



education

Department:
Education
North West Provincial Government
REPUBLIC OF SOUTH AFRICA

PROVINCIAL ASSESSMENT

GRADE 11

MATHEMATICS P2

JUNE 2024

MARKS: 100

TIME: 2 hours

This question paper consists of 8 pages and 1 diagram sheet.

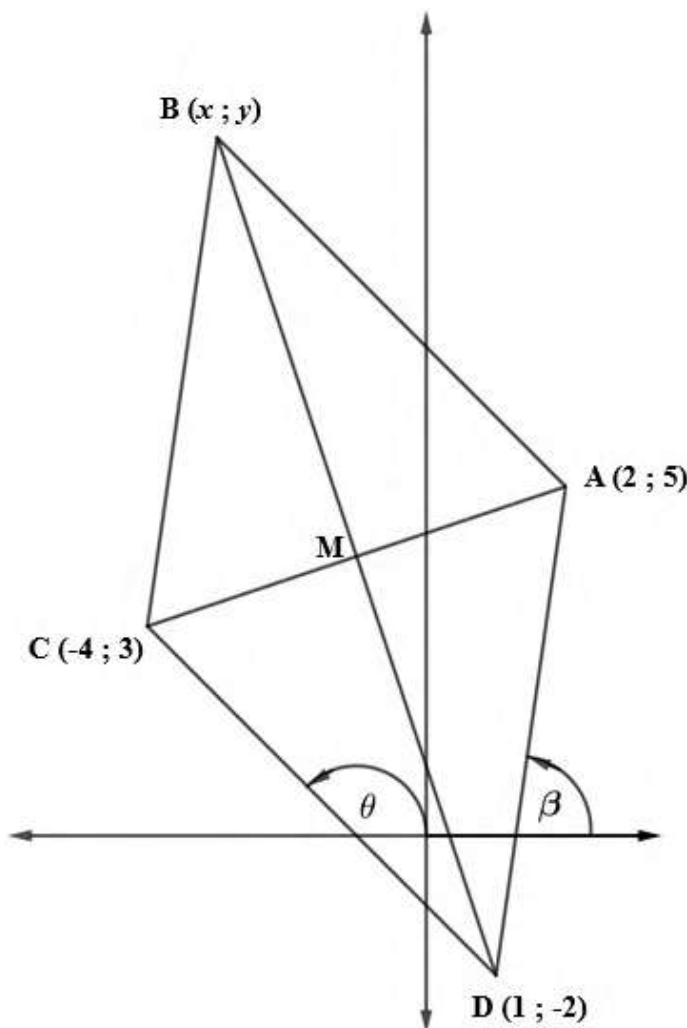
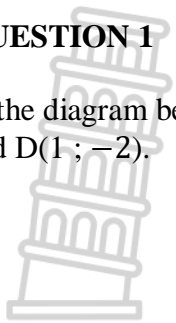
INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 5 questions.
2. Answer Question 3.2 and 4.1 on the DIAGRAMSHEET provided.
3. Clearly show ALL calculations, diagrams, graphs, etc. which you have used in determining your 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 answers correct to TWO decimal places, unless stated otherwise.
7. Diagrams are NOT necessarily drawn to scale.
8. Write neatly and legibly.

QUESTION 1

In the diagram below is ABCD a quadrilateral with vertices $A(2 ; 5)$, $B(x ; y)$; $C(-4 ; 3)$ and $D(1 ; -2)$.



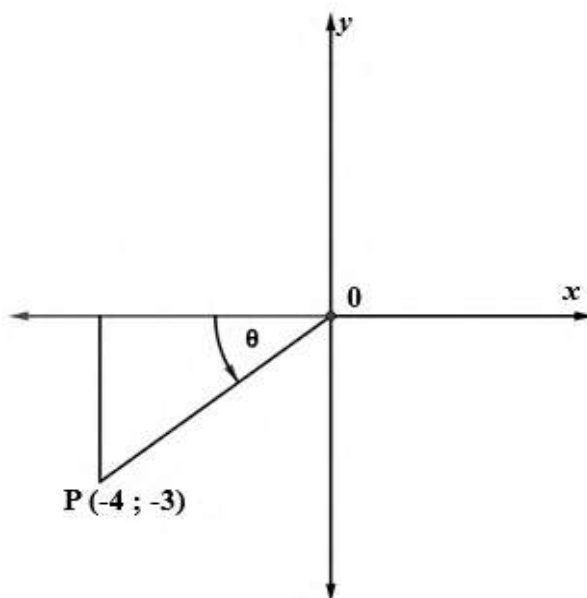
- 1.1 Calculate the length of AC. (Leave the answer in simplest surd form.) (2)
- 1.2 Determine the coordinates of M, the midpoint of AC. (2)
- 1.3 Show that BD is perpendicular to AC. (3)
- 1.4 Determine the equation of DC. (3)
- 1.5 Determine θ , the angle of inclination of DC. (3)
- 1.6 Calculate the size of \widehat{ADC} . (4)
- 1.7 Calculate the area of $\triangle ADC$. (4)
- 1.8 Calculate the coordinates of B, so that ABCD is a parallelogram. (3)
- 1.9 Determine the value of k if D, A and E $(4 ; k)$ are collinear. (3)

[27]

QUESTION 2

Answer this question **without using a calculator**.

- 2.1 In the figure below, OP is a radius with P (-4 ; -3) a point in the Cartesian plane.
 $\angle XOP = \theta$.



