Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE

GRADE 11

NOVEMBER 2016

MATHEMATICS P2

MARKS: **150**

TIME: **3 hours**

* I M A T 2 *

This question paper consists of 14 pages and a special answer book.

INSTRUCTIONS AND INFORMATION

1. This question paper consists of 10 questions.
2. Answer ALL the questions in the SPECIAL ANSWER BOOK provided.
3. Clearly show ALL calculations, diagrams graphs, et cetera which you have used in determining the answers.
4. Answers only will NOT necessarily be awarded full marks.
5. If necessary round off your answers to TWO decimal places, unless stated otherwise.
6. Diagrams are not necessarily drawn to scale.
7. You may use an approved scientific calculator (non-programmable and non-graphical) unless stated otherwise.
8. Write neatly and legibly.

QUESTION 1

Mr Ngwane is the sales manager for a furniture shop. Every month his 15 staff members report on the number of customers who visited during the previous month. The results were given as follows:

12 15 15 19 22 23 26 26 32 33 33 33 33 35 35

1.1 Determine the:

1.1.1 median of the data (1)

1.1.2 interquartile range (3)

1.1.3 mean of the data (2)

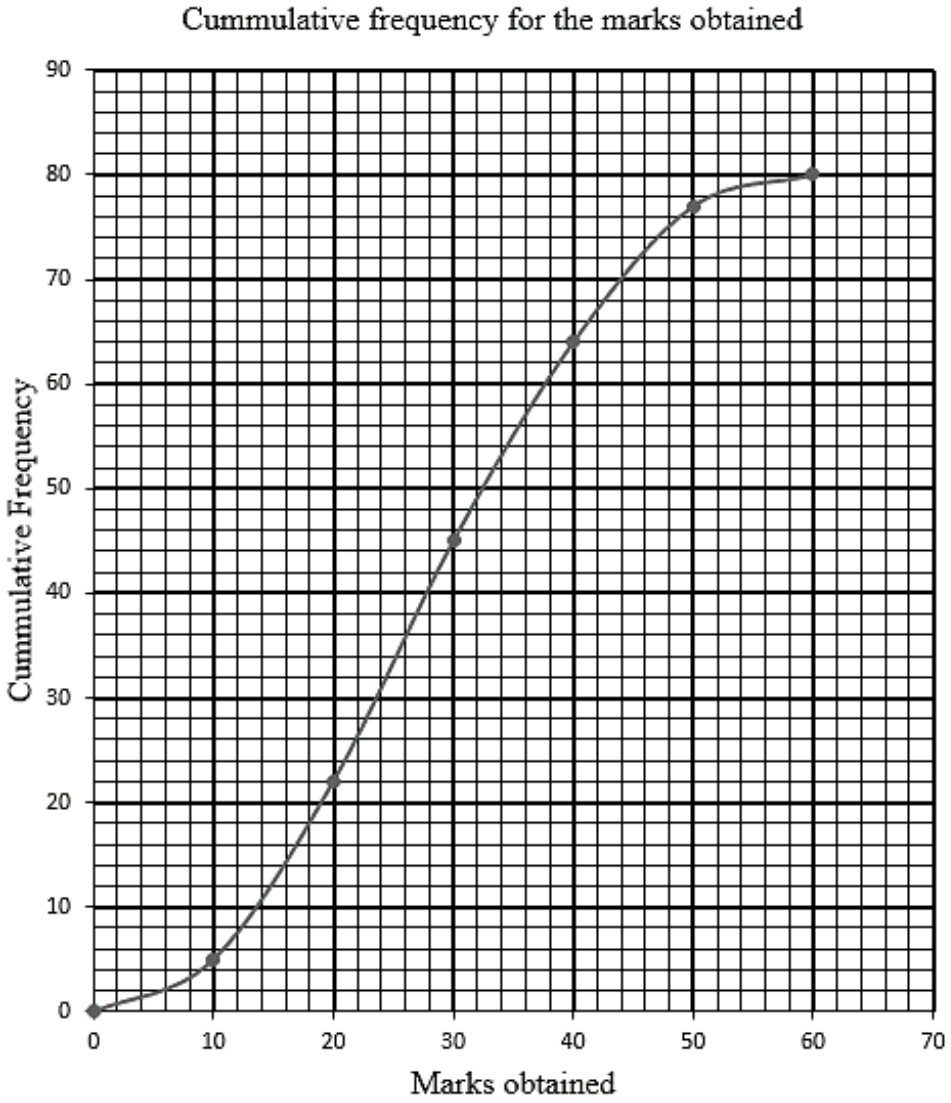
1.1.4 standard deviation of the data. (2)

