GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

JUNE EXAMINATION
GRADE 12
2026

TECHNICAL MATHEMATICS

(PAPER 2)

ANSWER ALL THE QUESTIONS IN THE QUESTION PAPER.

SURNAME:										
NAME:										
SCHOOL:										
DATE:	**2**	**0**	**2**	**6**	**-**	**M**	**M**	**-**	**D**	**D**

	MARKER				MODERATOR			
QUESTION	**MARKS**			**MARKER'S INITIALS**	**MARKS**			**MODERATOR'S INITIALS**
1	**0**				**0**			
2	**0**				**0**			
3	**0**				**0**			
4	**0**				**0**			
5	**0**				**0**			
6	**0**				**0**			
7	**0**				**0**			
8	**0**				**0**			
9	**0**				**0**			
10	**0**				**0**			
11	**0**				**0**			
				TOTAL				

TIME: **3 hours**
MARKS: **150**
29 pages + a 2-page information sheet

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 spaces provided.
3. Clearly show ALL calculations, diagrams, graphs, etc. that you have used in determining your answers.
4. Answers only will NOT necessarily be awarded full marks.
5. If necessary, round-off answers to TWO decimal places, unless stated otherwise.
6. Diagrams are NOT necessarily drawn to scale.
7. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
8. A 2-page INFORMATION SHEET with formulae is included at the end of the question paper.
9. Candidates may NOT retain a question paper or remove it from the examination room. Question papers must be returned to the invigilator at the end of the examination session.
10. Answers must be written in blue/black ink as distinctly as possible. Do NOT write in the margins.
11. Indicate the questions you have answered by drawing a circle around the relevant numbers on the front cover of the question paper where marks are to be recorded.
12. Draw a neat line through any work/rough work that must NOT be marked.
13. If you use the additional space provided:

    13.1 Write down the number of the question.
    13.2 Leave a line and rule off after your answer.

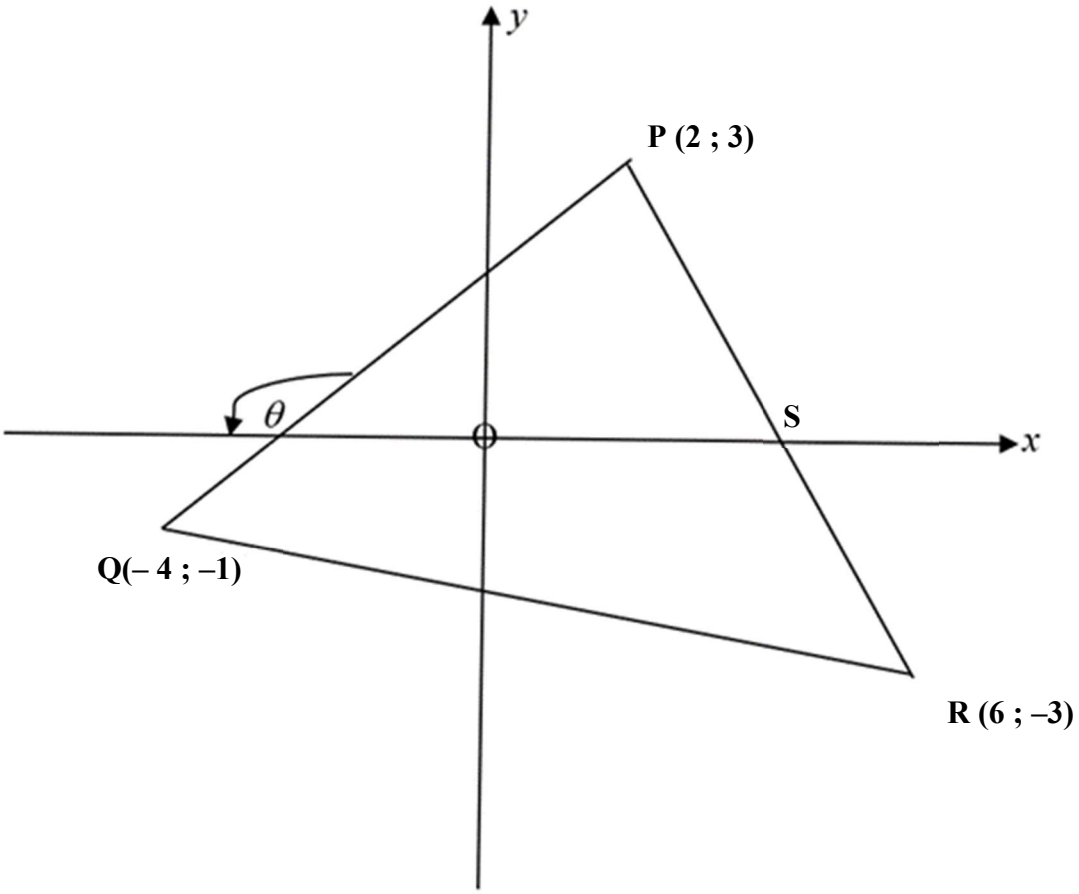
14. Write neatly and legibly.

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QUESTION 1

In a diagram below, ΔPQR with vertices P(2 ; 3), Q(− 4 ; −1) and R(6 ; −3) is given.

S is the midpoint of PR.

