GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

GAUTENG DEPARTMENT OF EDUCATION
PROVINCIAL EXAMINATION
JUNE 2016
GRADE 11

MATHEMATICS
(Second Paper)

TIME: 2 hours

MARKS: 100

9 pages + 2 diagram sheets

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INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of **7** questions. Answer ALL the questions.

2. Number your answers according to the numbering of the questions in the question paper.

3. Use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.

4. Round-off the final answer correct to 2 decimal places, unless instructed otherwise.

5. Show ALL calculations, diagrams, graphs, etc. that you have used to determine your answers.

6. Answers only will not necessarily be awarded full marks.

7. Diagrams are NOT necessarily drawn to scale.

8. Reasons must accompany statements made in Questions 5, 6 and 7.

9. It is in your interest to write legibly (in blue ink) and present all answers neatly and logically.

10. Use the diagram sheets on Pages 10 and 11 for additional constructions and labelling .
   (SUBMIT these sheets with your ANSWER BOOK.)

QUESTION 1

In the diagram below, K(-5 ; 1) , P(7 ; -2) and T(1 ; 6) are the vertices of ΔKTP. A and B are points on the *y*-axis and C and D are points on the *x*-axis.
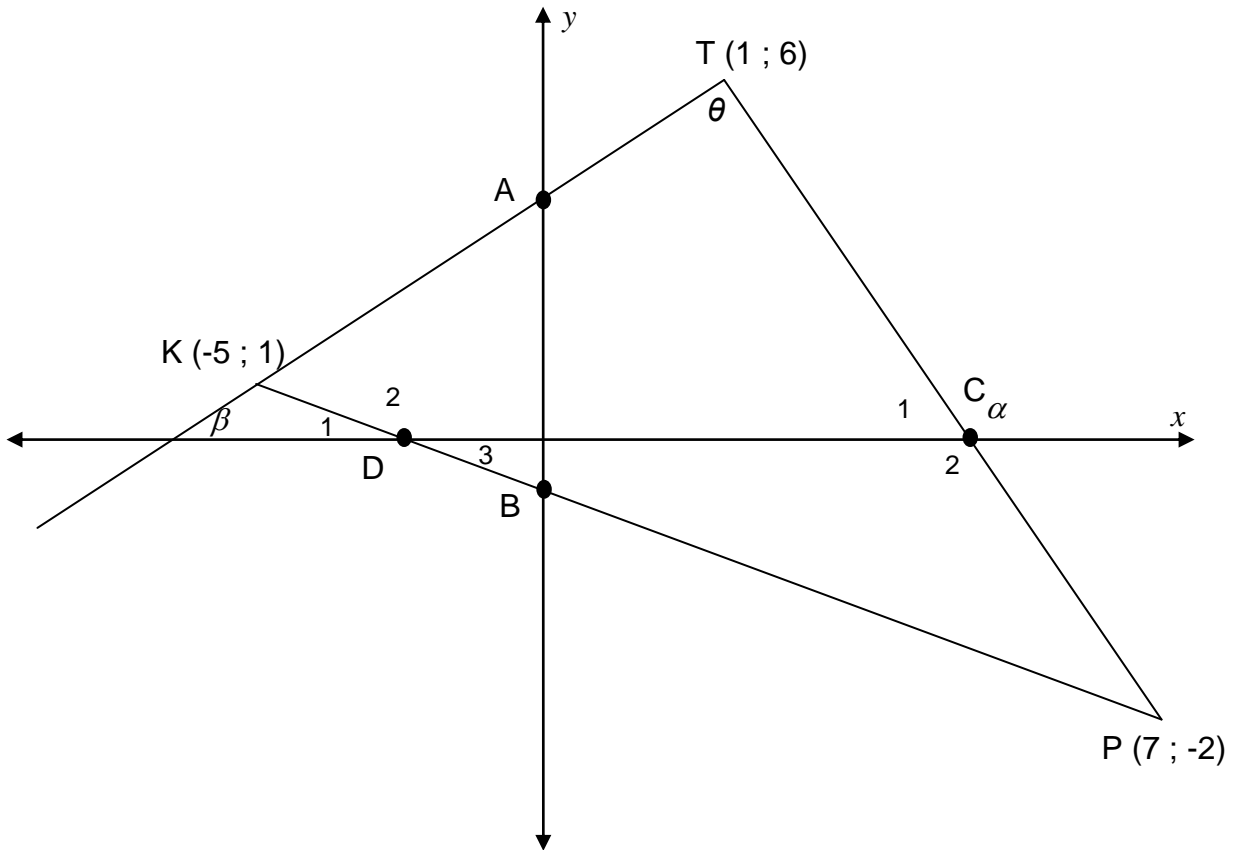
1.1   Calculate the length of KT. (Leave the answer in simplest surd form.)   (3)

