



**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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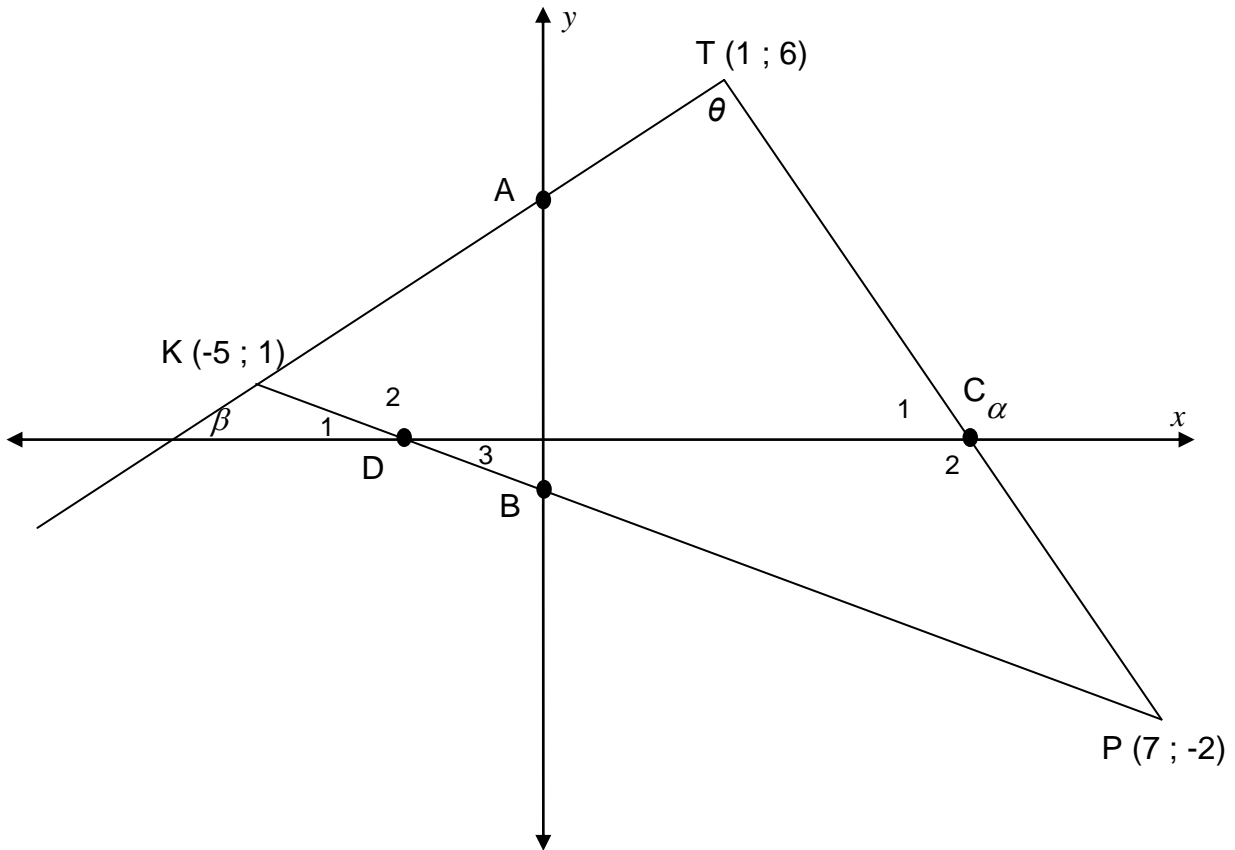
**INSTRUCTIONS AND INFORMATION**

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.)
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**QUESTION 1**

