Province of the
EASTERN CAPE
EDUCATION

Iphondo leMpuma Kapa: Isebe leMfundo
Provinsie van die Oos Kaap: Department van Onderwys
Porafensie Ya Kapa Botjahabela: Lefapha la Thuto

NATIONAL SENIOR CERTIFICATE

GRADE 11

NOVEMBER 2025

TECHNICAL MATHEMATICS P2

MARKS: **150**

TIME: **3 hours**

This question paper consists of 12 pages, including a 2-page formula sheet and an answer book of 23 pages.

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INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

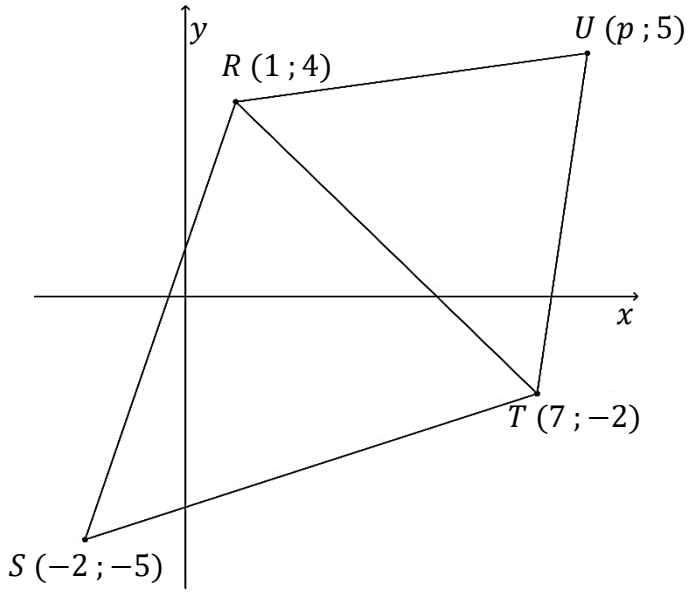
1. This question paper consists of TEN questions.
2. Answer ALL the questions in the SPECIAL ANSWER BOOK provided.
3. Clearly show ALL calculations, diagrams, graphs, et cetera which you have used in determining the answers.
4. Answers only will NOT necessarily be awarded full marks.
5. You may use an 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 S$(-2\,;\,-5)$, R$(1\,;\,4)$, U$(p\,;\,5)$ and T$(7\,;\,-2)$ are points on a Cartesian plane. The line RT is drawn to join R and T.



1.1 Determine the gradient of RT. (2)

1.2 Calculate the coordinates of Q, the midpoint of RT. (2)

1.3 Determine the length of RT. Leave the answer in the simplest surd form. (3)

1.4 Show that RT⊥SQ. (3)

1.5 Determine the equation of the line passing through S and which is parallel to RT. (4)

1.6 It is given that U is a point, such that the distance of SU $= 10\sqrt{2}$.
Calculate the value of p. (5)

1.7 Determine whether the line SQ divides ΔSRT in two equal parts. Justify your conclusion with calculations. (6)

[25]

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QUESTION 2

Given: $A = 22{,}31°$ and $B = 207{,}21°$

2.1 Determine the following:

2.1.1 $\sin(B - A)$ (2)

2.1.2 $\dfrac{13}{\cot^2(2A + B)}$ (3)

2.2 If $13\sin\theta - 5 = 0$ and $\tan\theta < 0$. With the aid of a diagram and without using a calculator, determine:

2.2.1 $\cos\theta$ (4)

2.2.2 $\tan\theta$ (1)

2.2.3 $\text{cosec}^2\theta + \sec^2\theta$ (3)

2.3 Solve for β if it is given that $5\cot\beta + 7 = 13$ for $\beta \in [0°; 360°]$. (5)

[18]

QUESTION 3

3.1 Simplify:

$$\frac{\cos(360° - x) \cdot \sin(180° + x) \cdot \tan(180° + x)}{\cos^2(180° + x) \cdot \cos\pi} \quad (7)$$

