Province of the
EASTERN CAPE
EDUCATION

Iphondo leMpuma Kapa: Isebe leMfundo
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Porafensie Ya Kapa Botjahabela: Lefapha la Thuto

NATIONAL SENIOR CERTIFICATE

GRADE 12

JUNE 2026

TECHNICAL MATHEMATICS P2

MARKS: **150**

TIME: **3 hours**

This question paper consists of 15 pages, including a 2-page information sheet and a 25-page answer book.

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INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

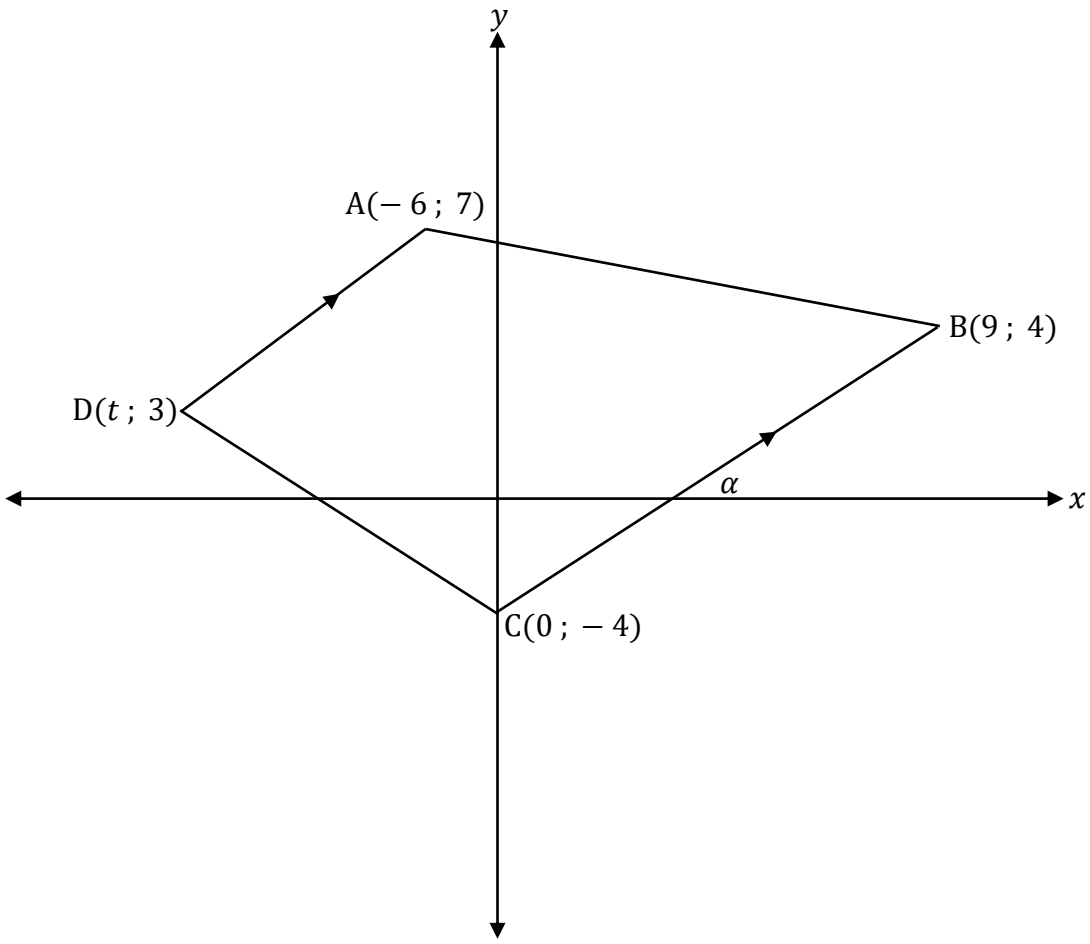
1. This question paper consists of ELEVEN questions.
2. Answer ALL the questions in the SPECIAL ANSWER BOOK provided.
3. Clearly show ALL calculations, diagrams, graphs, et cetera which you have used in determining the answers.
4. Answers only will NOT necessarily be awarded full marks.
5. You may use an approved scientific calculator (non-programmable and non-graphical) unless stated otherwise.
6. If necessary, round off your answers to TWO decimal places, unless stated otherwise.
7. Diagrams are NOT necessarily drawn to scale.
8. An information sheet with formulae is included at the end of the question paper.
9. Write neatly and legibly.