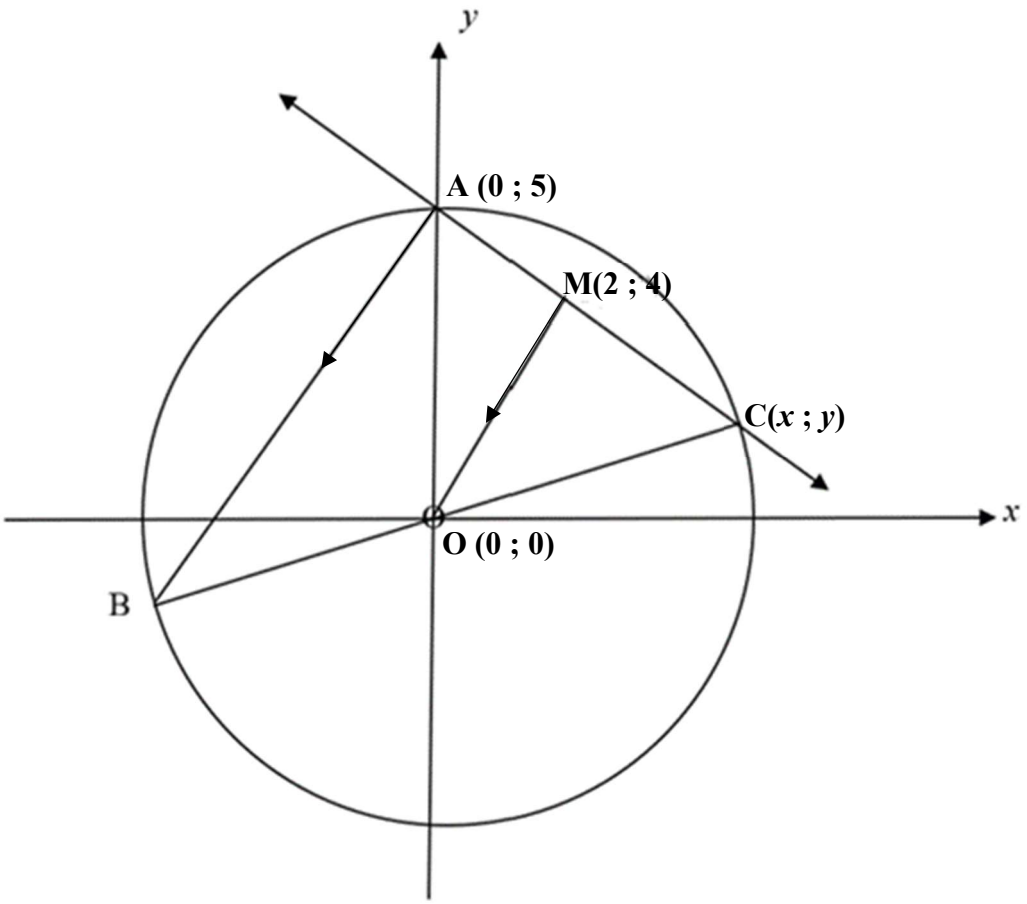


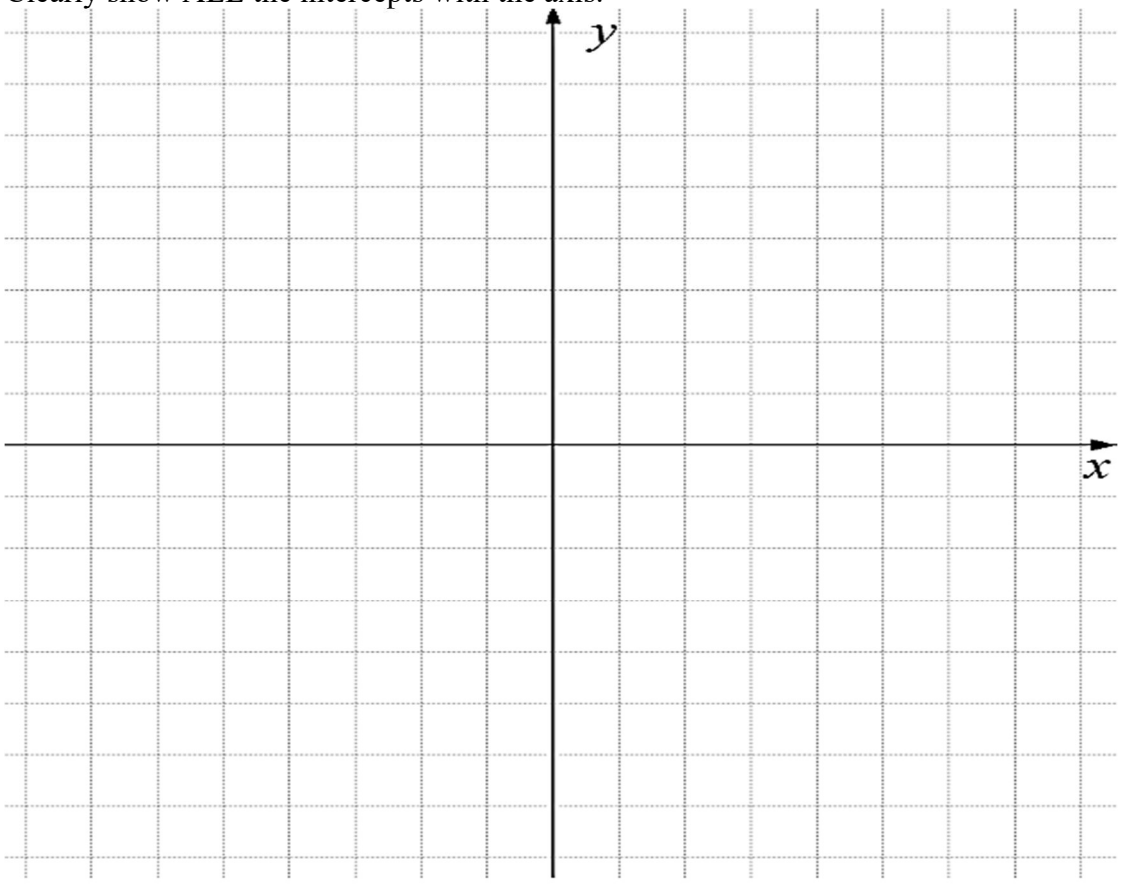
1.1	Determine the coordinates of S, the midpoint of PR.	(2)
1.2	Determine the gradient of PQ.	(2)