1.2 Determine the percentage of customers who visited the furniture shop that are outside one standard deviation of the mean. (3)

[11]

QUESTION 2

A group of learners wrote a standardised English test that was scored out of 60. The results were represented in a cumulative frequency graph below.



2.1 How many learners wrote the test? (1)

2.2 How many learners scored at least 20 out of 60? (2)

2.3 Using the graph, estimate the median test score. (2)

2.4 Complete the frequency table below using the SPECIAL ANSWER BOOK provided.

Marks obtained	Frequency
$0<x\leq10$	
$10<x\leq20$	
$20<x\leq30$	
$30<x\leq40$	
$40<x\leq50$	
$50<x\leq60$	

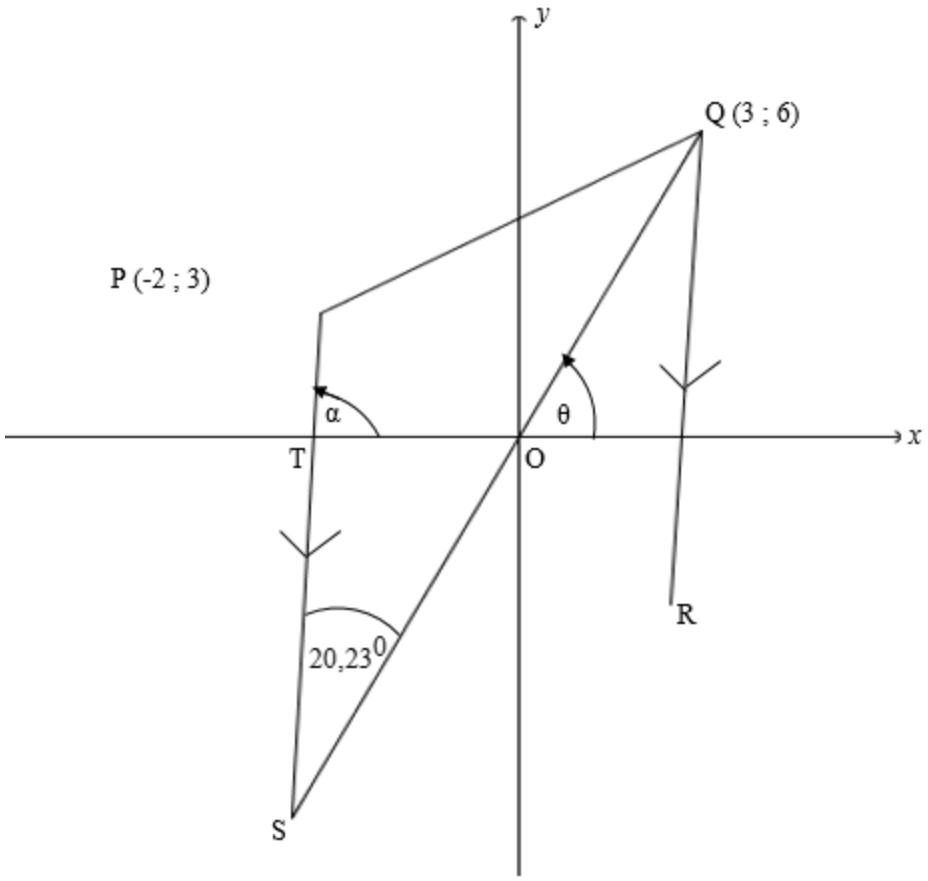
(5)

2.5 Write down the modal group. (1)

[11]

QUESTION 3

In the diagram below, Δ PQS is drawn with vertices P (-2 ; 3), Q (3 ; 6) and S in a Cartesian plane. Line QS passes through the origin at O. PS ∥ QR.
$P\hat{S}Q = 20{,}23^0$.



