LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
EDUCATION

NATIONAL
SENIOR CERTIFICATE

GRADE 11

MATHEMATICS
PAPER 2
NOVEMBER 2019

MARKS: 150

DURATION : 3 Hours

This question paper consists of 13 pages.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 10 questions. Answer ALL the questions.
2. Answer all questions on the ANSWERBOOK provided.
3. Clearly show ALL calculations, diagrams, graphs, et cetera you have use in determining the answers.
4. An approved scientific calculator (non-programmable and non-graphical) may be used, unless stated otherwise.
5. If necessary, answers should be rounded off to TWO decimal places, unless stated otherwise.
6. Diagrams are NOT necessarily drawn to scale.
7. Number the answers correctly according to the numbering system used in this question paper.
8. It is in your own interest to write legibly and to present work neatly.

QUESTION 1

1.1 A group of 14 athletes were asked how many kilometres they travel each day to the stadium and the results are given below:

42	15	15	6	75	36	5	8	53	25	27	31	6	60

1.1.1. Determine the mean of the data. (1)

1.1.2. Calculate the standard deviation of the data. (1)

1.1.3. How many athletes lie within one standard deviation of the mean? (3)

1.2. The table below represents values in a data set written in ascending order. None of the values in the data set are repeated:

5	a	19	b	c	d	35

Determine the values of a, b, c and d if:

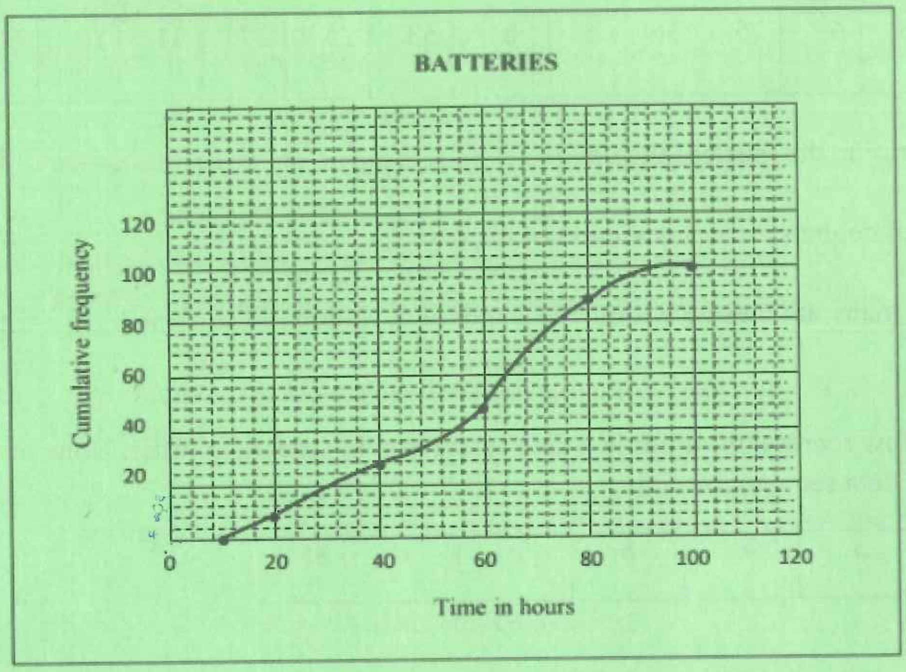
- The median is 20.
- The interquartile range is 16.
- The upper quartile is twice the lower quartile.
- The mean is 22. (6)

[11]

QUESTION 2

Batteries are used in everyday life. The Grade 11 Physical Sciences learners investigated the life span of batteries under constant test conditions.

The ogive (cumulative frequency graph) below shows the life span (in hours) of the batteries.