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QUESTION 1

In the diagram below, trapezium ABCD is drawn with vertices A(– 6 ; 7); B(9 ; 4); C(0 ; – 4) and D(t ; 3).



1.1 Calculate the distance of AB. (3)

1.2 Determine the midpoint of AC. (3)

1.3 Determine the gradient of BC. (2)

1.4 Find the equation of the line BC. (3)

1.5 Determine the inclination angle, α, of the line BC. (3)

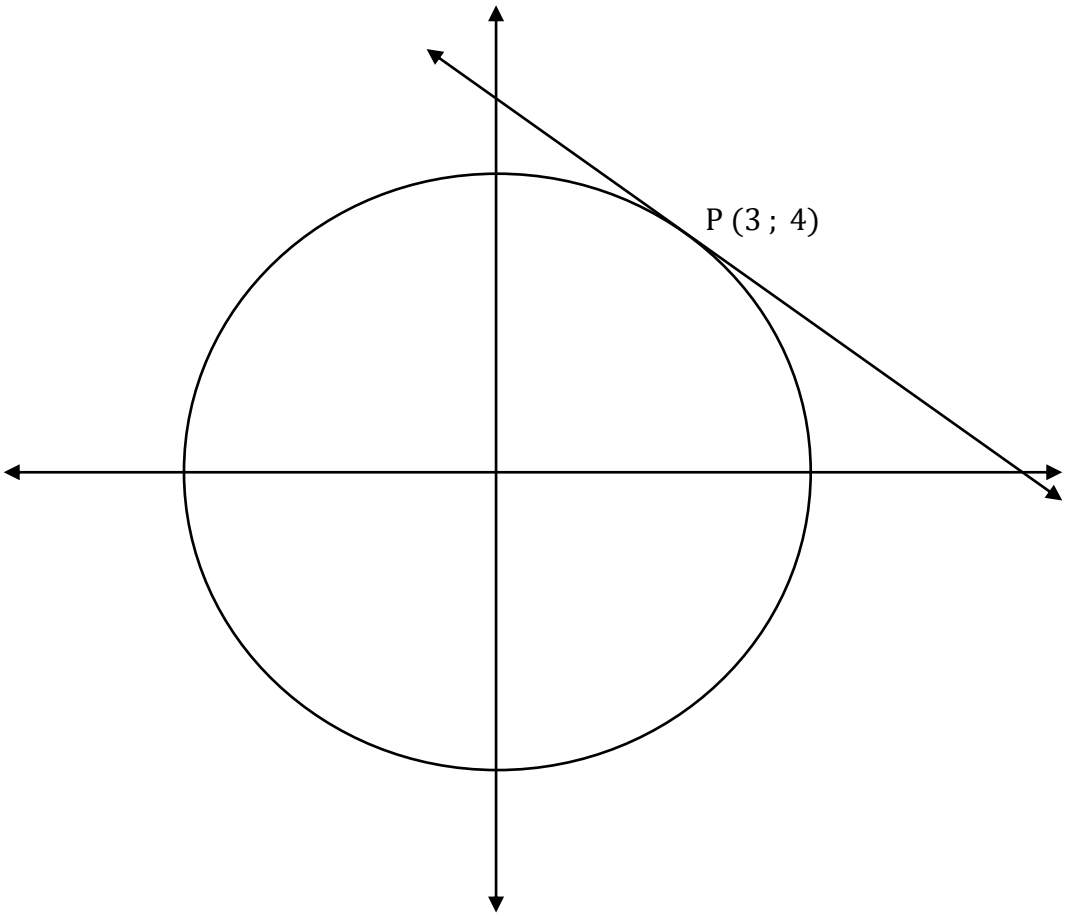
1.6 Determine the value of *t*. (3)
[17]

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QUESTION 2

2.1 The diagram below shows a circle, with the centre at the origin, with equation $x^2 + y^2 = 25$. The contact point of a tangent to the circle is at P $(3\ ;\ 4)$.



