



GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PROVINCIAL EXAMINATION
NOVEMBER 2022
GRADE 11

MATHEMATICS
(PAPER 2)

TIME: 3 hours

MARKS: 150

14 pages and 4 answer sheets

P.T.O

MATHEMATICS (PAPER 2)	GRADE 11	2
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INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
2. Clearly show ALL calculations, diagrams, graphs, et cetera that you have used in determining your answers.
3. Answers only will not necessarily be awarded full marks.
4. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
5. Where necessary, round off answers to TWO decimal places, unless stated otherwise.
6. Answer sheets for answering QUESTION 1.1, QUESTION 2.2, QUESTION 9.1 and QUESTION 11.1 are provided at the end of the question paper. Write your name in the spaces provided and submit them together with your ANSWER BOOK.
7. Diagrams are NOT necessarily drawn to scale.
8. Number the answers correctly according to the numbering system used in this question paper.
9. Write neatly and legibly.

Commented [BK1]: And Question 9.1

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QUESTION 1

The data below is the annual report from the local municipalities regarding the spending of money (in thousands of rands) on electricity.

250	266	277	287	287	259	306	315	294	329
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- 1.1 Draw a box-and-whisker diagram of the data above on the attached ANSWER SHEET A. (3)
 - 1.2 Comment on the skewness of the data. (1)
 - 1.3 Calculate the standard deviation. (2)
 - 1.4 How many municipalities are within one standard deviation of the mean? (3)
 - 1.5 Determine the semi-interquartile range of the municipalities. (3)
- [12]

QUESTION 2

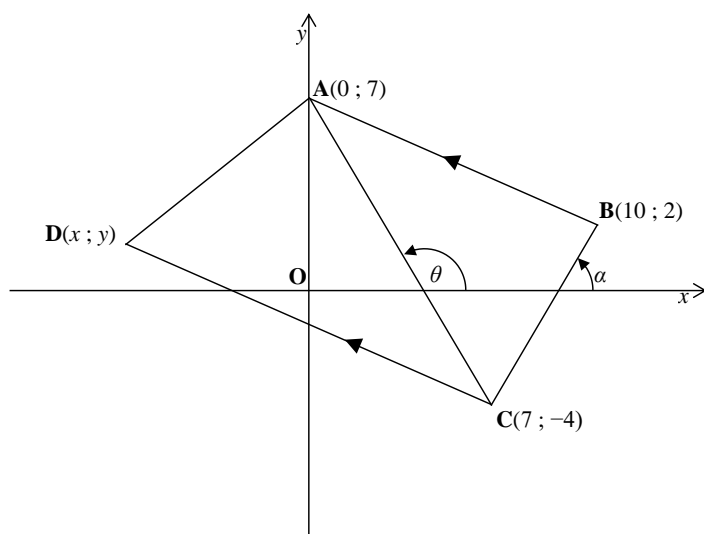
32 learners wrote a Mathematics test and the results are shown below.

Marks	Frequency	Cumulative Frequency
$20 \leq x < 30$	5	p
$30 \leq x < 40$	5	10
$40 \leq x < 50$	10	20
$50 \leq x < 60$	7	q
$60 \leq x < 70$	3	30
$70 \leq x < 80$	1	31
$80 \leq x < 90$	r	32

- 2.1 Find the values of p , q and r . (3)
 - 2.2 Draw a cumulative frequency graph (OGIVE) of the data on the grid provided in the ANSWER SHEET B. (3)
 - 2.3 Use the cumulative frequency graph to determine the value of the median. (2)
 - 2.4 From the cumulative frequency graph, determine the number of learners who obtained a mark of more than 55. (2)
- [10]

QUESTION 3

In the diagram below, the points $A(0 ; 7)$, $B(10 ; 2)$, $C(7 ; -4)$ and $D(x ; y)$ form quadrilateral $ABCD$. $AB \parallel CD$, with AC joined. The angles of inclination for AC and BC are θ and α respectively.



Determine:

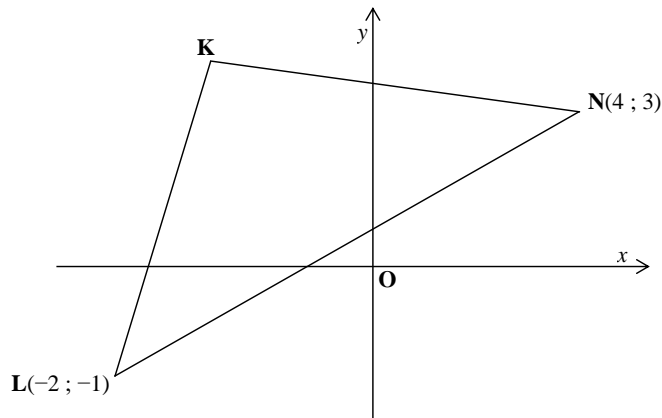
- 3.1 The length of AB (Leave your answer in simplified surd form.) (3)
- 3.2 The gradient of AC (2)
- 3.3 The size of θ , the angle of inclination of AC (3)
- 3.4 The magnitude (size) of \hat{BCD} (4)

[12]

P.T.O.