1.3	Hence, determine the size of θ.	(3)
1.4	Show that ΔPQR is right-angled at point P.	(3)
1.5	What can be deduced geometrically about QR in relation to a circle that is drawn through points P, Q and R?	(1)
1.6	Determine the length of the radius of a circle passing through points P, Q and R.	(3)

[14]

QUESTION 2

2.1	In the diagram below, the circle with the origin as centre O cuts the line AC at A $(0\ ;5)$ and C $(x\ ;y)$. M $(2\ ;4)$ is the midpoint of AC. BC is a diameter. OM $\|\|$ BA  	
2.1.1	Determine the equation of the circle.	(2)
2.1.2	Calculate the coordinates of C. (Show ALL calculations.)	(4)

2.1.3	Write down the size of $B\hat{A}C$.	(1)
2.1.4	Determine the equation of AB.	(3)
2.2	Draw the graph defined by: $\frac{x^2}{25}+\frac{y^2}{50}=1$ Clearly show ALL the intercepts with the axis. 	(3)

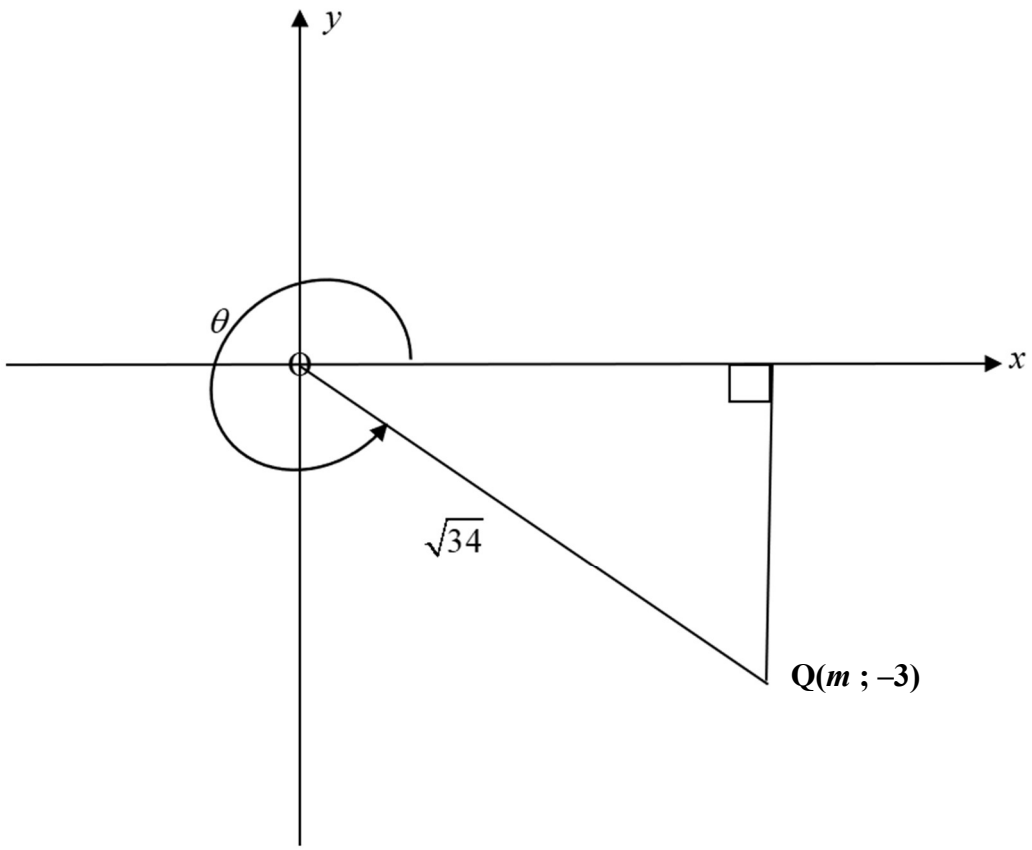
[13]

QUESTION 3

3.1	Given: $\hat{S}=\frac{4}{9}\pi$ and $\hat{T}=120°$	
3.1.1	Convert $\hat{S}=\frac{4}{9}\pi$ to degrees.	(1)
3.1.2	Determine the value of: $\cot 2\hat{T}+\sqrt{\sin\hat{S}}$	(3)

3.2 In the diagram below, $OQ=\sqrt{34}$ and $Q(m;-3)$ is a point on the Cartesian plane.

θ is a reflex angle.



3.2.1	Determine the numerical value of $\cos\theta$, **without using a calculator**.	(3)
3.2.2	Determine, **without calculating the value of θ**, the numerical value (in simplest form) of: $\cot^2\theta - 1$	(2)
3.3	Determine the value(s) of x if $2\sin(x+30^\circ) = 1,5$ and $x \in [0°; 360°]$.	(5)

[14]

