education

Department:
Education
North West Provincial Government
REPUBLIC OF SOUTH AFRICA

PROVINCIAL ASSESSMENT

GRADE 12

MATHEMATICS P2
JUNE 2024

MARKS: 150

TIME: 3 hours

This question paper consists of 11 pages, 1 information sheet and an answer book of 21 pages.

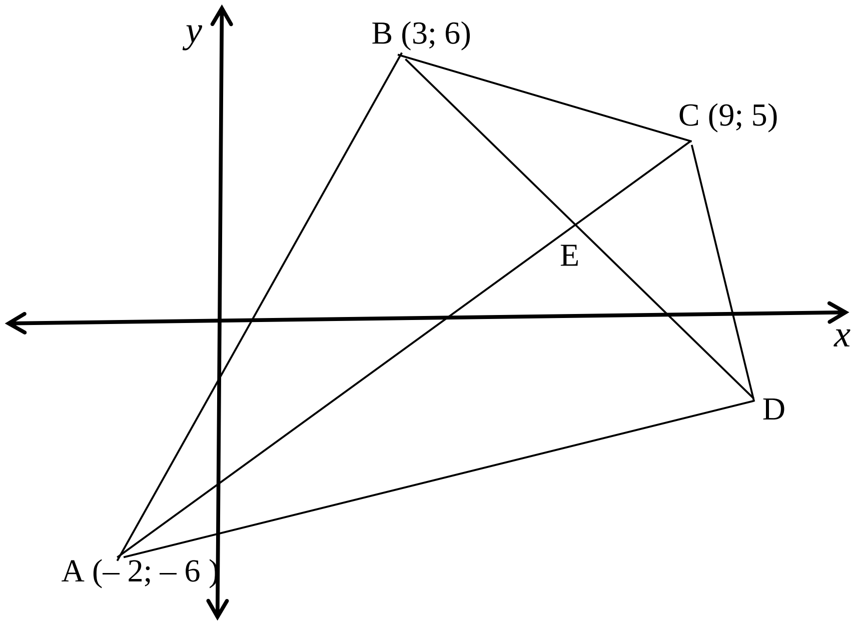
INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

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

QUESTION 1

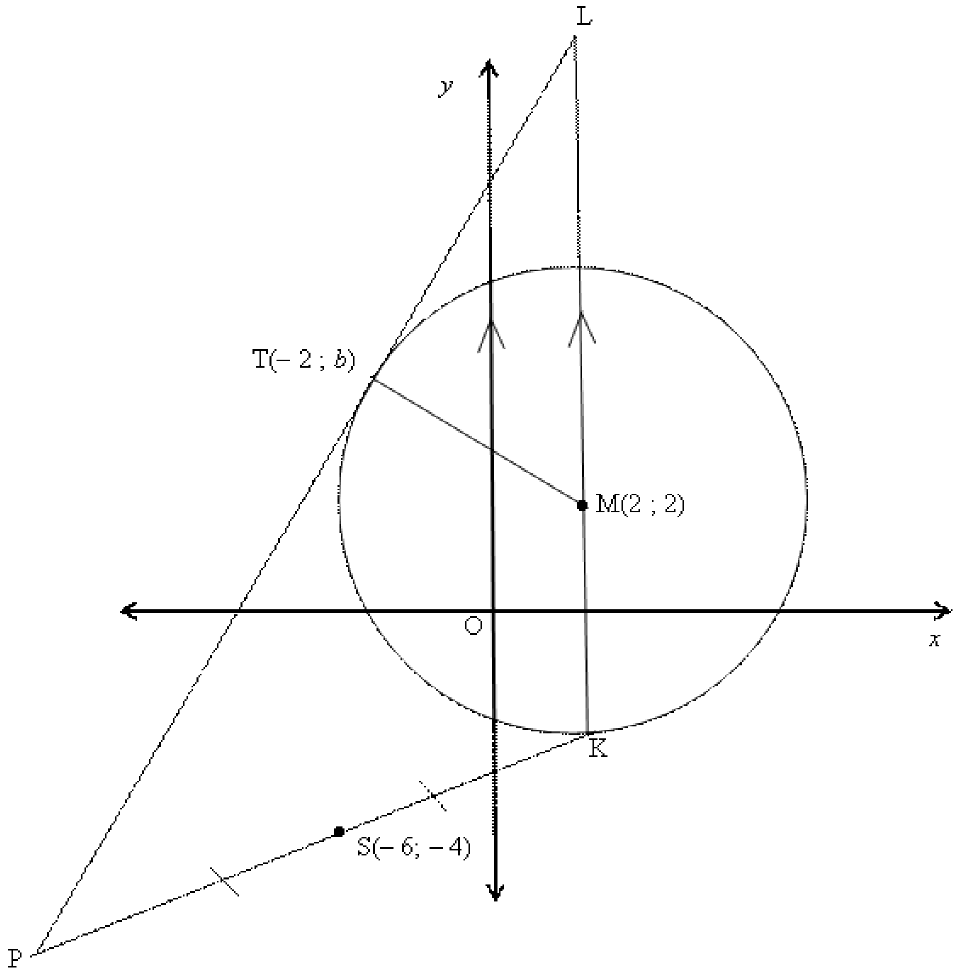
In the figure below, A $(-2; -6)$, B$(3; 6)$, C$(9; 5)$ and D are joined to from a kite.