3.2 Prove the following identity:

$$\frac{\cos x - \cos x \cdot \sin x}{\sin x - 1 + \cos^2 x} = \cot x \quad (4)$$

[11]

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QUESTION 4

Given: $f(x) = \tan x$ and $g(x) = \sin(x + 30°)$ for $x \in [0°; 360°]$

4.1 Draw a neat sketch graph of the functions of f and g on the same set of axes, for $x \in [0°; 360°]$, in the SPECIAL ANSWER BOOK provided. Clearly show the intercepts with axes, turning points and end points. (7)

4.2 Write down the asymptotes of f. (2)

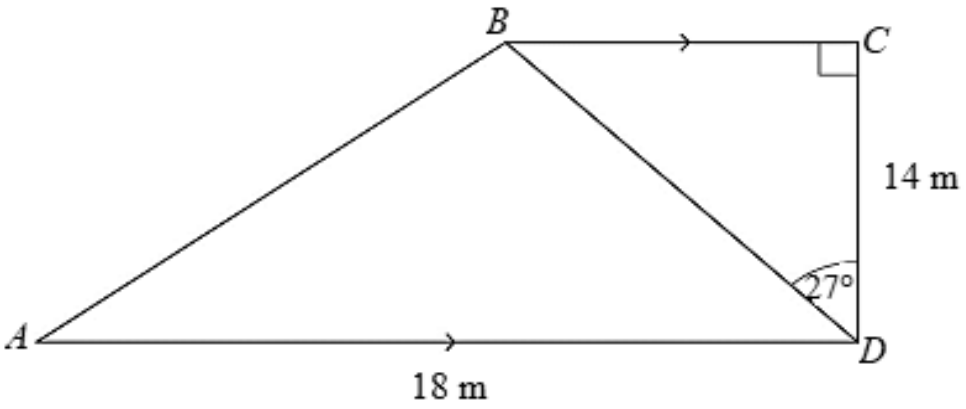
4.3 Write down the period of g. (1)

4.4 Use the graph to determine the values of x for which $f(x) \cdot g(x) > 0$. (3)

[13]

QUESTION 5

In the diagram below points A, B, C and D are vertices of a quadrilateral.
AD $= 18$ m, CD $= 14$ m and $\text{B}\widehat{\text{D}}C = 27°$. BC || AD



5.1 Determine the length of BD. (2)

5.2 Determine the length of AB. (5)

5.3 Calculate the area of ΔABP where P is an extension of BC, such that BP is a third of AD and $\text{A}\widehat{\text{B}}\text{D} = 65°$. (3)

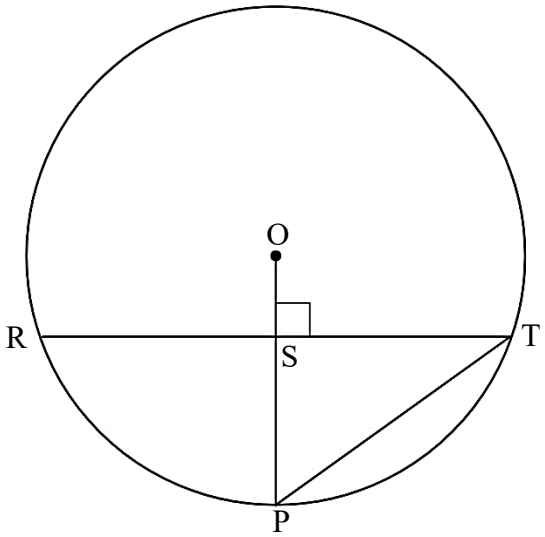
[10]

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QUESTION 6

In the diagram below, O is the centre of the circle with radius OP.
RT = 24 cm, OS = 5 cm and OP ⊥ RT.



