

**NUMBERS
BEYOND
MEASURE**



MATHEMATICS

GRADE 11

2026

REVISION: PAST PAPERS

PAPER 1 & PAPER 2



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SOURCES

1. GRADE 11 KZN AND LIMPOPO 2025 NOVEMBER PAPERS
2. GRADE 11 2018 NOVEMBER NATIONAL PAPER

PAPER 1

ALGEBRA, EQUATIONS AND INEQUALITIES

PAPER A – Nov 2018

QUESTION 1

1.1 Solve for x in each of the following:

1.1.1 $x(2x+1)=0$ (2)

1.1.2 $5x^2+2x-6=0$ (correct to TWO decimal places) (3)

1.1.3 $2x^2-2 \geq 3x$ (4)

1.1.4 $\sqrt{2x+5}-\frac{3}{\sqrt{2x+5}}=-2$ (6)

1.2 Solve for x and y simultaneously:

$y+x=2$ and $x^2+3xy+8=0$ (6)

1.3 The roots of the equation $f(x)=0$ are $x=\frac{4 \pm \sqrt{16-4m(-m+5)}}{2m}$

Determine the values of m for which the roots will be non-real. (4)

1.4 Show that the maximum value of $\sqrt{-x^2+4x+12}$ is 4. (4)
[29]

QUESTION 2

2.1 Simplify fully, WITHOUT using a calculator: $\frac{2^{x-3}-3 \cdot 2^{x+1}}{2^{x-2}}$ (4)

2.2 Solve for x :

2.2.1 $2-16x^{-\frac{3}{2}}=0$ (3)

2.2.2 $4^x+8=9 \cdot 2^x$ (4)

2.2.3 $\sqrt[3]{9}=243$ (3)

2.3 Simplify fully:

$$\frac{\sqrt{p^2-q^2} \times (p+q)^{\frac{5}{2}}}{(p-q)^{\frac{1}{2}}} \text{ if } p \neq q$$

(3)
[17]

PAPER B – KZN 2025**QUESTION 1**1.1 Solve for x :

1.1.1 $4x^2 - 9 = 0$ (3)

1.1.2 $-2x^2 + 6x - 3 = 0$ (answers correct to TWO decimal places) (3)

1.1.3 $x - 3 = \frac{2x^2 + x - 6}{x + 2}$ (4)

1.1.4 $x^2 - 2x - 15 \geq 9$ (4)

1.2 Two equations are given below:

$$\frac{1}{2^y} = 4^{1-x} \quad \text{and} \quad x + 6 = x^2 - y$$

1.2.1 Show that $\frac{1}{2^y} = 4^{1-x}$ can be written as $y = 2x - 2$. (2)

1.2.2 Hence, or otherwise, solve for both x and y . (4)

1.3 The roots of a quadratic equation are given as: $x = \sqrt{2-k}$, where $k \in (-9 : 0)$. Determine the integral values of k for which the roots are rational. (2)1.4 The roots of the equation $ax^2 + bx + c = 0$ are $\frac{-b \pm \sqrt{72}}{6}$ where $b < 0$ and $c = b + 18$. Calculate the values of a , b and c . (5)
[27]

QUESTION 2

2.1 Simplify fully, **WITHOUT** using a calculator:

$$2.1.1 \quad 2x \cdot (27x^3)^{\frac{2}{3}} \cdot \left(\frac{2x}{27x^3}\right)^0 \quad (3)$$

$$2.1.2 \quad \frac{(6-2\sqrt{3})^2}{\sqrt{3}} \quad (4)$$

2.2 It is given that $\frac{2^{m+4} - 4 \cdot 2^{m+1}}{5 \cdot 2^{m+3}}$

2.2.1 Simplify the above expression. (3)

2.2.2 Hence, solve for x if $\frac{5 \cdot 2^{m+3}}{2^{m+4} - 4 \cdot 2^{m+1}} = \frac{1}{125^x}$ (3)

2.3 Solve for x : $\sqrt{x^2 - 53} - 2\sqrt{2x - 5} = 0$ (5)
[18]

NUMBER PATTERNS

PAPER A – Nov 2018

QUESTION 3

- 3.1 Given the linear pattern: $7; 2; -3; \dots$
- 3.1.1 Determine the general term, T_n , of the linear pattern. (2)
- 3.1.2 Calculate the value of T_{20} . (2)
- 3.1.3 Which term in the pattern has a value of -138 ? (2)
- 3.2 $6; 2x+1$ and $3x-3$ are the first three terms of a linear pattern.
- Calculate the value of x . (3)
- [9]

QUESTION 4

The quadratic number pattern: $4; p; 11; q; 22; \dots$ has a constant second difference of 1.

- 4.1 Show that $p = 7$ and $q = 16$. (3)
- 4.2 Determine the general term, T_n , of the quadratic pattern. (4)
- 4.3 Determine the value of n if $T_n = 232$. (4)
- 4.4 If the sum of two consecutive terms in the pattern is 1 227, calculate the difference between these two terms. (5)
- [16]

PAPER B – KZN 2025

QUESTION 3

WhatsApp messages were sent using face emojis with two popping hearts per face (shown below).

MESSAGE 1	MESSAGE 2	MESSAGE 3
	  	    

These faces and popping hearts in the different messages forms a linear number pattern.

- 3.1 How many popping hearts will appear in message 4? (1)
- 3.2 Determine the n^{th} term (general term) of the popping hearts in the messages. (2)
- 3.3 Calculate the number of popping hearts in the tenth (T_{10}) message. (2)
- 3.4 In which message will there be 710 popping hearts? (2)
- 3.5 A new series of messages using the same emojis was created by:
 - keeping the number of faces in message 1 and message 2 the same as the original messages.
 - adding 2 more faces to the original message 3.
 - adding 6 more faces to the original message 4.

The new series of messages forms a quadratic number pattern.

Which message in the NEW PATTERN will have 266 popping hearts ?

(6)
[13]

QUESTION 4

The first four terms of a quadratic number pattern are -7 ; m ; 5 ; n . The constant second difference is 4.

- 4.1 Prove, by calculations, that $m = -3$ and $n = 17$. (3)
- 4.2 Which two consecutive terms of the quadratic number pattern has a first difference of 292? (3)
- 4.3 It is given that the general term of a quadratic number pattern is $T_n = 2n^2 - 2n - 7$. Calculate the value of n if $T_n = 1\,005$. (4)
[10]

FUNCTIONS AND GRAPHS

PAPER A – Nov 2018

QUESTION 5

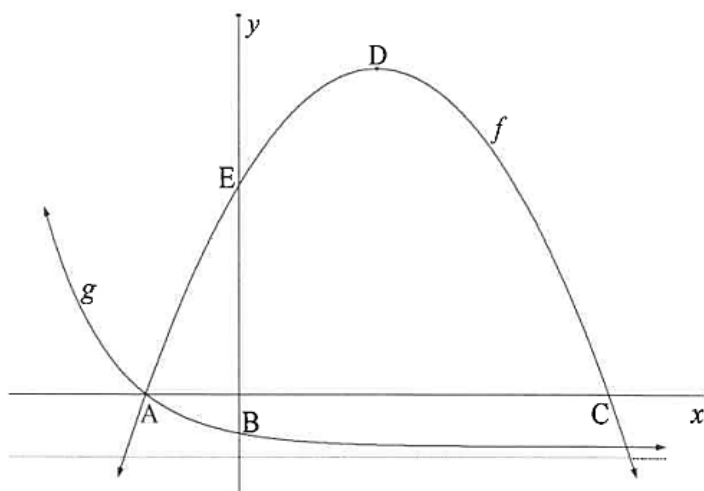
Given: $f(x) = \frac{4}{x-3} + 2$ and $g(x) = x + 2$

- 5.1 Write down the equations of the asymptotes of f . (2)
 - 5.2 Determine the x -intercept of f . (3)
 - 5.3 Determine the y -intercept of f . (2)
 - 5.4 Sketch the graphs of f and g on the same system of axes. Show clearly ALL the intercepts with the axes and any asymptotes. (5)
 - 5.5 Calculate the x -coordinates of the points of intersection of f and g . (4)
 - 5.6 If $x < 3$, determine the values of x for which $\frac{4}{x-3} + 2 < x + 2$. (2)
 - 5.7 The line $y = x - 1$ cuts f at $P(1; 0)$ and Q . Write down the coordinates of Q . (3)
- [21]**

QUESTION 6

The diagram below shows the graphs of $f(x) = -(x-3)^2 + 25$ and $g(x) = 2\left(\frac{1}{2}\right)^{x+1} - 4$.

Graph f cuts the x -axis at A and C , the y -axis at E and has a turning point at D .
Graph g cuts the x -axis at A and the y -axis at B .



- 6.1 Write down the equation of the asymptote of g . (1)
- 6.2 Write down the coordinates of D . (2)

- 6.3 Write down the range of f . (1)
- 6.4 Calculate the length of EB. (4)
- 6.5 Determine the values of x for which f is decreasing. (2)
- 6.6 Calculate the average gradient between points A and B. (5)
- 6.7 Graph t is obtained by reflecting g about the x -axis. Write down the range of t . (2)
- 6.8 If $p(x) = f(x) + 2$, write down the coordinates of the turning point of p . (2)
- 6.9 Determine the value of k for which the straight line $y = 2x + k$ will be a tangent to f . (4)
- [23]**

PAPER B – KZN 2025

QUESTION 5

Consider the function f defined by $f(x) = \frac{-3}{x+2} + \frac{1}{2}$. Graph f passes through $(4; 0)$.

