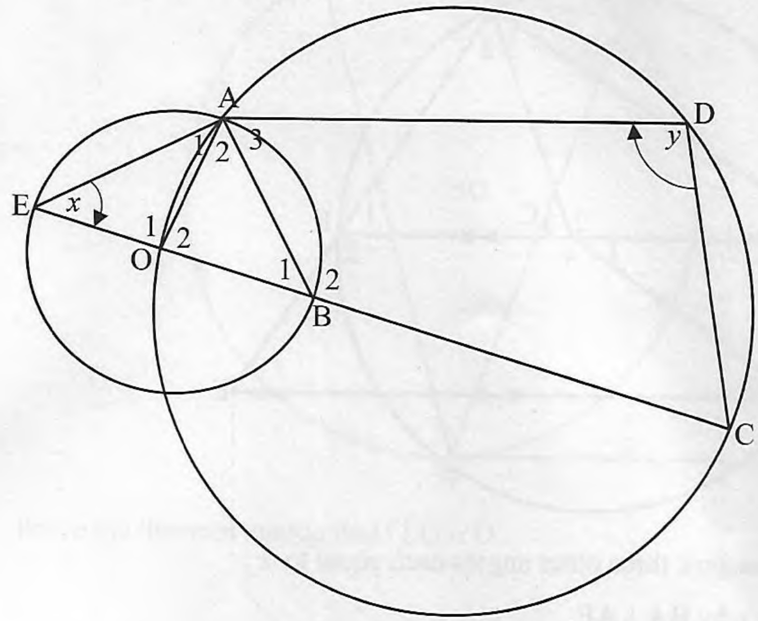
Prove that: $QS^2 = \dfrac{2y^2(1-\cos\theta)}{\tan^2\alpha}$ (5)

[5]

QUESTION 9

In the diagram O is the centre of the small circle. AOCD is a cyclic quadrilateral.

EOBC is a straight line and $\hat{B}_1 = 35°$. $\hat{E} = x$ and $\hat{D} = y$.



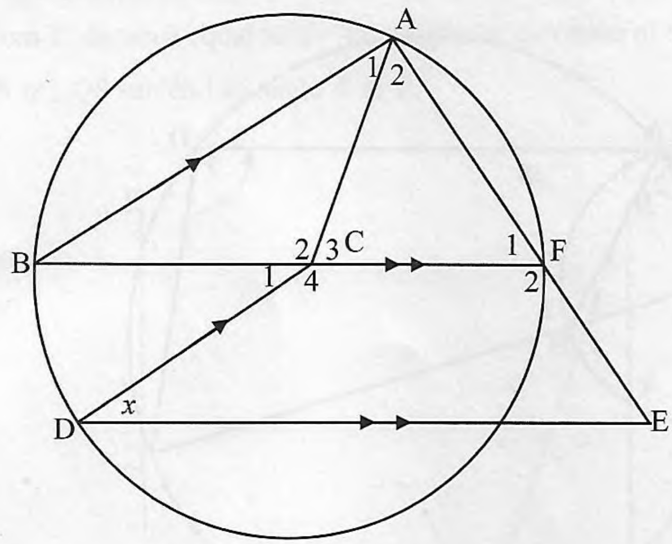
9.1 Determine the value of x. (3)

9.2 Determine the value of y. (4)

[7]

QUESTION 10

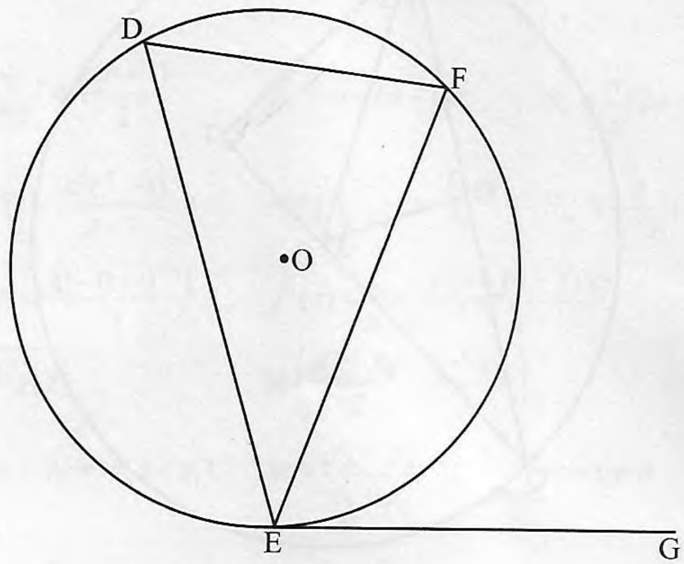
In the diagram BA and DC are parallel. C is the centre of the circle. Diameter BF $\parallel$ DE. E is on AF produced and $C\hat{D}E = x$.



10.1	Name, with reasons, three other angles each equal to x.	(5)
10.2	Give a reason why BA $\perp$ AE.	(1)
10.3	State, with reasons, whether or not CDEF is a cyclic quadrilateral.	(4)
		[10]

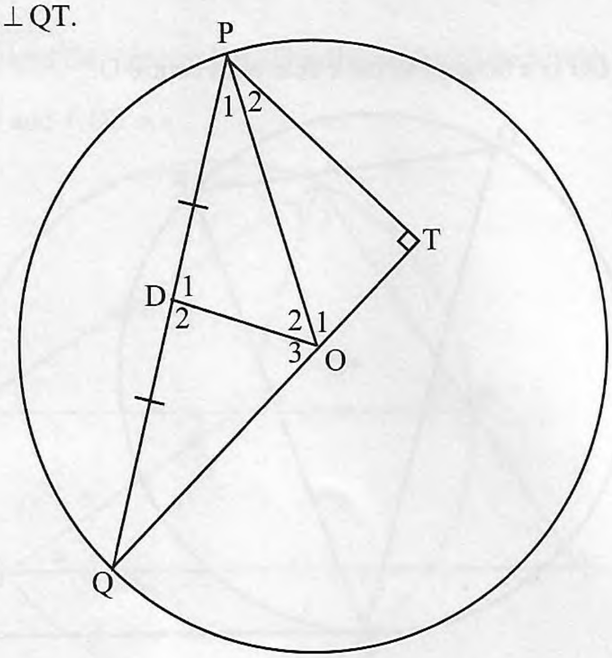
QUESTION 11

11.1 In the diagram EG is a tangent to the circle with centre O.



Prove the theorem stating that $\hat{FEG} = \hat{D}$. (5)

11.2 In the diagram below, OD bisect chord PQ. O is the centre of the circle and $PT \perp QT$.



Proof that:

11.2.1 $\hat{O}_3 = Q\hat{P}T$ (4)

11.2.2 $\Delta PTQ \parallel\!| \Delta ODQ$ (3)

11.2.3 $OQ.QT = 2PD^2$ (5)

11.2.4 $QT = \dfrac{QT^2 + PT^2}{2OQ}$ (5)

[22]

TOTAL: 150

INFORMATION SHEET: MATHEMATICS

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

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

$\sum_{i=1}^{n} 1 = n$ $\sum_{i=1}^{n} i = \dfrac{n(n+1)}{2}$ $T_n = a + (n-1)d$ $S_n = \dfrac{n}{2}(2a + (n-1)d)$

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

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

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

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

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

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

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

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

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

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

$(x ; y) \to (x\cos\theta + y\sin\theta ; y\cos\theta - x\sin\theta)$

$(x ; y) \to (x\cos\theta - y\sin\theta ; y\cos\theta + x\sin\theta)$

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

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

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