1.1	Calculate the length of AC and give your answer in simplest surd form.	(2)
1.2	Calculate the gradient of AC.	(2)
1.3	Determine the equation of AC.	(2)
1.4	Give a reason why $AE \perp BD$.	(1)
1.5	Determine the equation of BD.	(3)
1.6	Determine the coordinates of E.	(3)
1.7	Determine, with reasons, the coordinates of D.	(3)
1.8	Calculate the size of $A\hat{D}C$.	(5)
		[21]

QUESTION 2

In the diagram, the circle is centred at M (2; 2). Radius KM is produced to L, a point outside the circle, such that KML || y-axis. LTP is a tangent to the circle at T (–2; b). $S(-6\,;\,-4)$ is the midpoint of PK.



2.1 Given that the radius of the circle is 5 units, show that $b = 5$. (4)

2.2 Determine:

2.2.1 The coordinates of K. (2)

2.2.2 The equation of the tangent LTP in the form $y = mx + c$. (4)

2.2.3 The area of Δ LPK. (7)

2.3 Another circle with equation $(x-2)^2 + (y-n)^2 = 25$ is drawn. Determine, with an explanation, the value(s) of n for which the two circles will touch each other externally. (4)

[21]

QUESTION 3

3.1 Simplify the expression below to a single trigonometric ratio:

$$\frac{\cos(90^\circ + x).\sin(540^\circ + x)}{\tan(x - 180^\circ).\cos(-x)}$$ (6)

3.2 Given $\cos(P+Q) = \cos P.\cos Q - \sin P.\sin Q$
Use the above identity and express cos 2P in terms of cos P. (4)

3.3 If $\tan A = \frac{4}{3}$, where A $\in [90^\circ;360^\circ]$
Use a sketch to determine the following:

3.3.1 sin A (3)

3.3.2 $\cos(A + 30^\circ)$ (4)

3.4 Given: $\cos 12^\circ = p$. With the aid of the diagram, determine the following without using a calculator, in terms of p.

3.4.1 $\sin 78^\circ$ (2)

3.4.2 $\sin 6^\circ$ (4)
[23]

QUESTION 4

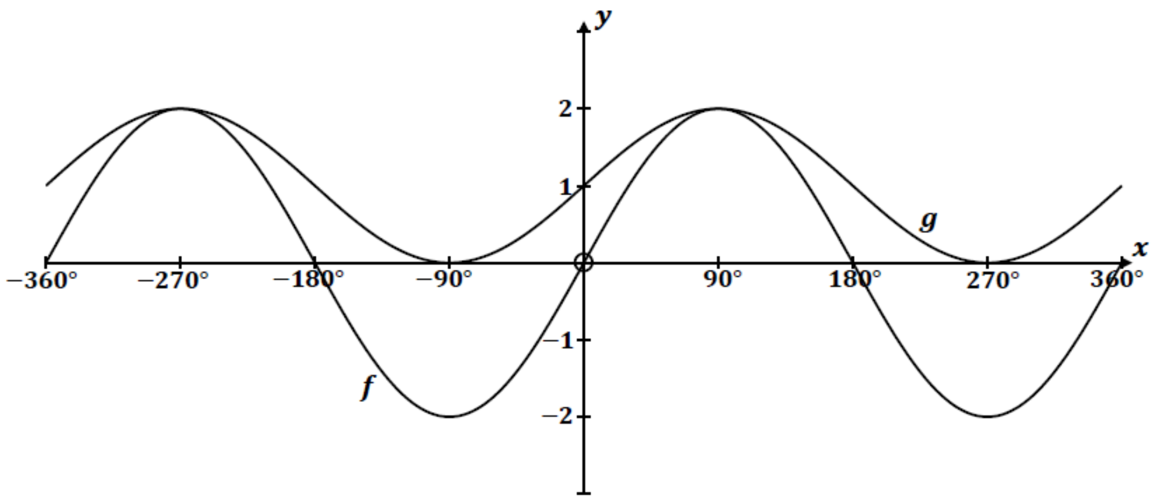
4.1 Prove that: $\frac{\sin 2x - \cos 2x + 1}{\sin 2x + \cos 2x + 1} = \tan x$ (7)

