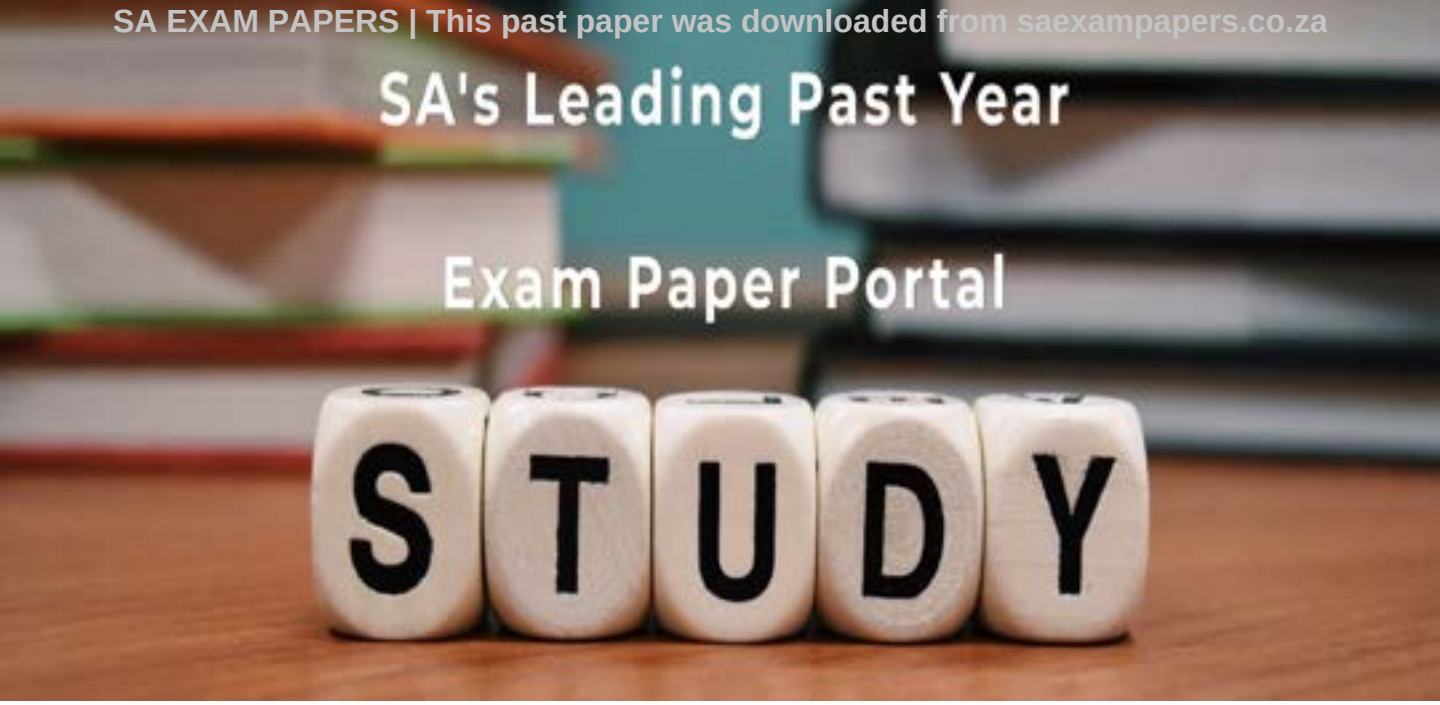


LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
EDUCATION

NATIONAL SENIOR CERTIFICATE

GRADE 12

MATHEMATICS P2

PRE – JUNE EXAMINATION 2024

MARKS: 150

TIME: 3 Hours

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

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 10 Questions.
2. Answer **ALL** the questions.
3 Number your answers correctly according to the numbering system used in this question paper.
4. Clearly show **ALL** calculations, diagrams and graphs that you have used in determining your answers.
5. Answers only will NOT necessarily be awarded full marks.
6. An approved scientific calculator (non-programmable and non-graphical) may be used, 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. Information sheet with formulae is included at the end of the question paper.
10. Write neatly and legibly.