1.2   Determine the equation of line KP in the form $y = mx + c$.   (3)

1.3   Calculate the length of AB.   (4)

1.4   Calculate the size of KÎP.   (6)

[16]

QUESTION 2

In the diagram below, the circle with centre M passes through the origin. AB is the diameter of the circle with B(8 ; 0).
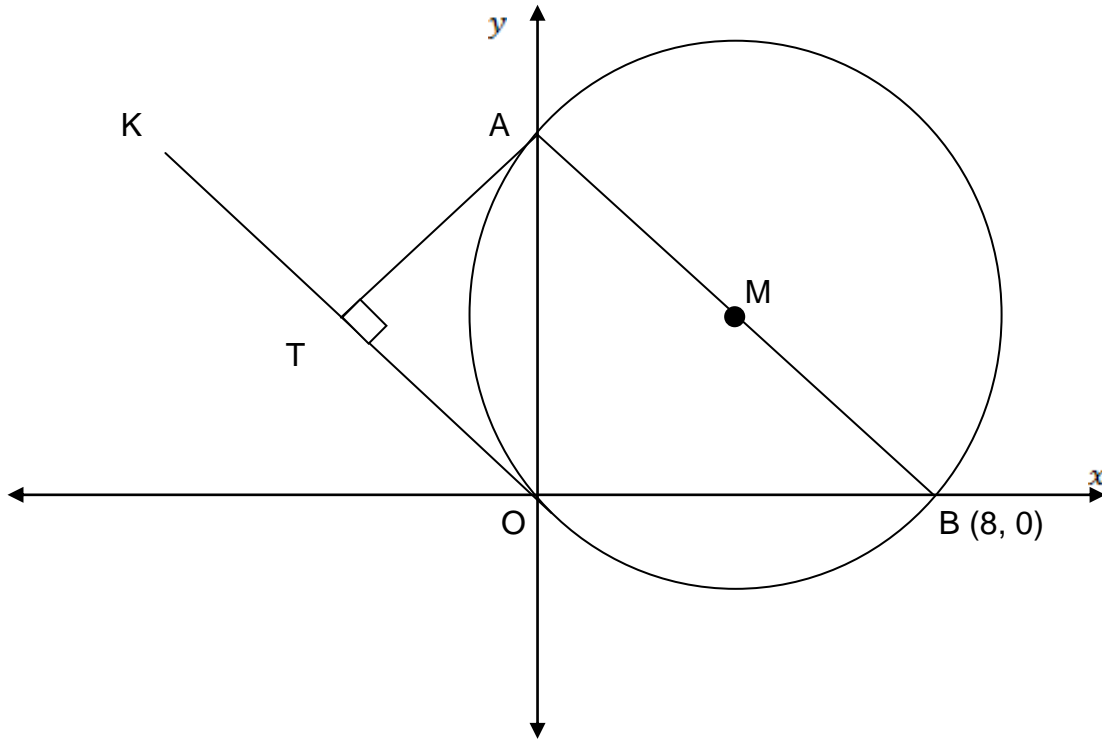
2.1   Calculate the *x*-co-ordinate of Point M.   (4)