4.2 Hence, or otherwise, determine the value of $\tan 22{,}5^\circ$, without using the calculator. (Leave your answer in SURD form). (3)

4.3 Determine the general solution of the equation:
$3\cos 2x = 1 + 5\cos x$. (7)
[17]

QUESTION 5

The sketch below, shows the graphs of $f(x) = a\sin x$ and $g(x) = \sin x + b$, for $x \in [-360^\circ; 360^\circ]$.



Use the given graphs to answer the following questions:

5.1 Write down the values of *a* and *b*. (2)

5.2 What is the amplitude of *g*? (1)

5.3 Determine the value(s) of *x*, where $x \in [-360^\circ; 360^\circ]$, for which:

5.3.1 $f(x) = g(x)$. (2)

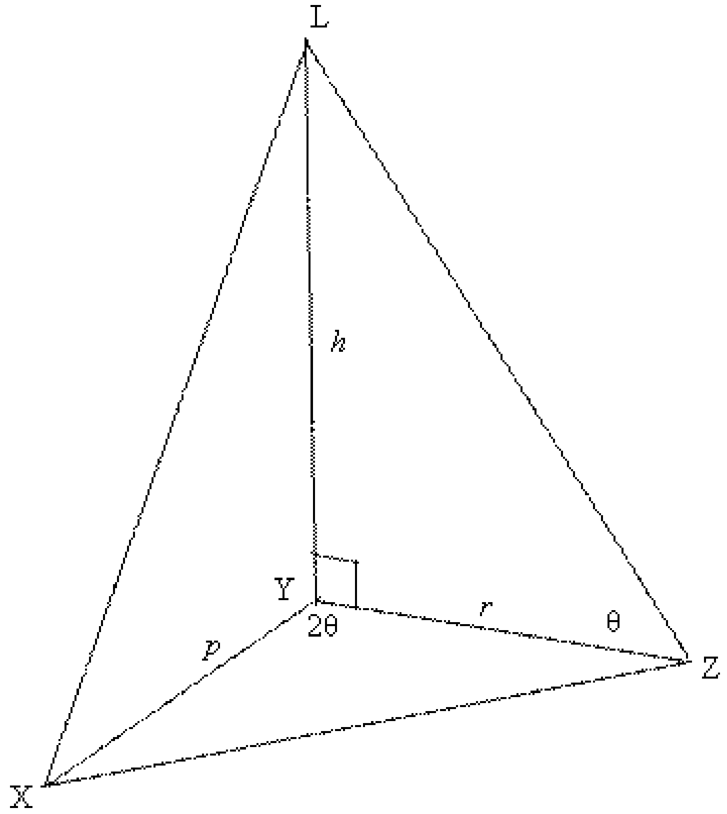
5.3.2 $f^{/}(x).g(x) > 0$. (3)

5.3.3 g decreases as *x* is increases. (2)

[10]

QUESTION 6

In the diagram below, a pole LY is placed at the corner of a triangular field XYZ.
The area of the field is A m^2 . $X\hat{Y}Z = 2\theta$, $Y\hat{Z}L = \theta$ and XY = p metres.
LY = h metres and YZ = r metres and XZ = t metres



6.1 Determine, A, the area of ΔXYZ in terms of r, p and θ. (1)

6.2 Express r in terms of A, p and θ. (2)

6.3 Hence, show that the height of the pole, h, is given by:

$$h = \frac{A}{p\cos^2\theta}$$

(5)

6.4 If h = 20m, p = 10m and $\theta = 60^\circ$.

Determine:

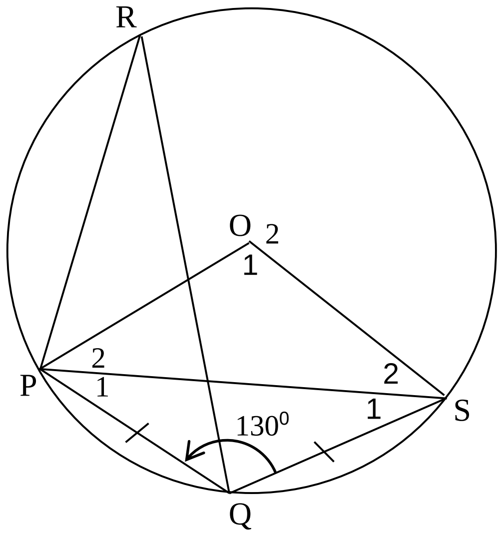
6.4.1 A, the area of ΔXYZ. (2)

6.4.2 The length of t correct to 2 decimal places (4)

[14]

QUESTION 7

7.1 In the diagram below, O is the centre of the circle. P, Q, S and R, are points on the circumference of the circle.
$PQ = QS$ and $P\hat{Q}S = 130^\circ$.



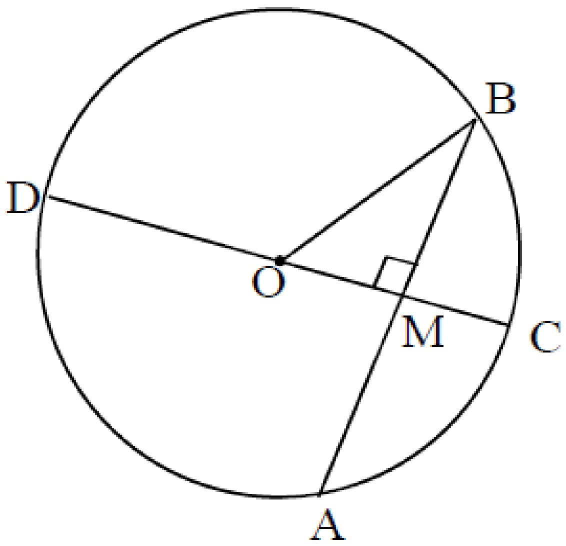
Determine, giving reasons, the sizes of:

7.1.1 $\hat{S}_1$ (3)

7.1.2 $\hat{R}$ (2)

7.1.3 $\hat{O}_1$ (3)

7.2 In the diagram below, O is the centre of the circle. AB is perpendicular to diameter DC. CM: MD = 2 : 7 and AB = 14 units.



If CM = $2x$:

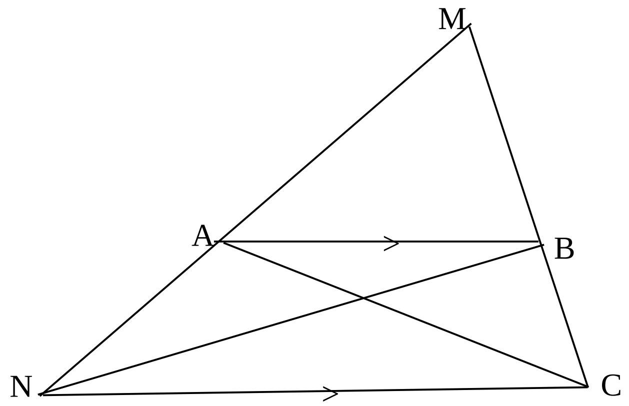
7.2.1 Express DC in terms of x. (1)

7.2.2 Express OM in terms of x. (2)

7.2.3 Hence, or otherwise, calculate the length of the radius. (5)
[16]

QUESTION 8

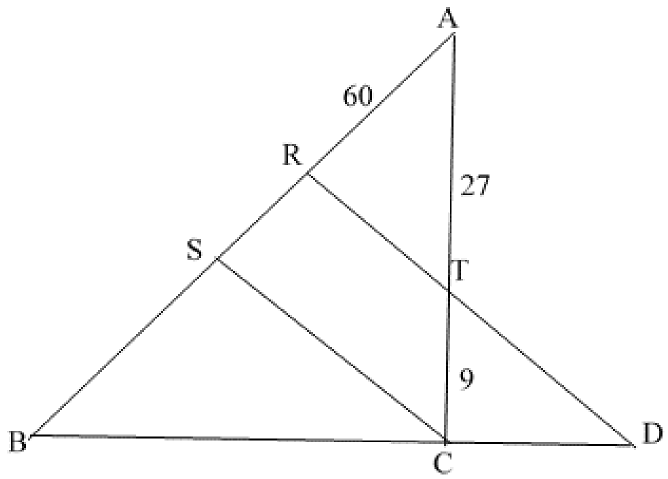
8.1 In the diagram below, ΔMNC is drawn. A is a point on MN and B is a point on MC such that AB || NC. AC and NC are drawn.