2.1. How many batteries were tested for this investigation? (1)

2.2. Use the graph to estimate the median time for the life span (in hours) of the batteries. (2)

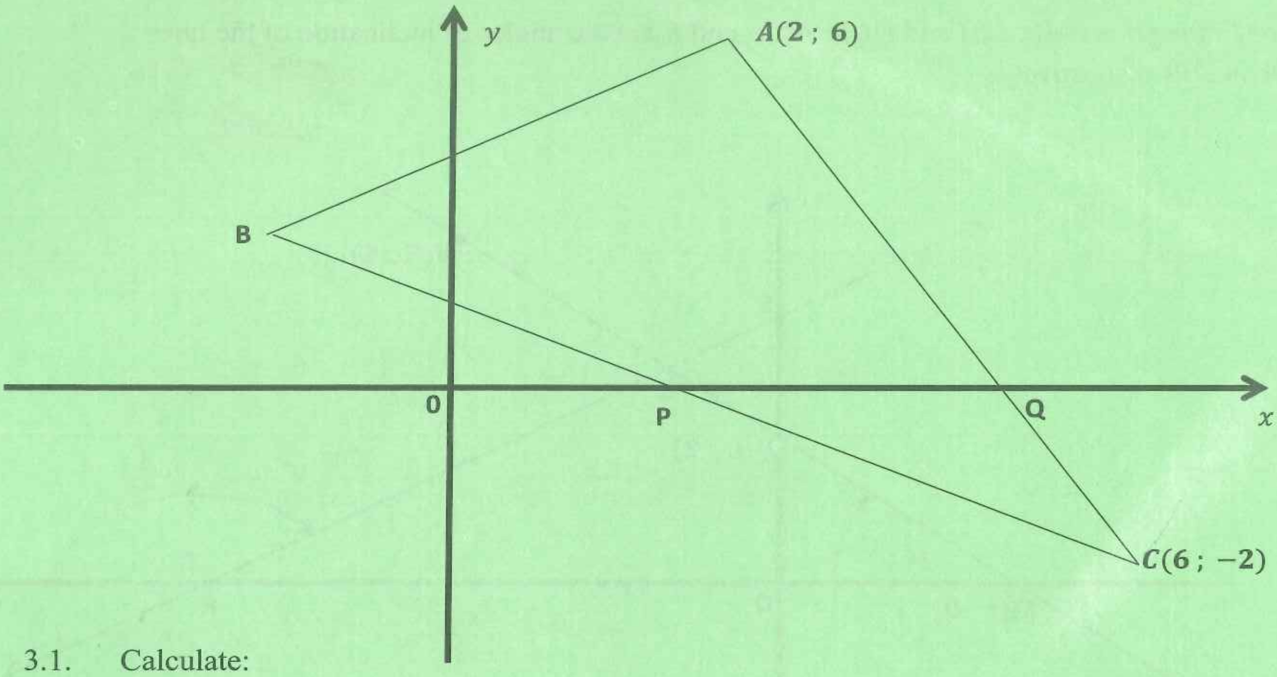
2.3. The minimum lifespan of batteries is 10 hours and the maximum lifespan is 100 hours. Use the cumulative frequency graph to draw a box and whisker diagram in your ANSWER BOOK. (5)

2.4. Comment on the skewness of the distribution of the lifespan of the batteries. (1)

[9]

QUESTION 3

In the diagram A$(2\,;\,6)$ and C$(6\,;\,-2)$ are vertices of $\Delta\,ABC$. The equation of BC is $2y + x = 10$. The $x -$ intercept of BC is at P and of AC is at Q