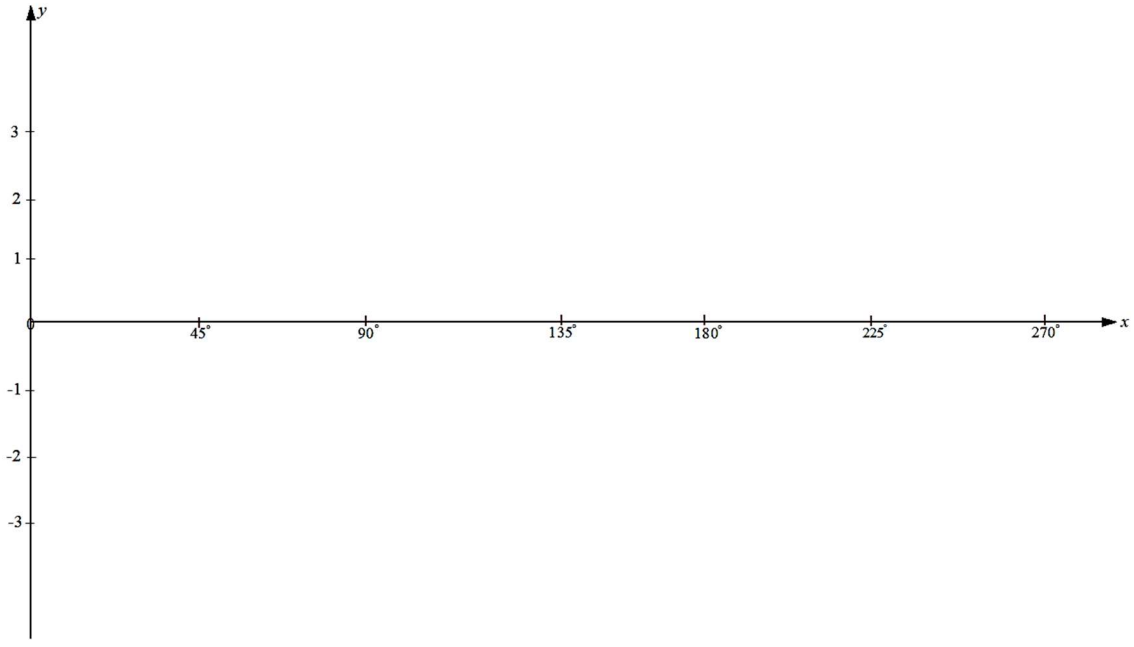
QUESTION 4

4.1	Simplify the following:	
4.1.1	$\sin\left(2\pi - x\right)$	(1)
4.1.2	$\cot\left(\pi - x\right)$	(1)
4.1.3	$\dfrac{\sin\left(2\pi - x\right)\cdot\text{cosec } x\cdot\cos\left(180^\circ - x\right)}{\tan\left(180^\circ - x\right)\cdot\cot\left(\pi - x\right)\cdot\cos x}$	(5)
4.2	Complete the identity: $\sec^2\beta - 1 = \ldots$	(1)

4.3	Prove the identity that: $\frac{\sin^2\beta}{1-\sin^2\beta} = \sec^2\beta - 1$	(3)

[11]

QUESTION 5

Given: $h(x) = \tan x$ and $g(x) = \cos x + 1$ for $x \in [0^\circ ; 270^\circ]$		
5.1	Write down:	
5.1.1	The amplitude of h	(1)
5.1.2	The period of g	(1)
5.2	If $f(x)$ is the graph of g translated one unit down, write down the equation of f.	(1)
5.3	Draw a sketch graph of h and g on the same set of axes on the graph provided below. Clearly show ALL the turning points, end points and intercepts with the axes. 	(7)
5.4	Use your graph in QUESTION 5.3 to write down the value(s) of x for which $g(x) \geq h(x)$, where $x \in [90^\circ ; 270^\circ]$.	(2)

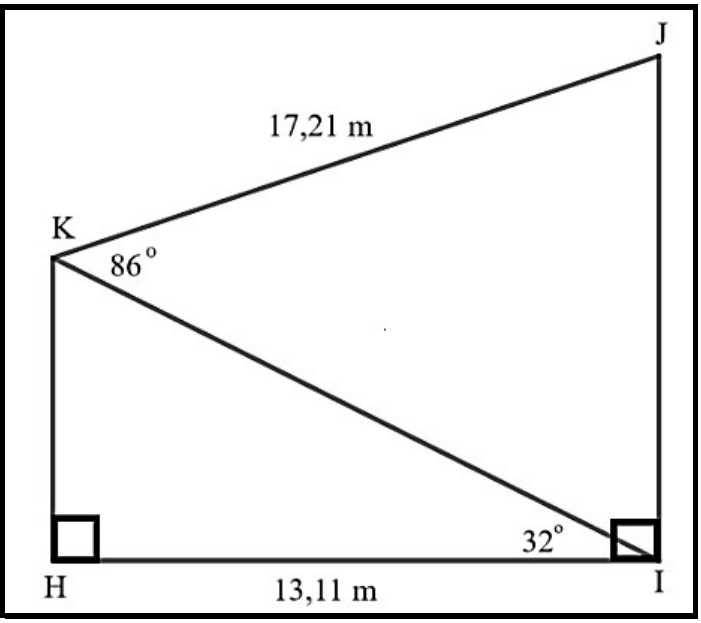
[12]

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QUESTION 6

The picture and diagram below show the water tower that was caught on camera as it falls. JI is the original height of the tower.