2.1.1 Calculate $\sin\theta$ (3)

2.1.2 If OP is produced to point Q ($k ; -5$), calculate the value of k . (2)

2.2 Simplify:

$$\frac{\sin(180^\circ + x) \cdot \cos(90^\circ - x)}{\tan(180^\circ - x) \cdot \cos(360^\circ - x) \cdot \sin(-x)} \quad (7)$$

2.3 Calculate the value of θ , if $0^\circ < \theta < 180^\circ$, **without using a calculator**:

$$\sin\theta = \sqrt{\frac{(9)^{\cos 300^\circ}}{\left(\frac{1}{4}\right)^{\sin 150^\circ} \cdot (8)^{\tan 225^\circ}} \quad (8)$$

2.4 If $\cos 20^\circ = p$, determine the following in terms of p :

2.4.1 $\cos(-20^\circ)$ (2)

2.4.2 $\tan 160^\circ$ (3)

2.5 Prove the identity:

$$\cos(90^\circ + x) \left[\frac{1}{\tan x} + \frac{\sin x}{\sin(90^\circ - x)} \right] = -\frac{1}{\cos x}$$

(6)
[31]

QUESTION 3

3.1 Determine the general solution of the following equation:

$$3\cos\theta - 2\sin^2\theta = 0$$

(6)

3.2 Use the given set of axes on the diagram sheet and draw the graph of $f(x) = 1 + 2\cos x$ for the interval $x \in [-180^\circ; 180^\circ]$.

Clearly indicate the intercepts with the axes as well as the coordinates of the turning points on the graph.

(3)

3.3 Hence, use your graph in question 3.2 and answer the following for $x \in [-180^\circ; 180^\circ]$

3.3.1 For which value(s) of x is $f(x) > 0$?

(2)

3.3.2 What is the period of $f\left(\frac{x}{2}\right) - 1$?

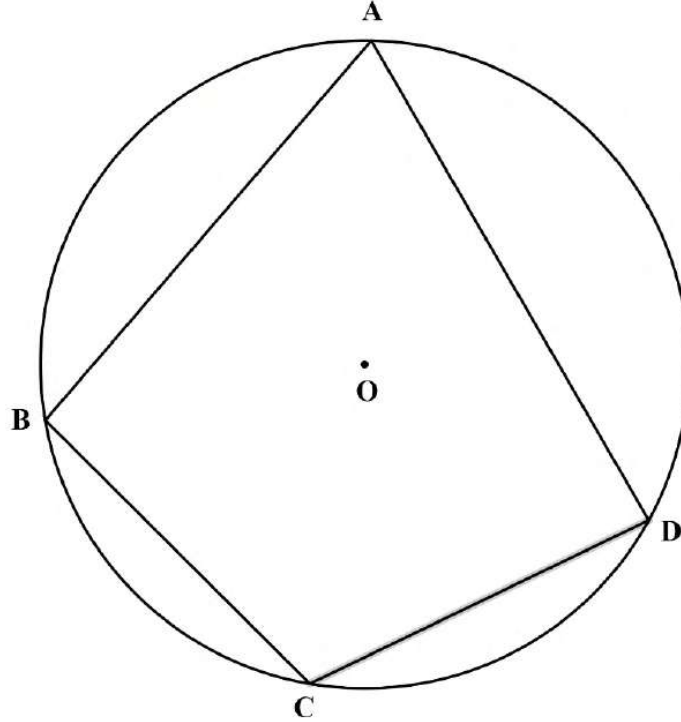
(2)

[13]

QUESTION 4

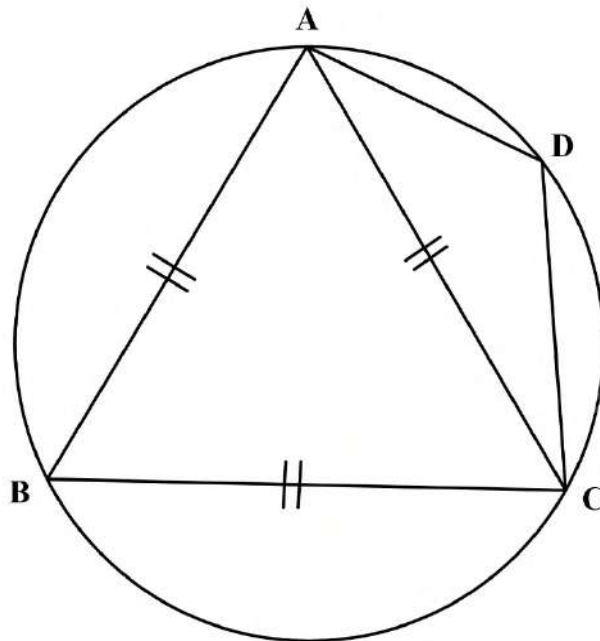
4.1 In the diagram below, O is the centre of the circle. ABCD is a cyclic quadrilateral.

Prove the theorem that states: $\widehat{BAD} + \widehat{BCD} = 180^\circ$. (5)



4.2 In the diagram below, $\triangle ABC$ is equilateral with A, B, C and D on the circumference of the circle.

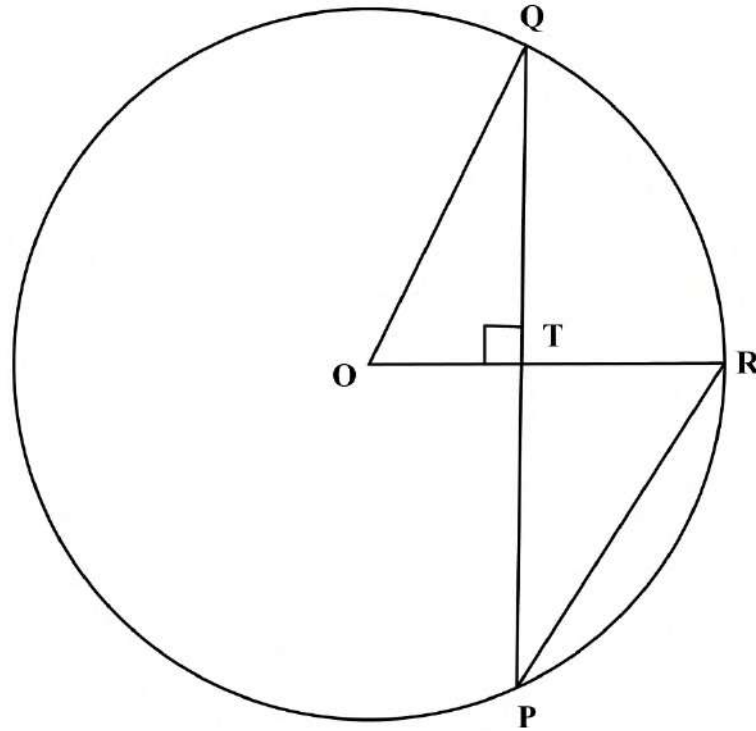
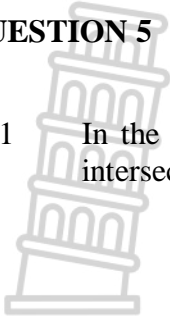
Calculate, with reasons the size of \widehat{D} . (3)



[8]

QUESTION 5

- 5.1 In the diagram below, PQ is the chord of circle O. OR is perpendicular to PQ and OR intersects PQ at T. The radius of the circle is 13 cm and $PT = 12$ cm.