2.2   Calculate the co-ordinates of Point A, the other *y*-intercept of the circle with centre
        M(4 ; 2).   (3)

2.3   Determine the equation of the line OK which is parallel to AB.   (3)

2.4   Determine the *x*-co-ordinate of T which lies on line OK, such that AT is the shortest
        distance from A to line OK.   (4)

                                                                                                          [14]

QUESTION 3

3.1   If $13\sin\alpha = -5$ and $\tan\alpha > 0$, use a diagram to evaluate: $3\cos\alpha$.   (5)

3.2   Simplify the following expressions **without** the use of a calculator.

    3.2.1 $\dfrac{\sin(\theta - 180°).\tan(360° - \theta).\sin(90° - \theta)}{\cos^2(\theta + 180°)}$ (6)

    3.2.2 $\dfrac{\sin 210°.\cos 400°}{\sin(-50°).\cos 120°}$ (6)

3.3   If $(4\theta - 8)\sin 30° = (\theta^3 - 8)$ and $(\theta^2 + 2\theta + 4) = 2$, determine the value of $\tan 240°$ **without** the use of a calculator.   (5)

3.4   3.4.1   Prove that : $\dfrac{1}{\tan\alpha}(\sin\alpha\tan\alpha + \cos\alpha) = \dfrac{1}{\sin\alpha}$ (4)

    3.4.2   Determine for which value(s) of α is:
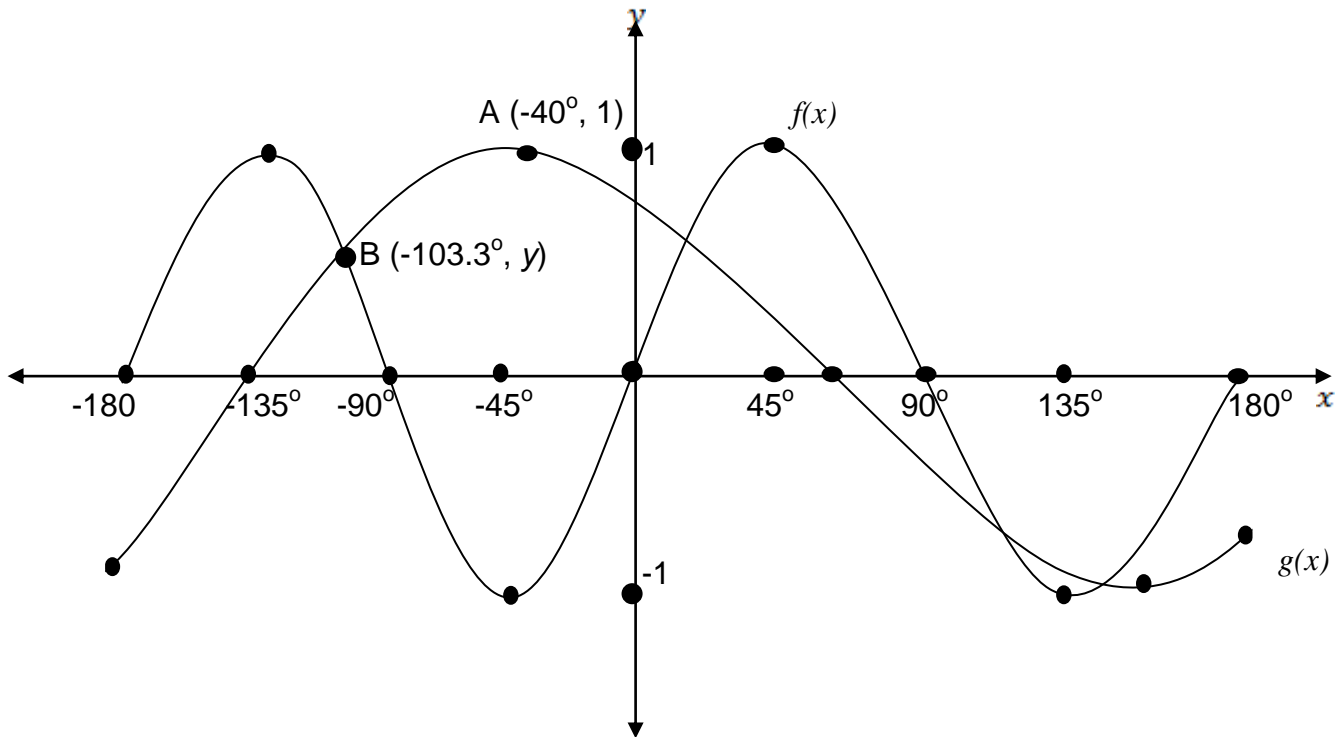
        $\dfrac{1}{\tan\alpha}(\sin\alpha\tan\alpha + \cos\alpha)$ undefined for $\alpha \in [0°; 360°]$.   (2)