QUESTION 1

Fifty motorists were asked to record the number of kilometres travelled in one week.
The following table shows the results:

Number of kilometres	Number of motorists	Cumulative frequency
$10 < x \leq 20$	2	
$20 < x \leq 30$	7	
$30 < x \leq 40$	4	
$40 < x \leq 50$	13	
$50 < x \leq 60$	16	
$60 < x \leq 70$	8	

1.1 Complete the Cumulative frequency column. (2)
1.2 Draw the cumulative frequency curve (ogive curve) (4)
1.3 Use your graph to estimate the median number of kilometres travelled per week. (2)
1.4 What percentage of motorists travelled more than 50km in one week? (2)

[10]

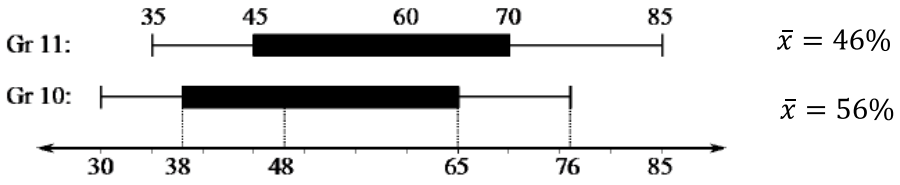
QUESTION 2

2.1 The maximum daily temperatures in degrees Celsius for Polokwane for the first 10 days in July were recorded in the following table:

Day 1	**Day 2**	**Day 3**	**Day 4**	**Day 5**	**Day 6**	**Day 7**	**Day 8**	**Day 9**	**Day 10**
24	25	22	28	27	21	18	17	24	25

2.1.1 Calculate the mean temperature for this data. (2)
2.1.2 Calculate the standard deviation from the mean for this data. (2)
2.1.3 How many days did the temperature lie outside one standard deviation of the mean? (4)

2.2 The box and whisker plots given below represent the Mathematics marks of the same 25 students at the end of their Grade 10 and 11 years at school.

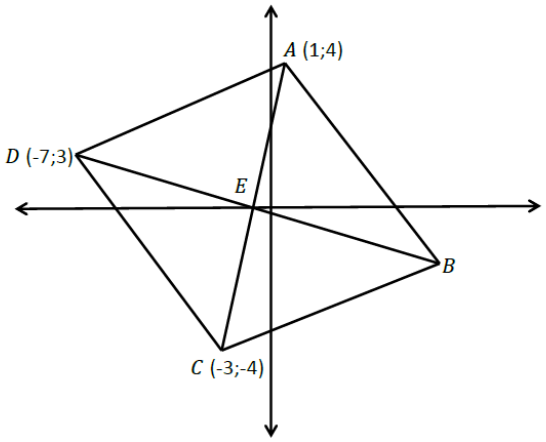


2.2.1 Calculate the inter-quartile range of each set of data. (4)
2.2.2 Comment on the way in which the distribution of the marks changes from the end of the Grade 10 year to the end of the Grade 11 year. (3)

[15]

QUESTION 3

In the diagram below $ABCD$ is a parallelogram.



3.1 Give the co-ordinates of point B. (2)

3.2 Find E, the midpoint of AC. (3)

3.3 Show that $AC \perp DB$. (3)

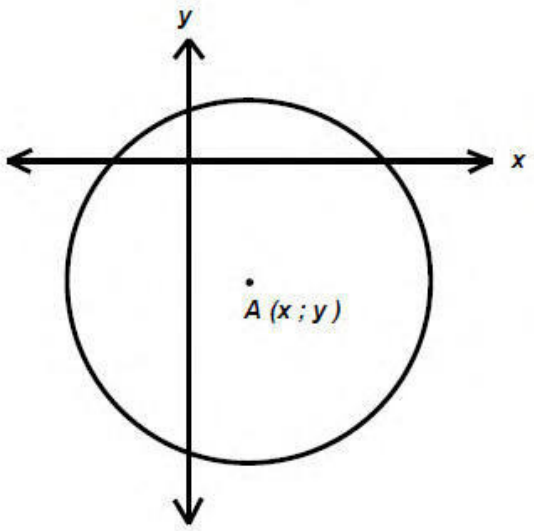
3.4 Hence give a reason why $ABCD$ is a rhombus. (1)

