



Province of the  
**EASTERN CAPE**  
EDUCATION



**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 12**

**JUNE 2024**

**MATHEMATICS P2  
(DEAF)**

**MARKS: 150**

**TIME: 3 hours**

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This question paper has 15 pages, a formula sheet and an answer book of 25 pages.

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**INSTRUCTIONS AND INFORMATION**

**Read the instructions.**

1. This question paper has 10 **questions**.
2. **Answer ALL** the questions.  
**Write in the SPECIAL ANSWER BOOK.**
3. **Show ALL calculations, diagrams, graphs, etc.** which you have **used in your answers**.
4. **Answers only** will **NOT** always get full marks.
5. You **may use** a prescribed **calculator**.  
**Some questions** will **tell** you **NOT** to use a **calculator**.
6. **Round off** answers correct to **TWO decimal places**.  
**Some questions** will **tell** you **how to round off**.
7. **Diagrams** are **NOT** always drawn to **scale**.
8. An **information sheet** with formulae is **included** at the **end** of the question paper.
9. Write **neatly**.  
Your work must be **easy to read**.

**QUESTION 1****Table:**

The **maximum daily temperatures** in Bloemfontein for the **first 11 days** in **January** were **recorded** as **indicated**<sub>(shown)</sub>.

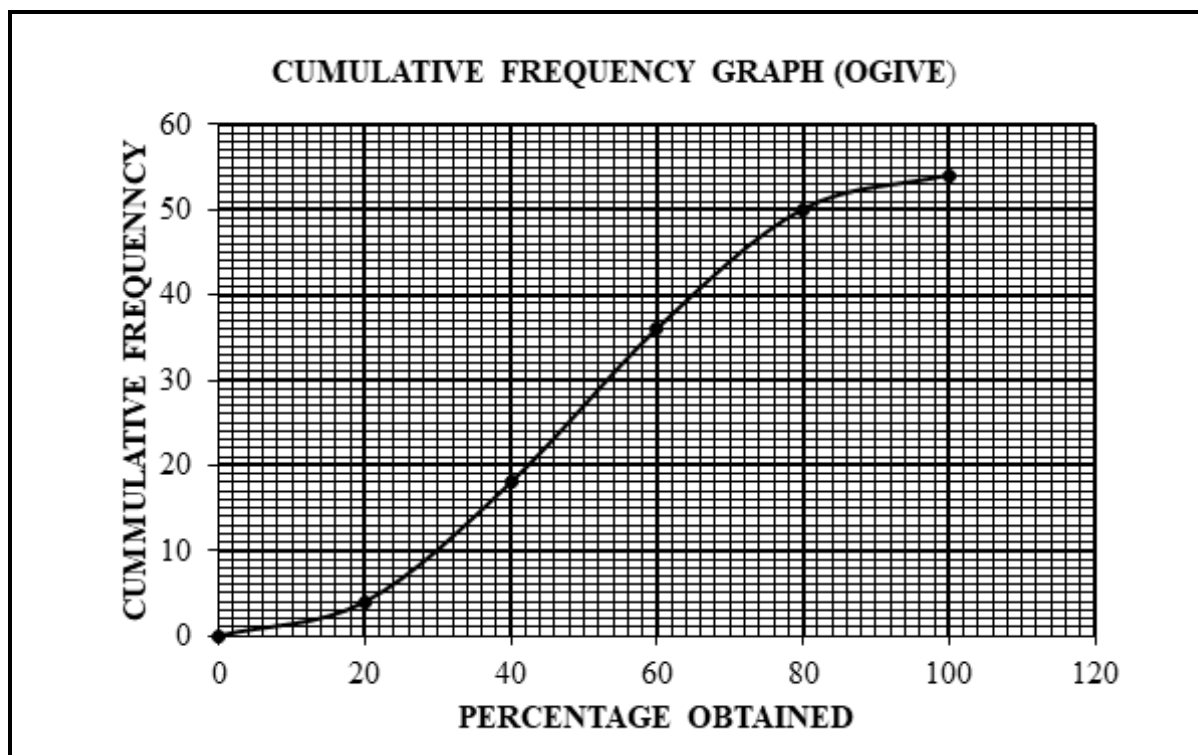
27	32	35	36	30	27	17	26	34	37	40
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- 1.1 Calculate the **mean** for the **maximum daily temperatures** for the **first 11 days** in **January**. (2)
- 1.2 Calculate the **standard deviation**. (1)
- 1.3 How many days were the **temperatures more than one standard deviation** of the **mean**? (3)
- 1.4 Determine the **interquartile range** of the **data**. (3)
- 1.5 Use the **grid** in the **ANSWER BOOK**.  
Draw a **box-and-whisker diagram**. (3)
- [12]