6.1 Complete the following statement:

The line drawn from the (i) ... of a circle perpendicular to a chord (ii) ... the chord. (2)

6.2 Determine, stating reasons, the length of:

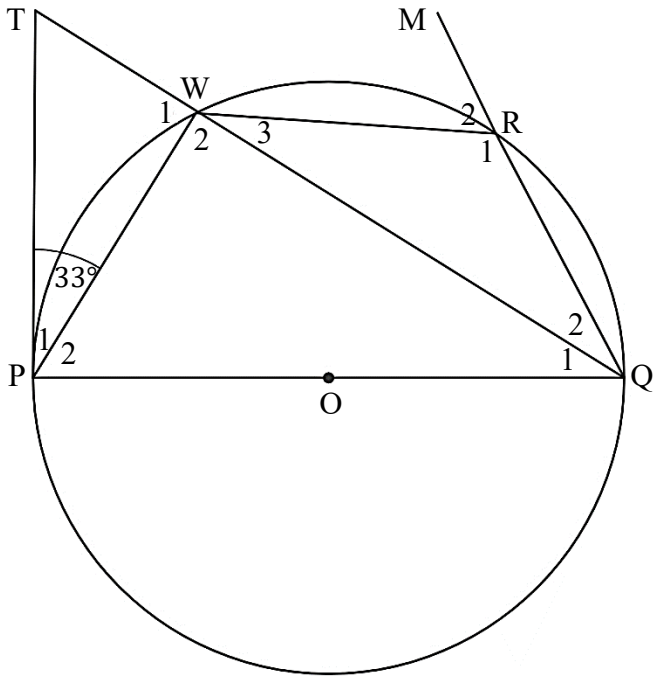
6.2.1 SP (4)

6.2.2 PT (3)
[9]

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QUESTION 7

In the diagram below O is the centre of the circle with P, Q, R and W points on the circumference of the circle. PT is a tangent to the circle at P. PQ is a diameter to the circle and QR extends to M. $\hat{P}_1 = 33°$.



7.1 Complete the following statement:

The (i) ... angle of a cyclic quadrilateral is equal to the (ii) ... opposite angle. (2)

7.2 State the reason why PT is a tangent to the circle. (1)

7.3 Calculate, stating reasons, the sizes of the following angles:

7.3.1 $\hat{Q}_1$ (2)

7.3.2 $\hat{R}_2$ (2)

7.3.3 $\hat{T}$ (2)

7.3.4 $\hat{Q}_2$ if RW = RQ (3)

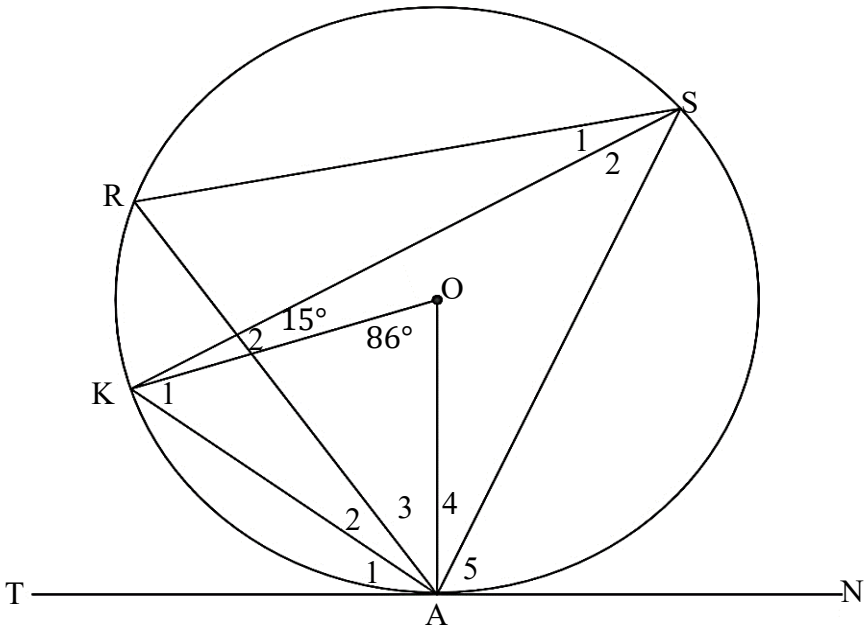
7.4 Show that $\Delta TQP \;|||\; \Delta PQW$ (4)