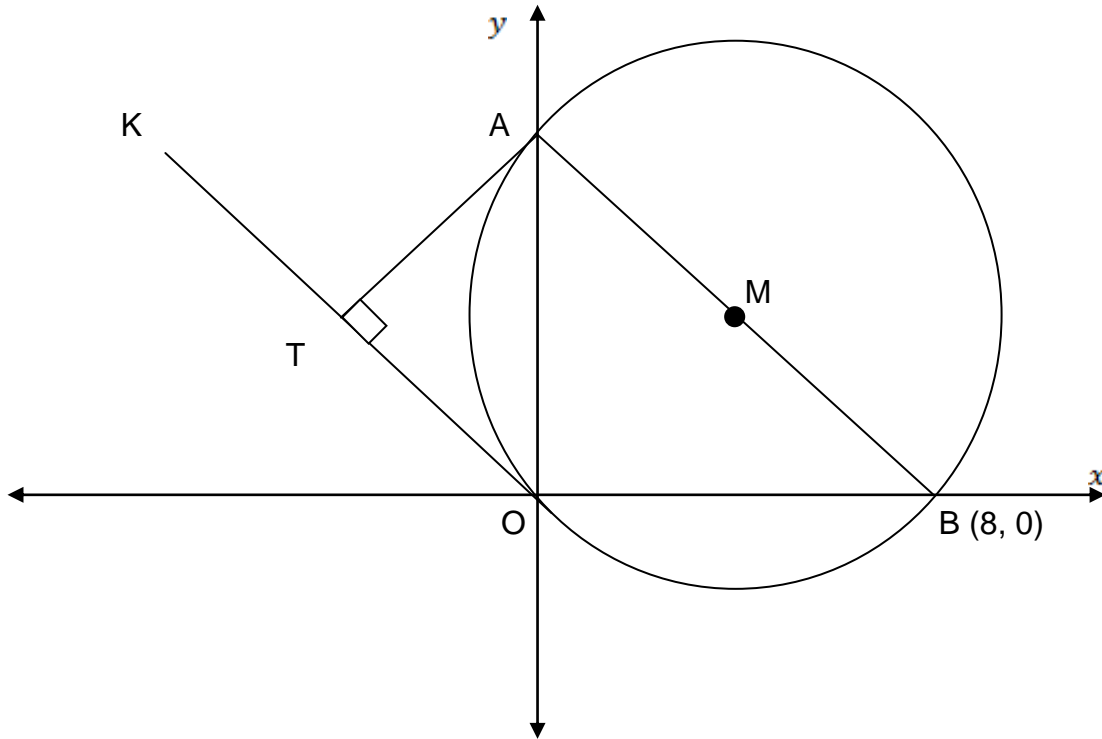
In the diagram below,  $K(-5 ; 1)$ ,  $P(7 ; -2)$  and  $T(1 ; 6)$  are the vertices of  $\triangle KTP$ .  $A$  and  $B$  are points on the  $y$ -axis and  $C$  and  $D$  are points on the  $x$ -axis.



- 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  $\hat{KTP}$ . (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 
$$\frac{\sin(\theta - 180^\circ) \cdot \tan(360^\circ - \theta) \cdot \sin(90^\circ - \theta)}{\cos^2(\theta + 180^\circ)}$$
 (6)

3.2.2 
$$\frac{\sin 210^\circ \cdot \cos 400^\circ}{\sin(-50^\circ) \cdot \cos 120^\circ}$$
 (6)