## QUESTION 2

**Graph:**

In a school, the analysis of mathematics matric results in percentages were represented in the cumulative frequency graph (ogive) given.



Use the graph. Answer the questions.

2.1 Use the ANSWER BOOK. Complete the frequency table.

Percentage obtained	Frequency	Cumulative frequency
$0 \leq x < 20$		4
$20 \leq x < 40$		18
$40 \leq x < 60$		36
$60 \leq x < 80$		50
$80 \leq x < 100$		54

(2)

2.2 Write the total number of matriculants who wrote mathematics in this school.

(1)

2.3 Write the modal class.

(1)

2.4 Estimate the median percentage for mathematics of this school.

(2)

2.5 The requirement<sub>(condition)</sub> for a learner to be admitted in a certain institution is 70% and more in mathematics.

Determine how many matriculants will qualify for admission.

(2)

[8]

## QUESTION 3

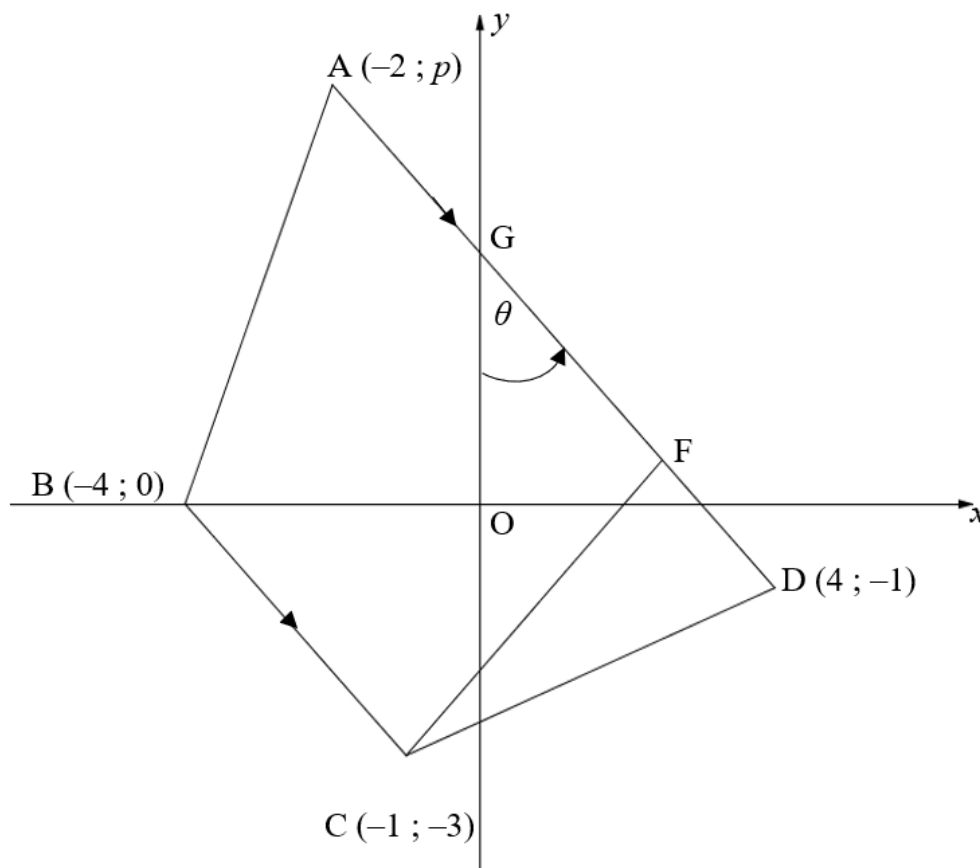
Diagram:

A  $(-2 ; p)$ , B  $(-4 ; 0)$ , C  $(-1 ; -3)$  and D  $(4 ; -1)$  are the vertices of a trapezium.