[28]

QUESTION 4

The sketch below shows the graphs of:

$$f(x) = \sin ax \text{ and } g(x) = \cos(x + \theta), \text{ for } x \in [-180°; 180°]$$

4.1   Determine the period of $f(x) = \sin ax$ (1)

4.2   Write down the range of $g(x) = \cos(x + \theta)$.   (2)

4.3   Write down the values of θ and a.   (2)

4.4   Calculate the value of: $g(180°)$.   (1)

4.5   Determine the values of x, if $x \in [0°; -180°]$ for which:

     4.5.1 $f(x) - g(x) > 0$ (2)

     4.5.2 $g(x).f(x) \geq 0$ (2)

4.6   Determine the minimum value of: $3^{\cos(90° - 2x)}$ (2)

     [12]

STATEMENTS AND REASONS ARE REQUIRED WHEN ANSWERING QUESTIONS 5 , 6 AND 7.
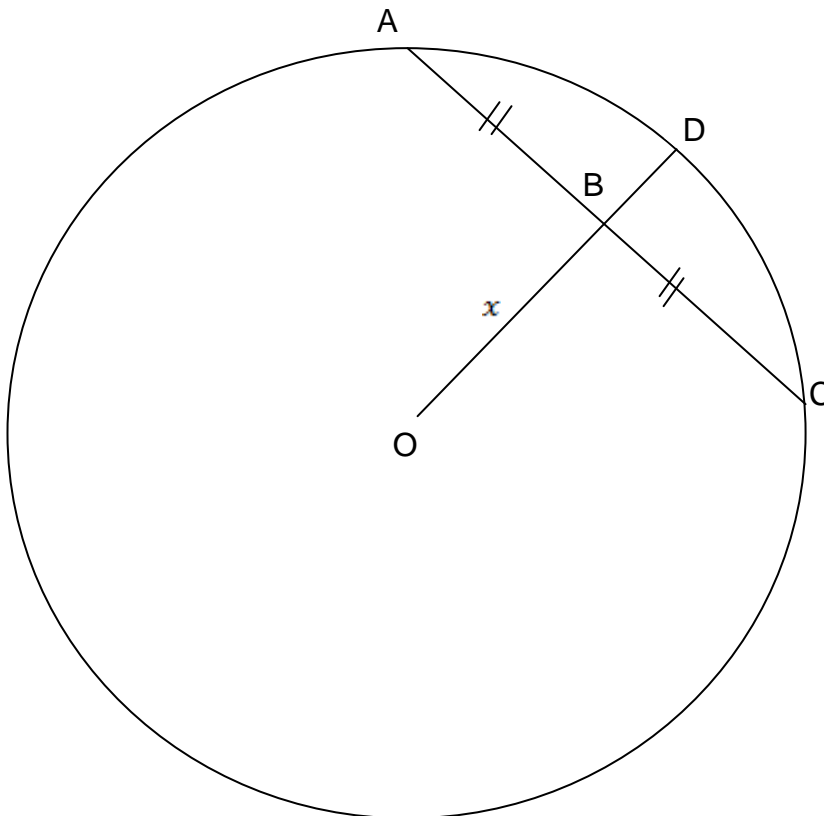
Diagram sheets are provided on Pages 10 and 11 to assist you.