- 5.1 Write down the y -intercept of f . (1)
- 5.2 Write down the equations of the asymptotes of f . (2)
- 5.3 Calculate the x -intercept of f . (2)
- 5.4 Draw a neat sketch of f . Clearly label all the intercepts with the axes and asymptotes. (3)
- 5.5 Determine the values of y for which f lies $x < -2$ or $0 \leq x \leq 4$. (2)
- 5.6 Graph f is reflected about the y -axis and shifted $\frac{3}{2}$ units up to form p .
Write down the equation of p in the form of $p(x) = \dots$. (2)
- [12]**

QUESTION 6

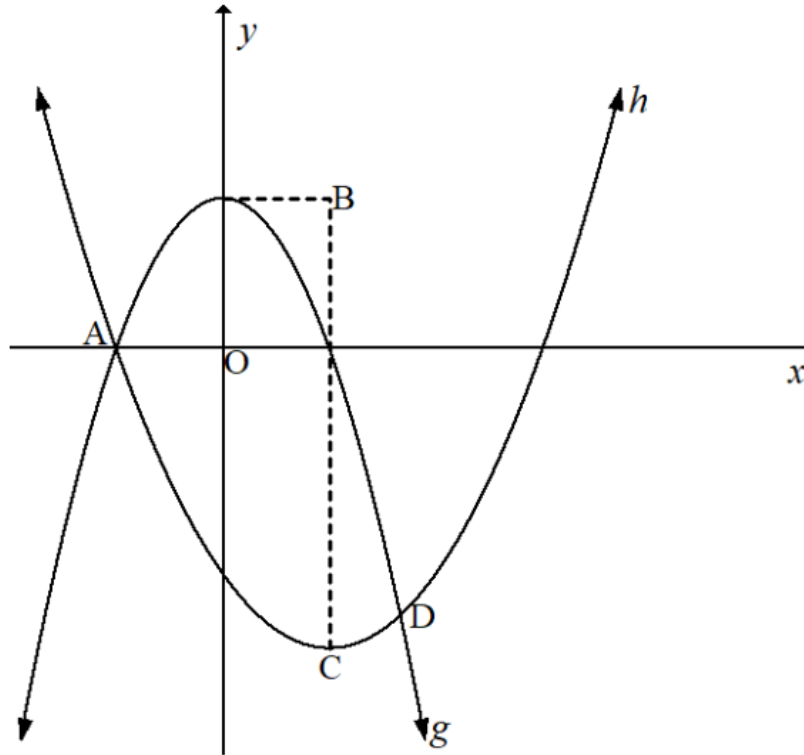
6.1 The function $h(x) = ax^2 + bx + c$ has the following properties:

- $h(2) = 0$
- the value of $\frac{-b}{2a}$ is 5
- the range of h is $y \leq 10; y \in \mathbb{R}$.

Draw a neat sketch of h . Clearly label the x -intercepts and turning point. (3)

6.2 The graphs of $g(x) = -x^2 + 9$ and $h(x) = ax^2 + bx - \frac{27}{4}$ are sketched below.

- A is an x -intercept of g and h and lies on the negative x -axis.
- A and D are the points of intersection of graphs g and h .
- C is the turning point of h .
- B lies on the horizontal line that passes through the turning point of g such that BC is parallel to the y -axis and passes through the other intercept of g .
- $BC = 18$ units



6.2.1 Calculate the coordinates of A. (3)

6.2.2 Show that $a = \frac{1}{4}$ and $b = -\frac{3}{2}$. (4)

6.2.3 Write down the range of h . (2)

6.2.4 It is given that $m(x) = x^2 - 4$. Explain, in words, the transformation from the graphs of g to m . (2)

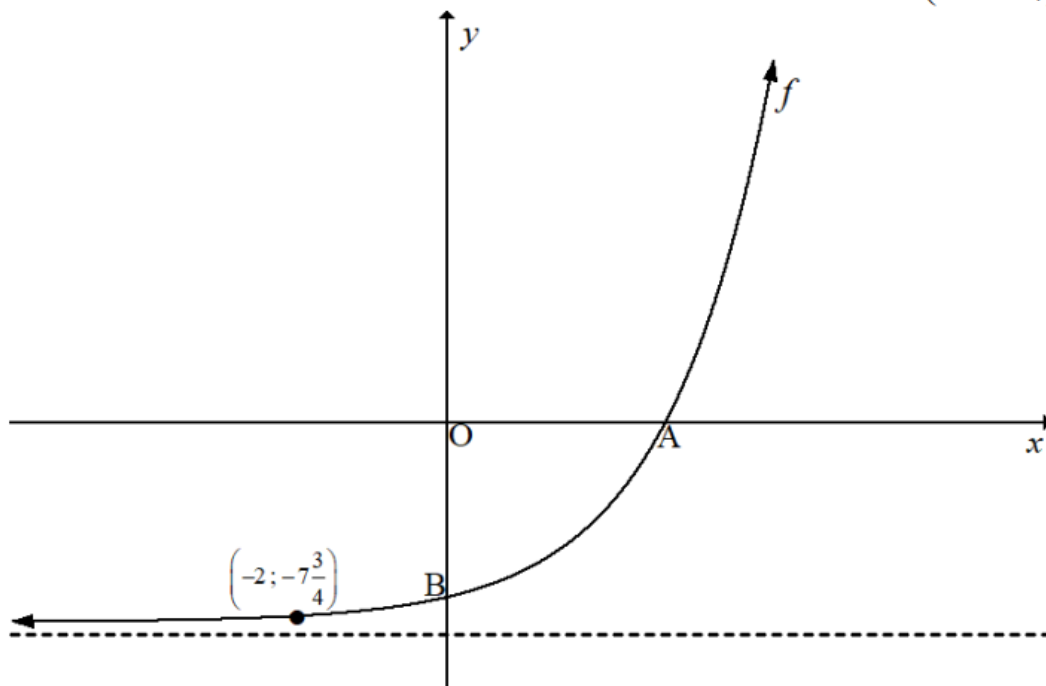
6.2.5 Calculate the coordinates of D. (5)

6.2.6 It is given that $p(x) = k$. Determine the integral value of k such that the distance between the points of intersection of h and p is 8 units. (2)

[21]

QUESTION 7

The graph of $f(x) = 2^x + q$ is drawn below. . Graph f passes through the point $\left(-2; -7\frac{3}{4}\right)$.



- 7.1 Calculate the value of q . (2)
 - 7.2 If $q = -8$, calculate the coordinates of A. (3)
 - 7.3 Determine the average gradient between A and B. (3)
 - 7.4 Determine the values of x where $\frac{x}{f(x)} \leq 0$ (2)
 - 7.5 Determine the values of k for which $8 - 2^x - k = 0$ will have negative roots. (2)
- [12]**

FINANCE, GROWTH AND DECAY

PAPER A – Nov 2018

QUESTION 7

- 7.1 Calculate the effective interest rate per annum if an investment earns interest at a rate of 11,5% p.a., compounded monthly. (3)
- 7.2 Karabo bought a computer for R4 700. The value of the computer depreciated at a rate of 18% p.a. Using the reducing-balance method, calculate the book value of the computer 4 years after it was bought. (3)
- 7.3 Nhlanhla made an initial deposit of R20 000 into an investment account that paid interest at the rate of 7,2% p.a., compounded quarterly. After 2 years the interest rate changed to 7,8% p.a., compounded monthly. Four years after his initial deposit, Nhlanhla withdrew R2 500 from his investment.
- 7.3.1 Calculate how much Nhlanhla had in this investment account 2 years after the initial deposit was made. (3)
- 7.3.2 How much will the investment be worth 7 years after the initial deposit was made? (4)
- [13]

PAPER B – KZN 2025

QUESTION 8

- 8.1 Dr Krishnanair invests R15 000 for a period of 6 years in an account that pays simple interest at the rate of 10% per annum. Calculate the interest his investment earned at the end of 6 years. (3)
- 8.2 Miss Coetzee bought a brand new car. The value of the car depreciates annually at the rate of 8,25% p.a. on the reducing balance method. If the book value of the car was R277 216 after 3 years, calculate the purchase price of the car. (2)
- 8.3 An advertisement reads “XY Bank offers loans at an effective interest rate of 12% per annum”. Calculate the nominal rate of interest if interest on the loan is compounded quarterly. (4)
- 8.4 Mr Dlezi invested R25 000 in an account that offers 9,25% per annum compounded half-yearly. Calculate the accumulated amount in this account at the end of nineteen half-years. (3)
- 8.5 Mr Masango invested R6 500 in a savings account that paid interest at the rate of 13% p.a., compounded monthly for the first two years. Thereafter, the interest rate changed to 10,5% p.a., compounded quarterly. Three years after making the initial deposit, Mr Masango withdrew R x from the account. At the end of 5 years, he had R928,30 more in the account than his initial deposit. Calculate the value of x , to the nearest rand (5)
- [17]

PROBABILITY

PAPER A – Nov 2018

QUESTION 8

A bag contains 6 red balls, 8 green balls and an unknown number of yellow balls. The probability of randomly choosing a green ball from the bag is 25%.

8.1 Show that there are 32 balls in the bag. (1)

8.2 A ball is drawn from the bag, the colour is recorded and it is not returned to the bag. Thereafter another ball is drawn from the bag, the colour is recorded and it is also not returned to the bag.

Draw a tree diagram to represent ALL the possible ways in which the two balls could have been drawn from the bag. Show the probabilities associated with EACH branch, as well as the outcomes. (4)

8.3 Calculate the probability that the two balls drawn from the bag will have the same colour. (4)
[9]

QUESTION 9

9.1 On a flight, passengers could choose between a vegetarian snack and a chicken snack. The snacks selected by the passengers were recorded. The results are shown in the table below.

SNACK	MALE	FEMALE	TOTAL
Vegetarian	12	20	32
Chicken	55	63	118
TOTAL	67	83	150

Was the choice of snack on this flight independent of gender? Motivate your answer with the necessary calculations. (5)

9.2 For any two events, A and B, it is given that $P(A \text{ and } B) = 0,12$, $P(A \text{ or } B) = 0,83$ and $P(B) = 4P(A)$.

9.2.1 Are events A and B mutually exclusive? Justify your answer. (2)

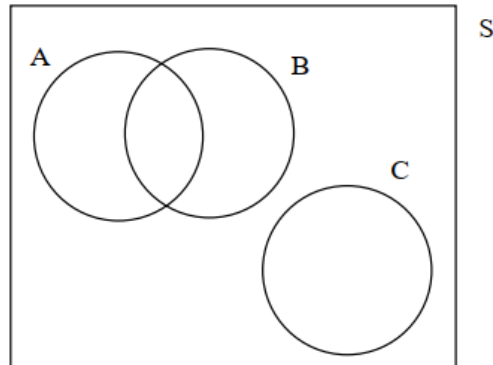
9.2.2 Calculate $P(B)$. (4)

9.2.3 Calculate $P(\text{not } A)$. (2)
[13]

PAPER B – KZN 2025

QUESTION 9

In the Venn diagram below, events A, B and C are shown.