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

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

3.4.2 Determine for which value(s) of  $\alpha$  is:

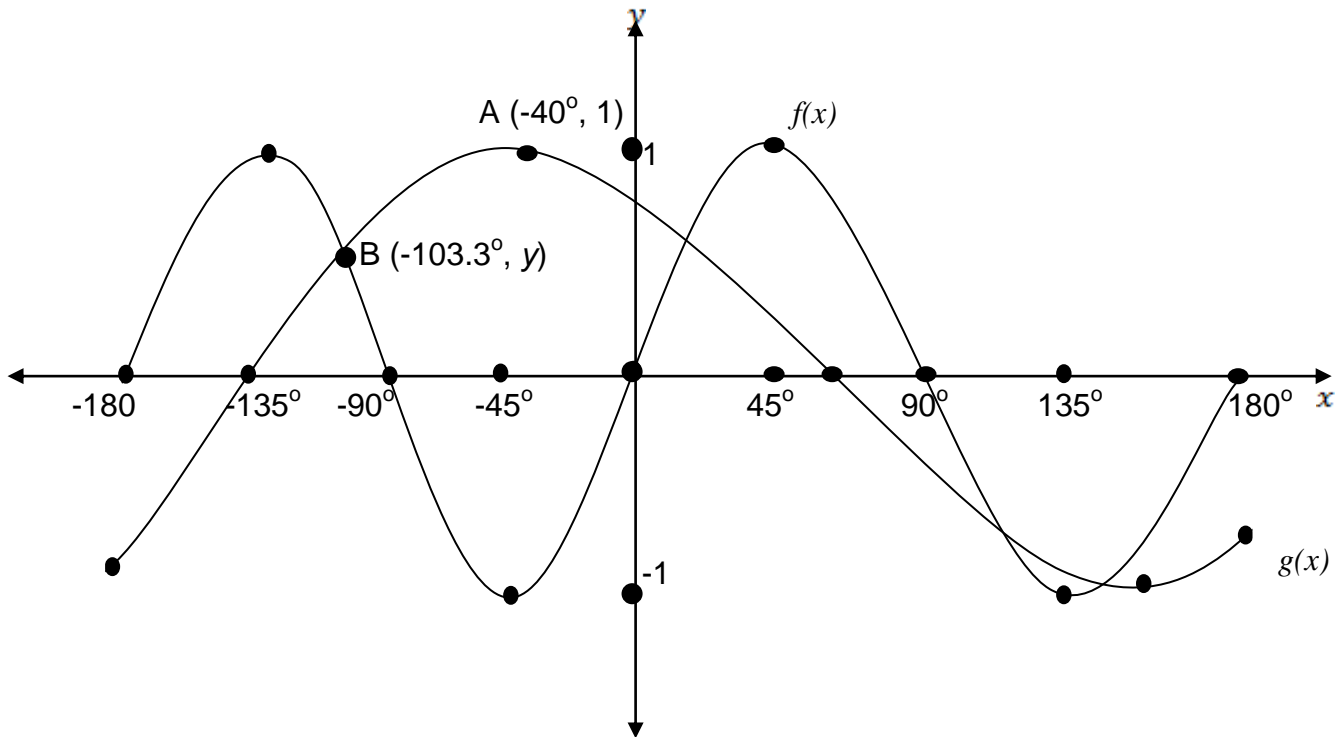
$$\frac{1}{\tan \alpha}(\sin \alpha \tan \alpha + \cos \alpha)$$
 undefined for  $\alpha \in [0^\circ; 360^\circ]$ . (2)

**[28]**

QUESTION 4

The sketch below shows the graphs of:

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



- 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  $\theta$  and  $a$ . (2)
- 4.4 Calculate the value of:  $g(180^\circ)$ . (1)
- 4.5 Determine the values of  $x$ , if  $x \in [0^\circ; -180^\circ]$  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:  $3^{\cos(90^\circ - 2x)}$  (2)

[12]

**STATEMENTS AND REASONS ARE REQUIRED WHEN ANSWERING QUESTIONS 5 , 6 AND 7.**

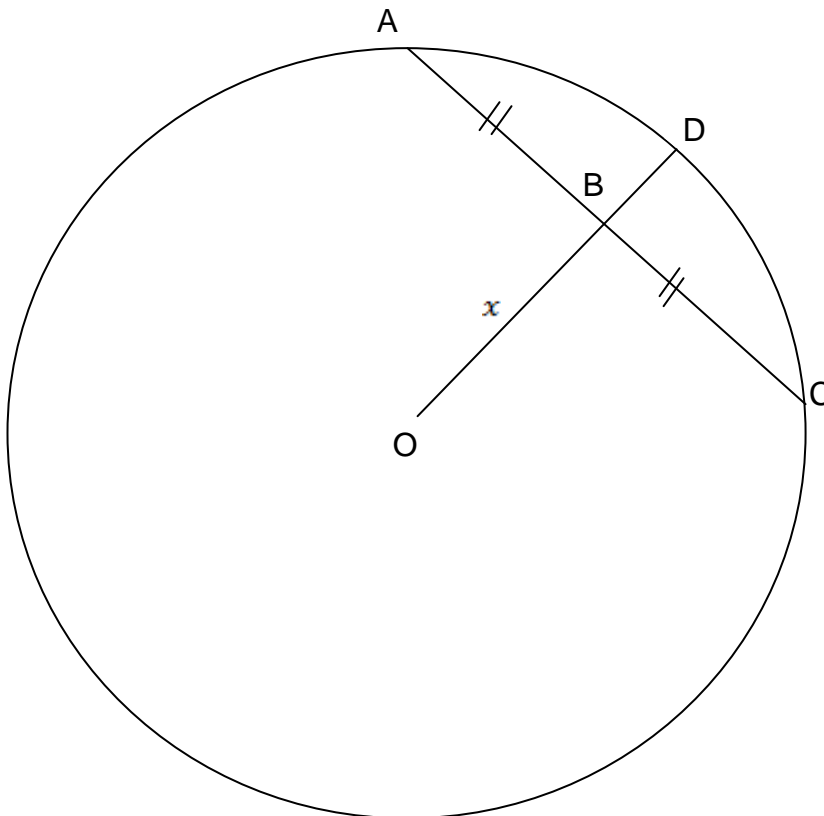
**Diagram sheets are provided on Pages 10 and 11 to assist you.**