3.1 Calculate the gradient of QS. (2)

3.2 Calculate the size of θ. (2)

3.3 Determine the:

3.3.1 gradient of PS, round off to the nearest number. (4)

3.3.2 equation of PS (3)

3.4 If it is further given that the equation of QS is $y = 2x$, determine the coordinates of S. (4)

3.5 Calculate the length of QS, in simplified surd form. (3)

3.6 Calculate the area of ΔPQS, rounded off to two decimal digits. (5)

3.7 If it is further given that PQRS is a parallelogram, determine the coordinates of R. (3)

3.8 A(5 ; 4), B(0 ; -1) and C(t ; 2) are collinear points, determine the value of t. (4)

[30]

QUESTION 4

4.1 Given: $p.\sin\beta - 4 = 0 \text{ and } p.\cos\beta + 3 = 0 \text{ where } p > 0$

4.1.1 Explain why $\beta \in [90^0; 180^0]$. (3)

4.1.2 Show that: $\tan\beta = -\frac{4}{3}$ (2)

4.1.3 Determine the numerical value of p. (2)

4.2 Simplify **without using a calculator:**

$\sin 143^0.\cos 127^0 - \sin 53^0.\cos 37^0$ (5)

4.3 Prove the identity: $\left(\tan y + \frac{1}{\tan y}\right)\left(1 - \cos^2 y\right) = \tan y$ (6)

4.4 Determine the general solution of: $\cos\theta - \frac{1}{\cos\theta} = \frac{5}{6}$ (6)

[24]

QUESTION 5

5.1 On the same set of axes draw $f(x) = -\cos(45^0 - x)$ and $g(x) = \tan(-x)$ in the interval of $-90^0 \leq x \leq 180^0$. Make use of the grid provided in the SPECIAL ANSWER BOOK.

5.2 For which values of x is $f(x) - g(x) \leq 0$ for $x \in [-90° ; 90°]$ (2)

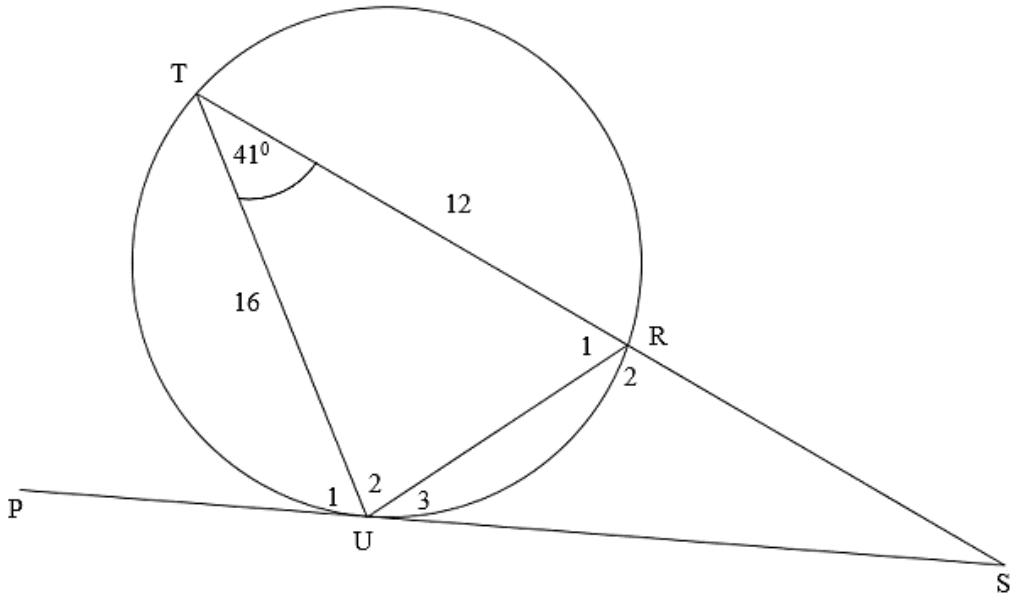
5.3 Write down the equation of $h(x)$ if $h(x) = -f(x - 45^0)$. (2)