HI = 13,11 m and KJ = 17,21 m
$H\hat{I}K = 32°$ and $I\hat{K}J = 86°$

6.1	Complete the following ratio: $\cos 32° = \frac{\ldots}{\ldots}$	(1)
6.2	Hence, determine the length of KI.	(2)
6.3	Complete the following: $k^2 = i^2 + j^2 - 2 \ldots$	(1)

6.4	Determine JI, the original height of the water tower.	(2)
6.5	Calculate the area of HIJK.	(5)

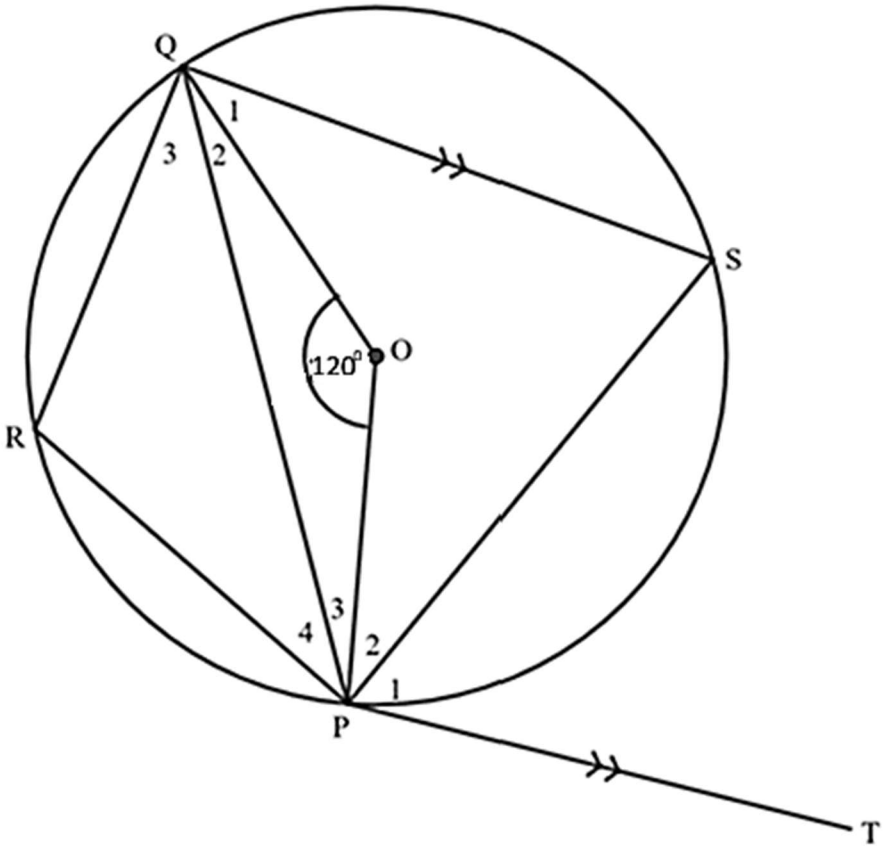
[11]

Give reasons for your statements in QUESTIONS 7, 8 and 9.

QUESTION 7

In the diagram below, O is the centre of the circle. Radii OQ and OP are drawn.

PT is a tangent at P. QS || PT. QRPS is a cyclic quadrilateral. $Q\hat{O}P = 120^{\circ}$.



7.1	Give, with reasons, THREE other angles, each equal to 60°.	
		(6)

7.2	Determine, with reasons, the size of $\hat{R}$.	
		(2)
7.3	Determine, with reasons, the size of $\hat{P}_3$.	
		(2)

[10]

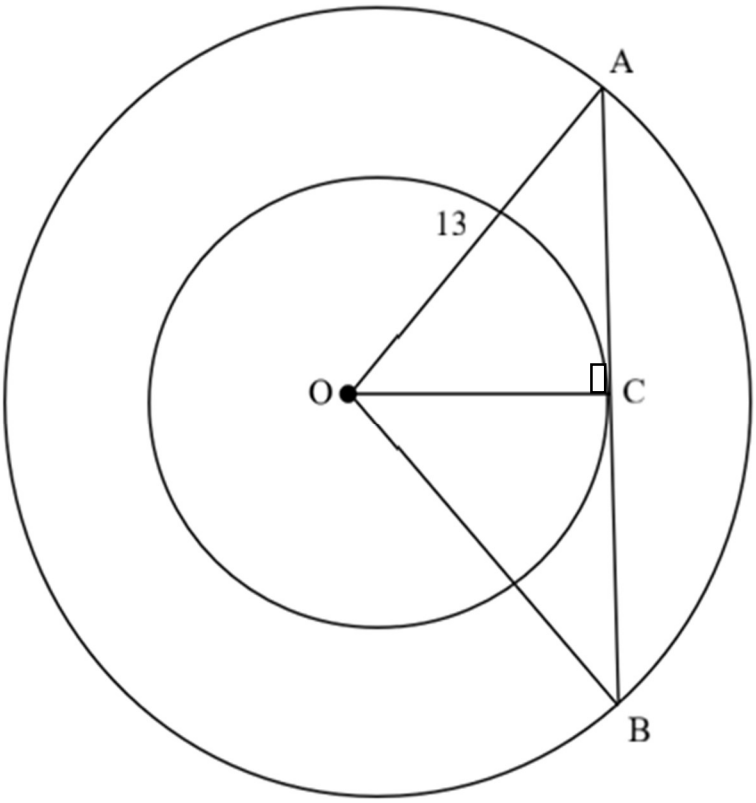
QUESTION 8

8.1 In the diagram below, O is the centre of both the smaller circle and the larger circle.

Chord AB is a tangent to the smaller circle.