QUESTION 4

Consider $\triangle KLN$ drawn below. KL has the equation $y = 5x + 9$, while KN has the equation $5y + x - 19 = 0$.



- 4.1 Show that the coordinates of K are $(-1; 4)$. (3)
- 4.2 Show that $KL \perp KN$. (3)
- 4.3 Hence, or otherwise, determine the area of $\triangle KNL$. (4)
- 4.4 Determine the equation of the perpendicular bisector of LN . (5)
- 4.5 If L, N and P $(7; y)$ are collinear, find y . (2)
- 4.6 Determine the coordinates of Q, if $KLQN$ is a parallelogram. (2)
- 4.7 Explain, with geometric reasons, why $KLQN$ is a square. (2)

[21]

QUESTION 5

- 5.1 Determine the value of the following without the use of a calculator:

$$\frac{\tan(180^\circ - x)\cos(360^\circ + x)}{2\cos(90^\circ + x)} \quad (6)$$

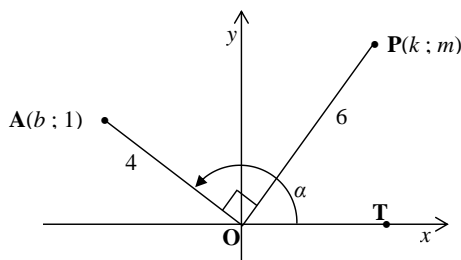
- 5.2 Given the identity:

$$\frac{\sin\theta - 2\sin\theta\cos\theta}{2\cos^2\theta + \cos\theta - 1} = \frac{-\sin\theta}{\cos\theta + 1}$$

- 5.2.1 Prove the above identity. (4)

- 5.2.2 For which values of θ will the identity be undefined? (5)

- 5.3 In the diagram below A is a point on the Cartesian plane such that $\hat{AOT} = \alpha$ with $OA = 4$. P ($k ; m$) is a point such that $OP = 6$ and $AO \perp OP$.



- 5.3.1 Determine the value of b . (2)

- 5.3.2 Determine, without the use of a calculator, the value of:

(a) $\tan \alpha$ (2)

(b) $\sin(-\alpha - 180^\circ) + \cos(-\alpha)$ (3)

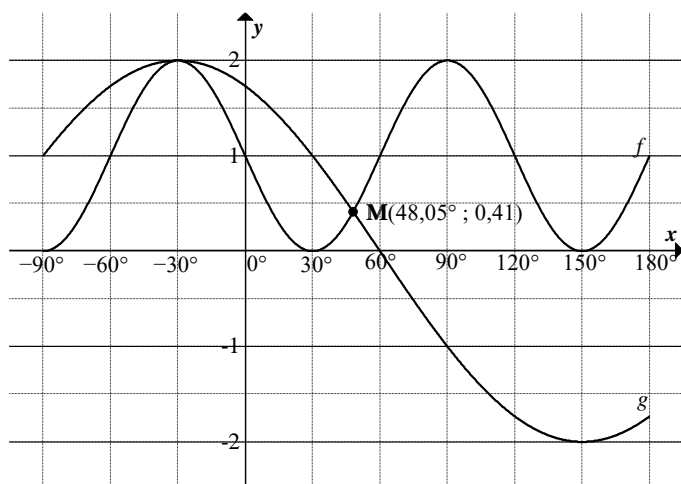
- 5.3.3 Without the use of a calculator, determine the values of k and m . (5)

[27]

Commented [BK2]: Bracket missing

QUESTION 6

In the diagram below, the graphs of $f(x) = a \sin bx + 1$ and $g(x) = 2 \cos(x + p)$ are shown for the interval $-90^\circ \leq x \leq 180^\circ$.