3.5 Find the size of angle $A\hat{D}C$. (6)

[15]

QUESTION 4

4.1 The equation of a circle is $x^2 + y^2 - 2x + 4y - 4 = 0$.



4.1.1 Determine the coordinates of A, the centre of the circle and the length of the radius, r. (5)

4.1.2 Calculate the value of p if N (1; p) with $p > 0$ is a point on the circle. (1)

4.1.3 Determine the equation of the tangent to the circle at N. (2)

4.2 A second circle, centre B, with equation $(x-4)^2 + y^2 = k^2$ cuts the circle given in (4.1) twice. Determine the values of k for which point A will be inside the circle B. (6)

[14]

QUESTION 5

5.1 If $sin\,\alpha = \frac{-2}{3}$ and $cos\,\alpha > 0$, calculate the values of the following without the use of a calculator:

5.1.1 $tan\,\alpha$ (3)

5.1.2 $2sin\,\alpha.cos\,\alpha$ (3)

5.1.3 $sin^2\alpha + cos^2\alpha$ (4)

5.2 Given that $\cos(\alpha-\beta)=\cos\alpha.\cos\beta+\sin\alpha.\sin\beta$, derive the identity for $\sin(\alpha-\beta)$ (4)

5.3 Determine, without the use of a calculator, the value of :

$\cos 35^\circ.\sin 25^\circ - \cos(-205^\circ).\cos 55^\circ$ (5)

5.4 Consider the following identity:

$$\frac{2\sin^3 x+\sin 2x\cos x}{\cos x}=2\tan x$$

5.4.1 Prove the identity. (4)

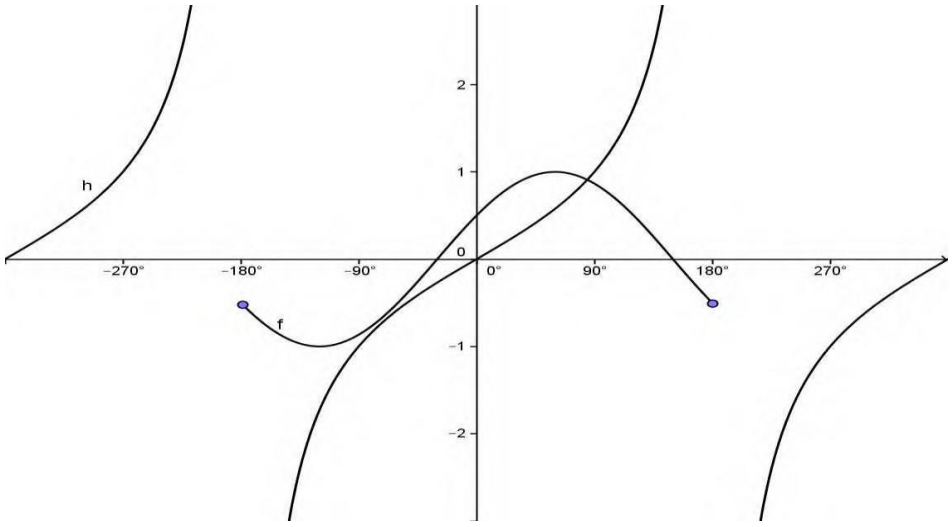
5.4.2 For which values of x, $x \in (-180°; 180°)$, is this identity not valid? (2)

5.5 Determine the general solution for $cos\,2x - cos\,x = 2$ (7)

[32]

QUESTION 6

The diagram shows the graphs of $f(x) = sin(x + 30°)$ and $h(x) = tan\frac{1}{2}x$.