9.1 It is given that $P(A) = 0,47$ and $P(C) = \frac{3}{7}$

9.1.1 Write down the $P(A \text{ and } C)$. (1)

9.1.2 Calculate the $P(A \text{ or } C)$. (2)

9.2 It is given that events A and B are independent and $P(A) = \frac{2}{5}P(B)$.

9.2.1 Determine the $P(A \text{ and } B)$ in terms of $P(B)$. (2)

9.2.2 It also given that $P(A \text{ or } B) = 70\%$. Calculate $P(B)$. (5)

[10]

QUESTION 10

A survey was conducted amongst 45 males and 85 females who were randomly selected. This survey was about the brand of clothes they would love to buy between Gucci (G) and Louis Vuitton (LV). The results are summarised below.

- 3y females said they would love to buy Louis Vuitton.
- y males said they would love to buy Gucci.
- The total number of males who said they would love to buy Louis Vuitton is double the total number of females who said they would love to buy Gucci.

10.1 Calculate the total number of females who said they would love to buy Gucci. (6)

10.2 Are the events of being a 'male' and having said that they would love to buy one of the brands **independent**? Justify your answer with calculations. (4)

[10]

PAPER 2

STATISTICS

PAPER A – Nov 2018

QUESTION 1

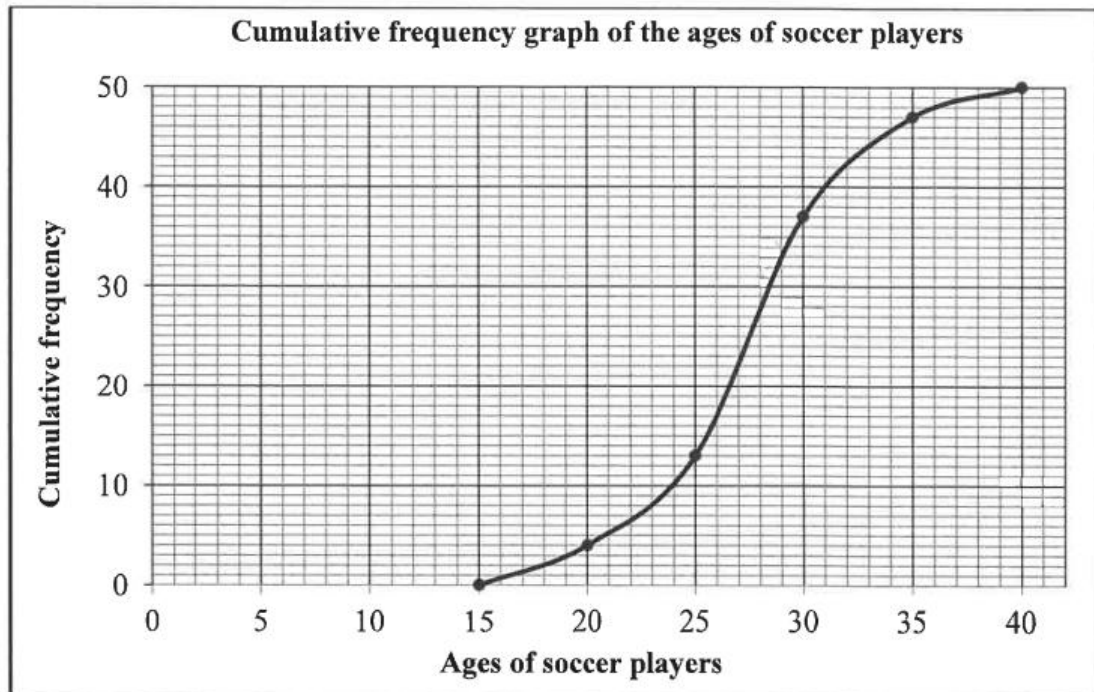
A school held a sports day. One of the items on the programme was an obstacle race. Teams of 10 parents and learners participated in this race. The table below shows the time taken, in minutes, by each member of a particular team to complete the race.

4	12	13	16	17	18	20	22	22	25
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- 1.1 How long, in minutes, did it take for the fastest member of this team to complete the race? (1)
 - 1.2 Determine the mean time taken by this team. (2)
 - 1.3 Calculate the standard deviation for the data. (1)
 - 1.4 How many members of the team completed the obstacle race outside of two standard deviations of the mean? (3)
 - 1.5 It took another team a total time of $x+5$ minutes to complete the race. Calculate the value of x if the overall mean of the two teams combined was 18 minutes. (3)
- [10]

QUESTION 2

- 2.1 A survey was conducted of the ages of players at a soccer tournament. The results are shown in the cumulative frequency graph (ogive) below.



- 2.1.1 How many players took part in the soccer tournament? (1)
- 2.1.2 Determine the number of players between the ages of 24 and 31 years old. (2)
- 2.1.3 Complete the frequency column of the table below in the ANSWER BOOK.

CLASS INTERVAL	FREQUENCY	CUMULATIVE FREQUENCY
$15 \leq x < 20$		4
$20 \leq x < 25$		13
$25 \leq x < 30$		37
$30 \leq x < 35$		47
$35 \leq x < 40$		50

- 2.1.4 Use the grid provided in the ANSWER BOOK to draw a frequency polygon for the data. (4)

- 2.2 Two Grade 11 Mathematics classes have the same number of learners. The five-number summaries of the marks obtained by these classes for a test are shown below.

CLASS A (30 ; 48 ; 65 ; 82 ; 90)

CLASS B (50 ; 58 ; 65 ; 75 ; 90)

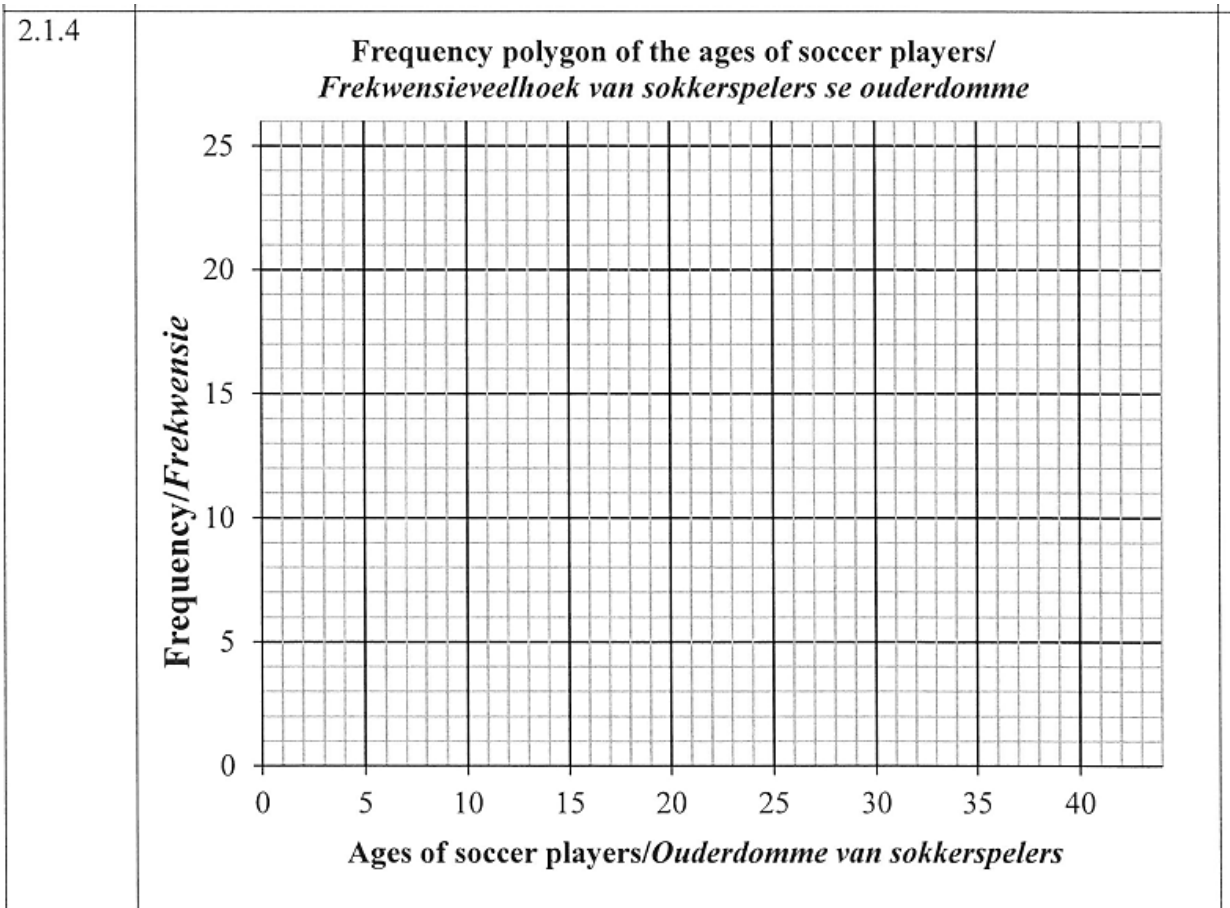
The parents of learners in CLASS A and CLASS B observe that both classes have the same median and the same maximum mark and therefore claim that there is no difference in the performance between these classes.

Do you agree with this claim? Use at least TWO different arguments to justify your answer.

(3)
[13]

ANSWER BOOK FOR QUESTION 2

2.1.3	CLASS INTERVAL/ KLASINTERVAL	FREQUENCY/ FREKWENSIE	CUMULATIVE FREQUENCY/ KUMULATIEWE FREKWENSIE
	$15 \leq x < 20$		4
	$20 \leq x < 25$		13
	$25 \leq x < 30$		37
	$30 \leq x < 35$		47
	$35 \leq x < 40$		50



PAPER B – LP 2025**QUESTION 1**

During the cricket season, a batsman from Limpopo recorded the following scores.

48, 73, 17, 30, 6, 40, 69, 19, 2, 35, 11, 22, 57, 90, x

- 1.1 Calculate his last score, if his average score was 37.6 runs per over. (3)
- 1.2 Determine the standard deviation of the overs. (2)
- 1.3 Calculate what percentage (%) of scores lie within ONE standard deviation of the mean. (3)
- 1.4 If his scores were recorded incorrectly, and each score had to be reduced by two runs, determine:
 - 1.4.1 The new average runs per over. (1)
 - 1.4.2 The new standard deviation of the overs. (1)

[10]**QUESTION 2**

The weights of 100 chickens (in kg) were summarised in the frequency table below.