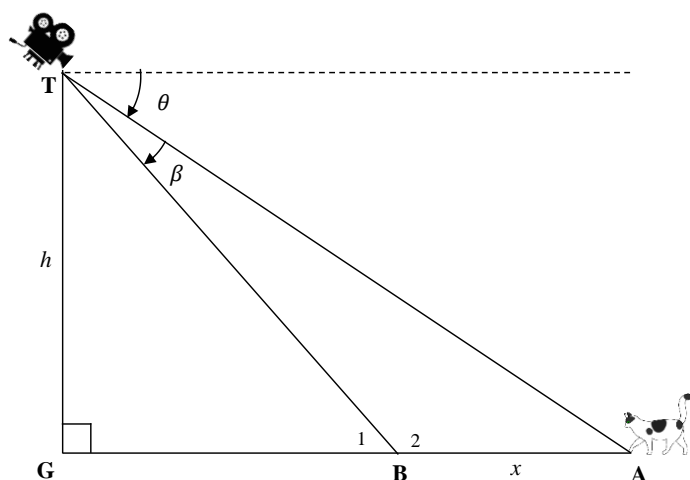
- 6.1 Write down the amplitude of g . (1)
- 6.2 Determine the period of f . (1)
- 6.3 Determine the values of a , b and p . (3)
- 6.4 Determine the value(s) of x such that:
 - 6.4.1 $g(x) > 0$ (1)
 - 6.4.2 $f(x) \geq g(x)$ (2)
 - 6.4.3 $f(x) \cdot g(x) < 0$ (2)
- 6.5 Given $h(x) = g(x + t)$, determine ALL values of t where $h(x) = h(-x)$. (3)

[13]

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QUESTION 7

A camera person is stationed at the top of a vertical tower (TG) where $TG = h$. She films a cat starting at A, where the angle of depression of T after A is θ . The camera follows the cat as it walks (in the same vertical plane) a distance of x metres horizontally to B, creating the angle β .

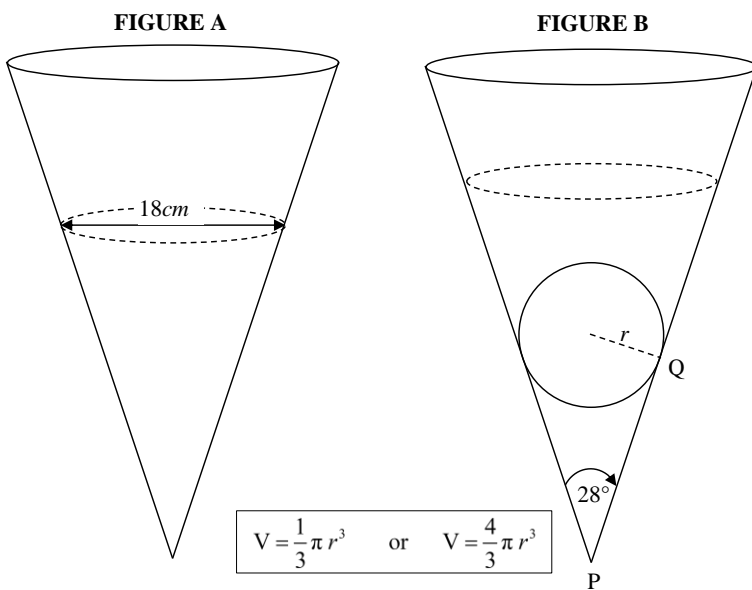


- 7.1 Determine \hat{B}_1 in terms of θ and β . (1)
- 7.2 Show that $x = \frac{h \sin \beta}{\sin(\theta + \beta) \sin \theta}$ (5)
- 7.3 Determine the distance (x) the cat walked from A to B if the tower was 20 m high, $\theta = 65^\circ$ and $\beta = 37^\circ$ (2)
- [8]**

QUESTION 8

Figure A below shows a rainwater gauge in the shape of a cone. The level of rainwater is indicated, with a diameter of 18 cm.

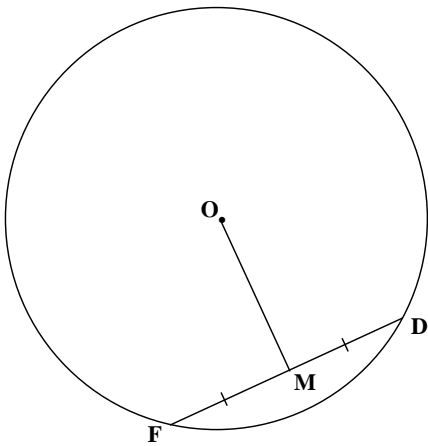
Figure B shows the same cone after a steel ball has been dropped into the cone. The angle of the cone is $\hat{P} = 28^\circ$, with the steel ball having a radius of r cm. Q is the point where the ball touches the side of the cone.