6.1 Write down the domain of (x). (2)

6.2 Write down the period of $h(x)$. (2)

6.3 Determine the equation of the function, (x), obtained when $h(x)$ is translated 45° to the right and then 2 units downwards. (2)

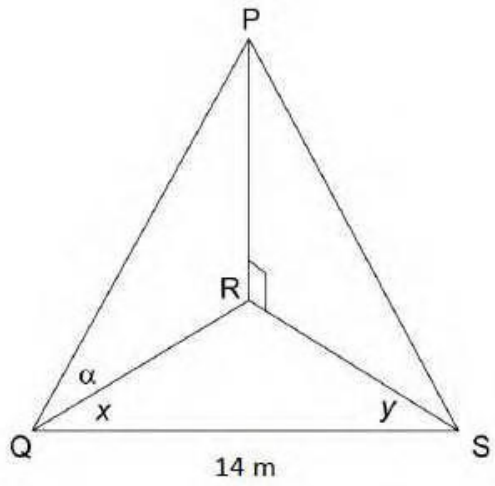
6.4 Determine a value of x for which $f(x) - h(x) = \frac{1}{2}$. (2)

6.5 Determine the distance between (x) and $h(x)$ if $x = -135°$. (3)

[11]

QUESTION 7

The diagram below shows a vertical tower PR, with points Q, R and S all on horizontal ground. The angle of elevation of P from Q is ∝, the length QS = 14 m. $R\hat{Q}S = x$ and $R\hat{S}Q = y$.



7.1 Express PR in terms of QR and ∝ (2)

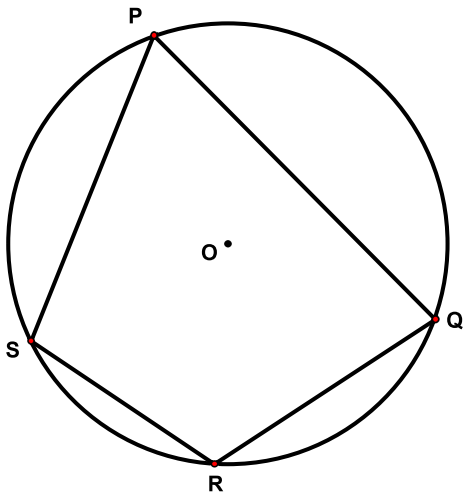
7.2 Show that $QR = \frac{14 \sin y}{\cos y}$ (3)

7.3 If $x = y$, show that $PR = \frac{7 \tan \propto}{\cos y}$ (4)

[9]

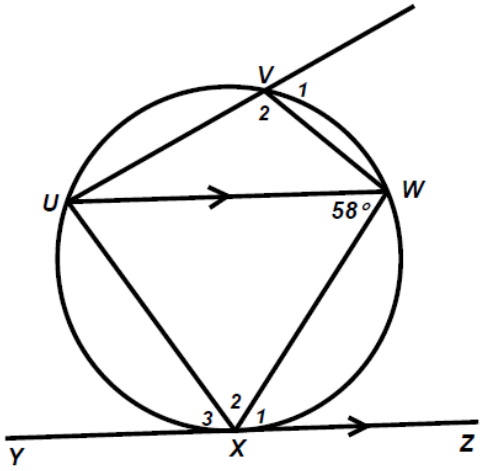
QUESTION 8

8.1 In the diagram below, P, Q, R and S are points that lie on the circumference of the circle with centre O. Given below is the partially completed proof of the theorem that states that $\hat{P} + \hat{R} = 180°$.



(7)

8.2 In the figure below, UVWX is a cyclic quadrilateral, with $UW||YZ$ and tangent YXZ touching the circle at X. $U\widehat{W}X = 58°$.