QUESTION 5

5.1   Complete:

The line drawn through the centre of a circle to the midpoint of a chord is ...   (1)

5.2   In the diagram below, AC is a chord of the circle with centre O. AC = 48 cm , BD = 16 cm and OB = x . B is the midpoint of line AC.
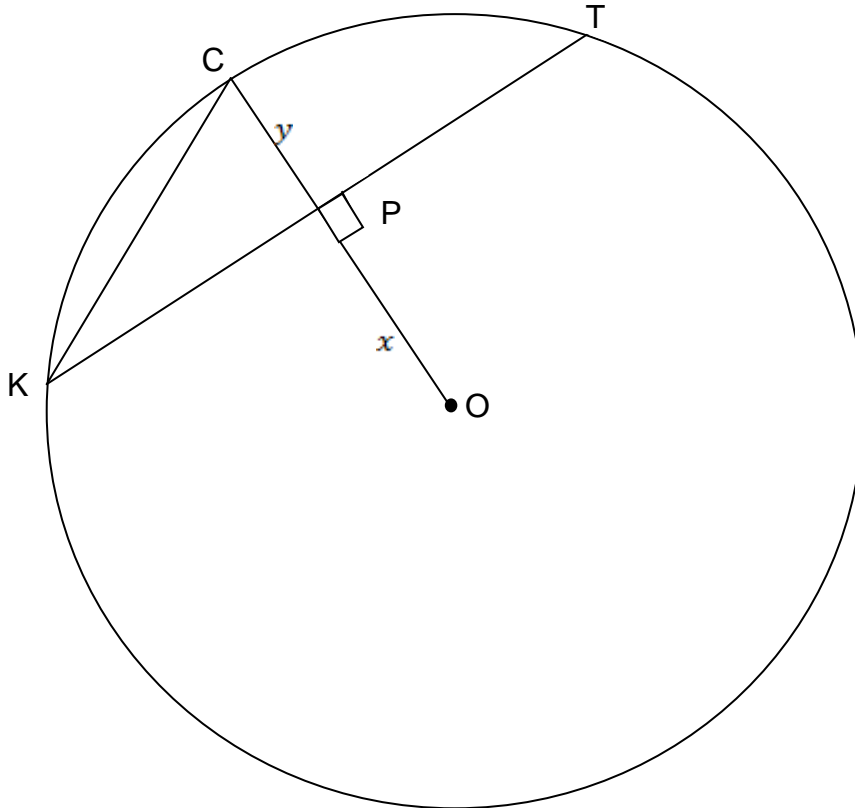

5.2.1   Calculate the length of AD.   (2)

5.2.2   Determine the length of OD in terms of x.   (1)

5.2.3   Determine the numerical value of x.   (4)

[8]