**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.  $AC = 48 \text{ cm}$  ,  $BD = 16 \text{ cm}$  and  $OB = x$  . B is the midpoint of line AC.



5.2.1 Calculate the length of AD. (2)

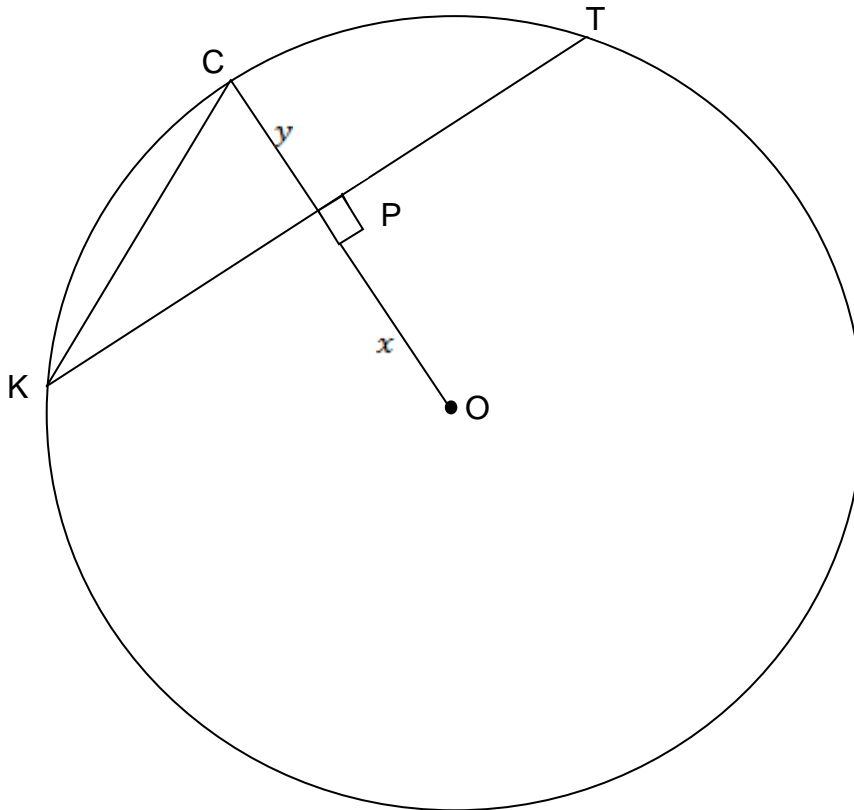
5.2.2 Determine the length of OD in terms of  $x$ . (1)

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  $PC = y$ .



