



education

Department:
Education
PROVINCE OF LIMPOPO

MOPANI WEST DISTRICT

GRADE 12

MATHEMATICS FRIDAY TEST

22 MAY 2026

MARKS: 50

DURATION: 2 HOURS

This question paper consists of 8 pages (including the formula sheet and the cover page)

QUESTION 1

- 1.1 If $n \in \mathbb{N}$, calculate the smallest value of n for which:

$$\sum_{k=1}^n \frac{1}{32} (2)^{k-1} > 900 \quad (4)$$

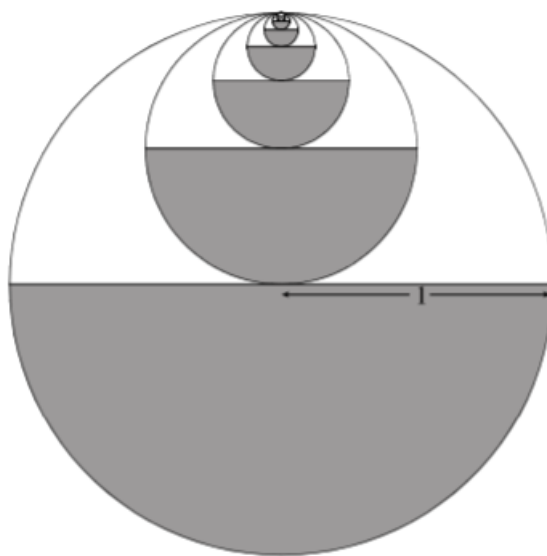
- 1.2 Given:

$$\sum_{p=1}^n (2p - 5) = m \quad \text{and} \quad \sum_{p=1}^{14} (2p - 5) = 140$$

Determine, in terms of m , the value of

$$\sum_{p=15}^n (2p - 5) \quad (2)$$

- 1.3 The diagram represents a sketch of circles. Half of the area of each circle is shaded. The radius of the largest circle is 1 *unit*. The diameter of each smaller circle is equal to the radius of the previous circle. Determine the sum of the shaded areas of all the circles, if this process is going on forever. (Give your answer in terms of π .)

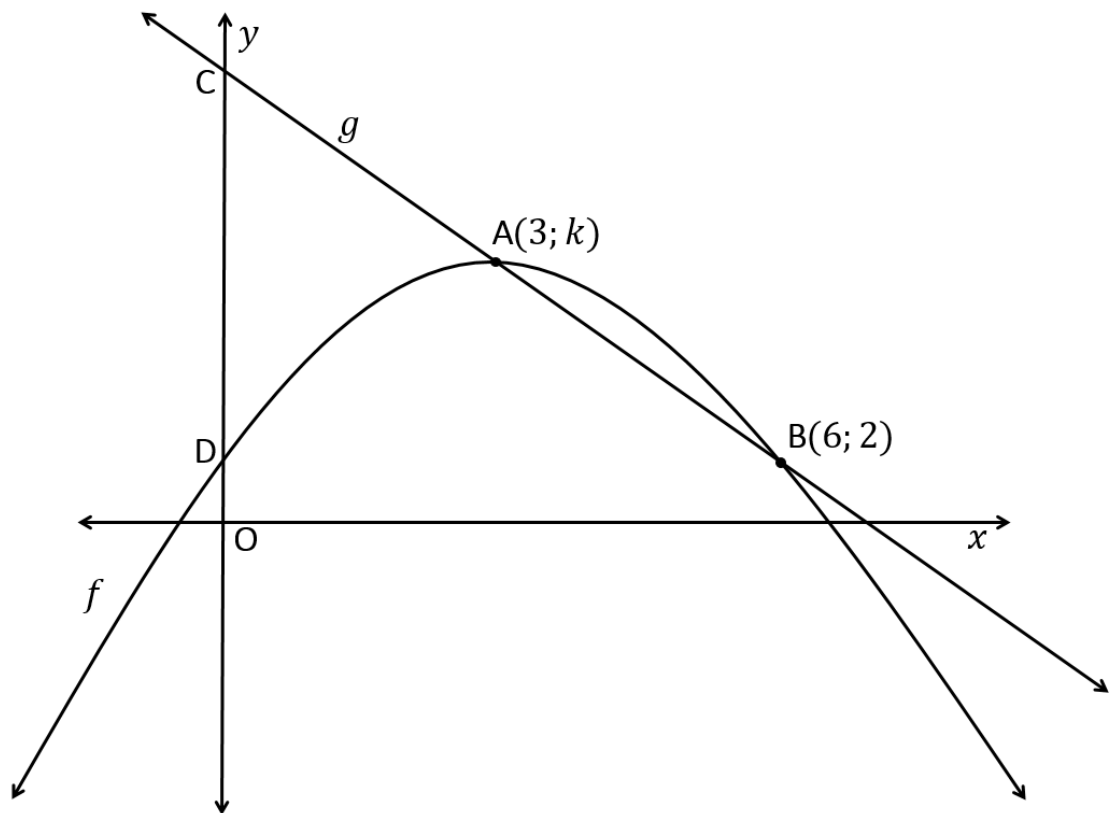


(4)

[10]

QUESTION 2

Sketched below are the graphs of $g(x) = -3x + 20$ and $f(x) = ax^2 + bx + c$. Graph f has a turning point at $A(3; k)$. Graph f and g intersect at A and $B(6; 2)$.