QUESTION 6

In the diagram below, KT is a chord of Circle O. OC is drawn perpendicular to KT and cuts KT at P. OP = x and PC = y.
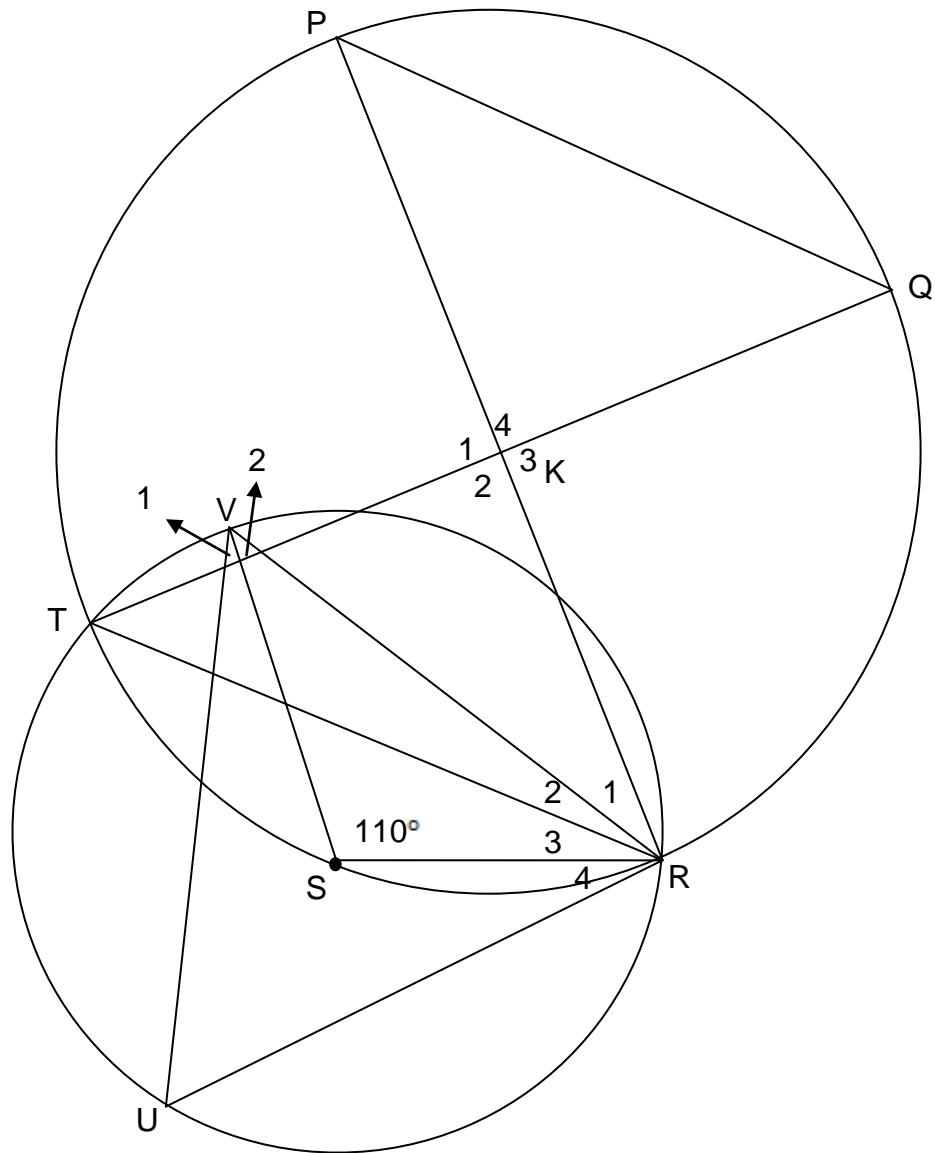

6.1   Determine PT in terms of KT. (2)

6.2   Prove that: $KC^2 = 2xy + 2y^2$ (6)

[8]

QUESTION 7

In the accompanying figure, V and U are points on the smaller circle with centre S.
T and R are the points of intersection of the two circles. PR and TQ are chords of the larger circle.

$V\hat{S}R = 110°$; $\hat{R}_3 = 20°$ and $\hat{R}_1 = 30°$

Calculate:

7.1 $\hat{U}$ (2)

7.2 $\hat{V}_2$ (3)

7.3 $\hat{Q}$ (3)