$AD \parallel BC$ .

Point G is the y-intercept of line AD.

F lies on line AD.



- 3.1 Determine the length of BC. (2)
- 3.2 Determine the gradient of BC. (2)
- 3.3 Determine the equation of line AD in the form  $y = mx + c$ . (3)
- 3.4 Calculate the value of  $p$ . (2)
- 3.5 If the coordinates of F are  $\left(\frac{5}{2}; \frac{1}{2}\right)$ , show that  $CF \perp AD$ . (2)
- 3.6 Calculate the size of  $\theta$ . (3)
- 3.7 Calculate the area of trapezium ABCD. (4)

[18]

## QUESTION 4

**Diagram:**

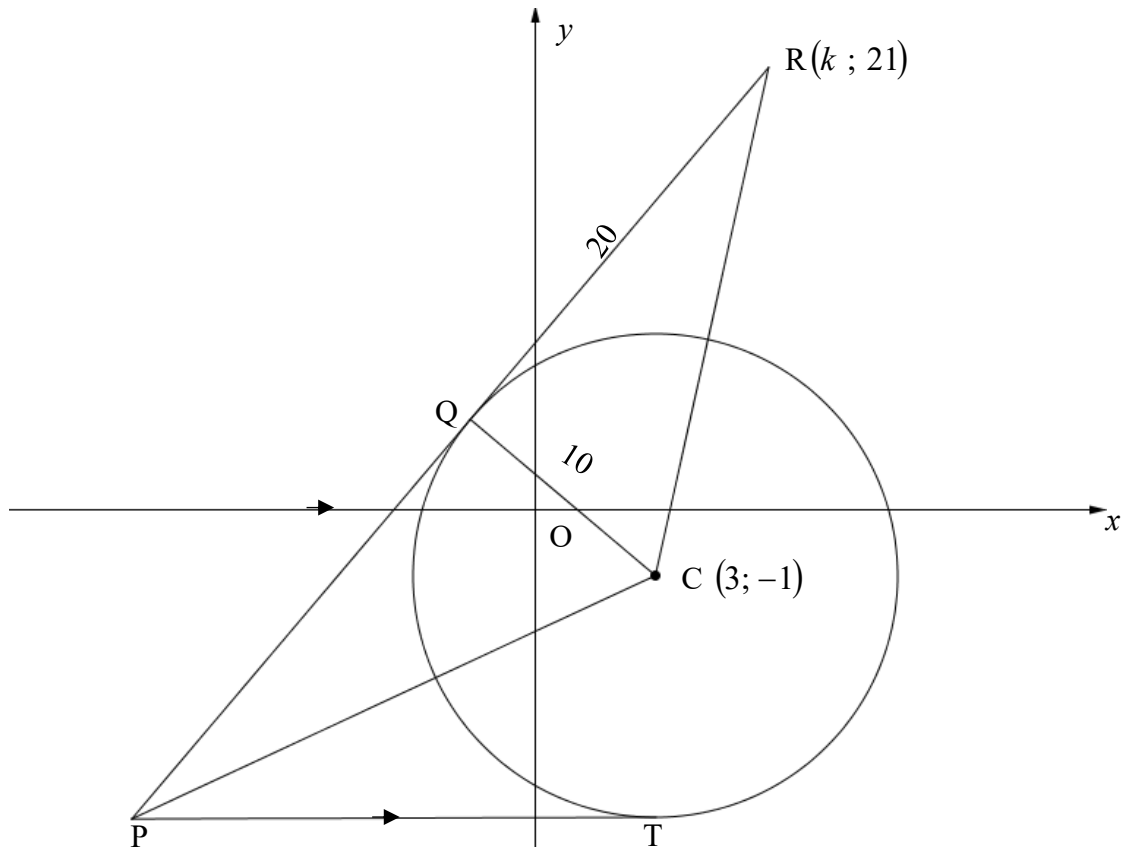
A circle with centre  $C(3;-1)$  and a radius of 10 units is drawn.

$PQR$  and  $PT$  are tangents to the circle at  $Q$  and  $T$  respectively.