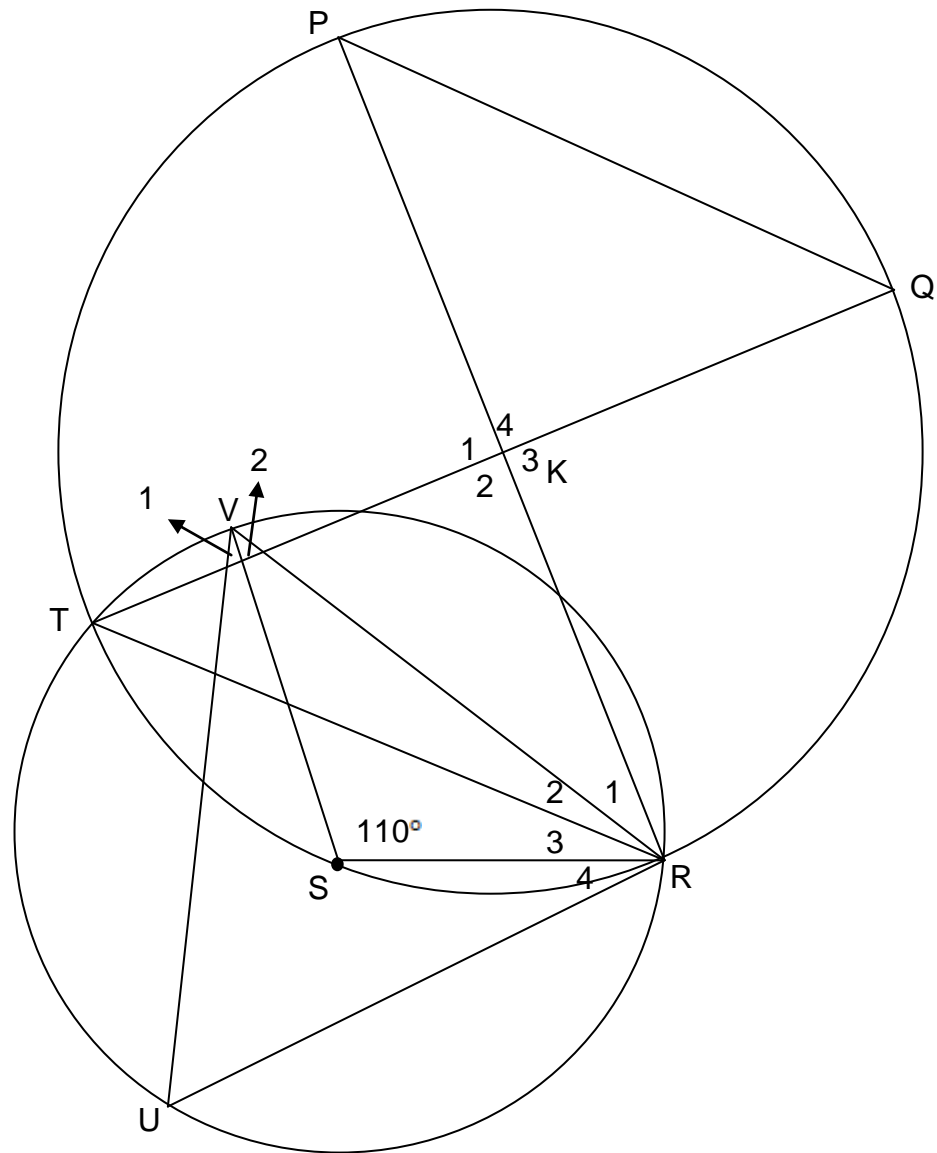
- 6.1 Determine  $PT$  in terms of  $KT$ . (2)
- 6.2 Prove that:  $KC^2 = 2xy + 2y^2$  (6)
- [8]**



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.

$\hat{VSR} = 110^\circ$ ;  $\hat{R}_3 = 20^\circ$  and  $\hat{R}_1 = 30^\circ$



Calculate:

- 7.1  $\hat{U}$  (2)
- 7.2  $\hat{V}_2$  (3)
- 7.3  $\hat{Q}$  (3)
- 7.4 Given that  $\hat{K}_2 = 90^\circ$ , calculate  $\hat{P}$ . (4)
- 7.5 Prove that  $TR \parallel PQ$ . (2)

[14]