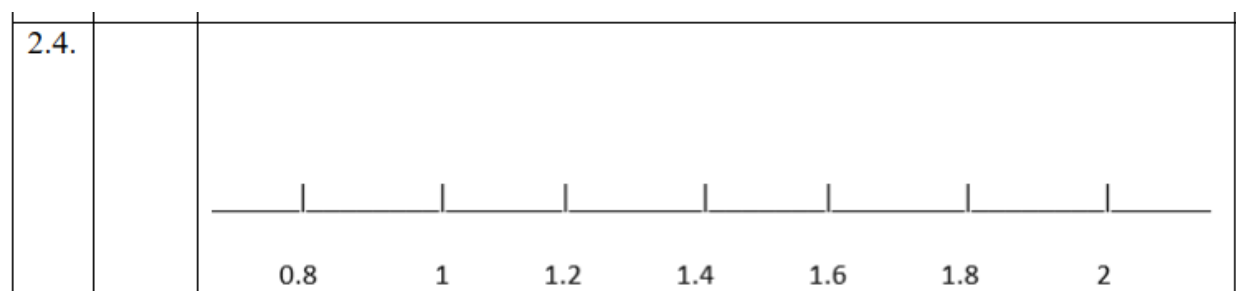
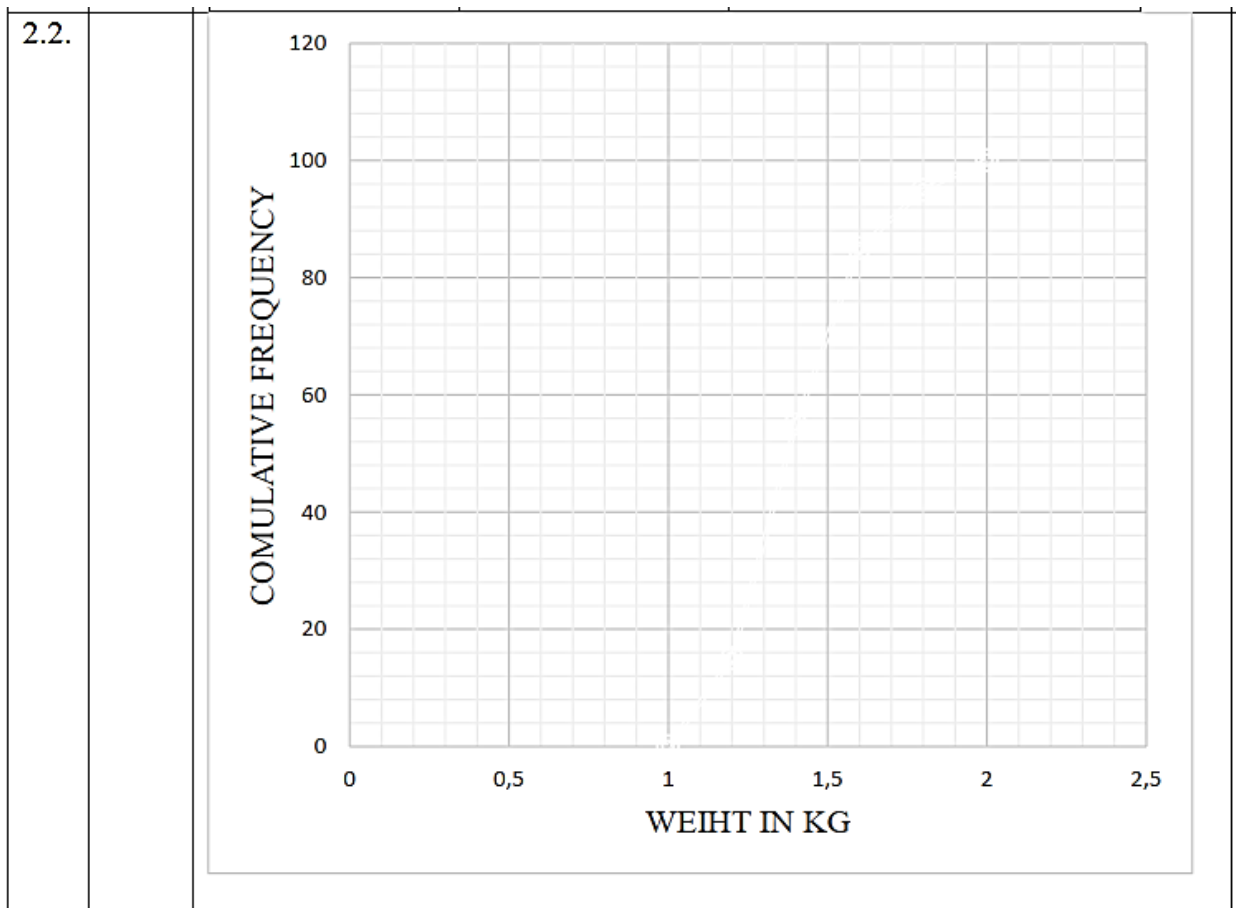
Weights in kg	Number of chickens
$1 \leq w < 1,2$	15
$1,2 \leq w < 1,4$	40
$1,4 \leq w < 1,6$	30
$1,6 \leq w < 1,8$	10
$1,8 \leq w < 2$	5

- 2.1 Complete the cumulative frequency column of the data. (3)
- 2.2 Draw a cumulative frequency graph (ogive) of the above data on the grid provided. (2)
- 2.3 Use your graph to determine the median, lower quartile and upper quartile for the data. (3)
- 2.4 Draw a box and whisker diagram of the data. (2)
- 2.5 Comment on the skewness of the data. (1)

[11]

ANSWER BOOK FOR QUESTION 2

QUESTION 2 / VRAAG 2																				
2.1.	<table border="1"> <thead> <tr> <th>Weights in kg / <i>Gewig in kg</i></th><th>Number of chickens / <i>Aantal hoenders</i></th><th>Cumulative frequency / <i>Kumulatiewe frekwensie</i></th></tr> </thead> <tbody> <tr> <td>$1 \leq w < 1,2$</td><td>15</td><td></td></tr> <tr> <td>$1,2 \leq w < 1,4$</td><td>40</td><td></td></tr> <tr> <td>$1,4 \leq w < 1,6$</td><td>30</td><td></td></tr> <tr> <td>$1,6 \leq w < 1,8$</td><td>10</td><td></td></tr> <tr> <td>$1,8 \leq w < 2$</td><td>5</td><td></td></tr> </tbody> </table>		Weights in kg / <i>Gewig in kg</i>	Number of chickens / <i>Aantal hoenders</i>	Cumulative frequency / <i>Kumulatiewe frekwensie</i>	$1 \leq w < 1,2$	15		$1,2 \leq w < 1,4$	40		$1,4 \leq w < 1,6$	30		$1,6 \leq w < 1,8$	10		$1,8 \leq w < 2$	5	
Weights in kg / <i>Gewig in kg</i>	Number of chickens / <i>Aantal hoenders</i>	Cumulative frequency / <i>Kumulatiewe frekwensie</i>																		
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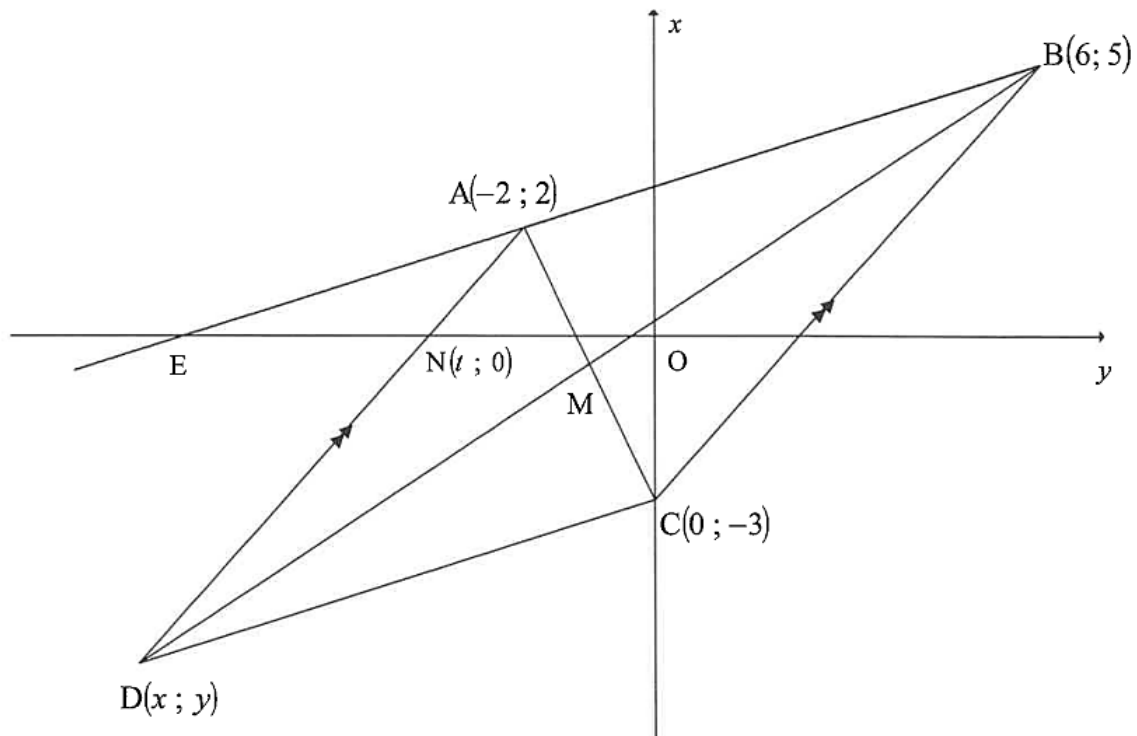


ANALYTICAL GEOMETRY

PAPER A – Nov 2018

QUESTION 3

In the diagram, $A(-2; 2)$, $B(6; 5)$, $C(0; -3)$ and $D(x; y)$ are the vertices of a quadrilateral having $AD \parallel BC$. BA produced has an x -intercept at E . BD and AC intersect at M . $N(t; 0)$ is a point on AD .