7.4   Given that $\hat{K}_2 = 90°$, calculate $\hat{P}$. (4)

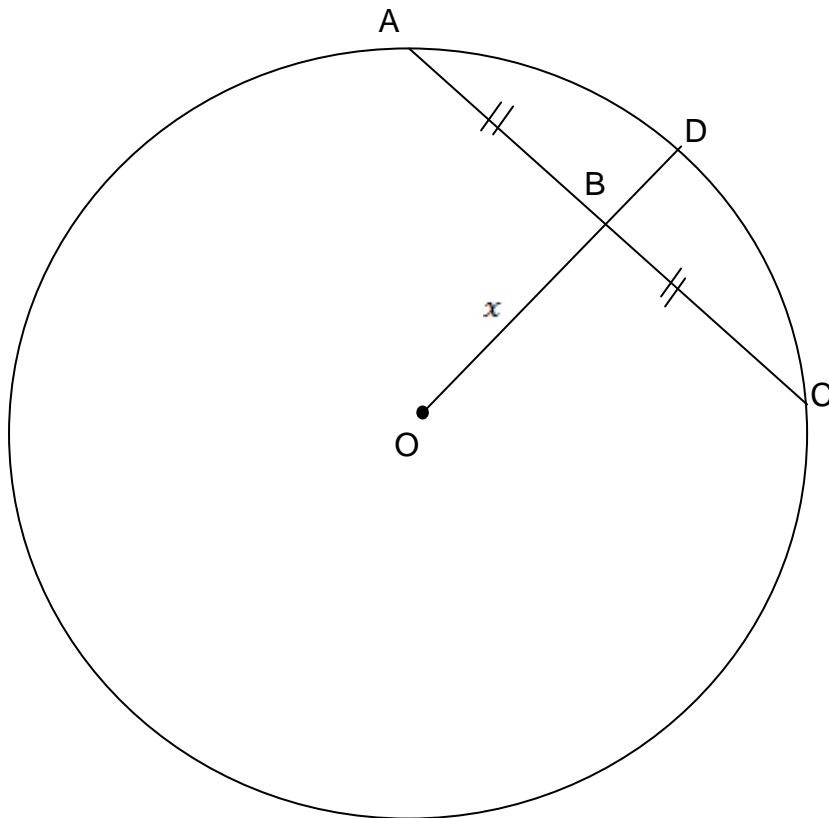7.5   Prove that TR//PQ. (2)

[14]

TOTAL: 100

END

DIAGRAM SHEET 1

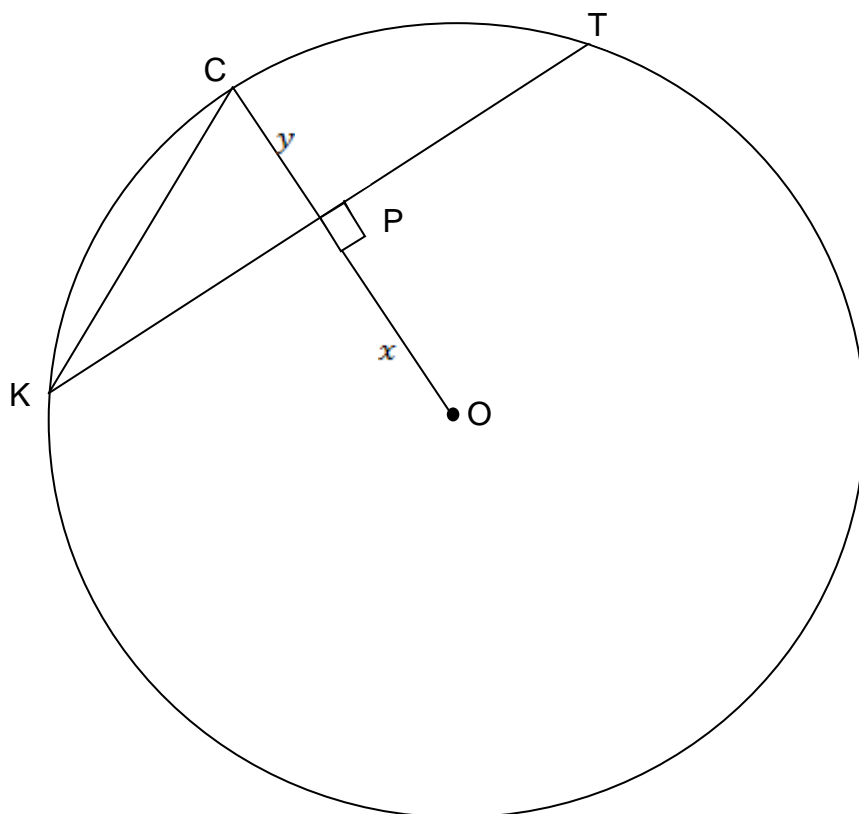Name :_____ Grade: 11_____

QUESTION 5

QUESTION 6

DIAGRAM SHEET 2

Name :_____ Grade: 11____

QUESTION 7