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

2.1.2 Determine the equation of the tangent to the circle at point *P* in the form $y = \ldots$ (4)

2.2 Sketch the graph of $\frac{x^2}{25} + \frac{y^2}{100} = 1$. Clearly indicate the intercepts. (3)
[8]

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QUESTION 3

3.1 If $25\sin\theta = -7$ and $0° < \theta < 270°$, determine with the aid of a diagram, the values of the following:

3.1.1 $\tan\theta$ (5)

3.1.2 $sec\,(180° - \theta)$ (2)

3.2 Determine the values of β, if $\cos(\beta - 60°) = 0{,}25$ and $0° \leq \beta \leq 360°$. (4)

[11]

QUESTION 4

4.1 Simplify: $$\frac{\cot(180°+\theta).\sec(360°-\theta)}{\sin(360°-\theta).\sin(180°+\theta)+\cos(540°+\theta).\cos(180°-\theta)}$$ (8)

4.2 Prove that: $$\frac{1}{1+\cos x} + \frac{1}{1-\cos x} = 2cosec^2 x$$ (6)

[14]

QUESTION 5

Given the functions defined by $f(x) = \tan 3x$ and $g(x) = \sin 6x$ for $x \in [0° ; 90°]$

5.1 On the same axes, given in your SPECIAL ANSWER BOOK, draw the graphs of *f* and *g*. Clearly show the turning points, asymptotes, endpoints, and the intercepts with the axes. (8)

5.2 Write down the period of *f* and *g*. (2)

5.3 Use your graphs to determine for which values of *x* is $\tan 3x = \sin 6x$. Give any TWO values. (2)

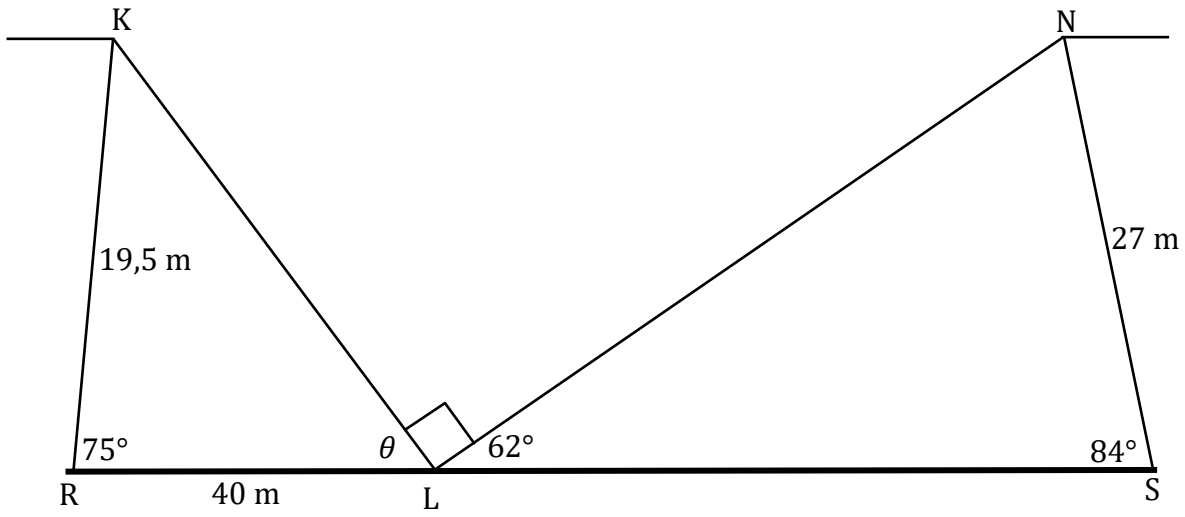
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QUESTION 6

The diagram below represents a cross-section of a valley. The vertical heights, KR and NS, of the valley are 19,5 m and 27 m, respectively. RL = 40 m, $N\hat{S}L = 84°$ and $N\hat{L}S = 62°$.