$PT$  is parallel to the  $x$ -axis.

$R(k; 21)$ ,  $C$  and  $P$  are vertices of  $\triangle RCP$ .

$QR = 20$  units.



- 4.1 Write the size of  $\widehat{CQR}$ . (1)
- 4.2 Calculate the length of  $RC$ .  
Leave your answer in surd form. (2)
- 4.3 Calculate the value of  $k$ , if  $R$  lies in the first quadrant. (4)
- 4.4 Determine the equation of the circle with centre  $C$ , passing through  $T$  and  $Q$ .  
Write your answer in the form  $(x - a)^2 + (y - b)^2 = r^2$ . (2)
- 4.5 Determine the equation of  $PT$ . (2)

4.6 The **equation** of line **PR** is given by  $3y - 4x = 35$ .

4.6.1 **Calculate the coordinates of P.** (2)

4.6.2 **Calculate the length of PQ with a reason.** (2)

4.6.3 Is the **area** of  $\triangle QRC = \text{area of } \triangle QCP$ ?  
**Motivate your answer.** (3)

4.7 **Consider another circle with equation  $(x - 3)^2 + (y + 16)^2 = 16$  and having centre M.**

4.7.1 **Write the coordinates of the centre M.** (1)

4.7.2 **Write the length of the radius of the circle with centre M.** (1)

4.7.3 **Prove that the circle with centre C and the circle with centre M, do not touch each other (intersect).** (3)

[23]

**QUESTION 5****5.1 Do NOT use a calculator.**

If  $\sin 14^\circ = p$ , **determine the values of the following in terms of  $p$ :**

$$5.1.1 \quad \cos 76^\circ \quad (2)$$

$$5.1.2 \quad \cos 44^\circ \quad (4)$$

$$5.1.3 \quad 2 \sin 218^\circ \cdot \cos 38^\circ \quad (3)$$

$$5.2 \quad \textbf{Given: } 1 + \frac{\sin(90^\circ + \theta) \cdot \cos(\theta - 360^\circ)}{\sin(\theta - 30^\circ) \cdot \cos \theta - \sin \theta \cdot \cos(\theta - 30^\circ)}$$

**5.2.1 Do NOT use a calculator.**

**Simplify to a single trigonometric ratio of  $\theta$ .**

$$1 + \frac{\sin(90^\circ + \theta) \cdot \cos(\theta - 360^\circ)}{\sin(\theta - 30^\circ) \cdot \cos \theta - \sin \theta \cdot \cos(\theta - 30^\circ)} \quad (6)$$

**5.2.2 Write down the maximum value of**

$$y = 1 + \frac{\sin(90^\circ + \theta) \cdot \cos(\theta - 360^\circ)}{\sin(\theta - 30^\circ) \cdot \cos \theta - \sin \theta \cdot \cos(\theta - 30^\circ)} \quad (1)$$

$$5.3 \quad \textbf{Prove that } \frac{\sin 3x}{\sin x} = 3 - 4 \sin^2 x \quad (5)$$

$$5.4 \quad \textbf{Given: } \sin^2 x + \sin 2x - 3 \cos^2 x = 0.$$

**5.4.1 Determine the general solution of the above equation. (5)**

$$5.4.2 \quad \textbf{Determine the values of } x \text{ in the interval } x \in [-90^\circ; 180^\circ]. \quad (3)$$

**[29]**



**QUESTION 6**

6.1 Use the **grid** in the ANSWER BOOK.

Draw the graphs of  $f(x) = 3 \sin x$  and  $g(x) = \tan \frac{1}{2}x$  in the interval of  $x \in [-180^\circ; 180^\circ]$ .

Show **ALL** intercepts with the axes.

Show the **turning points**

Show the **asymptotes**.