- 8.1 Determine the volume of rainwater in **FIGURE A**. (2)
- 8.2 The volume of rainwater in **FIGURE B** is increased by $268,08 \text{ cm}^3$ when the steel ball is placed inside the cone. Determine the length of PQ. (5)
- [7]

QUESTION 9

9.1 In the diagram, chord FD is drawn in a circle with centre O and $FM = MD$.



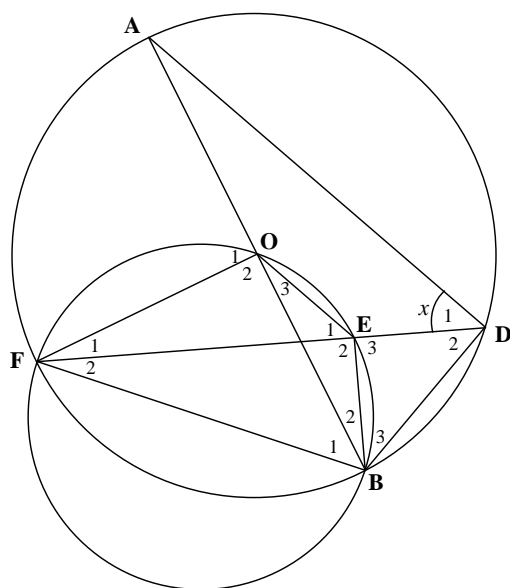
Use the diagram on the attached ANSWER SHEET C to complete the proof of the theorem which states that the line drawn from the centre of the circle to the midpoint of a chord will be perpendicular to that chord, that is, prove that $OM \perp FD$.

(4)

P.T.O.

QUESTION 10

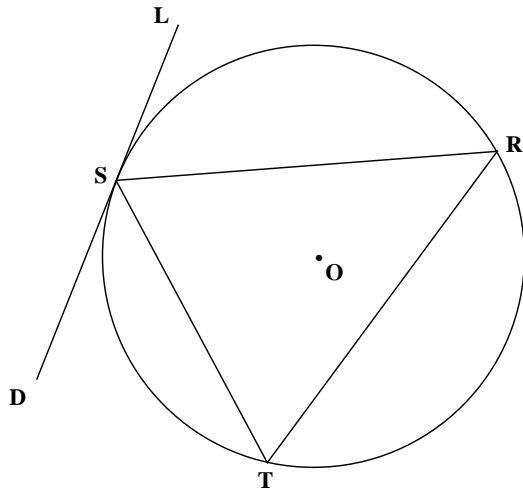
The larger circle ADBF with centre O, intersects the smaller circle at F and B respectively. Points O and E also lie on the smaller circle, with FED and AOB joined. $\hat{D}_1 = x$



- 10.1 Determine TWO other angles, each equal to x . (2)
- 10.2 Determine, with reasons, the following angles in terms of x :
- 10.2.1 \hat{O}_1 (2)
- 10.2.2 $\angle OFB$ (2)
- 10.2.3 \hat{D}_2 (2)
- 10.2.4 \hat{E}_2 (4)
- 10.3 Prove, with reasons, that $EB = ED$. (4)
- [16]

QUESTION 11

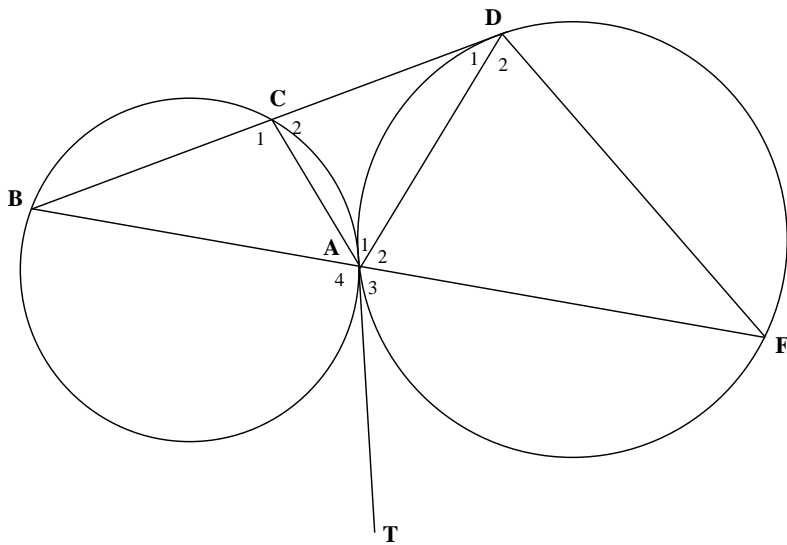
- 11.1 In the diagram, chords SR, RT and ST are drawn in a circle, with centre O. DSL is a tangent to the circle at S.