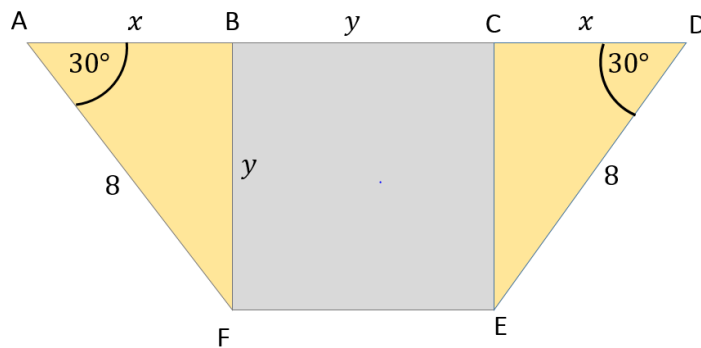
- 2.1 Calculate the numerical value of k , the y -coordinate of A . (2)
- 2.2 Calculate the numerical values of a , b and c . (5)
- 2.3 Determine the value(s) of x for which $f'(x) \cdot g'(x) > 0$. (2)

[9]

QUESTION 3

A certain high school wants to build a stage as shown in the diagram below:

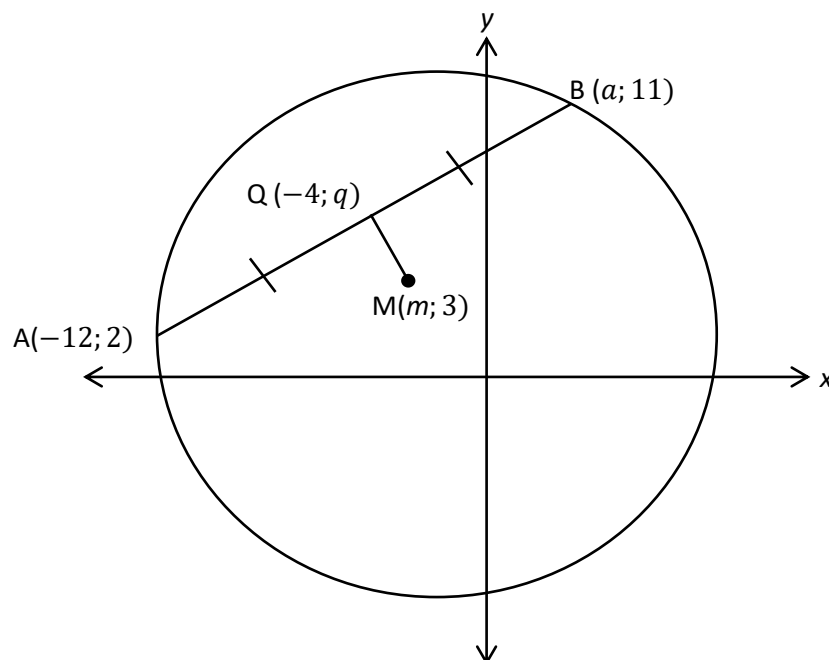
- The stage floor consists of a square (BCEF) and two congruent triangles ($\triangle ABF$ and $\triangle DCE$)
- Each side of the square is equal to y units.
- The length of the hypotenuse of the congruent triangles is equal to 8 units each.
- $AB = CD = x$ units.
- $\hat{A} = \hat{D} = 30^\circ$



- 3.1 Show that the area of the stage floor can be written as:
 $A = 8x \sin 30^\circ + 64 - x^2$ (3)
- 3.2 Calculate the value of x , for which the area of the floor will be a maximum. (3)
[6]

Question 4

- 4.1 In the diagram below, $M(m; 3)$ is the centre of the circle. $Q(-4; q)$ is the midpoint of chord AB with $A(-12; 2)$ and $B(a; 11)$. The length of the radius of the circle is 10.