(6)

6.2 Use your graphs.

Answer the following questions for  $x \in [-180^\circ; 180^\circ]$

6.2.1 Write the **period** of  $g$ .

(1)

6.2.2 Write the **value(s)** of  $x$  for **which** the **graph** of  $g$  is **undefined**.

(2)

6.2.3 Write the **range** of  $h$  if  $h(x) = f(x) - 2$ .

(2)

6.2.4 How many solutions exists for  $f(x) = g(x)$ ?

(1)  
[12]

## QUESTION 7

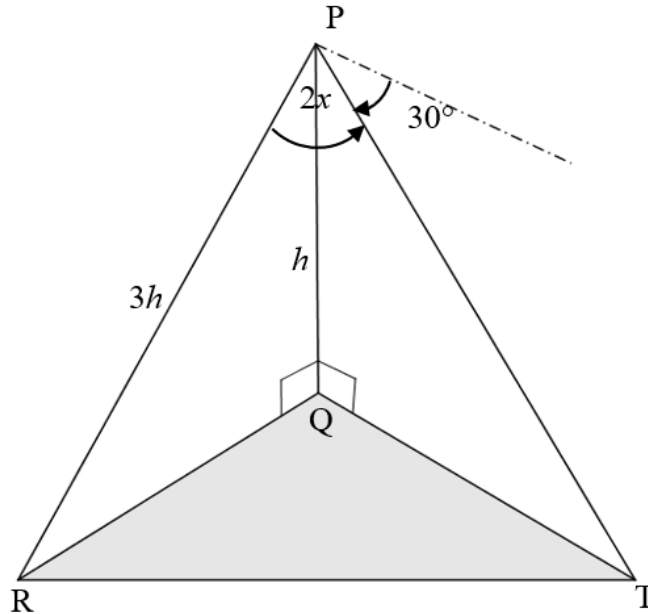
**Diagram:**

PQ is a vertical pole having height  $h$  metres.

R, Q and T are three points on the same horizontal plane.

PR and PT are cables and the angle of depression from P to T is  $30^\circ$ .

PR =  $3h$  and angle  $\widehat{RPT} = 2x$ .



7.1 Write the size of  $\widehat{PTQ}$ . (1)

7.2 Determine the length of PT in terms of  $h$ . (3)

7.3 Calculate the size of  $x$  if  $RT = \sqrt{7}h$ . (5)

[9]

## QUESTION 8

**Diagram:**

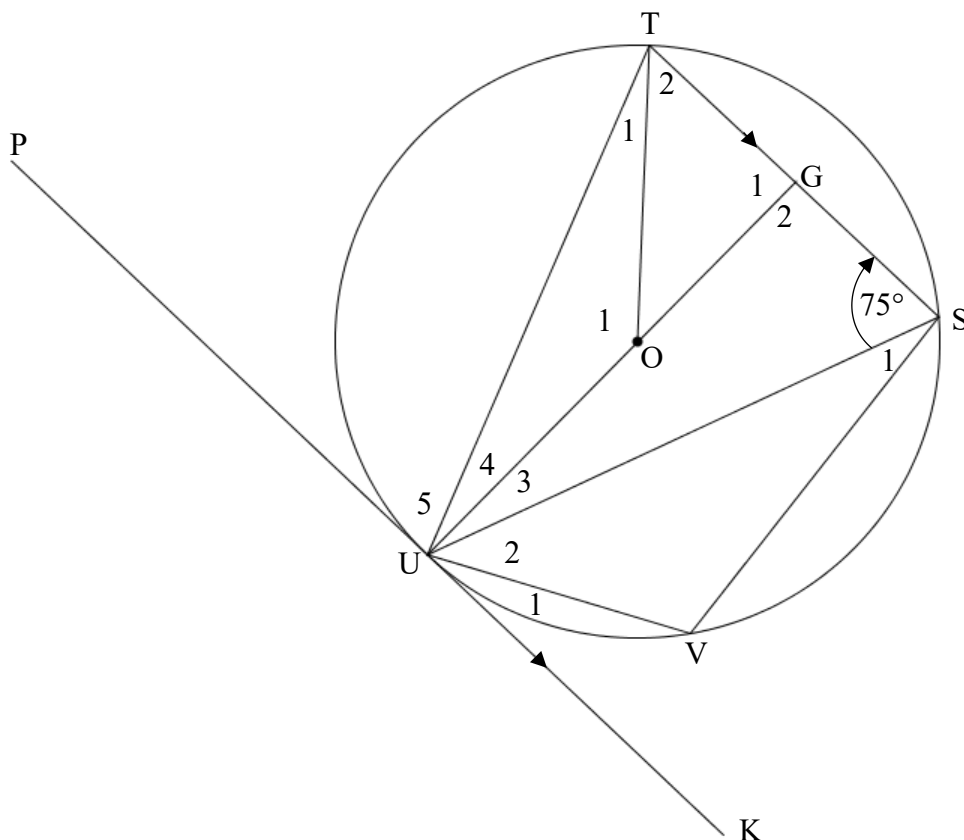
The circle having centre  $O$ , passes through  $U$ ,  $T$ ,  $S$  and  $V$ .