3.1. Calculate:

3.1.1. The coordinates of M, the midpoint of AC. (2)

3.1.2. The gradient of AC. (2)

3.1.3. The equation of the perpendicular bisector of AC. (3)

3.2. Determine whether the point $E(6\,;\,3)$ lies on the equation in 3.1.3. (3)

3.3. Determine the equation of the line AC. (2)

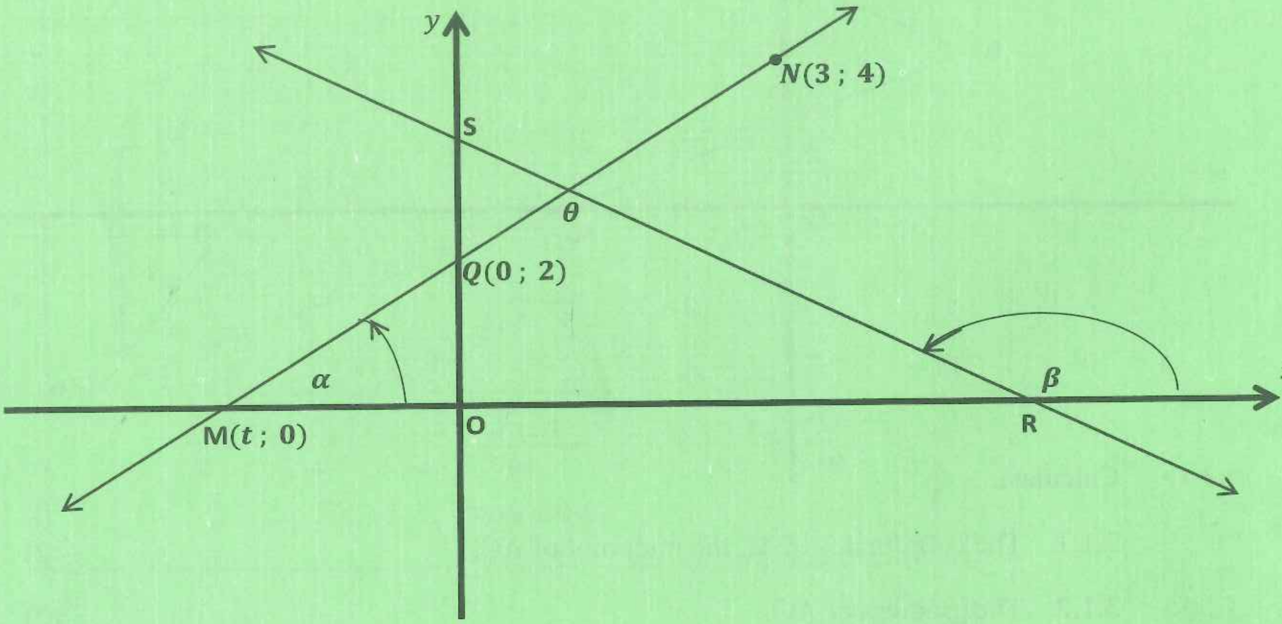
3.4. Calculate the coordinates of point P. (2)

3.5. If it is further given that $B(-2\,;\,2)$. Calculate the coordinates of D, which is in the first quadrant and ABCD is a parallelogram. (4)

[18]

QUESTION 4

In the diagram R and S are the $x-$ and $y-$intercepts respectively of the straight line SR. The equation of SR is $y = \frac{-1}{3}x + 6$. Another straight line cuts the $y-$axis at $Q(0\ ;\ 2)$ and passes through the points $M(t\ ;\ 0)$ and $N(3\ ;\ 4)$. α and β are the angles of inclination of the lines MN and SR respectively.



4.1. Given that M, Q and N are collinear points. Calculate the value of t. (3)

4.2. Determine the size of θ, the obtuse angle between the two lines. (5)

4.3. Calculate the length of MR. (3)

4.4. Calculate the area of ΔMNR. (3)

[14]

QUESTION 5

5.1. If $cos\ 23° = \sqrt{1-t^2}$, express each of the following in terms of t:

5.1.1. $sin\ 23°$ (3)

5.1.2. $tan\ 113°$ (3)

5.1.3. $\sin 67°$ (1)

5.2. Simplify the following expressions without using the calculator, and show ALL the calculations.

5.2.1. $\frac{\tan(180°-x).\sin(90°+x)}{sin\ (-x)} - sin\ y.cos(90° - y)$ (7)

5.2.2. $\frac{cos^2 208°}{tan\ 242°.cos\ 28°} \times \frac{1}{cos\ 30°.(-tan\ 120°).sin\ 928°}$ (9)