6.1 Determine the length of LN, to the nearest meter. (3)

6.2 Determine the distance of KL, to the nearest meter. (3)

6.3 Determine the size of θ. (1)

6.4 Determine the area of ΔKRL, to the nearest square meter. (3)

6.5 Determine the length of KN, to the nearest meter. (2)

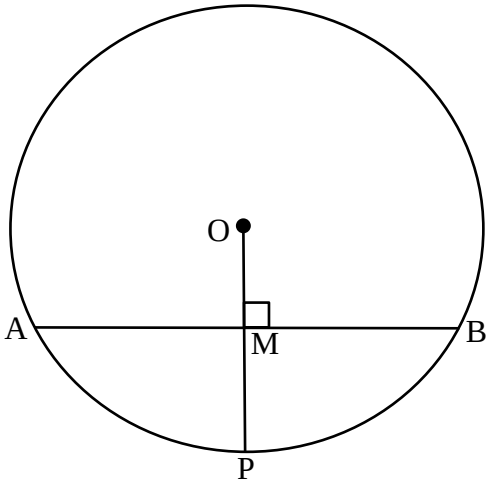
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QUESTION 7

In the diagram below, O is the centre of the circle. AB = 14 cm; OMP ⊥ AB with M on AB. MP = 3 cm and OM = x cm.



7.1 Calculate, with reasons, the lengths of AM and MB. (2)

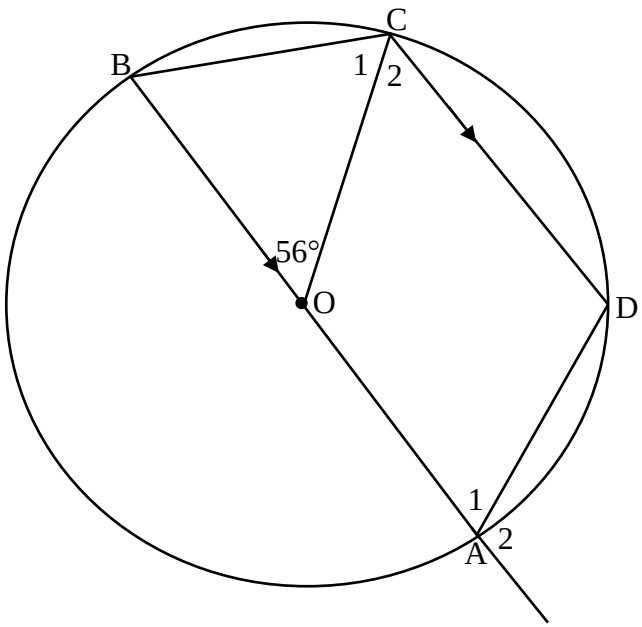
7.2 Write down the length of OP in terms of x. (1)

7.3 Determine the value of x, to the nearest cm. (4)
[7]

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QUESTION 8

8.1 In the diagram below, AB is a diameter in the circle with centre O and DC ∥ AB.



If $B\widehat{O}C = 56°$, determine, with reasons, the size of:

8.1.1 $\widehat{C}_1$ (3)

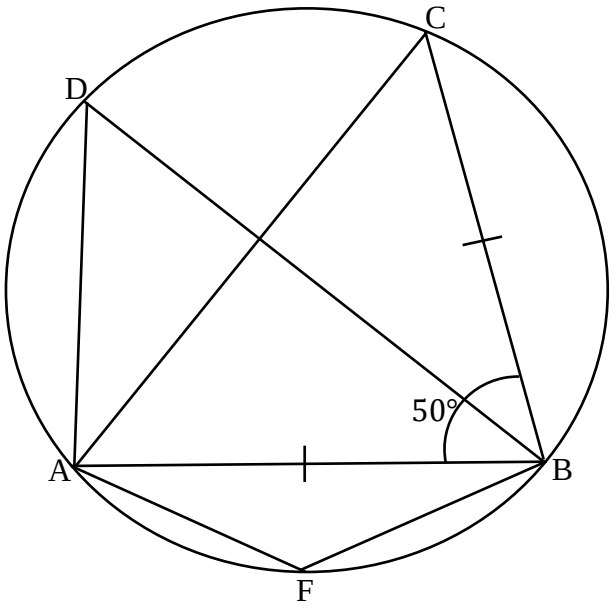
8.1.2 $\widehat{D}$ (2)

8.1.3 $\widehat{C}_2$ (2)

8.1.4 $\widehat{A}_2$ (2)

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8.2 A, B, C, D and F are points on the circumference of a circle. AB = BC and $A\hat{B}C = 50°$.