$PUK$  is a **tangent** to the circle at  $U$ .

$TS \parallel PK$ .

$UOG$  is a straight line.

$\hat{T}SU = 75^\circ$ .



8.1 Calculate with reasons the size of:

8.1.1  $\hat{O}_1$  (2)

8.1.2  $\hat{U}_5$  (2)

8.1.3  $\hat{T}_1$  (3)

8.1.4  $\hat{V}$  (3)

8.1.5  $\hat{U}_3$  (2)

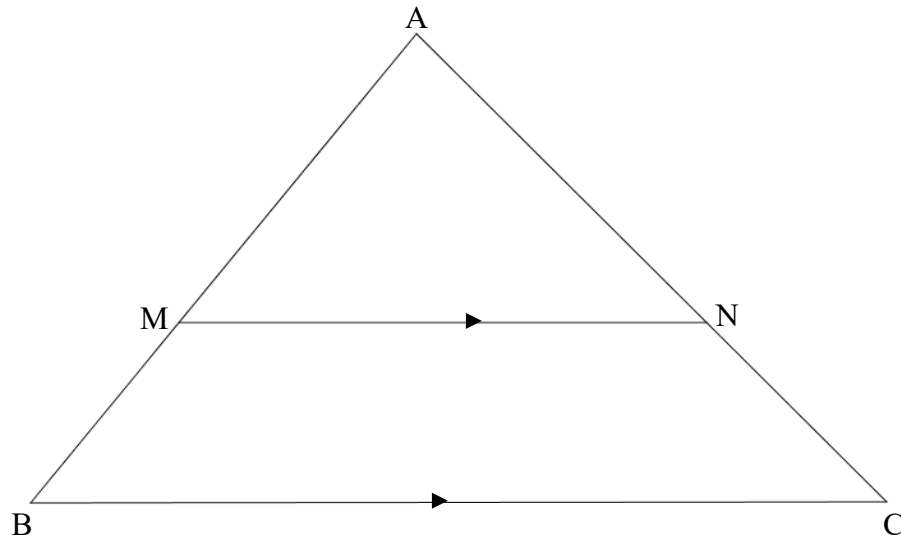
8.1.6  $\hat{G}_2$  (3)

8.2 If it is further **given** that  $TS = \sqrt{80}$ .  
**Calculate** the **length** of  $TG$ . **Give reasons.**  
**Leave your answer in simplest surd form.**

(2)  
**[17]**

**QUESTION 9**

9.1 In  $\triangle ABC$  below, **M** is a **point** on **AB** and **N** is a **point** on **AC**, such that  $MN \parallel BC$ .



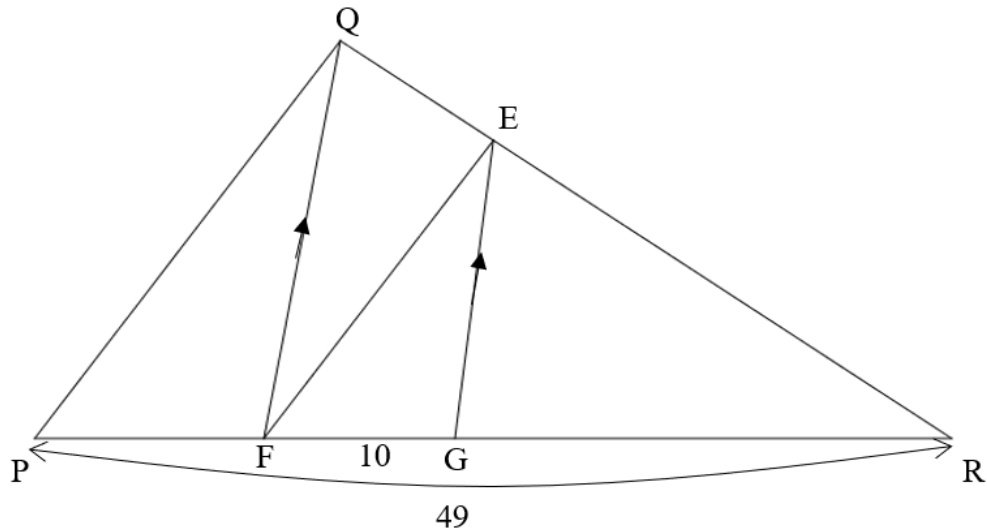
**Prove the theorem** which **states** that  $\frac{AM}{MB} = \frac{AN}{NC}$ . (5)