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

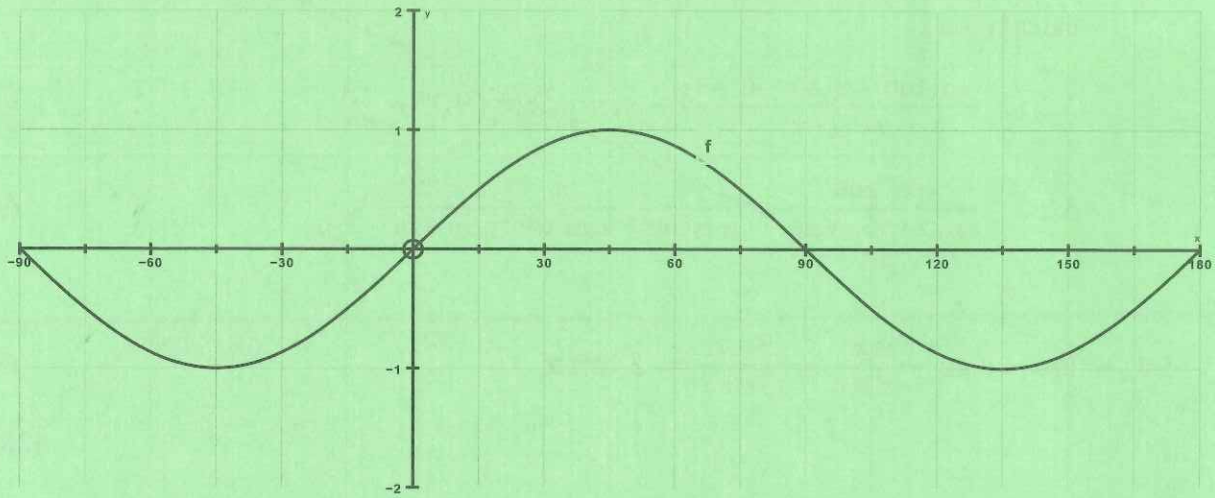
[28]

QUESTION 6

6.1.1. Determine the general solution of $\sin 2x = \cos(x + 60°)$ (6)

6.1.2. Hence, solve for x if $\sin 2x = \cos(x + 60°)$ and $x \in [-90° ; 180°]$ (2)

6.2. In the diagram the graph of $f(x) = sin2x$ is drawn for the interval $[-90° ; 180°]$



On the same system of axes, draw the graph of $g(x) = \cos(x + 60°)$ for the interval $[-90° ; 180°]$ (3)

6.3. Use the graphs to determine the values of x for the interval $[-90° ; 180°]$, for which:

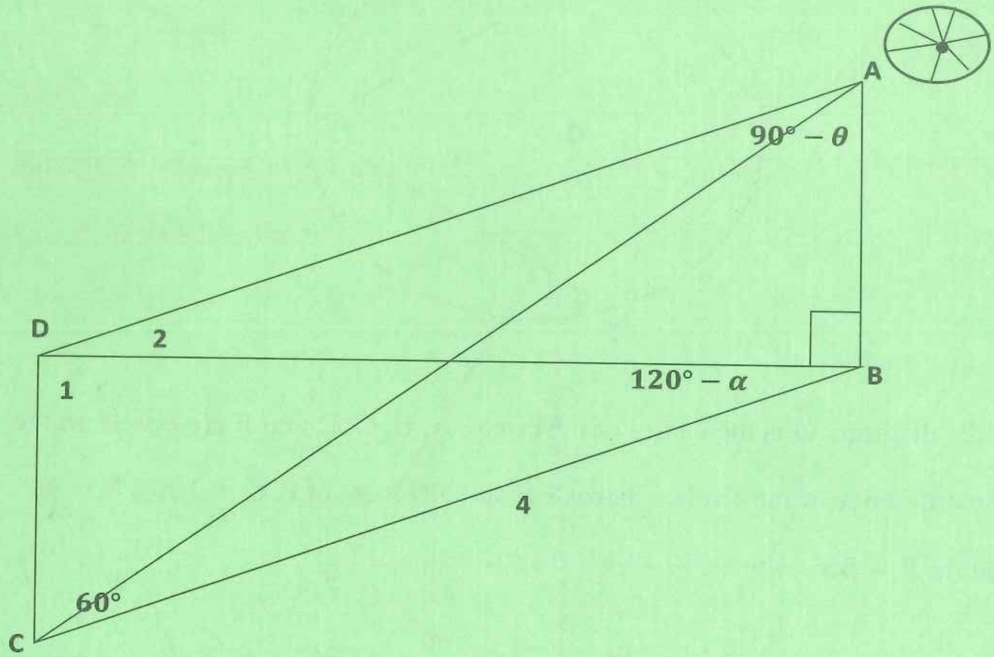
6.3.1. $f(x) \geq g(x)$ (2)