[10]

QUESTION 6

6.1 Complete: $\cdots = a^2 + b^2 - 2ab\cos\hat{C}$ (1)

6.2 TRS is a secant of the circle, and SU is a tangent at U. TU = 16 cm, TR = 12 cm and $\hat{T} = 41^0$.



Calculate the:

6.2.1 Length of UR, correct to two decimals. (3)

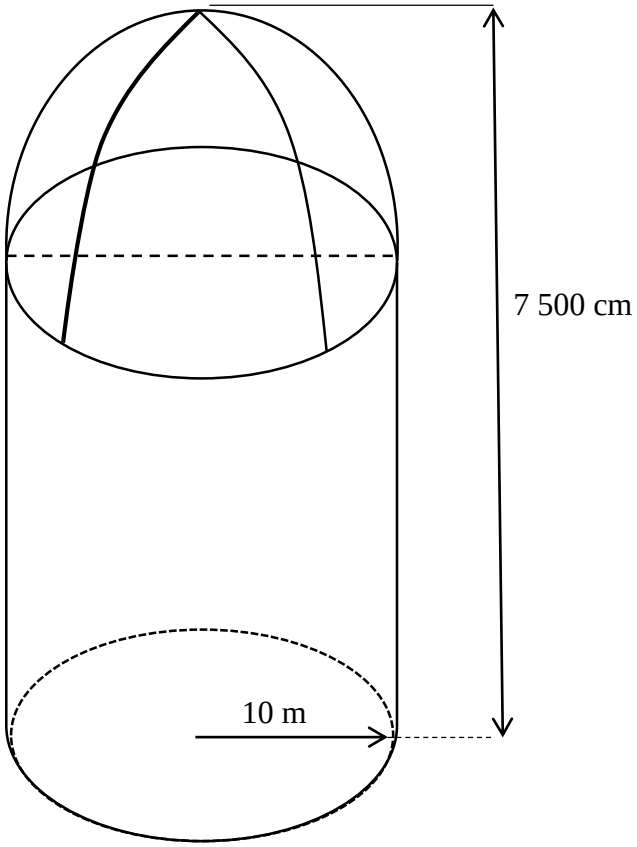
6.2.2 Size of $\hat{U}_2$ (3)

6.2.3 Length of secant TRS (5)
[12]

QUESTION 7

Surface Area $= 2\pi rh$	Surface Area $= 4\pi r^2$
Volume $= \frac{1}{3}lbh$	Volume $= lbh$

The picture below shows a storage tank in which a farmer stores his grain. The tank is made up of a right cylinder with a hemisphere on top. The perpendicular height of the tank to the top is 7 500 cm and the radius of the tank is 10 m.