Calculate, with reasons, the sizes of:

8.2.1 $\hat{C}$ (3)

8.2.2 $\hat{F}$ (2)

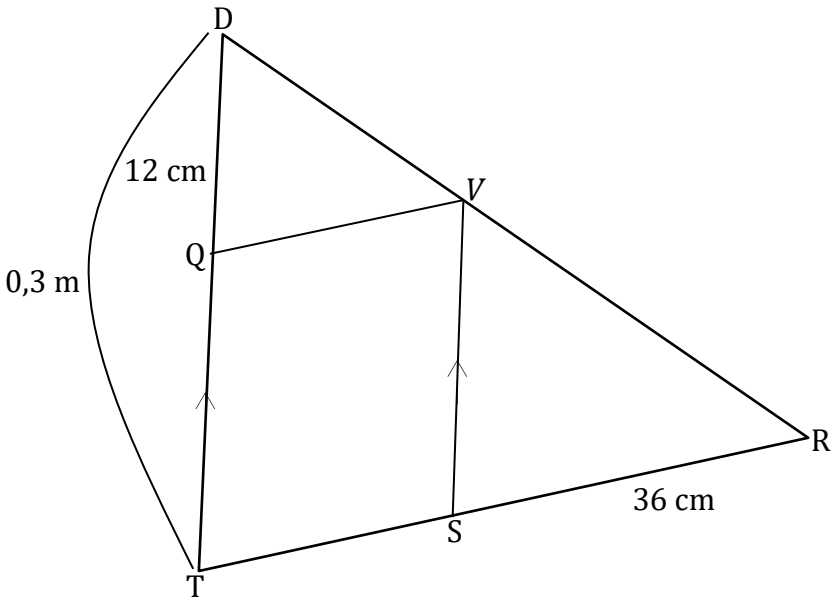
8.2.3 $\hat{D}$ (2)

[16]