6.3.2. $f(x).g(x) \leq 0$ (2)

[15]

QUESTION 7

In the diagram below, B, C and D are in the same horizontal plane. A drone positioned at A, captures the images of two objects at B and C. B is directly below the drone and C is 4 units away from B. $D\hat{C}B = 60°$; $D\hat{B}C = 120° - \alpha$ and $D\hat{A}B = 90° - \theta$



7.1. Determine $\hat{D}_1$ in terms of α. (2)

7.2. Without the use of a calculator, determine BD in terms of α. (3)

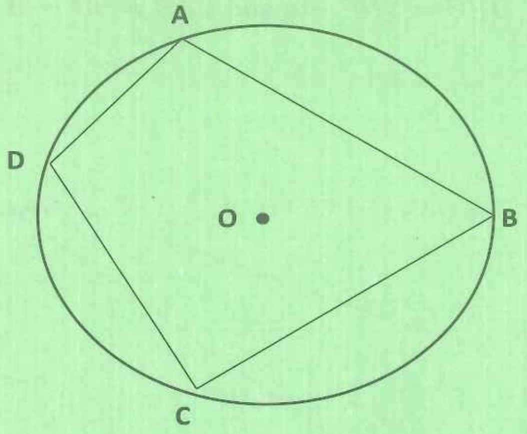
7.3. Show that $AB = \frac{2\sqrt{3}\tan\theta}{\sin\alpha}$ (3)

[8]