7.1 Calculate the total surface area of the tank. (5)

7.2 Calculate the volume of the tank (5)

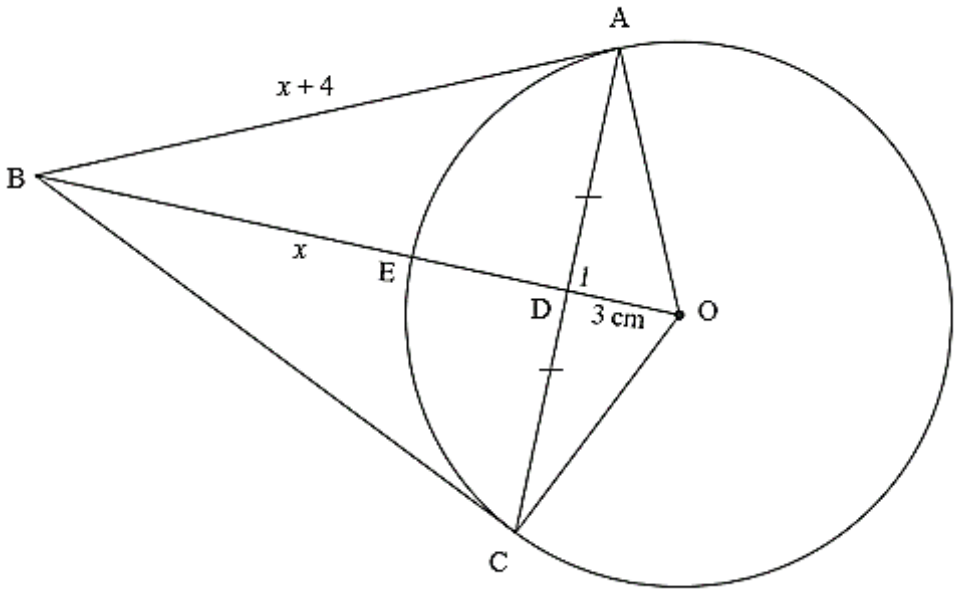
[10]

Give reasons for ALL statements in QUESTIONS 8, 9 and 10.

QUESTION 8

In the diagram below O is the centre of the circle. Quadrilateral ABCO is drawn with A and C on the circumference. AB is a tangent to the circle at point A and BC is a tangent to circle at point C. D is the midpoint of chord AC and AD = DC. E is the point on the circumference of the circle with centre O.

The length of:
AC = 8 cm,
OD = 3 cm,
BE = x and
AB = $x + 4$.



8.1 Write down the size of $\hat{D}_1$ with a reason. (2)

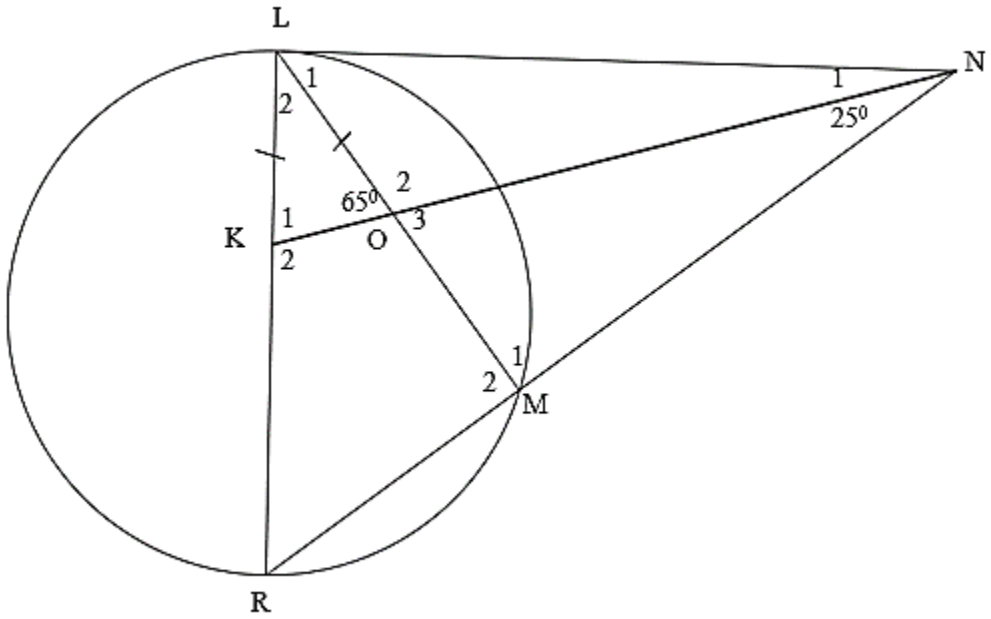
8.2 Calculate the length of OA. (2)

8.3 Determine the size of $\hat{A}$ and give a reason for your answer. (2)

8.4 Calculate the value of x if $x > 1$. (4)
[10]

QUESTION 9

In the diagram ΔLNR is drawn with points L and R on the circumference of a circle. NR cuts the circle at M. K is a point on LR with KN the bisector of $L\hat{N}R$. KN cuts the chord LM at O. LK = LO. $L\hat{O}K = 65^0$ and $K\hat{N}M = 25^0$.