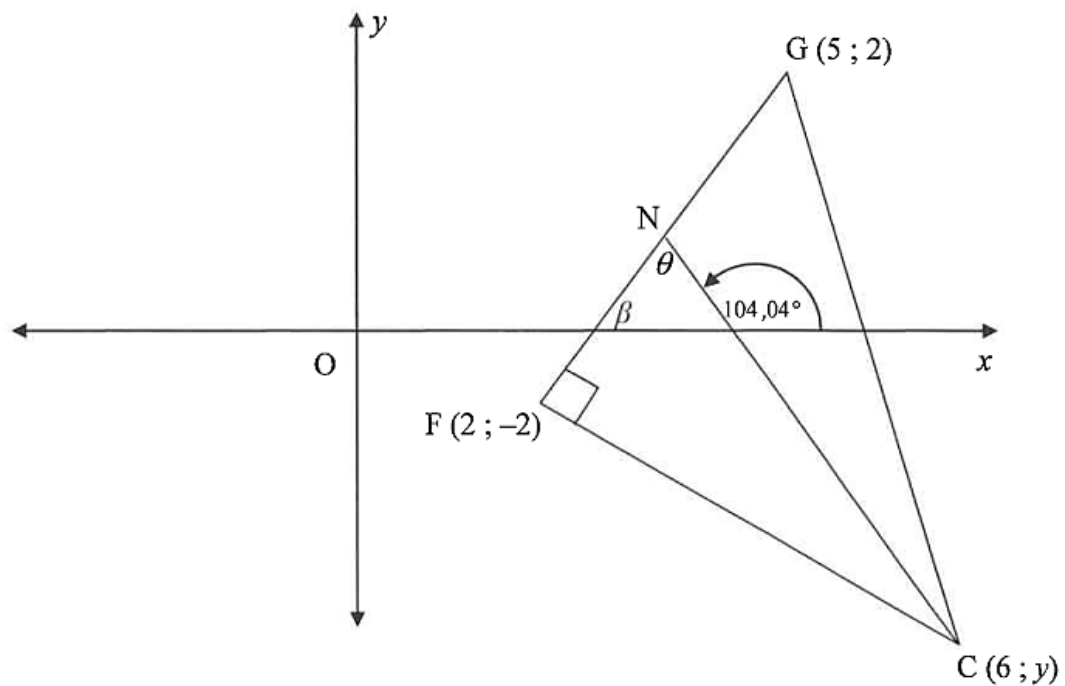
- 3.1 Calculate the gradient of BC . (2)
- 3.2 Determine the equation of AD . (3)
- 3.3 Determine the value of t . (2)
- 3.4 Calculate the length of AN . (2)
- 3.5 If DC is defined by $y = \frac{3}{8}x - 3$, determine the coordinates of D . (4)
- 3.6 Prove that $ABCD$ is a parallelogram. (3)
- 3.7 Calculate the coordinates of M . (3)

[19]

QUESTION 4

In the diagram, $F(2; -2)$, $G(5; 2)$ and $C(6; y)$ are the vertices of $\triangle FGC$. $FG \perp FC$.
 N is a point on FG such that the inclination of NC is $104,04^\circ$.

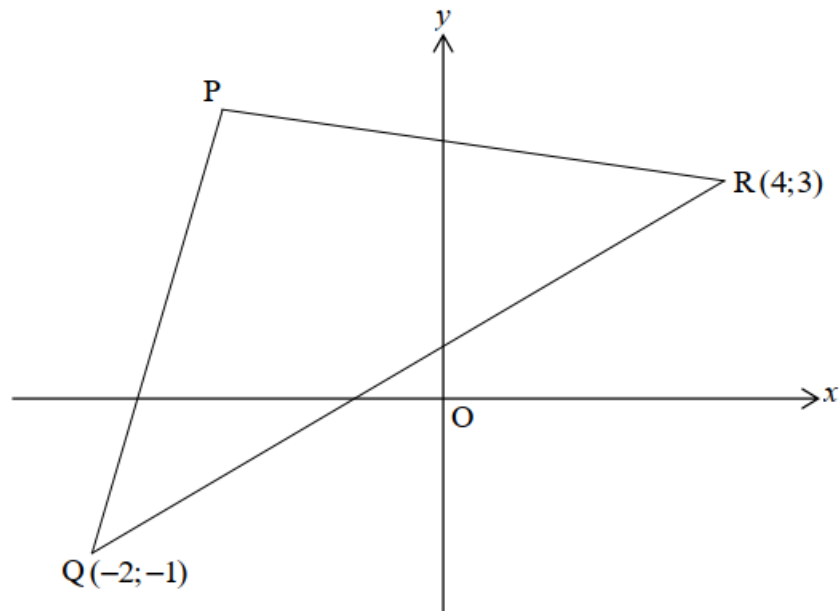
The angle of inclination of FG is β and $\hat{FNC} = \theta$.



- | | | |
|-----|----------------------------------|------|
| 4.1 | Calculate the gradient of FG . | (2) |
| 4.2 | Calculate the value of y . | (3) |
| 4.3 | Calculate the size of θ . | (3) |
| 4.4 | Calculate the length of NC . | (4) |
| | | [12] |

PAPER B – LP 2025**QUESTION 3**

Consider $\triangle PQR$ drawn below. PO has the equation $y = 5x + 9$, while PR has the equation $5y + x - 19 = 0$.

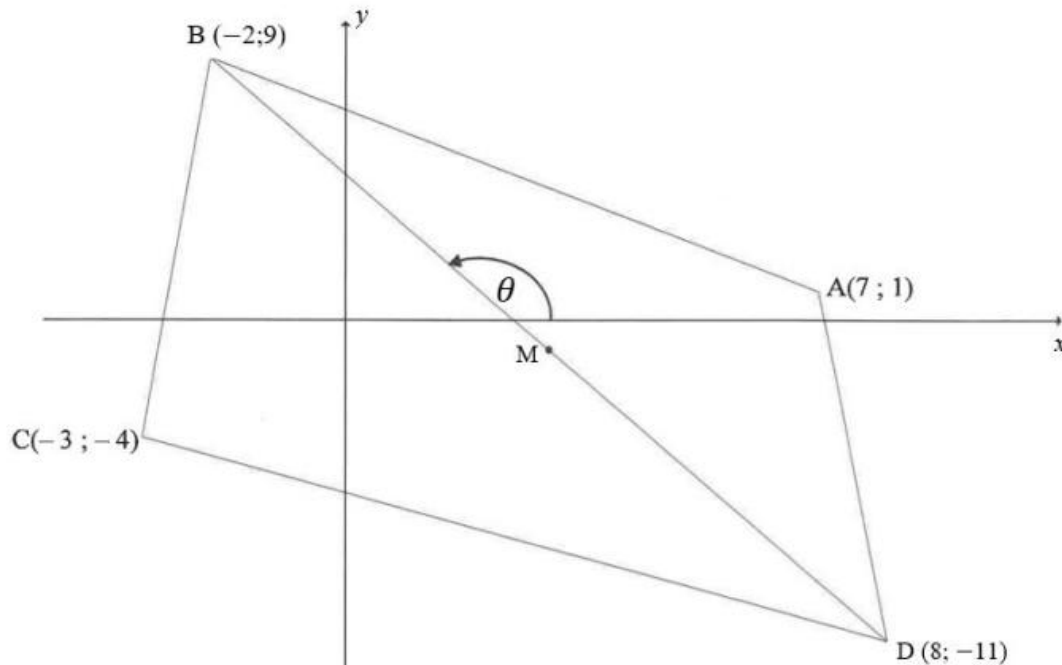


- 3.1 Show that the coordinates of P are $(-1; 4)$. (3)
- 3.2 Show that $PO \perp PR$. (3)
- 3.3 Hence or otherwise, calculate the area of triangle $\triangle PQR$. (4)
- 3.4 Determine the equation of the line parallel to QR passing through P. (4)
- 3.5 Determine the coordinates of S, if PQSR is a parallelogram. (2)

[16]

QUESTION 4

In the diagram, ABCD is a quadrilateral having vertices A (7;1), B (-2;9), C (-3;-4) and D (8;-11). M is the midpoint of BD.



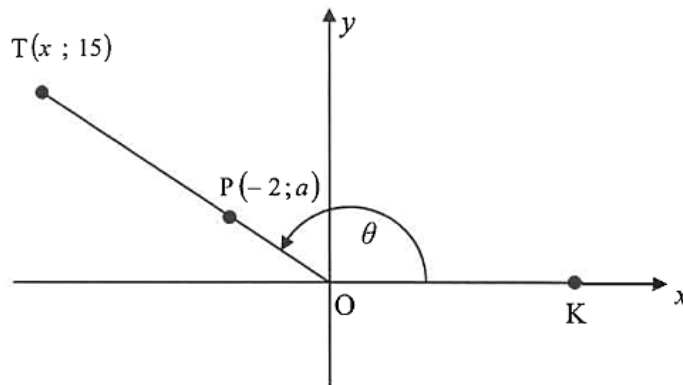
- 4.1 Calculate the gradient of AC. (2)
 - 4.2 Determine the equation of AC in the form $y = mx + c$. (2)
 - 4.3 Determine whether M lies on AC (4)
 - 4.4 Given that $BD \perp AC$, calculate:
 - 4.4.1 θ , the inclination of BD. (2)
 - 4.4.2 The size of $\angle CBD$ (3)
- [13]

TRIGONOMETRY

PAPER A – Nov 2018

QUESTION 5

- 5.1 In the diagram below, $T(x; 15)$ is a point in the Cartesian plane such that $OT = 17$ units. $P(-2; a)$ lies on OT . K is a point on the positive x -axis and $\hat{OK} = \theta$.