AB = 24 units

OA = 13 units

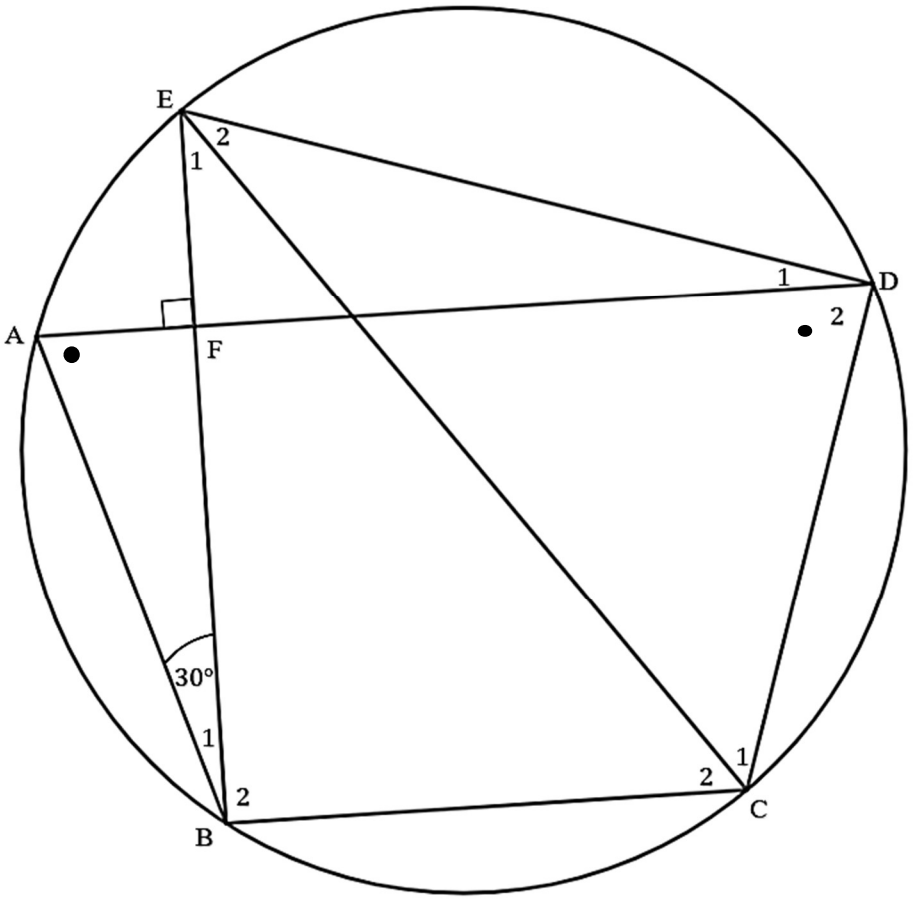


8.1.1		
(a)	Determine the length of AC.	
		(2)
(b)	Determine the length of OC.	
		(2)

8.1.2	Use the diagram in QUESTION 8.1 and complete the table below, so that the statements and/or reasons are TRUE.		
	STATEMENT	**REASON**	
	$O\hat{C}B =$ _____	tan ⊥ radius	(1)
	OC = _____	Common side	(1)
	OB = OA	_____	(1)
	_____ ≡ _____	90°, Hypotenuse, Side	(1)

8.2 In the given diagram below, A, B, C, D and E are vectors of the circle.

$\hat{B}_1 = 30°$, $\hat{A} = \hat{D}_2$ and EFB $\perp$ AD.



8.2.1	Determine, with reasons, the sizes of the following angles.	
(a)	$\hat{D}_1$	
		(2)
(b)	$\hat{A}$	
		(1)

8.2.2	Show that AD || BC.	(4)
8.2.3	Show that CE is the diameter of the circle.	(2)

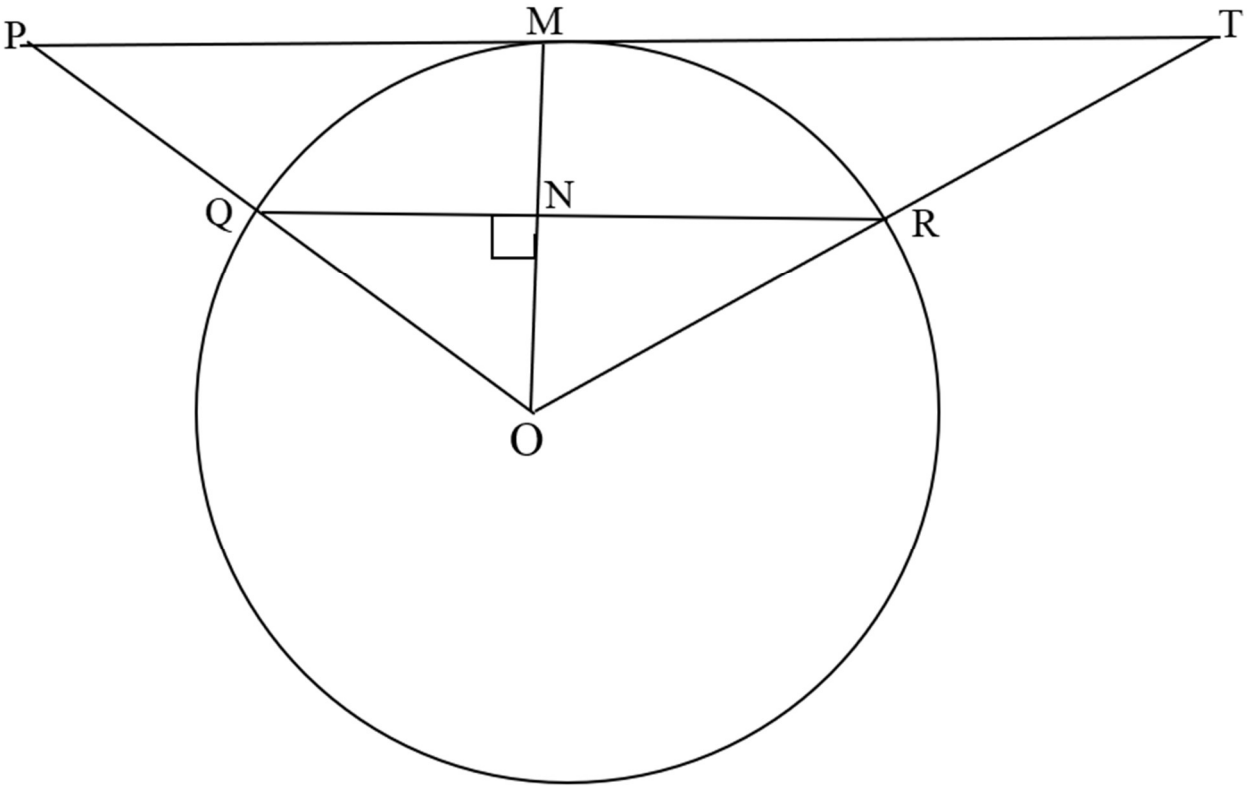
[17]