- 4.1.1 Calculate the values of a and q . (2)
- 4.1.2 If $M(-2; 3)$, determine the equation of the circle in the form $(x - a)^2 + (y - b)^2 = r^2$ (1)
- 4.2 Calculate the length of the tangent AB drawn from the point $A(6; 4)$ to the circle with equation $(x - 3)^2 + (y + 1)^2 = 10$ (3)
- 4.3 The circle defined by $(x + 2)^2 + (y - 1)^2 = 25$ has centre M , and the circle defined by $x^2 + y^2 - 2x - 6y + 1 = 0$ has centre N . show that the circle intersect each other at two distinct points (4)

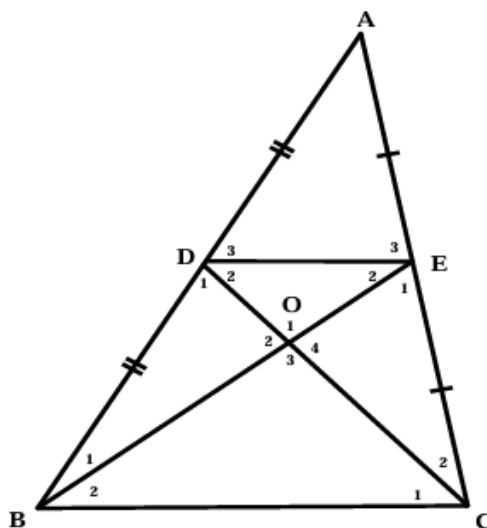
[10]

Question 5

In the figure alongside D and E are midpoints of AB and AC respectively.

$DC \perp EB$.

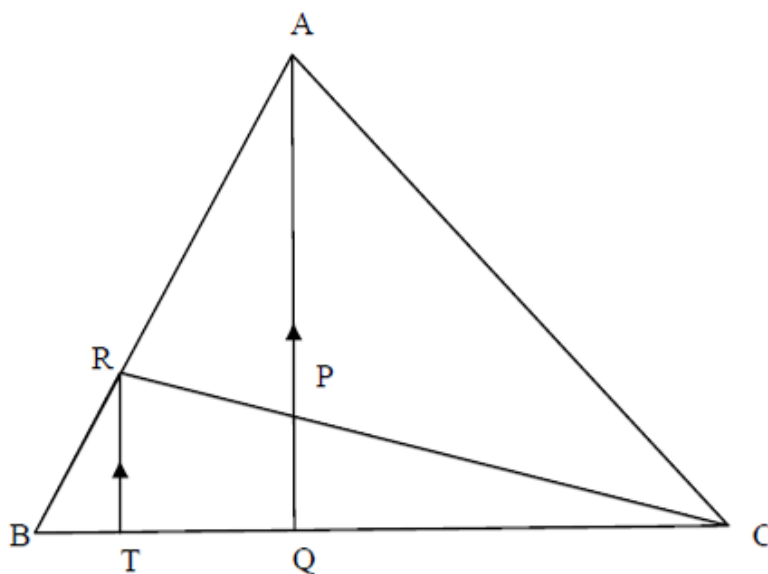
Prove : $AB^2 + AC^2 = 5BC^2$



[05]

Question 6

In the figure $AQ \parallel RT$, $\frac{BQ}{QC} = \frac{3}{5}$ and $\frac{BR}{RA} = \frac{1}{2}$



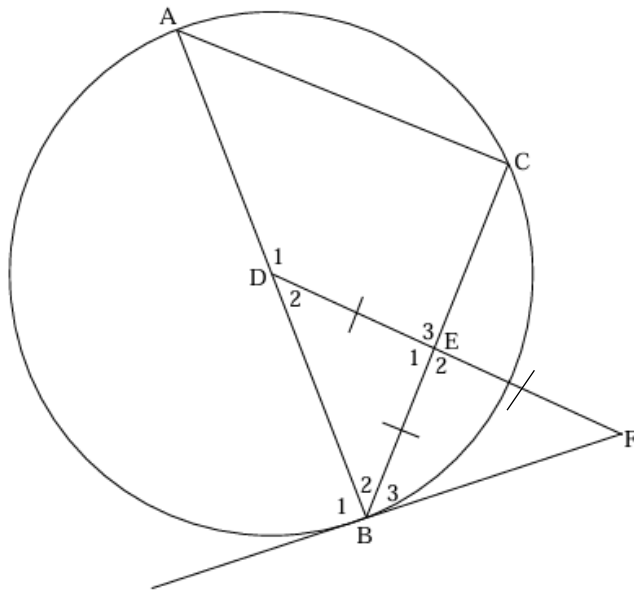
6.1 Hence, or otherwise, calculate the numerical value of:

$$\frac{\text{Area } \triangle RCT}{\text{Area } \triangle ABC}$$

[05]

Question 7

- 7.1 In the diagram, D is the centre of the circle. BF is a tangent that touches the circle at B. C lies on the circle to form chords AC and BC. D is joined with F and BE=DE=EF. Given that $\triangle CAB \sim \triangle BFD$.



7.1.1 Prove that: $\frac{1}{BC^2 - AB^2} = -\frac{AD \cdot FB}{EF \cdot AC^3}$

[05]

INFORMATION SHEET

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$y = mx + c$$

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

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

$$m = \tan \theta$$

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

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

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

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

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

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

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

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

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

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

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

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

$$P(A) = \frac{n(A)}{n(S)}$$

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

$$\hat{y} = a + bx$$

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