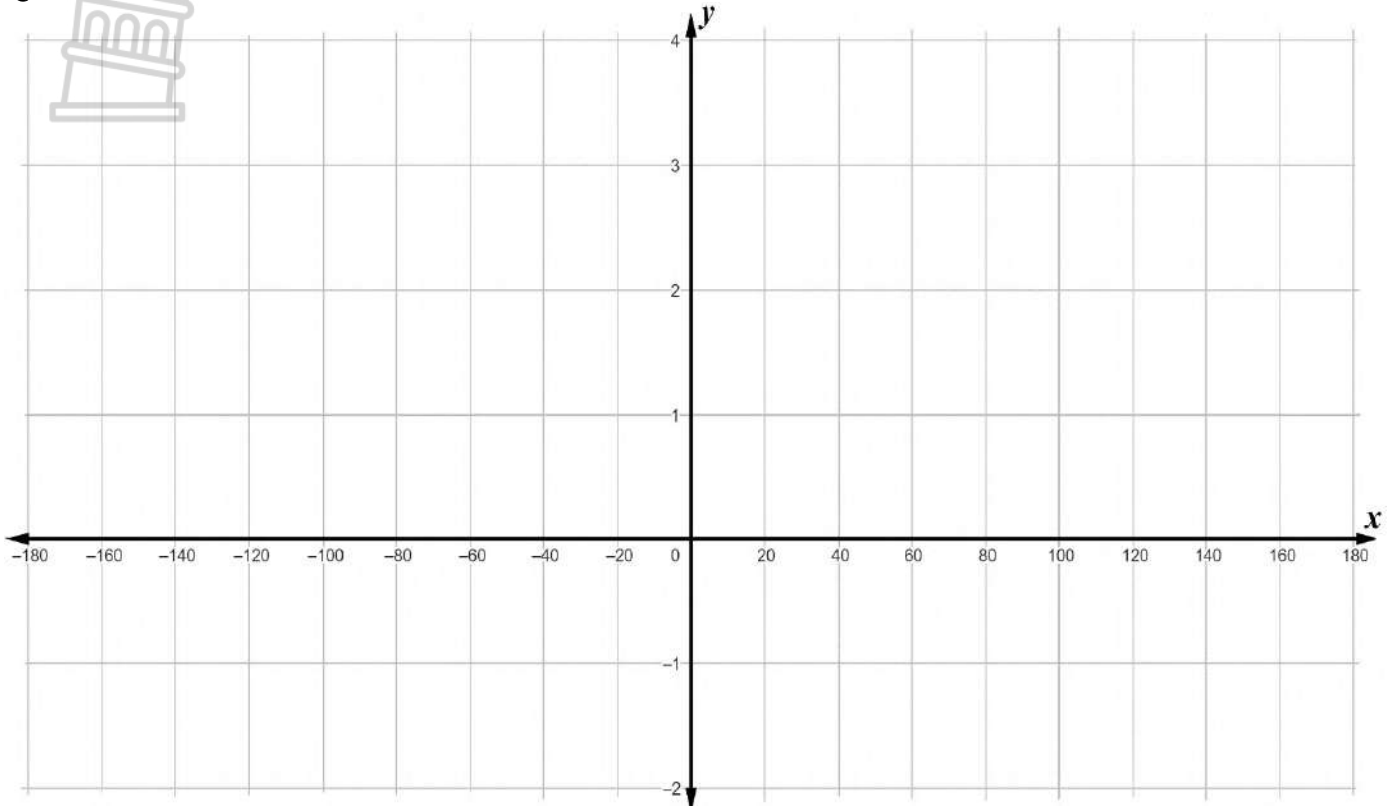
Calculate the length of:

- 5.1.1 PQ (2)
- 5.1.2 PR (4)

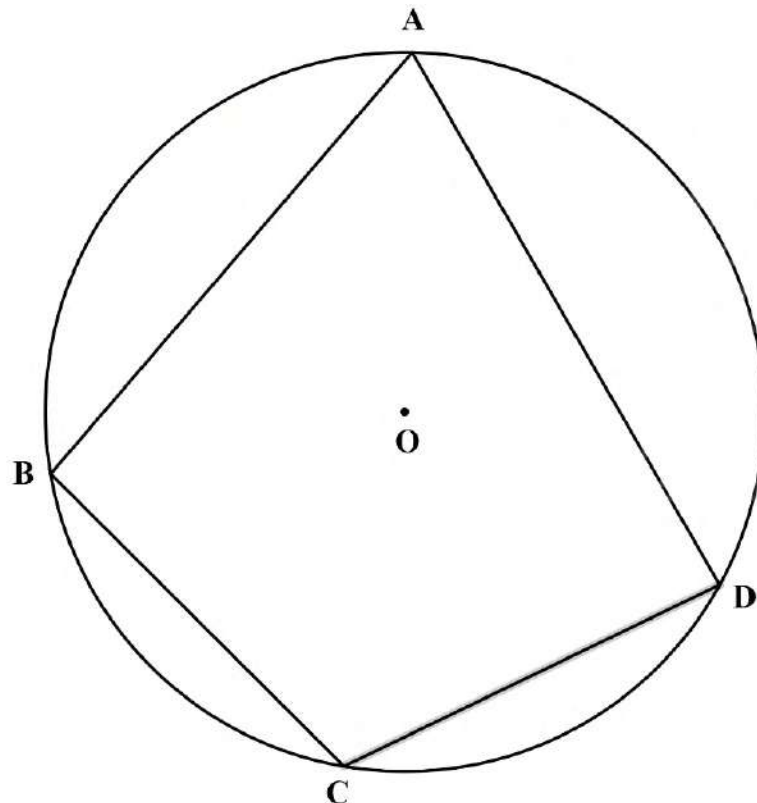
DIAGRAM SHEET

NAME: _____

QUESTION 3.2



QUESTION 4.1





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**PROVINCIAL ASSESSMENT/
PROVINSIALE ASSESSERING**

GRADE/GRAAD 11

MATHEMATICS P2/ WISKUNDE V2

JUNE/JUNIE 2024

MARKING GUIDELINES/NASIENRIGLYNE

MARKS/PUNTE: 100

**These marking guidelines consist of 12 pages./
Hierdie nasienriglyne bestaan uit 12 bladsye.**

NOTE:

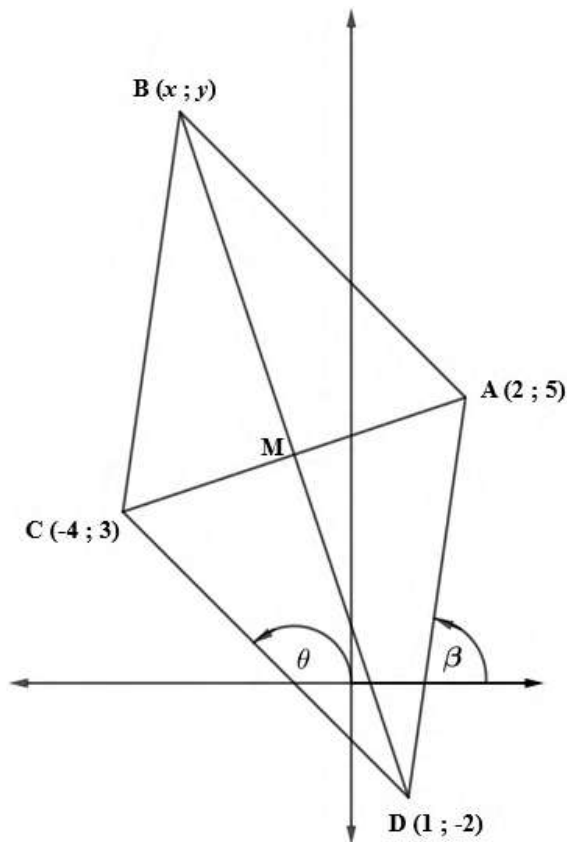
- If a candidate answers a question TWICE, only mark the FIRST attempt
- If a candidate has crossed out an attempt of a question and not redone the question, mark the crossed out version.
- Consistent accuracy applies in ALL aspects of marking memorandum. Stop marking at the second calculation error.
- Assuming answers/values in order to solve a problem is NOT acceptable.

NOTA:

- *As 'n kandidaat 'n vraag TWEE KEER beantwoord, sien slegs die EERSTE poging na.*
- *As 'n kandidaat 'n antwoord van 'n vraag doodtrek en nie oordoen nie, sien die doodgetrekte poging na.*
- *Volgehoue akkuraatheid word in ALLE aspekte van nasienriglyne toegepas. Hou op nasien by die tweede berekeningsfout.*
- *Om antwoorde/waardes aan te neem om 'n probleem op te los, word NIE toegelaat NIE.*

GEOMETRY / MEETKUNDE	
S	A mark for correct statement (A statement mark is independent of a reason)
	<i>'n Punt vir 'n korrekte bewering ('n Punt vir 'n bewering is onafhanklik van die rede)</i>
R	A mark for the correct reason. (A reason mark may only be awarded if the statement is correct)
	<i>'n Punt vir 'n korrekte rede ('n Punt word slegs vir die rede toegeken as die bewering korrek is)</i>
S/R	Award a mark if statement AND reason are both correct
	<i>Ken 'n punt toe as die bewering EN rede beide korrek is</i>

QUESTION/VRAAG 1

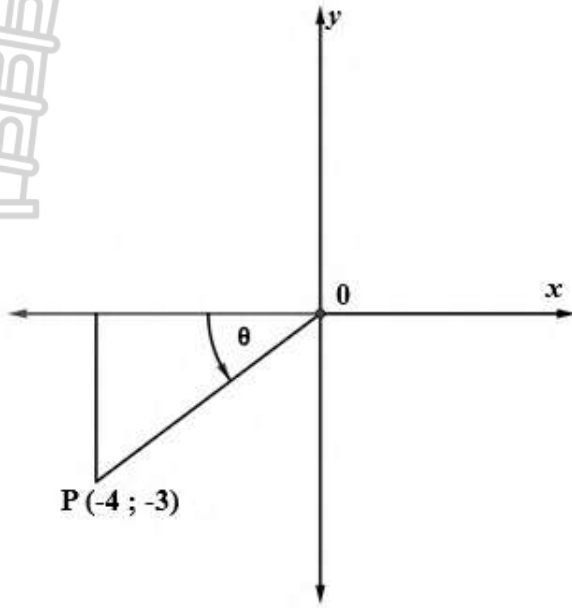


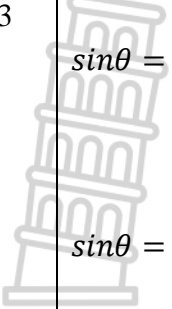
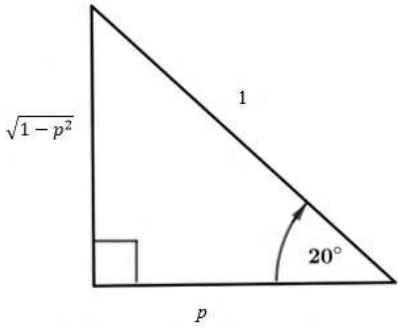
1.1	$d_{AC} = \sqrt{(2 - (-4))^2 + (5 - 3)^2}$ $d_{AC} = \sqrt{40}$ $d_{AC} = 2\sqrt{10}$	✓ correct substitution into distance formula/ korrekte vervanging in afstand formule ✓ $d_{AB} = \sqrt{40}$ or $2\sqrt{10}$ (2)
1.2	$M\left(\frac{-4 + 2}{2}; \frac{3 + 5}{2}\right)$ $M(-1; 4)$	✓ $x = -1$ ✓ $y = 4$ (2)
1.3	$m_{BD} = \frac{-2 - 4}{1 - (-1)}$ $= -3$ $m_{AC} = \frac{5 - 3}{2 - (-4)}$ $= \frac{1}{3}$ $m_{BD} \times m_{AC} = -3 \times \frac{1}{3} = -1$ $\therefore BD \perp AC$	✓ $m_{BD} = -3$ ✓ $m_{AC} = \frac{1}{3}$ ✓ $-3 \times \frac{1}{3} = -1$ (3)