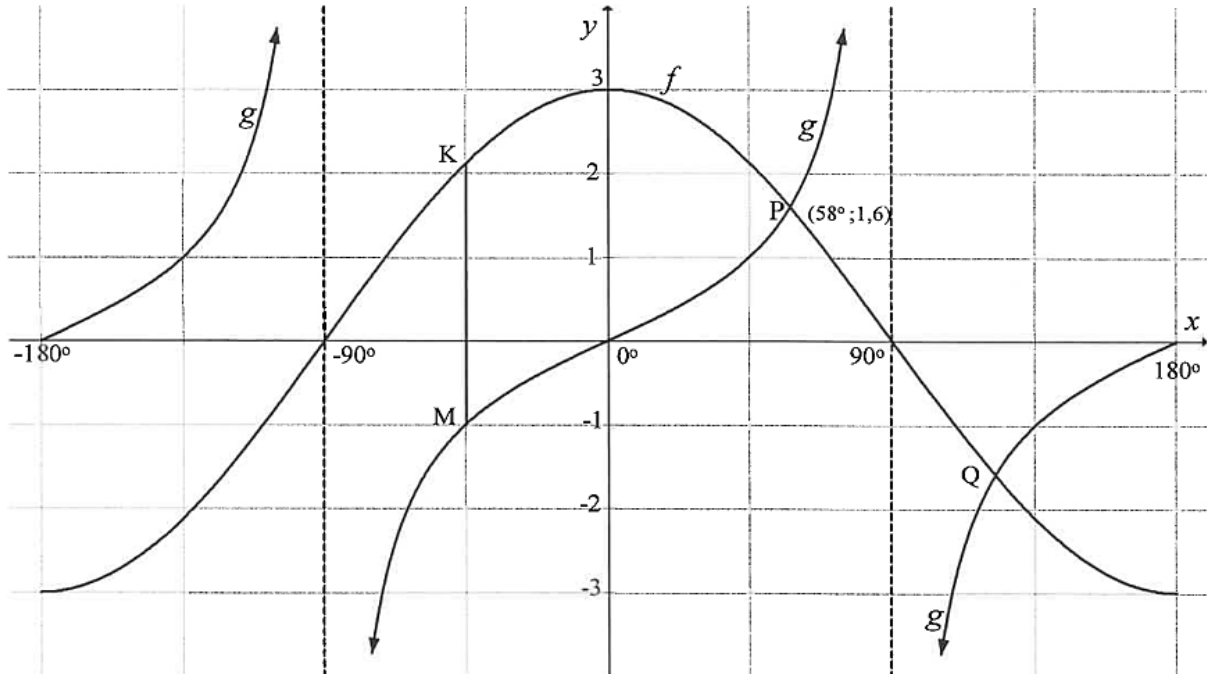


Determine, with the aid of the diagram, the following:

- 5.1.1 The value of x (2)
- 5.1.2 $\tan \theta$ (1)
- 5.1.3 $\cos(180^\circ - \theta)$ (2)
- 5.1.4 $\sin^2 \theta$ (2)
- 5.1.5 The value of a (3)
- 5.2 Simplify WITHOUT using a calculator:
- $$\frac{\sin 120^\circ \cdot \cos 210^\circ \cdot \tan 315^\circ \cdot \cos 27^\circ}{\sin 63^\circ \cdot \cos 540^\circ} \quad (7)$$
- 5.3 Prove the identity:
- $$\frac{1}{\cos \theta} - \frac{\cos \theta}{1 + \sin \theta} = \tan \theta \quad (5)$$
- 5.4 Determine the general solution of $3 \sin x = 2 \tan x$ (6)
[28]

QUESTION 6

The graphs of the functions $f(x) = a \cos b\theta$ and $g(x) = c \tan \theta$ for $x \in [-180^\circ; 180^\circ]$ are sketched below. The graphs intersect at $P(58^\circ; 1,6)$ and Q .

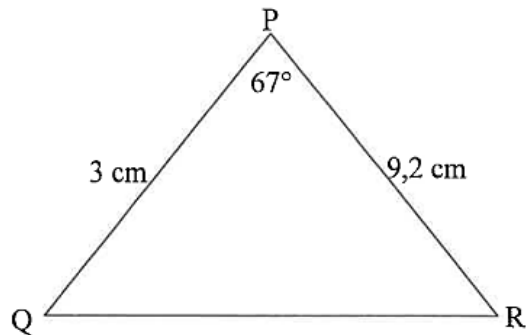


- 6.1 Write down the range of f . (2)
- 6.2 If $M(-45^\circ; -1)$ lies on g , determine the value of c . (1)
- 6.3 Write down the values of a and b . (2)
- 6.4 Determine the coordinates of Q . (2)
- 6.5 K lies on f such that KM is parallel to the y -axis. Calculate the length of KM . (2)
- 6.6 If the system of axes is shifted 45° to the left and the graphs remain fixed, write down the equation that is now represented by graph f . (2)

[11]

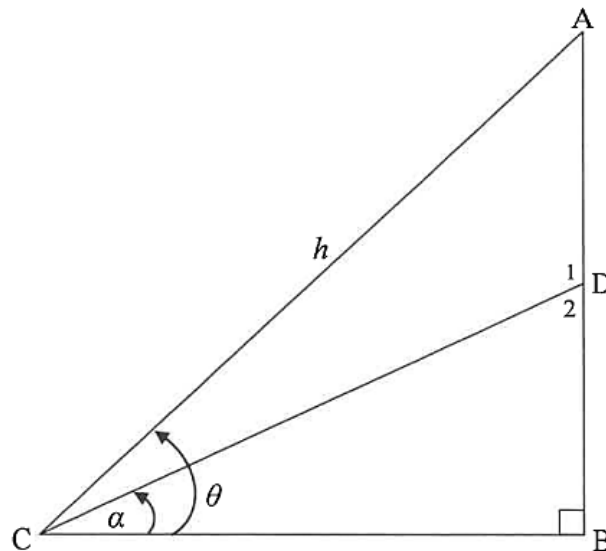
QUESTION 7

- 7.1 In the diagram, $\hat{P} = 67^\circ$, $PQ = 3$ cm and $PR = 9,2$ cm.
Determine the length of QR .



(3)

- 7.2 In the diagram below, $\hat{DCB} = \alpha$, $AC = h$ units and $\hat{ACB} = \theta$.



- 7.2.1 Determine size of $\hat{ACD}$ in terms of θ and α . (1)
- 7.2.2 Prove that $AD = \frac{h \sin(\theta - \alpha)}{\cos \alpha}$ (4)
- 7.2.3 Determine the length of AD if $h = 17$ units, $\theta = 58^\circ$ and $\alpha = 23^\circ$. (2)
- 7.2.4 Calculate the area of $\triangle ADC$. (3)

[13]

PAPER B – LP 2025

QUESTION 5

5.1 If $12 \tan \theta - 5 = 0$ and $90^\circ \leq \theta \leq 360^\circ$, determine the value of $\sin \theta + \cos \theta$ (4)

5.2 If $\sin 40^\circ = p$, find $\sin 220^\circ$ in terms of p . (2)

5.3 Simplify the following WITHOUT the use of a calculator:

5.3.1
$$\frac{\sin 120^\circ \cdot \cos 210^\circ \cdot \tan 315^\circ \cdot \cos 27^\circ}{\sin 63^\circ \cdot \cos 540^\circ}$$
 (6)

5.3.2
$$\frac{\cos(180^\circ - x) \cdot \sin(x - 90^\circ) - 1}{\tan^2(540^\circ + x) \cdot \sin(90^\circ + x) \cdot \cos(-x)}$$
 (7)

5.4 Prove that: $\frac{\cos x}{1 - \sin x} - \frac{\cos x}{1 + \sin x} = 2 \tan x$ (5)

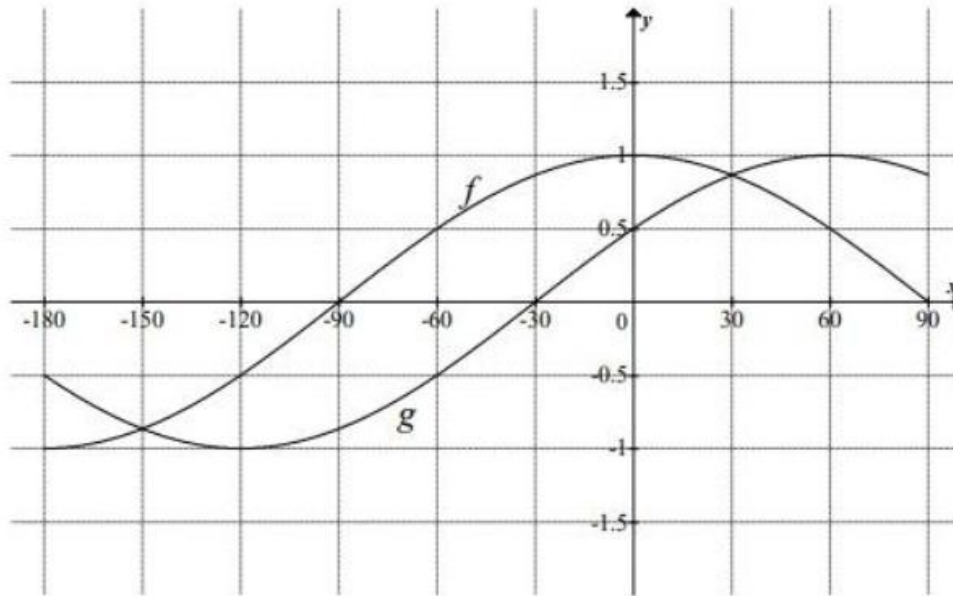
5.5 For which values of x will the identity in 5.4 be undefined for $x \in [0^\circ; 180^\circ]$. (1)

5.6 Determine the general solution of $\sin 2x = \cos(x + 30^\circ)$ (6)

[31]

QUESTION 6

In the diagram below, the graphs of $f(x) = \cos x$ and $g(x) = \sin(x + b)$ are drawn for the interval $-180^\circ \leq x \leq 90^\circ$.



- 6.1 Write down the value of b . (1)
- 6.2 Write down the period of g . (1)
- 6.3 Write down the value(s) of x in the interval $-180^\circ \leq x \leq 90^\circ$ for which $f(x) - g(x) = 0$. (2)
- 6.4 For which values of x in the interval $-180^\circ \leq x \leq 90^\circ$ is $\sin(90^\circ - x) > g(x)$? (3)
- 6.5 The graph of h is obtained by shifting f by 3 units upwards. Determine the equation h and write down its range. (3)

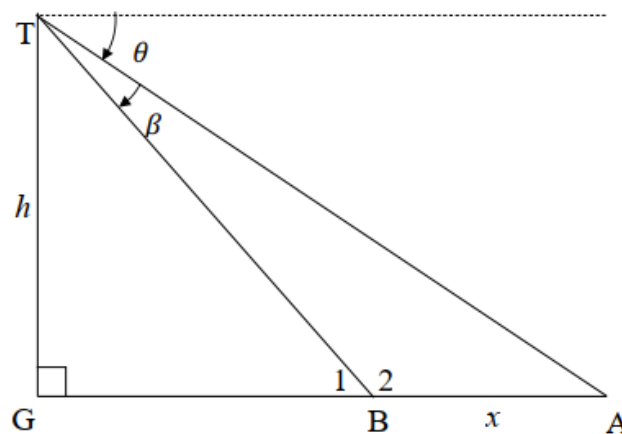
[10]

QUESTION 7

7.1 Prove that in any acute-angled $\triangle ABC$, $\frac{a}{\sin A} = \frac{b}{\sin B}$. (5)

7.2 In the diagram, TG represents a vertical cliff which is h meters high. An observer at T sees two boats A and B in the sea below. The angle of depression from T to boat A is θ . The boats are in the same horizontal plane as G.