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QUESTION 9

9.1 The diagram below shows ΔDTR. DQ = 12 cm, DT = 0,3 m, SR = 36 cm, VR : DV = 3 : 2 and DT||VS.

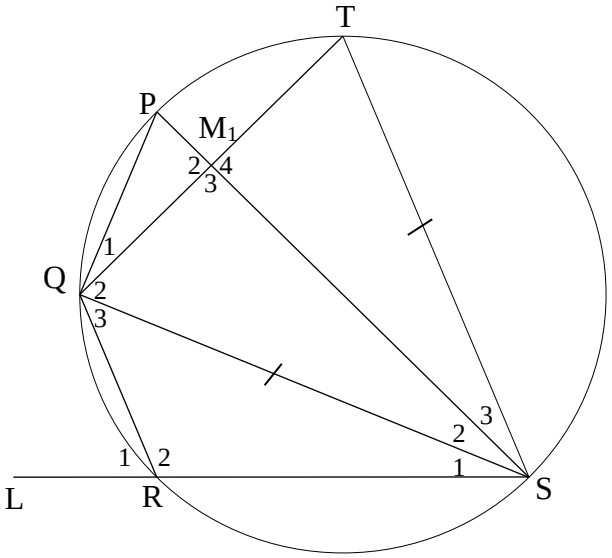


9.1.1 Write down the length of QT in cm. (2)

9.1.2 Prove that QV||TS. (3)

9.1.3 Determine the length of QV. (4)

9.2 The diagram below shows circle PQRS. SR produced to L and SQ = ST.



9.2.1 Prove, with reasons, that ΔPQM ||| ΔTSM. (4)

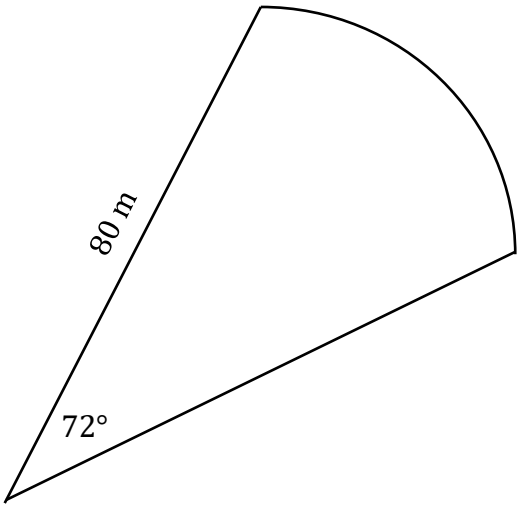
9.2.2 Hence, prove that $PQ = \frac{QM.QS}{SM}$ (3)

[16]

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QUESTION 10

10.1 An enclosure is in the shape of a 72° sector of a circle with a radius of 80 m.



Calculate the cost of fencing the enclosure, if fencing costs R360 per meter. (6)

10.2 The arc length of a sector is 3,1 m and it subtends an angle of 1,9 radians.

Calculate:

10.2.1 The radius of the circle (2)

10.2.2 The area of the sector (3)

10.3 A chord with a length of 250 mm divides a circle of diameter 38 cm into two segments. Calculate the heights of the segments in cm. (5)

10.4 A wheel of a car has a diameter of 540 mm and is rotating at $\frac{1500}{\pi}$ rev/min.

10.4.1 Calculate the angular velocity of the wheel. (3)

10.4.2 Calculate the linear velocity of a point on the rim of the wheel in m/s. (4)

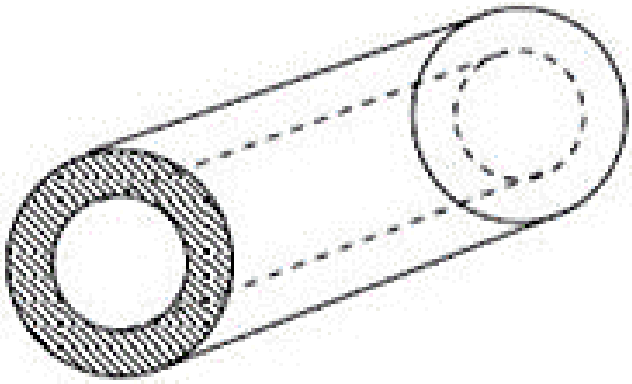
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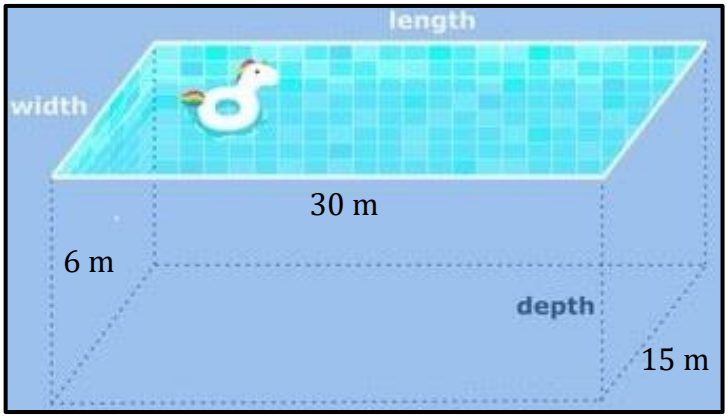
QUESTION 11

11.1 A cylindrical concrete pipe has an inner diameter of 26 cm and an outer diameter of 30 cm.



Calculate the length of the pipe, if the volume of the concrete is 20 600 cm^3. (4)

11.2 The inside of a pool is in the shape of a rectangular prism. The pool is 30 m long, 15 m wide and 6 m deep.



Volume of a prism $= l \times b \times h$
Surface area of a prism $= 2(l \times b) + 2(l \times h) + 2(b \times h)$