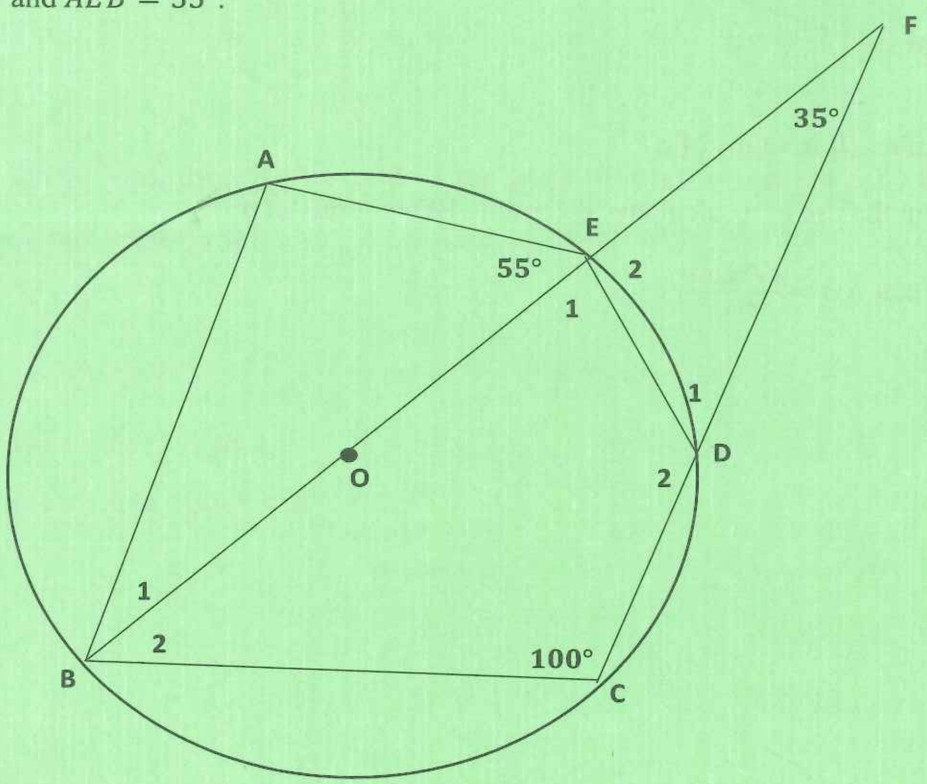
QUESTION 8

8.1. In the diagram below, ABCD is a cyclic quadrilateral of the circle with centre O.

Use the diagram to prove the theorem which states that $\hat{B} + \hat{D} = 180°$. (5)



8.2. In the diagram, O is the centre of the circle. A, B, C, D and E are points on the circumference of the circle. Chords BE and CD meet at F. $\hat{C} = 100°, \hat{F} = 35°$ and $A\hat{E}B = 55°$.



8.2. Calculate, giving reasons, the size of each of the following angles:

8.2.1. $\hat{A}$ (2)

8.2.2. $\hat{E}_1$ (2)

8.2.3. $\hat{D}_1$ (2)

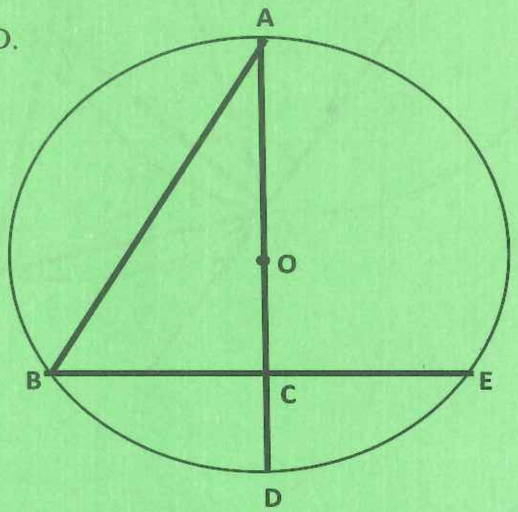
8.3. Prove, giving reasons, that AB | | CF (4)

[15]

QUESTION 9

In the diagram below, AOCD is a diameter of the circle with centre O and chord BE = 30 cm

AOCD ⊥ BE and OC = 2CD.



Calculate with reasons:

9.1. BC (2)

9.2. If CD $= a$ units, determine OC in terms of a. (1)

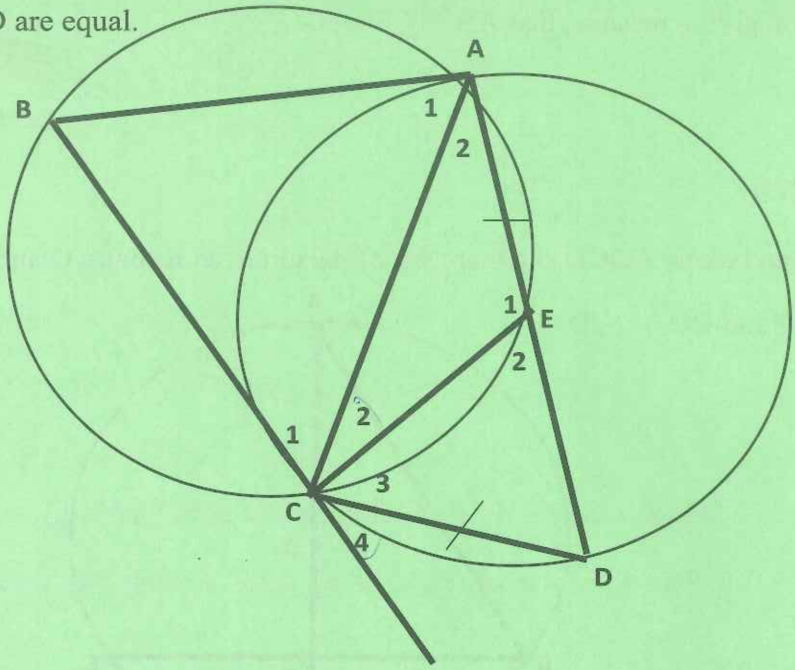
9.3. OB, in terms of a (2)