The distance between the boats is x meters and $\hat{ATB} = \beta$.



7.2.1 Determine $\hat{B_1}$ in terms of θ and β (1)

7.2.2 Show that $x = \frac{h \sin \beta}{\sin(\theta + \beta) \sin \theta}$ (5)

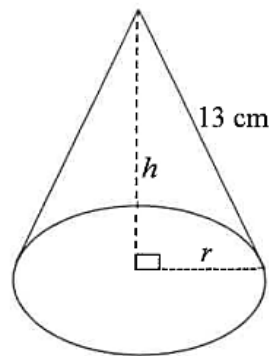
[11]

MEASUREMENT

PAPER A – Nov 2018

QUESTION 8

The diagram below shows a cone with a perpendicular height of h cm, a radius of r cm and a slant height of 13 cm.



$$\text{Volume of cone} = \frac{1}{3}\pi r^2 h$$

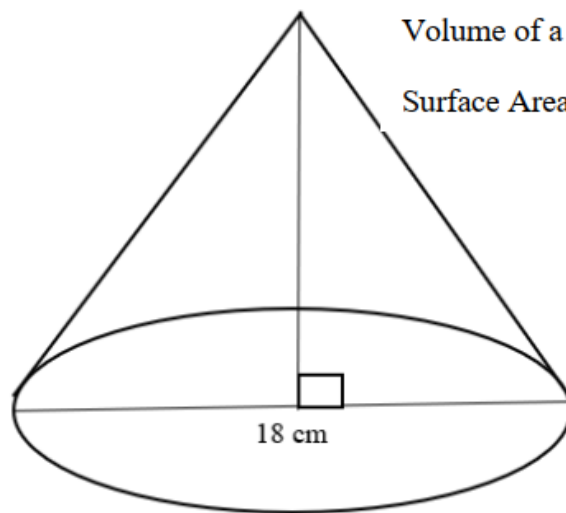
$$\begin{aligned} \text{Total surface area of the cone} \\ = \pi r^2 + \pi r s \end{aligned}$$

- 8.1 Show that the volume of the cone is given by $V = \frac{169\pi h - \pi h^3}{3}$ (4)
- 8.2 If $h = 12$ cm, determine the total surface area of the cone. (3)
- [7]

PAPER B – LP 2025

QUESTION 8

The figure below shows a right cone which has a volume of 3392.92 cm^3 and a diameter of 18 cm.



Formulae:

$$\text{Volume of a cone} = \frac{1}{3} \pi r^2 h$$

$$\text{Surface Area of a cone} = \pi r^2 + \pi r l$$

- 8.1 Determine the radius of the given figure. (1)
 - 8.2 Determine the height of the cone. (2)
 - 8.3 Determine the slant height of the cone. (2)
 - 8.4 Calculate the surface area of the cone. (3)
- [8]**

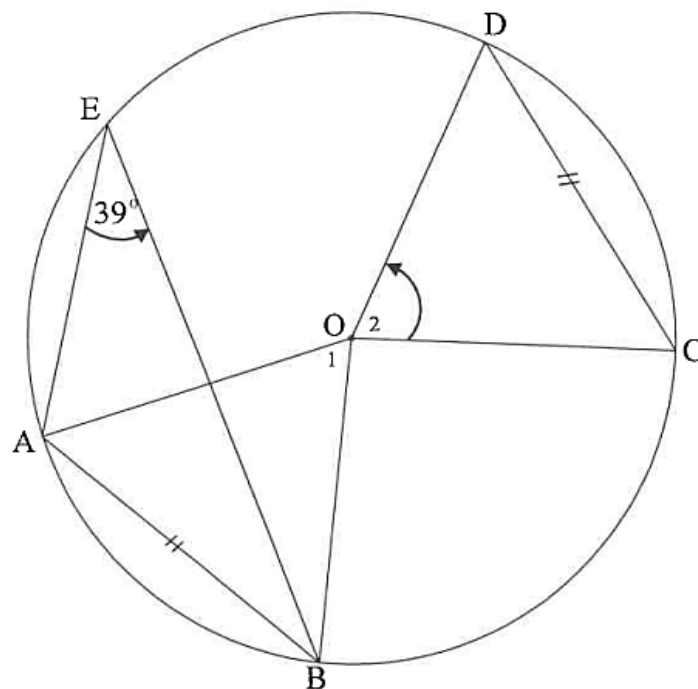
EUCLIDEAN GEOMETRY

PAPER A – Nov 2018

Give reasons for your statements and calculations in QUESTIONS 9, 10 and 11.

QUESTION 9

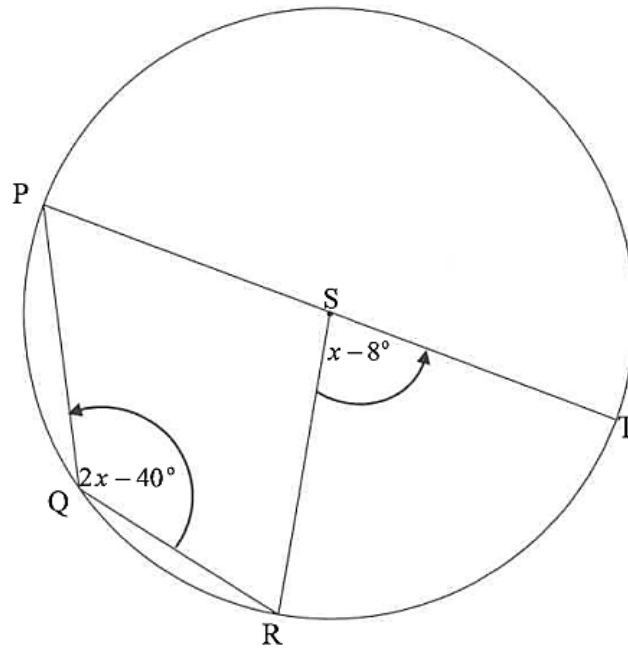
- 9.1 In the figure, O is the centre of the circle. A , B , C , D and E lie on the circle such that chord AB and chord DC are equal in length and $\angle AEB = 39^\circ$.



9.1.1 Determine the size of $\hat{O}_1$. (2)

9.1.2 Determine the size of $\hat{O}_2$. (2)

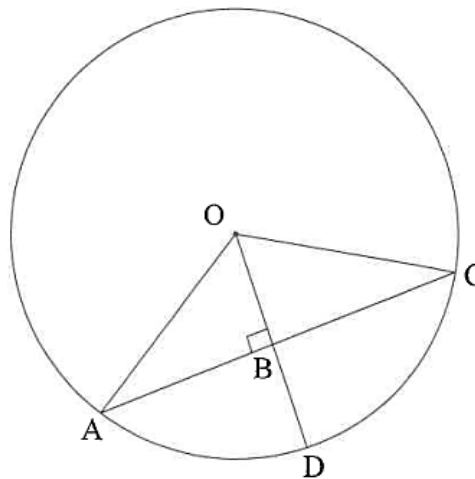
- 9.2 In the diagram, S is the centre of circle PQRT. PT is a diameter.
 $\angle RST = x - 8^\circ$ and $\angle PQR = 2x - 40^\circ$.



Determine the value of x .

(4)

- 9.3 In the diagram, O is the centre of the circle. Chord AC is perpendicular to radius OD at B. $OB = 2x$ units and $AC = 8x$ units.

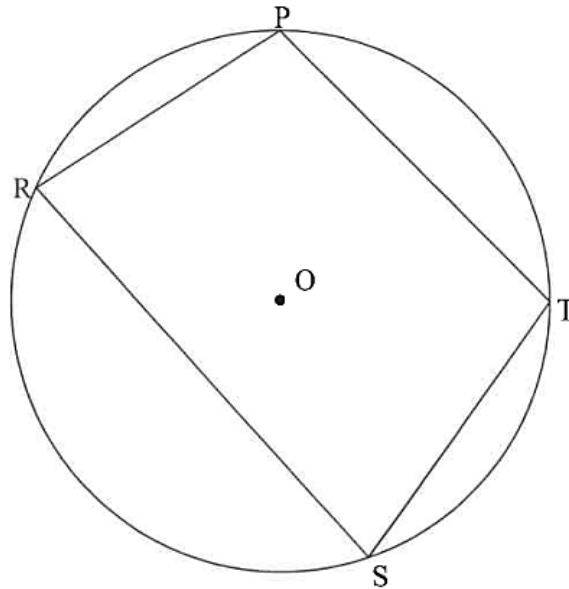


Show that the length of BD is $2x(\sqrt{5}-1)$ units.

(5)
[13]

QUESTION 10

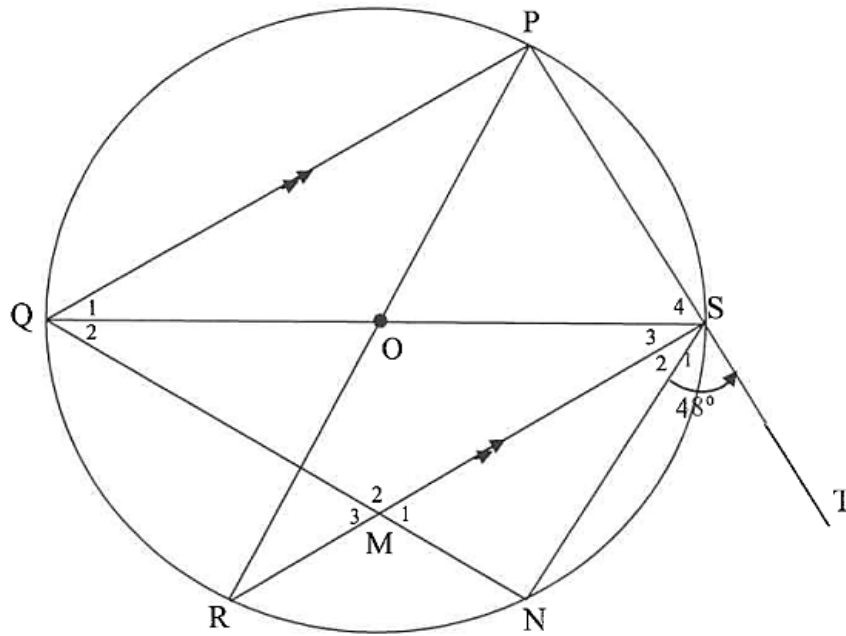
- 10.1 In the diagram below, O is the centre of the circle and $PTSR$ is a cyclic quadrilateral.