Use the diagram to prove the theorem which states that:

$$\frac{MA}{AN} = \frac{MB}{BC}$$ (7)

8.2 The figure below shows ΔABC with BC produced to D. RD is drawn with point T on AC and R on BA. CS is drawn. TC = 9 cm, AT = 27 cm, AR = 60 cm and AS = 80 cm.



8.2.1 Prove that SC || RT (3)

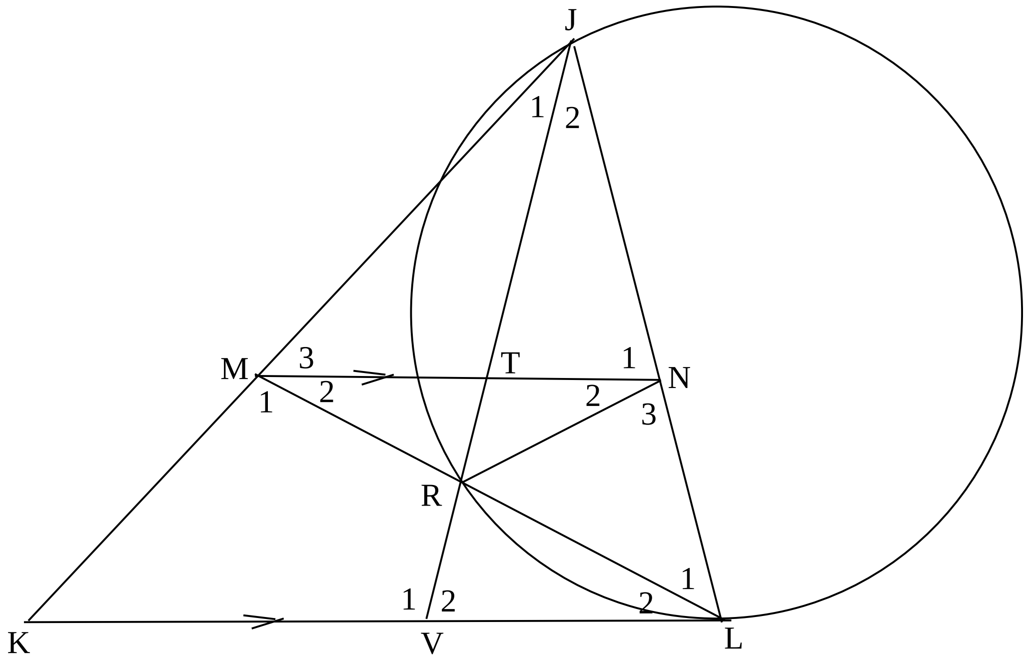
8.2.2 Determine the length of RS (1)

8.2.3 If AR : RB = 2 : 3 and BC = 30 cm, calculate the length of CD. (5)

[16]

QUESTION 9

In the figure below, KL is a tangent to the circle. L, J and R are points on the circle and MN is parallel to KL.



Prove that:

9.1 JMRN is a cyclic quadrilateral. (3)

9.2 $\Delta JNR \mid\mid\mid \Delta LMK$ (3)

9.3 $\dfrac{NL.JT}{TV} = \dfrac{LM.NR}{MK}$ (6)

[12]

TOTAL : 150

INFORMATION SHEET: MATHEMATICS

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

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

$T_n = a + (n-1)d$ $S_n = \frac{n}{2}\left(2a + (n-1)d\right)$

$T_n = ar^{n-1}$ $S_n = \frac{a\left(r^n - 1\right)}{r-1}$; $r \neq 1$ $S_\infty = \frac{a}{1-r}$; $-1 < r < 1$

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

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

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

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

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

In ΔABC: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ $a^2 = b^2 + c^2 - 2bc.\cos A$

$$area\,\Delta ABC = \frac{1}{2}ab.\sin C$$

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

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

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

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

$P(\text{A}) = \frac{n(\text{A})}{n(\text{S})}$ P(A or B) = P(A) + P(B) –P(A and B)

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