<p>1.4</p>	$m_{DC} = \frac{3 - (-2)}{-4 - 1}$ $= -1$ $\therefore y = -x + c$ <p>Subst./ Vervang D (1 ; -2) into equation</p> $-2 = -(1) + c$ $c = -1$ $\therefore y = -x - 1$ <p style="text-align: center;">OR/OF</p> $y - (-2) = -1(x - 1)$ $y = -x - 1$	$\checkmark m_{DC} = -1$ $\checkmark \text{Subst./Vervang D (1 ; -2) or C (-4 ; 3) /}$ $\checkmark y = -x - 1$ <p style="text-align: center;">OR</p> $\checkmark m_{DC} = -1$ $\checkmark \text{Subst./Vervang D (1 ; -2) or C (-4 ; 3)}$ $\checkmark y = -x - 1 \quad (3)$
<p>1.5</p>	$\tan\theta = m_{DC}$ $\tan\theta = -1$ $\theta = 180^\circ - 45^\circ$ $\theta = 135^\circ$	$\checkmark \tan\theta = -1$ $\checkmark \theta = 180^\circ - 45^\circ$ $\checkmark \theta = 135^\circ \quad (3)$
<p>1.6</p>	$m_{AD} = \frac{5 - (-2)}{2 - 1}$ $= 7$ $\tan\beta = 7$ $\beta = 81,87^\circ$ $\therefore \widehat{ADC} = \theta - \beta \text{exterior angle of } \Delta / \text{buite hoek van } \Delta$ $\widehat{ADC} = 135^\circ - 81,87^\circ$ $\widehat{ADC} = 53,13^\circ$	$\checkmark \tan\beta = 7$ $\checkmark \beta = 81,87^\circ$ $\checkmark \widehat{ADC} = 135^\circ - 81,87^\circ$ $\checkmark \widehat{ADC} = 53,13^\circ \quad (4)$
<p>1.7</p>	$d_{DM} = \sqrt{(1 - (-1))^2 + (-2 - 4)^2}$ $d_{DM} = \sqrt{40}$ <p>Area of ΔADC</p> $= \frac{1}{2} \times MC \times AC$ $= \frac{1}{2} \times \sqrt{40} \times \sqrt{40}$ $= 20 \text{ units}^2$	$\checkmark d_{DM} = \sqrt{40}$ $\checkmark \frac{1}{2} \times MC \times AC$ $\checkmark \frac{1}{2} \times \sqrt{40} \times \sqrt{40}$ $\checkmark 20 \text{ units}^2 \quad (4)$

<p>1.8</p>	<p>$AB \parallel CD$ and/en $BC \parallel AD$</p> <p>$x_A = 2 ; x_D = 1$ $y_A = 5 ; y_D = -2$</p> <p>$\therefore x_A - x_D = 1$ $\therefore y_A - y_D = 7$</p> <p>$\therefore x_C = -4 ; x_B = -4+1$ $\therefore y_C = 3 ; y_B = 3+7$</p> <p>$\therefore x_B = -3$ $\therefore y_D = 10$</p> <p>$\therefore B(-3 ; 10)$</p> <p style="text-align: center;">OR/OF</p> <p>Diagonals of parallelogram ABCD have the same midpoint <i>Hoeklyne van parallelogram ABCD het dieselfde middelpunt.</i></p> <p>$\therefore M(-1 ; 4)$ is midpoint of BD</p> <p>$x_B : \frac{1+x}{2} = -1$ $y_B : \frac{-2+y}{2} = 4$</p> <p>$x = -3$ $y = 10$</p> <p>$\therefore B(-3 ; 10)$</p> <p style="text-align: center;">OR/OF</p> <p>Translation $D \rightarrow C$ $(x ; y) \rightarrow (x - 5 ; y + 5)$</p> <p>$\therefore$ Translation would be the same for $A \rightarrow B$ $(2 ; 5) \rightarrow (2 - 5 ; 5 + 5)$</p> <p>$\therefore B(-3 ; 10)$</p>	<p>✓ Method</p> <p>✓ $x_B = -3$</p> <p>✓ $y_B = 10$</p> <p>Answer only: Full marks</p> <p>✓ Method</p> <p>✓ $x_B = -3$</p> <p>✓ $y_B = 10$</p> <p>Answer only: Full marks</p> <p>✓ Method</p> <p>✓ $x_B = -3$</p> <p>✓ $y_B = 10$</p> <p>Answer only: Full marks</p> <p style="text-align: right;">(3)</p>
<p>1.9</p>	<p>$m_{AE} = \frac{5-k}{2-4}$</p> <p>$m_{AD} = 7$</p> <p>$\therefore m_{AE} = m_{AD}$</p> <p>$\frac{5-k}{2-4} = 7$</p> <p>$5-k = -14$</p> <p>$\therefore k = 19$</p>	<p>✓ $m_{AE} = \frac{5-k}{2-4}$</p> <p>✓ $\frac{5-k}{2-4} = 7$</p> <p>✓ $k = 19$</p> <p style="text-align: right;">(3)</p>
<p>[27]</p>		