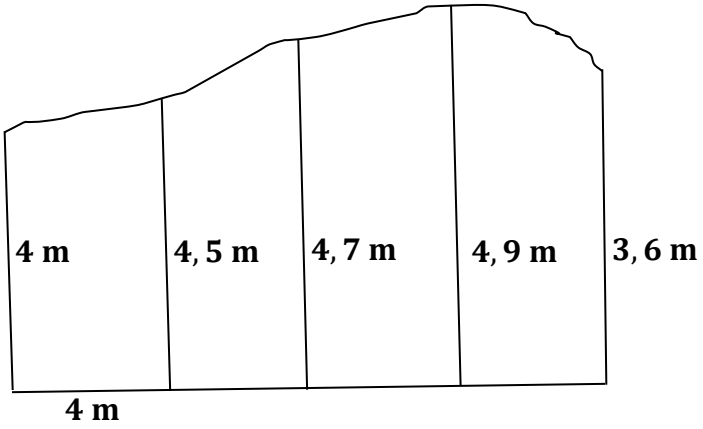
11.2.1 Calculate the volume of the water that is needed to fill the pool. (3)

11.2.2 Calculate the cost of the paint that will be needed to paint the inside of the pool if the paint cost R45 per square meter. (4)

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11.3 The irregular shape below has one straight side divided into 4 equal parts, that is 4 m apart. The ordinates dividing the parts are: 4 m; 4,5 m; 4,7 m; 4,9 m; 3,6 m.



Calculate the area with the mid-ordinate rule. (3)
[14]

TOTAL: 150

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INFORMATION SHEET: TECHNICAL MATHEMATICS

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

$$a^x = b \Leftrightarrow x = \log_a b, \quad a > 0,\ a \neq 1 \text{ and } b > 0$$

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

$$i_{eff} = \left(1 + \frac{i}{m}\right)^m - 1$$

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

$$\int x^n dx = \frac{x^{n+1}}{n+1} + C \quad , \quad n \neq -1 \qquad \int kx^n dx = k \cdot \frac{x^{n+1}}{n+1} + C \quad , \quad n \neq -1$$

$$\int \frac{1}{x} dx = \ln(x) + C, \quad x > 0 \qquad \int \frac{k}{x} dx = k \cdot \ln(x) + C, \quad x > 0$$

$$\int a^x dx = \frac{a^x}{\ln a} + C \quad , \quad a > 0 \qquad \int ka^{nx} dx = k \cdot \frac{a^{nx}}{n \ln a} + C \quad , \quad a > 0$$

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

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

$$x.x_1 + y.y_1 = r^2$$

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$

In ΔABC:

$$\frac{a}{\sin \text{A}} = \frac{b}{\sin \text{B}} = \frac{c}{\sin \text{C}} \qquad a^2 = b^2 + c^2 - 2bc\cos \text{A} \qquad \text{Area} = \frac{1}{2}ab.\sin \text{C}$$

$$\sin^2\theta + \cos^2\theta = 1 \qquad \tan^2\theta + 1 = \sec^2\theta \qquad 1 + \cot^2\theta = \text{cosec}^2\theta$$

$$\pi rad = 180°$$

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Angular velocity = $\omega = 2\pi n$ where n = rotation frequency

Circumferential velocity = $v = \pi Dn$ where D = diameter and n = rotation frequency

Circumferential velocity = $v = \omega r$ where ω = Angular velocity and r = radius

Arc length $s = r\theta$ where r = radius and θ = central angle in radians

$$\text{Area of a sector} = \frac{rs}{2}$$ where r = radius and s = arc length

$$\text{Area of a sector} = \frac{r^2\theta}{2}$$ where r = radius and θ = central angle in radians

$4h^2 - 4dh + x^2 = 0$ where h = height of segment, d = diameter of the circle and x = length of chord

$A_T = a(m_1 + m_2 + m_3 + \ldots + m_{n-1})$ where a = width of equal parts, $m_1 = \frac{o_1 + o_2}{2}$ and n = number of ordinates

OR

$$A_T = a\left(\frac{o_1 + o_n}{2} + o_2 + o_3 + o_4 + \ldots + o_{n-1}\right)$$ where a = width of equal parts, $o_i = i^{th}$ ordinate and n = number of ordinates

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