9.1 Prove that LN is a diameter of a circle passing through L, M and N. (5)

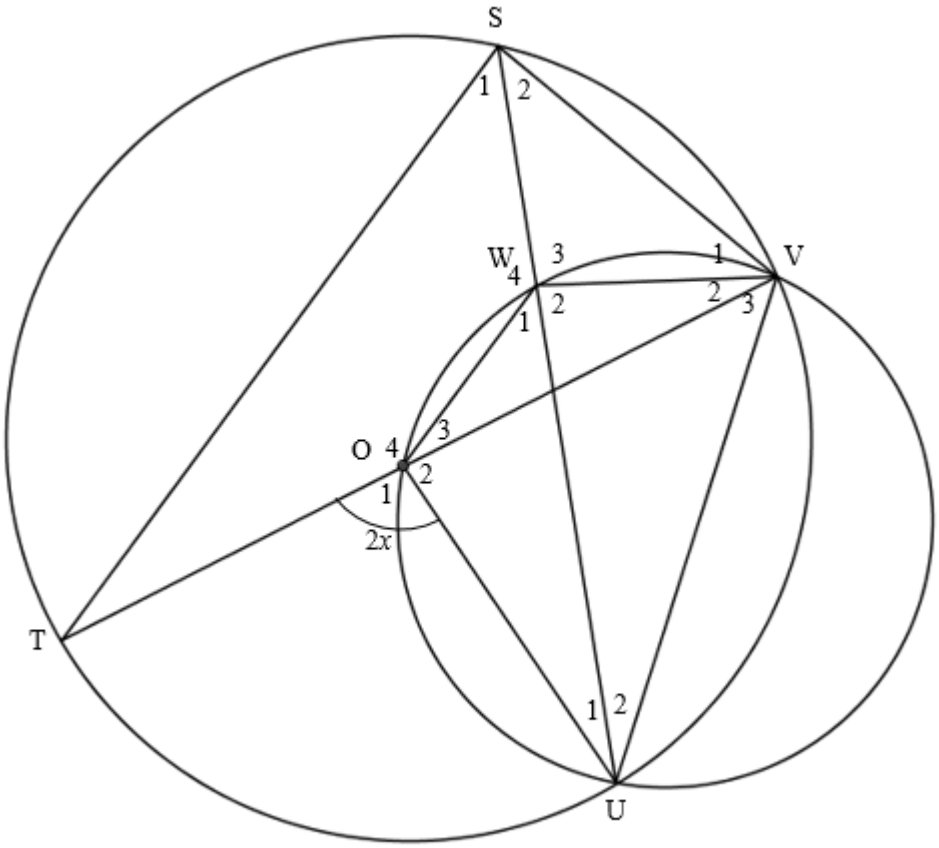
9.2 Determine the size of $\hat{L}$. (5)

9.3 Show that LN is a tangent to circle LMR. (3)

9.4 Is LR a diameter to circle LMR? Motivate your answer. (2)
[15]

QUESTION 10

O is the centre of the bigger circle. O lies on the circumference of the smaller circle. OWVU are points on the circumference of the smaller circle. TSVU are points on the circumference of the bigger circle.



10.1 Name FOUR other angles each equal to *x* with reasons. (8)

10.2 Determine the size of $\hat{W}_2$ in terms of *x* with reasons. (4)

10.3 Prove that WS = WV. (5)
[17]

TOTAL: 150