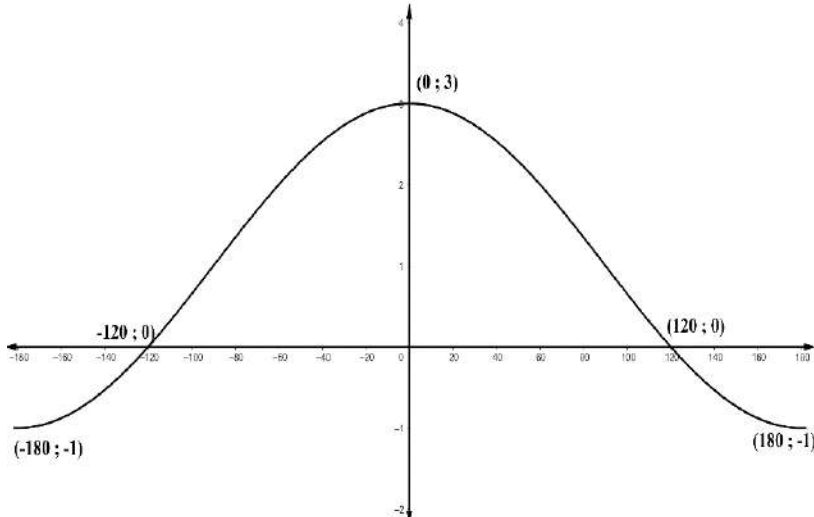
QUESTION/VRAAG 2

<p>2.1.1</p>	 <p>$y^2 = (5)^2 - (-4)^2$ $\therefore y = -3$ $\sin\theta = \frac{-3}{5}$</p>	<p>✓ using Pythagoras correctly ✓ $y = -3$. ✓ $\sin\theta = \frac{-3}{5}$</p> <p>(3)</p>
<p>2.1.2</p>	<p>$\tan\theta = \frac{-3}{-4} = \frac{-5}{k}$ $\therefore k = -\frac{20}{3}$ or $-6\frac{2}{3}$</p>	<p>✓ $\frac{-3}{-4} = \frac{-5}{k}$ ✓ $k = -\frac{20}{3}$ or $-6\frac{2}{3}$</p> <p>(2)</p>
<p>2.2</p>	<p>$\frac{\sin(180^\circ + x) \cdot \cos(90^\circ - x)}{\tan(180^\circ - x) \cdot \cos(360^\circ - x) \cdot \sin(-x)}$ $= \frac{(-\sin x) \cdot \sin x}{-\tan x \cdot (\cos x) \cdot (-\sin x)}$ $= \frac{-\sin x}{-\frac{\sin x}{\cos x} \cdot \cos x \cdot -1}$ $= -1$</p>	<p>✓ $-\sin x$ ✓ $\sin x$ ✓ $-\tan x$ ✓ $\cos x$ ✓ $-\sin x$ ✓ $\tan x = \frac{\sin x}{\cos x}$ ✓ answer</p> <p>(7)</p>

<p>2.3</p>	 $\sin\theta = \sqrt{\frac{(9)^{\cos 300^\circ}}{\left(\frac{1}{4}\right)^{\sin 150^\circ} \cdot (8)^{\tan 225^\circ}}$ $\sin\theta = \sqrt{\frac{(3^2)^{\cos 60^\circ}}{(2^{-2})^{\sin 30^\circ} \cdot (2^3)^{\tan 45^\circ}}$ $\sin\theta = \sqrt{\frac{(3^2)^{\frac{1}{2}}}{(2^{-2})^{\frac{1}{2}} \cdot (2^3)^1}}$ $\sin\theta = \sqrt{\frac{3}{2^{-1} \times 8}}$ $\sin\theta = \sqrt{\frac{3}{4}}$ $\sin\theta = \frac{\sqrt{3}}{2}$ <p>$\therefore \theta = 60^\circ \text{ or } 120^\circ$</p>	<p>✓ $\cos 60^\circ$</p> <p>✓ $\sin 30^\circ$</p> <p>✓ $\tan 45^\circ$</p> <p>✓ $3^2, 2^{-2}$ & 2^3</p> <p>✓ $\cos 60^\circ = \frac{1}{2}, \sin 30^\circ = \frac{1}{2}$</p> <p>& $\tan 45 = 1$</p> <p>✓ $\sin\theta = \frac{\sqrt{3}}{2}$</p> <p>✓ $\theta = 60^\circ$</p> <p>✓ $\theta = 120^\circ$ (8)</p>
<p>2.4</p>		
<p>2.4.1</p>	<p>$\cos(-20^\circ)$ $= \cos 20^\circ$ $= p$</p>	<p>✓ $\cos 20^\circ$</p> <p>✓ p (2)</p>
<p>2.4.2</p>	<p>$\tan 160^\circ$ $= -\tan 20^\circ$ $= -\frac{\sqrt{1-p^2}}{p}$</p> <p style="text-align: center;">OR/OF</p> <p>$= -\tan 20^\circ$ $= -\frac{\sin 20^\circ}{\cos 20^\circ}$ $= -\frac{\sqrt{1-p^2}}{p}$</p>	<p>✓ $-\tan 20^\circ$</p> <p>✓ $y = \sqrt{1-p^2}$</p> <p>✓ $-\frac{\sqrt{1-p^2}}{p}$ (3)</p>