QUESTION 9

9.1	Complete the following theorem statement. A line drawn parallel to one side of a triangle divides the other two sides … 	(1)

9.2 The diagram below shows circle QMR with centre O having a radius of 12 units.

- OQ and OR are produced to P and T respectively.
- PT is a tangent to the circle at M
- OM and QR intersect at N such that OM ⊥ QR.
- OR : OT = 6 : 10



9.2.1	Show, with reasons, that QR || PT.	(3)

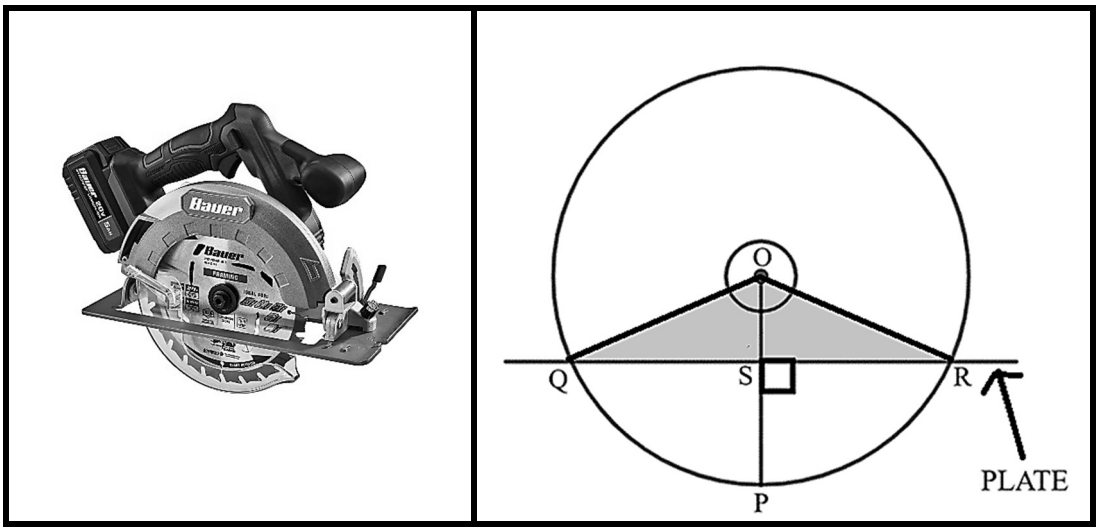
9.2.2	Determine the ratio of PT : QR (in simplest form).	(2)
9.2.3	Determine the length of MN.	(3)
9.2.4	Determine the value of $\frac{\text{Area } \triangle OTM}{\text{Area } \triangle ORN}$ if NR = 9,6 units and MT = 16 units.	(3)

[12]

QUESTION 10

10.1 The picture below shows a circular cutting machine. The cutting disc rotates at 3 500 revolutions per minute, and it has a radius of 20 cm.

The diagram alongside the picture depicts the plate and the cutting disc of the circular cutting machine. The length of the plate is 60 cm and QR = 25 cm.



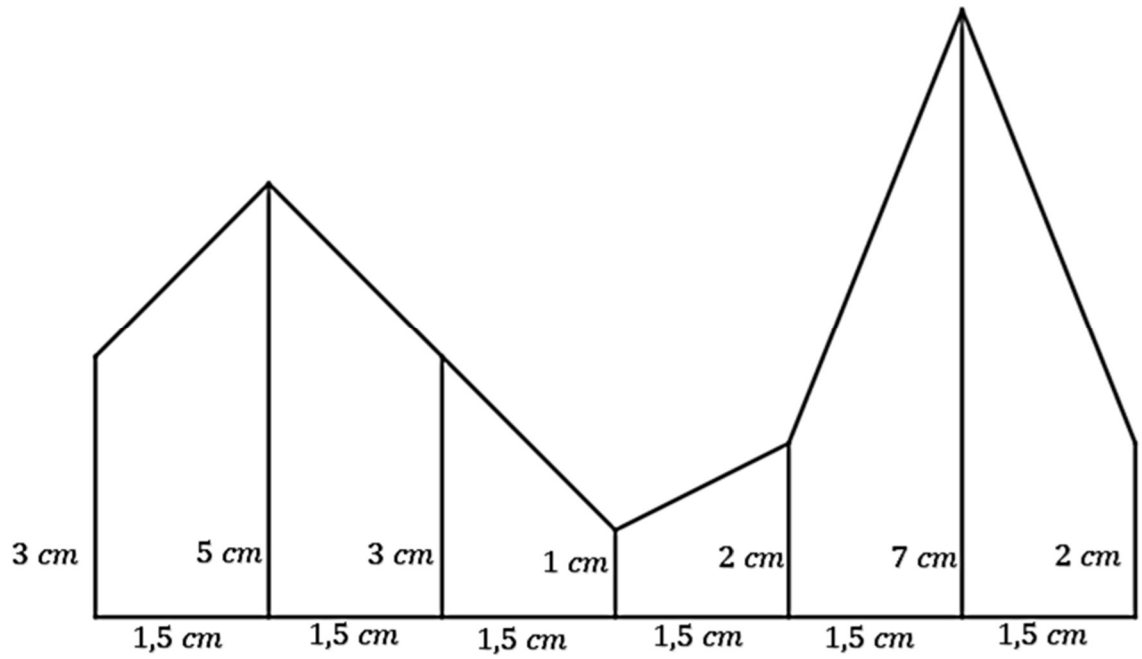
10.1.1	Write down the diameter of the cutting disc.	(1)
10.1.2	Determine the length of SP (the height of the segment).	(4)
10.1.3	Convert 3 500 rev/min to rev/sec.	(1)
10.1.4	Hence, determine the angular velocity.	(3)