Prove the theorem that states that $\hat{P} + \hat{S} = 180^\circ$. (5)

- 10.2 In the figure, QS and PR are diameters of the circle with centre O such that $PQ \parallel SR$. PS is produced to T. N is a point on the circle such that $\hat{Q}_1 = \hat{Q}_2$. SN is drawn.

RS intersects QN at M. $\hat{S}_1 = 48^\circ$



- 10.2.1 Determine, with reasons, the size of:

(a) $\hat{Q}_1$ (3)

(b) $\hat{R}$ (2)

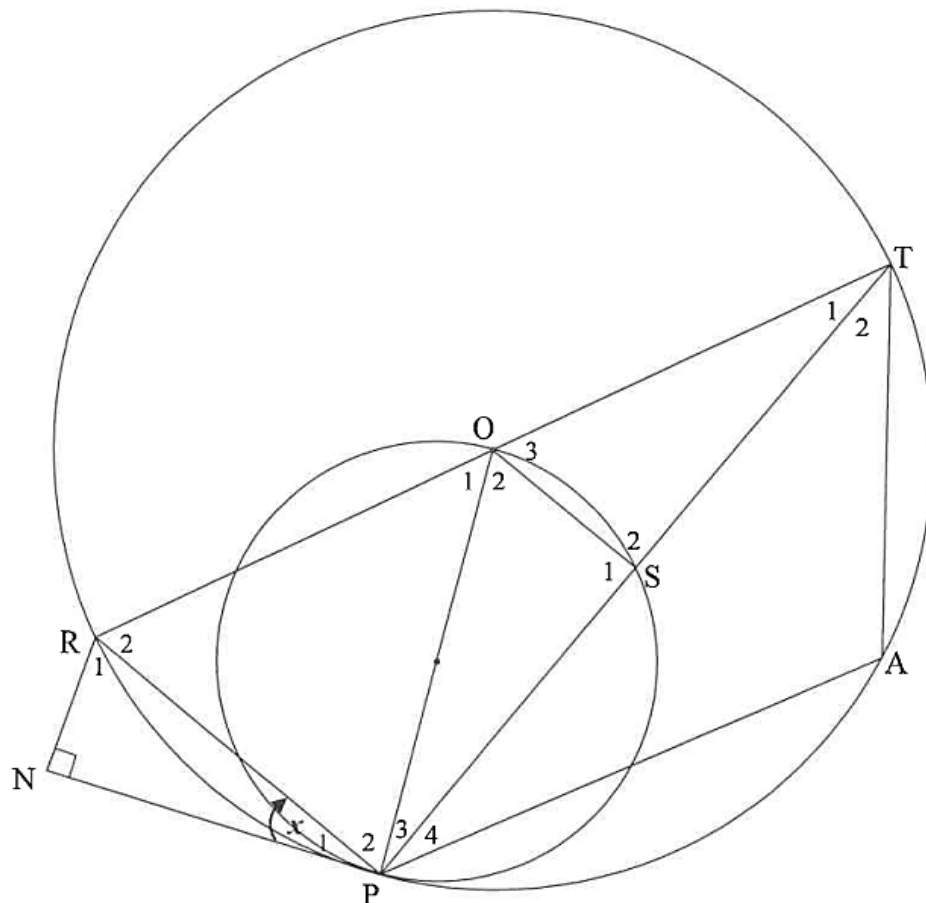
(c) $\hat{M}_1$ (2)

- 10.2.2 Prove that ST is a tangent to the circle passing through M, N and S. (2)
[14]

QUESTION 11

O is the centre of the larger circle RTAP. OP is the diameter of the smaller circle PSO. NP is a tangent to both circles at P. $RN \perp NP$.

Let $\hat{P}_1 = x$.



11.1 Prove that PR bisects $\hat{ORN}$. (5)

11.2 Prove that $\hat{ROS} = \hat{PAT}$. (5)
[10]

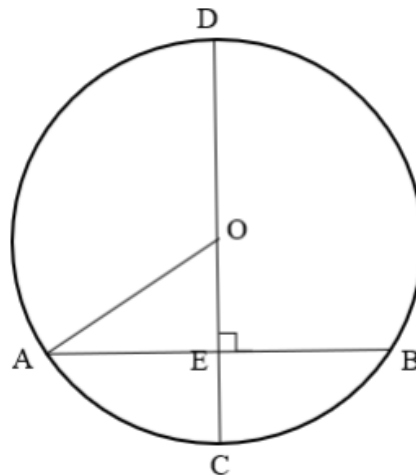
PAPER B – LP 2025

QUESTION 9

9.1 Complete the statement so that it is valid:

The line drawn from the centre of the circle perpendicular to the chord ... (1)

9.2 In the diagram, O is the centre of the circle. The diameter DC is perpendicular to the chord AB at E. DE = 18 cm and AB = 24 cm.



9.2.1 Determine, with reasons, the length of AE. (2)

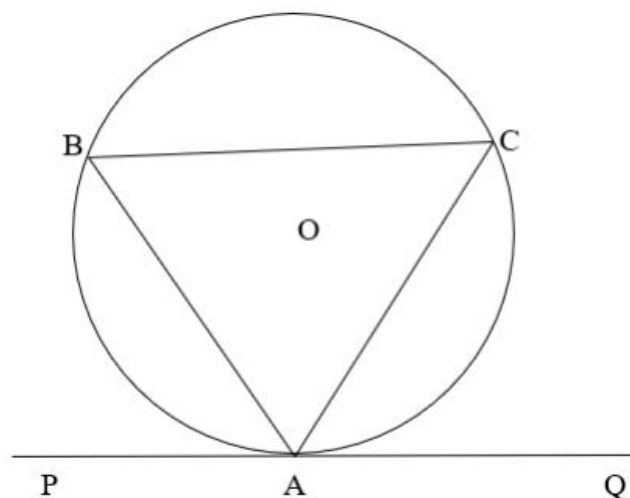
9.2.2 If the radius of the circle is x centimetres, express OE in terms of x . (1)

9.2.3 Calculate, with reasons, the value of x . (3)

[7]

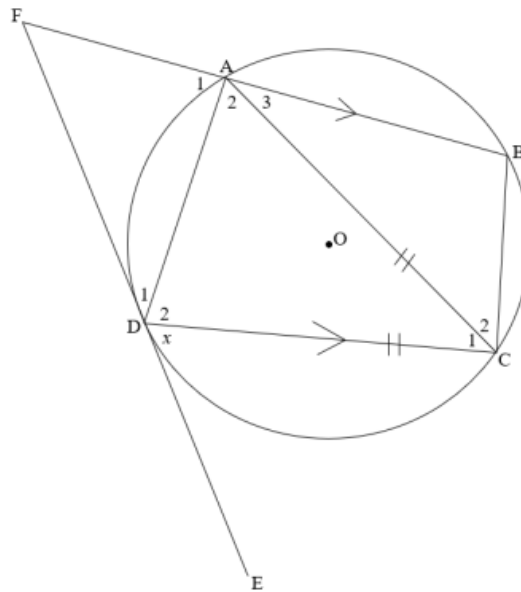
QUESTION 10

10.1 In the diagram below, O is the centre of circle ABC. PAQ a tangent at A.



Use the diagram to prove the theorem which states that $\angle CAQ = \angle B$. (5)

- 10.2 In the diagram below, FDE is a tangent to the circle with points A, B, C and D on the circumference of the circle. $FB \parallel DC$ and $AC = DC$.



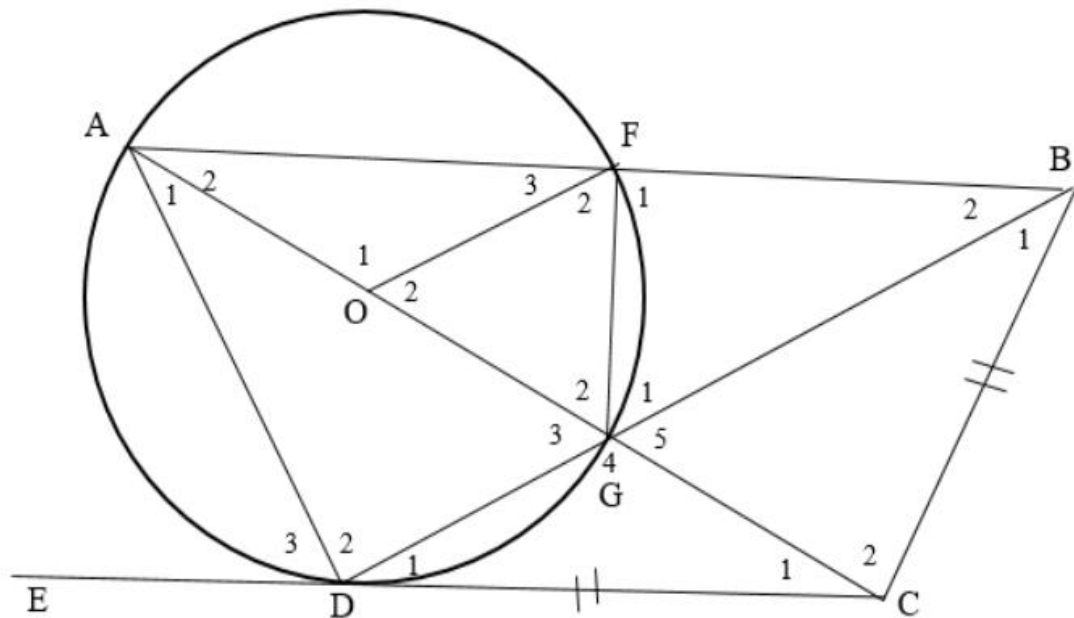
10.2.1 Name with reasons, FIVE other angles, each equal to x . (10)

10.2.2 Prove that FBCD is a parallelogram. (4)

[19]

QUESTION 11

In the diagram below, A, D, G, and F are points on the circumference of the circle with centre O. The diameter AG is produced to C. EC is a tangent to the circle at D, and $DC = BC$. AFB is a straight line.



- 11.1 Prove that ADCB is a cyclic quadrilateral. (4)
- 11.2 Prove that AC bisects $\hat{BAD}$. (2)
- 11.3 Determine with reasons the size of $\hat{C}_2$. (2)
- 11.4 Prove that $\hat{G}_1 = \hat{O}_2$. (6)

[14]

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