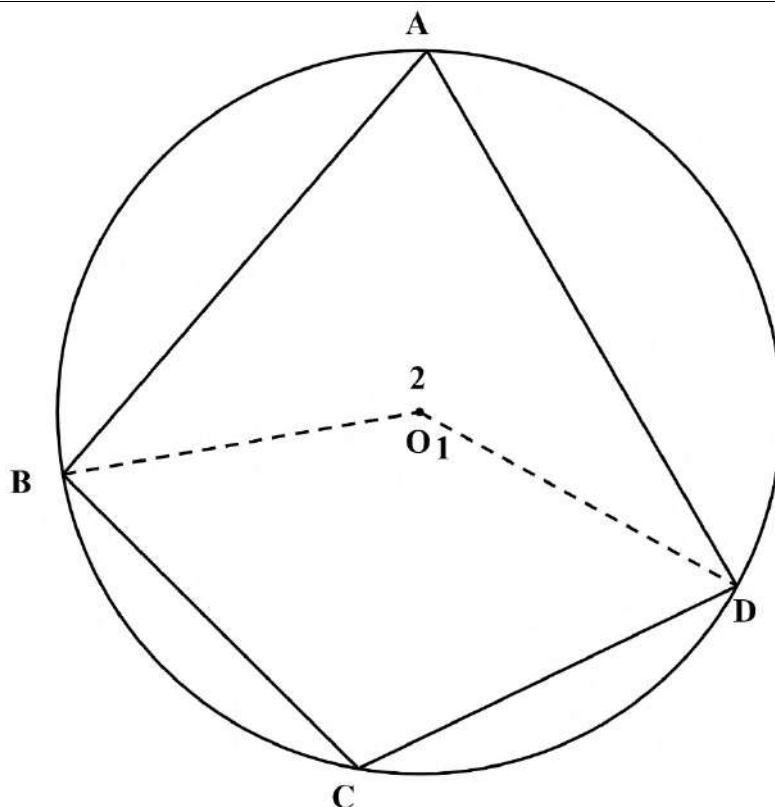
2.5	$\cos(90^\circ + x) \left[\frac{1}{\tan x} + \frac{\sin x}{\sin(90^\circ - x)} \right] = -\frac{1}{\cos x}$ <p>LH: $-\sin x \left[\frac{1}{\frac{\sin x}{\cos x}} + \frac{\sin x}{\cos x} \right]$ $= -\sin x \left[\frac{\cos x}{\sin x} + \frac{\sin x}{\cos x} \right]$ $= -\sin x \left[\frac{\cos^2 x + \sin^2 x}{\sin x \cdot \cos x} \right]$ $= -\sin x \left[\frac{1}{\sin x \cdot \cos x} \right]$ $= -\frac{1}{\cos x}$ LH = RH</p>	<ul style="list-style-type: none"> ✓ $\cos(90^\circ + x) = -\sin x$ ✓ $\sin(90^\circ - x) = \cos x$ ✓ $\tan x = \frac{\sin x}{\cos x}$ ✓ $\cos^2 x + \sin^2 x$ ✓ $\sin x \cdot \cos x$ ✓ $\cos^2 x + \sin^2 x = 1$ <p style="text-align: right;">(6)</p>
[31]		

QUESTION/VRAAG 3

3.1	$3\cos\theta - 2\sin^2\theta = 0$ $3\cos\theta - 2(1 - \cos^2\theta) = 0$ $3\cos\theta - 2 + 2\cos^2\theta = 0$ $2\cos^2\theta + 3\cos\theta - 2 = 0$ $(2\cos\theta - 1)(\cos\theta + 2) = 0$ $\cos\theta = \frac{1}{2} \text{ OR } \cos\theta = -2$ $\text{ref } \angle : 60^\circ \text{ OR No solution}$ $\theta = 60^\circ + k \cdot 360^\circ, k \in \mathbb{Z} \quad \theta = 360^\circ - 60^\circ + k \cdot 360^\circ, k \in \mathbb{Z}$ $\theta = 300^\circ + k \cdot 360^\circ, k \in \mathbb{Z}$	<ul style="list-style-type: none"> ✓ $\sin^2\theta = 1 - \cos^2\theta$ ✓ $2\cos^2\theta + 3\cos\theta - 2$ ✓ $\cos\theta = \frac{1}{2} \text{ OR } \cos\theta = -2$ ✓ $\theta = 60^\circ + k \cdot 360^\circ$ ✓ $\theta = 300^\circ + k \cdot 360^\circ$ ✓ $k \in \mathbb{Z}$ <p style="text-align: right;">(6)</p>
3.2		<ul style="list-style-type: none"> ✓ Shape/vorm ✓ intercepts with axis/afsnitte met asse ✓ Turning points/draaipunte <p style="text-align: right;">(3)</p>
3.3.1	$-120^\circ < \theta < 120^\circ$	<ul style="list-style-type: none"> ✓ interval ✓ notation/ notasie <p style="text-align: right;">(2)</p>
3.3.2	720°	<ul style="list-style-type: none"> ✓✓ answer <p style="text-align: right;">(2)</p>
[13]		

QUESTION/VRAAG 4

4.1



NOTE: If candidate fails to draw the construction or indicate the construction, it is an immediate **BREAK DOWN**. 0/5 marks.

NOTA: Indien kandidaat nie die konstruksie teken of aandui dat 'n konstruksie plaasvind nie, is dit 'n onmiddellike "BREAK DOWN" en daar word nie verder gemerk nie. 0/5 punte.

Construction: Connect BO and OD
 Konstruksie: Verbind BO en OD

$\hat{O}_1 = 2\hat{A}$ [angle at centre = $2 \times \angle$ at circumference/
 middelpunts $\angle = 2 \times$ omtreks \angle]

$\hat{O}_2 = 2\hat{C}$ [angle at centre = $2 \times \angle$ at circumference/
 middelpunts $\angle = 2 \times$ omtreks \angle]

$\hat{O}_1 + \hat{O}_2 = 360^\circ$ [\angle^s around a point = 360° /
 \angle^e om 'n punt = 360°]