9.2 **Diagram:**

$\triangle PQR$  is **drawn**,  $EG \parallel QF$  and **EF** is a **straight line**.

$QE:ER = 2:5$ .

$PR = 49$  units and  $FG = 10$  units.



9.2.1 Calculate the **length** of **GR**. Give reasons.

(4)

9.2.2 Prove that  $FE \parallel PQ$ .

(3)

[12]

## QUESTION 10

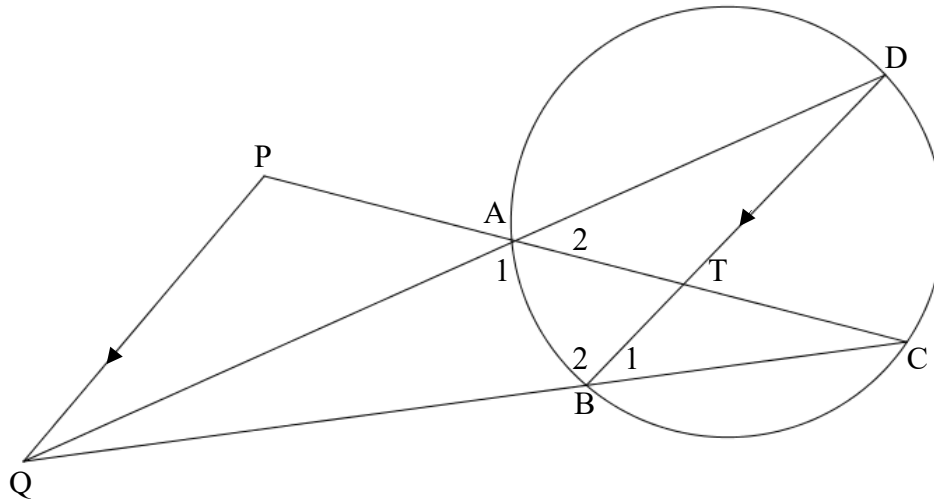
**Diagram:**

**A, B, C and D** are **points** on the **circumference** of the **circle**.

**PC** and **QC** are **drawn** from **P** and **Q** respectively and **intersect** at **C**.

**QP** is **joined**.

**DB**  $\parallel$  **PQ**. **QB** = 5**BC**.



Prove that:

10.1  $\frac{CT}{PC} = \frac{1}{6}$  (3)

10.2  $\triangle QAC \parallel \triangle QBD$  (4)

10.3  $QD \cdot QA = 30BC^2$  (3)

**[10]**

**TOTAL: 150**

## INFORMATION SHEET

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

$$A = P(1 + ni)$$

$$A = P(1 - ni)$$

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

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

$$T_n = a + (n - 1)d$$

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

$$T_n = ar^{n-1}$$

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

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

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

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

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

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$M\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$$

$$y = mx + c$$

$$y - y_1 = m(x - x_1)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \tan \theta$$

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

In  $\triangle ABC$ :

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

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

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

$$\sin(\alpha + \beta) = \sin \alpha \cdot \cos \beta + \cos \alpha \cdot \sin \beta$$

$$\sin(\alpha - \beta) = \sin \alpha \cdot \cos \beta - \cos \alpha \cdot \sin \beta$$

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

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

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

$$\sin 2\alpha = 2\sin \alpha \cdot \cos \alpha$$

$$\bar{x} = \frac{\sum fx}{n}$$

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