10.1.5	Write down the diameter in metres.	(1)
10.1.6	Determine the circumferential velocity, in metres per second.	(3)
10.2	Use the diagram in QUESTION 10.1. It is given that the area of a shaded part is $153,21\ cm^2$.	
10.2.1	Determine the size of $Q\hat{O}R$, which is an obtuse angle. Leave your answer to the nearest degree.	(4)
10.2.2	Determine the arc length of QR.	(3)

[20]

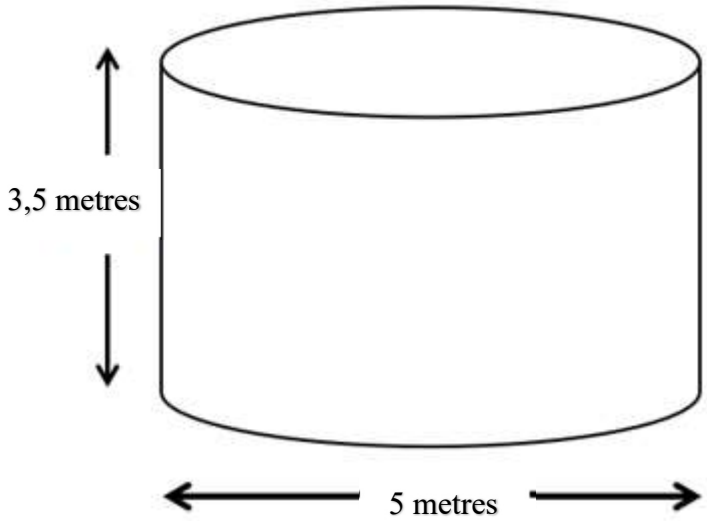
QUESTION 11

11.1



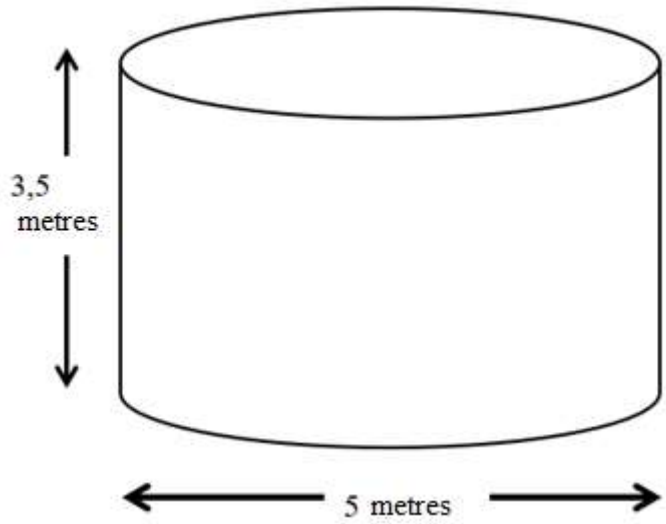
Determine the area of the irregular figure.

(4)

11.2	Clean Cut Construction must build a swimming pool. The designer wants a cylindrical pool. The swimming pool has an internal diameter of 5 metres and a depth of 3,5 metres.  Surface area of a cylinder $= 2\pi r^2 + 2\pi rh$ Volume of a cylinder $= \pi r^2 \times h$ Capacity $1\ m^3 = 1\ 000\ l$	
11.2.1	Determine the radius of the swimming pool.	(1)
11.2.2	Determine the surface area of the inside of the swimming pool.	(3)

11.2.3	The inside area of the swimming pool must be painted with two coats of paint before completion. Determine the amount of paint required if the paint covers 2,3 m^2 per litre.	(3)
11.2.4	When the swimming pool is complete, it must be filled with water. Determine the amount of water (in litres) required if the pool is filled to 14 cm below the top.	(5)

[16]



	ADDITIONAL SPACE	

TOTAL: 150

INFORMATION SHEET: TECHNICAL MATHEMATICS

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

$a^x = b \Leftrightarrow x = log_a\, b, \qquad a > 0, a \neq 1$ and $b > 0$

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

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

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

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

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

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

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

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

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

In ΔABC: $\qquad \frac{a}{sinA} = \frac{b}{sinB} = \frac{c}{sinC} \qquad a^2 = b^2 + c^2 - 2bc.cosA$

Area of $\Delta ABC = \frac{1}{2}ab.sinC$

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

$\pi rad = 180°$

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

Angular velocity $= \omega = 360°n$ 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, 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 circle and x = length of chord

$A_T = a(m_1 + m_2 + m_3 + \cdots + m_n)$ where a = width of the equal parts, $m_1 = \frac{o_1+o_2}{2}$ $O_n = n^{th}$ ordinate and n = number of ordinates

OR

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

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JUNE EXAMINATION
GRADE 12
2026

TECHNICAL MATHEMATICS

(PAPER 2)

ANSWER ALL THE QUESTIONS IN THE QUESTION PAPER.

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