$\therefore 2\hat{A} + 2\hat{C} = 360^\circ$

$\therefore \hat{A} + \hat{C} = 180^\circ$

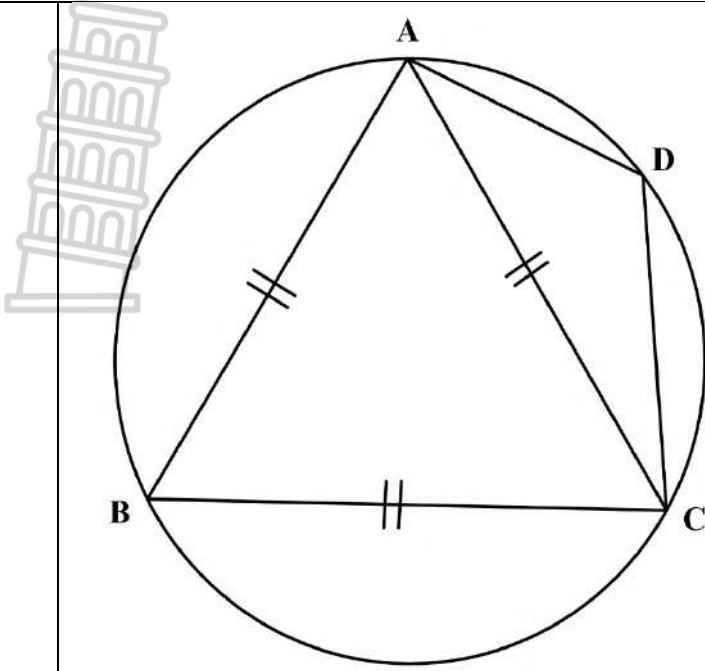
✓ Construction/
 Konstruksie

✓S ✓R

✓S/R

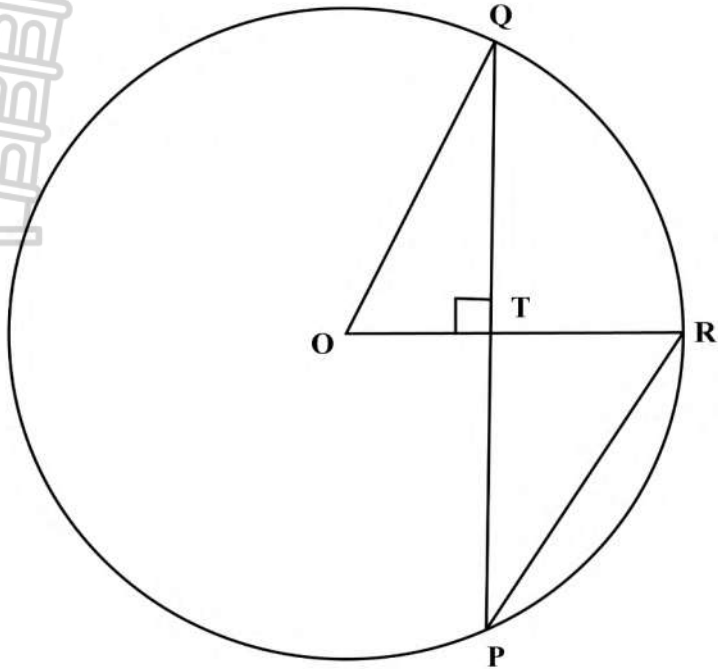
✓S $\hat{O}_1 + \hat{O}_2 = 360^\circ$

(5)



4.2	$\hat{B} = 60^\circ$ [\angle s of equilateral Δ / \angle e van gelyksydige Δ] $\hat{D} = 120^\circ$ [opposite angles of cycl.quad/ teenoorst hoeke KVH]	✓S ✓S✓R (3)
		[8]

QUESTION/VRAAG 5

<p>5.1</p>		
<p>5.1.1</p>	<p>$PQ = 24\text{cm}$ [line from centre \perp chord/ <i>lyn vanaf middelpunt \perp koord</i>]</p>	<p>✓S✓R (2)</p>
<p>5.1.2</p>	<p> $OT^2 = OQ^2 - QT^2$ [Pyth] $OT^2 = 13^2 - 12^2$ $OT = \sqrt{25}$ $OT = 5$ $\therefore TR = 13 - 5$ $\therefore TR = 8$ $PR^2 = TR^2 + PT^2$ [Pyth] $PR^2 = 8^2 + 12^2$ $PR = \sqrt{208}$ $\therefore PR = 4\sqrt{13}$ or $PR = 14,42$ </p>	<p> ✓ Subst into Pyth ✓ $OT = 5$ ✓ $TR = 8$ ✓ $PR = \sqrt{208}$ (4) </p>

<p>5.2</p>		
<p>5.2.1</p>	<p>$\hat{E}_1 = x$ [angle at centre = $2 \times$ \angle at circumference/ <i>middelpunts $\angle = 2 \times$ omtreks \angle</i> $\hat{A}_2 = x$ [\angles in the same segment/ \angle e in dieselfde <i>segment]</i> $\hat{C}_2 = x$ [\angles opp = radii/ \angle e teenoor = radiusse]</p>	<p>✓S✓R ✓S✓R ✓S✓R (6)</p>
<p>5.2.2</p>	<p>$E\hat{A}B = 90^\circ$ [\angle in semi circle/ \angle in halwe sirkel]</p>	<p>✓S✓R (2)</p>
<p>5.2.3</p>	<p>$\hat{M}_2 = 90$ [line from center to midpoint of chord/ <i>lyn vanaf middelpunt van sirkel na middelpunt van koord]</i> $\hat{C}_2 = x$ [proven/bewys in 5.2.1] $\therefore \hat{O}_2 = 90^\circ - x$ [\angles of Δ/ \angle e van Δ]</p>	<p>✓S✓R ✓R (3)</p>
<p>5.2.4</p>	<p>$D\hat{C}O = 90^\circ$ [radius \perp tangent / <i>radius \perp raaklyn]</i> $\therefore \hat{D} = 180^\circ - (90^\circ - x) - 90^\circ = x$ [\angles of Δ/ \angle e van Δ] $\therefore \hat{D} = B\hat{E}C = x$ $\therefore DEOC$ is cycl. quad/ <i>KVH</i> [COVERSE \angles in the same segment/ <i>OMGEKEERDE \angle e in dieselfde segment]</i> OR [= \angles subt by line/ = \angle e onderspan deur lynstuk] OR/OF $D\hat{C}O = 90^\circ$ [radius \perp tangent / <i>radius \perp raaklyn]</i> $\therefore \hat{C}_1 = 90^\circ - x$ But $\hat{O}_1 = 90^\circ - x$ [\angles of Δ/ \angle e van Δ] $\therefore \hat{C}_1 = \hat{O}_1 = 90^\circ - x$ $\therefore DEOC$ is cycl. quad/ <i>KVH</i> [COVERSE \angles in the same segment/ <i>OMGEKEERDE \angle e in dieselfde segment]</i> OR [= \angles subst by line/ = \angle e onderspan deur lynstuk]</p>	<p>✓S✓R ✓S ✓R OR/OF ✓S✓R ✓S ✓R (4)</p>
		<p>[21]</p>
	<p>TOTAL/TOTAAL:</p>	<p>100</p>