9.4. the value of a (leave your answer simplified surd form) (4)

[9]

QUESTION 10

10.1. Two equal circles intersect each other in A and C. BA and BC are tangents to one circle at A and C respectively and they are chords of the other circle. E is a point on the circumference of one circle and AE produced cuts the other circle in D. Chords AE and CD are equal.



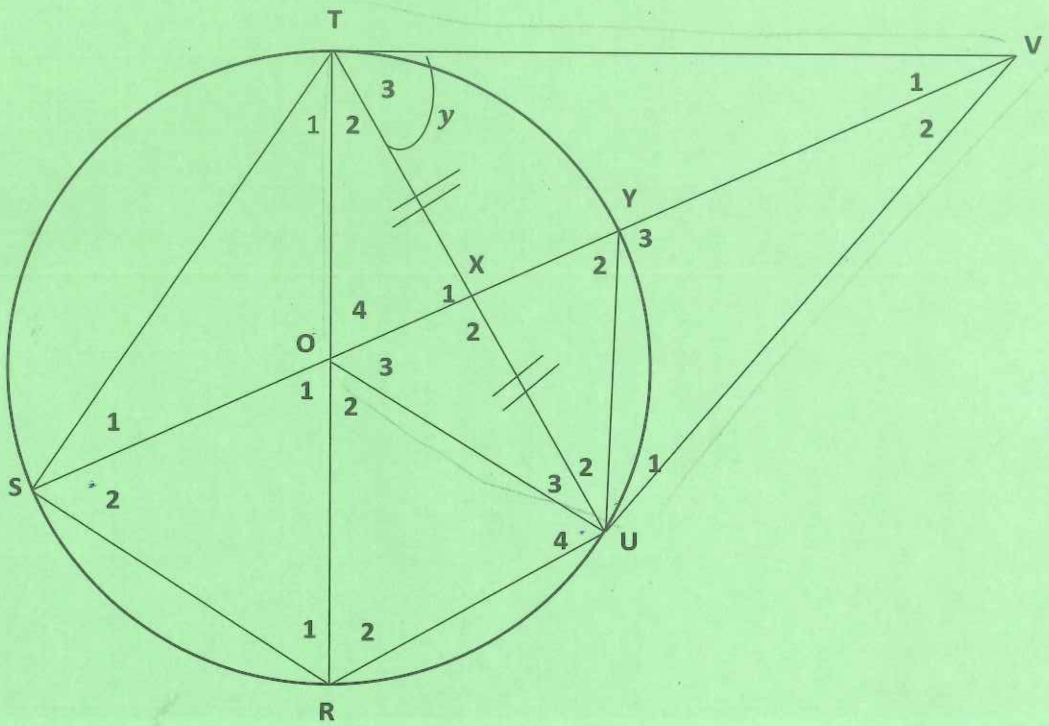
Prove that:

10.1.1. $\hat{C}_2 = \hat{C}_4$ (4)

10.1.2. $\hat{C}_3 = \hat{A}_1$ (3)

10.2. TV and VU are tangents to the circle with centre O at T and U respectively. T, S, R, U and Y are points on the circle such that RT is a diameter. X is the midpoint of chord TU.

$\hat{T}_3 = y$.



Prove that:

10.2.1.	RU | | SY	(5)
10.2.2.	$\hat{T}_1 = \frac{1}{2}y$.	(6)
10.2.3.	TOUV is a cyclic quadrilateral.	(5)

[23]

GRAND TOTAL: 150