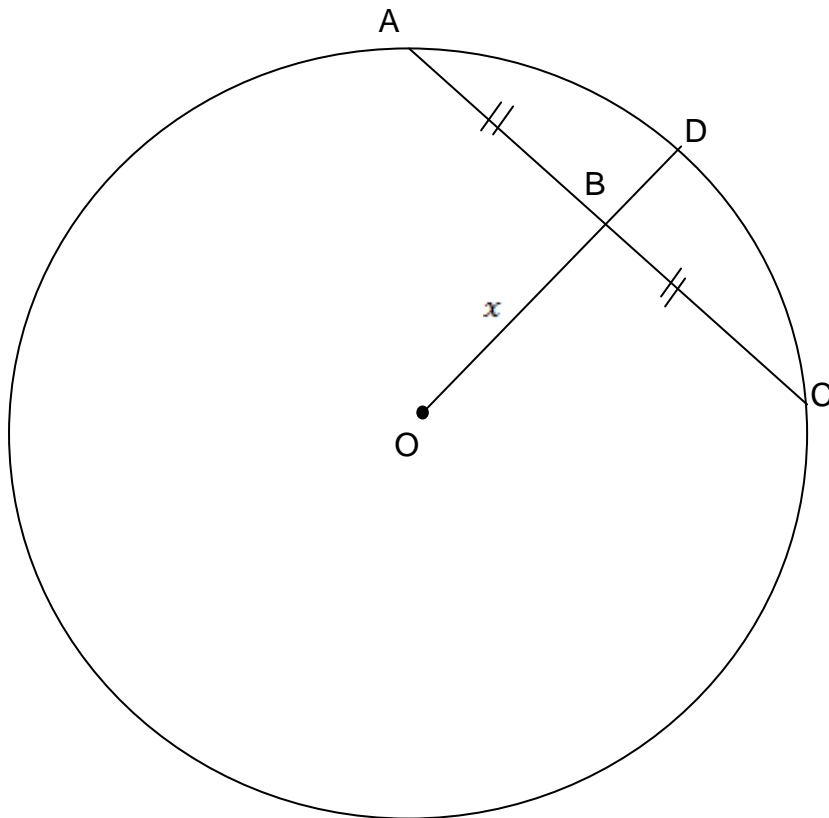
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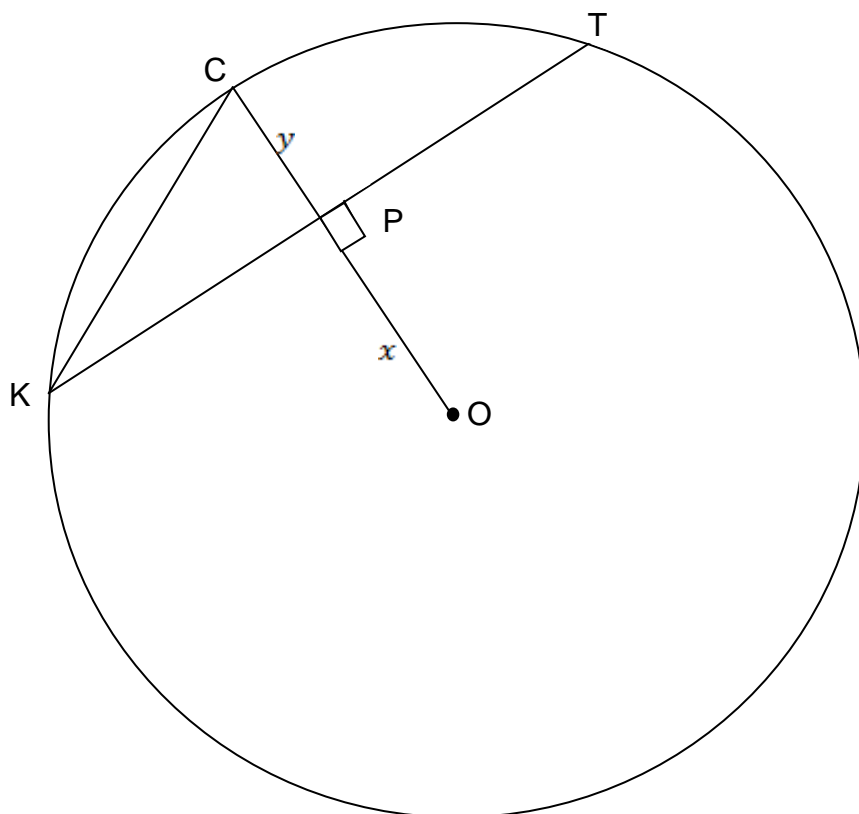
DIAGRAM SHEET 1

Name : \_\_\_\_\_ Grade: 11 \_\_\_\_\_

QUESTION 5



QUESTION 6



**DIAGRAM SHEET 2**

Name : \_\_\_\_\_ Grade: 11 \_\_\_\_\_

**QUESTION 7**