Determine the values of the following angles, showing all steps and reasons:

8.2.1 $\hat{X}_1$ (2)

8.2.2 $\hat{X}_3$ (2)

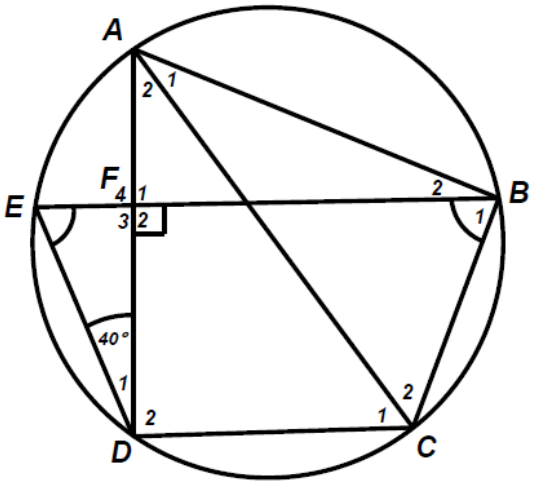
8.2.3 $\hat{X}_2$ (2)

8.2.4 $\hat{V}_1$ (2)

[15]

QUESTION 9

In the diagram below, AC is a chord of circle ABCDE. $AFD \perp EFB$, $\angle D1 = 40°$ and $\angle E = \angle B1$.



In the following questions, give a reason for each statement:

9.1 Name THREE angles each equal to 50°. (3)

9.2 Calculate the size of $\angle DCB$. (3)

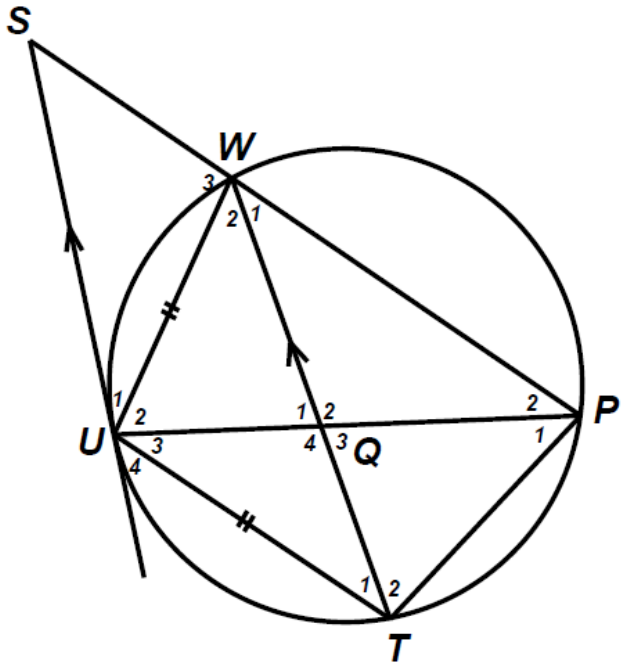
9.3 Prove that EB||DC. (3)

9.4 Prove that AC is a diameter of the circle. (4)

[13]

QUESTION 10

In the diagram, WPTU is a cyclic quadrilateral with $UW = UT$. Chords WT and PU intersect at Q. PW extends to S such that $SU \| WT$.



Prove that:

10.1 US is a tangent to circle PWUT at U. (6)

10.2 $\Delta SPU \,|||\, \Delta SUW$ (4)

10.3 $SU^2 = SP.SW$ (2)

10.4 $SU^2.QU = PU.SW^2$ (4)

[16]

INFORMATION SHEET

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

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

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

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

$F = \frac{x[(1+i)^n - 1]}{i}$ $P = \frac{x[1-(1+i)^{-n}]}{i}$ $f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$

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

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

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

In ΔABC: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

$a^2 = b^2 + c^2 - 2bc.\cos A$

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

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

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

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

$\sin 2\alpha = 2\sin\alpha.\cos\alpha$

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

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

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