[16]

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QUESTION 8

In the diagram below O is the centre of the circle AKRS. Tangent TAN touches the circle at point A. $\widehat{O} = 86°$ and $\widehat{K}_2 = 15°$



Calculate, stating reasons, the sizes of the following angles:

8.1 $\widehat{A}_1$ (4)

8.2 $\widehat{K}_1$ (2)

8.3 $\widehat{R}$ (3)

8.4 $\widehat{A}_4$ (3)

8.5 Given: M is the midpoint of RA and is the point intersection of RA and KO.
Calculate, stating reasons, the size of $\widehat{A}_3$ (3)
[15]

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QUESTION 9

9.1 The picture below shows a unicycle with a radius of the wheel of 27 cm. It rotates at 30 revolutions per minute.



9.1.1 How many revolutions are done by the unicycle in a second? (1)

9.1.2 Determine the angular velocity of the unicycle. (3)

9.1.3 Determine the peripheral velocity of the rotating unicycle in metres per second. (4)

9.2 A circular garden has a diameter of 28 m. A sector of the garden with an angle of 135° at the centre is specially designed for specific vegetables.

9.2.1 Calculate the arc length of the sector. (3)

9.2.2 Calculate the area of the sector. (4)

9.3 A chord with a length of 200 mm divides the circle with radius of 30 cm into segments. Calculate the height of the minor sector in centimetres. (6)

[21]

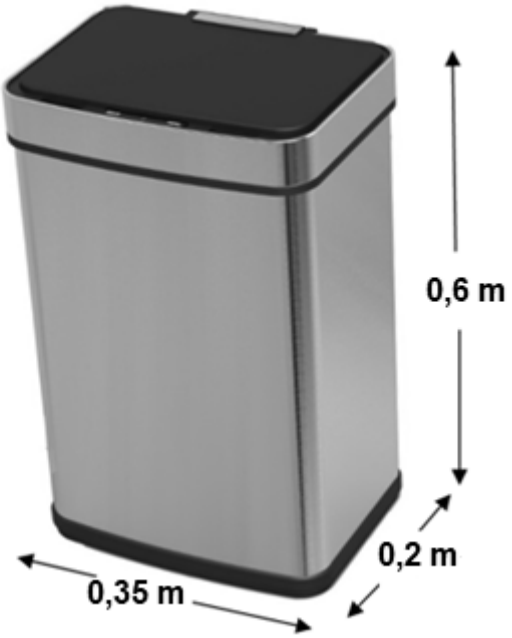
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QUESTION 10

10.1 An irregular plot has to be planted with maize. The plot has one flat side with a length of 320 m. The flat side is divided into eight equal strips. The length of the strips is 140 m, 147 m, 150 m, 138 m, 166 m, 170 m, 160 m and 155 m.
Use the mid-ordinate rule to calculate the area of the plot. (5)

10.2 As part of the practical task, you have been asked to make a rectangular rubbish bin with a height of 0,6 m, length of 0,35 m and of width 0,2 m. The image below gives the illustration.



Volume of a rectangular prism $= \boldsymbol{lbh}$
Surface Area of a rectangle $= \boldsymbol{2(lb + lh + bh)}$

10.2.1 Calculate the volume of the rubbish bin in litres. (3)

10.2.2 Determine how much material will be required to make 15 rubbish bins, if the material costs R150,80 per square metre. (4)
[12]

TOTAL: 150

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INFORMATION SHEET

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

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

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

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

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

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

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

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

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

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

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

In ΔABC:

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

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

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$\pi rad = 180°$

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

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

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

$A_T = a\left(m_1 + m_2 + m_3 + \ldots + m_{n-1}\right)$ 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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