Use the diagram on the attached ANSWER SHEET D to prove the theorem which states that the angle between the tangent DSL and chord SR is equal to the angle in the alternate segment, that is, prove that $\angle LSR = \angle STR$.

(6)

- 11.2 TA is a common tangent to circles CBA and FDA at A. Chords AC and AD are drawn, with BCD a tangent to the circle at D.



11.2.1 Provide the geometric reason that $\hat{D}_1 = \hat{F}$. (1)

11.2.2 Prove that $\hat{A}_1 = \hat{A}_2$. (7)
[14]

TOTAL: 150

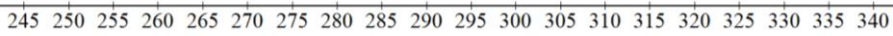
END

Name and Surname: _____ Grade: _____

ANSWER SHEET A

QUESTION 1

1.1



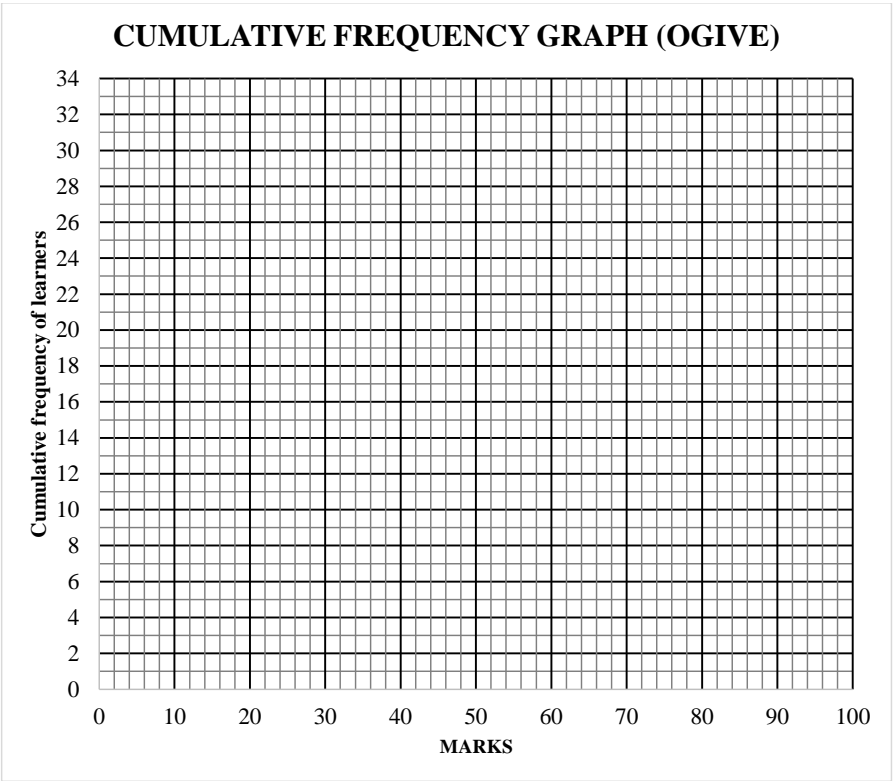
(3)

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ANSWER SHEET B

QUESTION 2

2.2

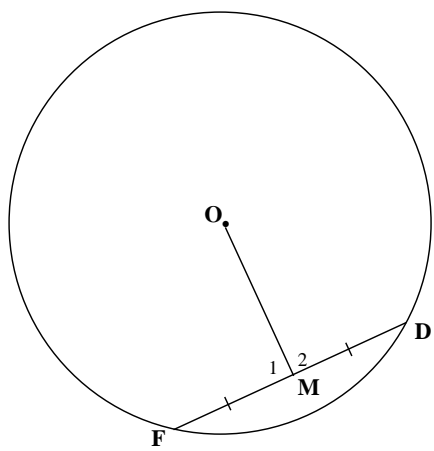


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ANSWER SHEET C

QUESTION 9.1

9.1



Construction:

In $\triangle OFM$ and $\triangle ODM$

- i. $FM = MD$ [GIVEN]
- ii. OM is a common side
- iii. $OF = OD$ [.....]

$\therefore [\triangle OFM \equiv \triangle ODM]$ [.....]

..... $[\triangle OFM \equiv \triangle ODM]$

But $\hat{M}_1 = \hat{M}_2 = 180^\circ$ [\angle 's on a straight line]

$\therefore \hat{M}_1 = \hat{M}_2 = 90^\circ$

$\therefore OM \perp FD$

(4)

Commented [BK3]: Not = but +

Name and Surname: _____ Grade: _____

ANSWER SHEET D

QUESTION 11.1

11.1

