

CHAPTER  
**10**

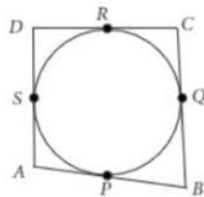
# Circles

CASE STUDY / PASSAGE BASED QUESTIONS

1

### Park with Fountain

In a park, four poles are standing at positions  $A$ ,  $B$ ,  $C$  and  $D$  around the fountain such that the cloth joining the poles  $AB$ ,  $BC$ ,  $CD$  and  $DA$  touches the fountain at  $P$ ,  $Q$ ,  $R$  and  $S$  respectively as shown in the figure.



#### Syllabus

Tangent to a circle at point of contact.

1. (Prove) The tangent at any point of a circle is perpendicular to the radius through the point of contact.
2. (Prove) The lengths of tangents drawn from an external point to a circle are equal.

Based on the above information, answer the following questions.

- (i) If  $O$  is the centre of the circular fountain, then  $\angle OSA =$ 
  - (a)  $60^\circ$
  - (b)  $90^\circ$
  - (c)  $45^\circ$
  - (d) None of these
- (ii) Which of the following is correct?
  - (a)  $AS = AP$
  - (b)  $BP = BQ$
  - (c)  $CQ = CR$
  - (d) All of these
- (iii) If  $DR = 7$  cm and  $AD = 11$  cm, then  $AP =$ 
  - (a) 4 cm
  - (b) 18 cm
  - (c) 7 cm
  - (d) 11 cm
- (iv) If  $O$  is the centre of the fountain, with  $\angle QCR = 60^\circ$ , then  $\angle QOR =$ 
  - (a)  $60^\circ$
  - (b)  $120^\circ$
  - (c)  $90^\circ$
  - (d)  $30^\circ$
- (v) Which of the following is correct?
  - (a)  $AB + BC = CD + DA$
  - (b)  $AB + AD = BC + CD$
  - (c)  $AB + CD = AD + BC$
  - (d) All of these

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Smita always finds it confusing with the concepts of tangent and secant of a circle. But this time she has determined herself to get concepts easier. So, she started listing down the differences between tangent and secant of a circle along with their relation. Here, some points in question form are listed by Smita in her notes. Try answering them to clear your concepts also.

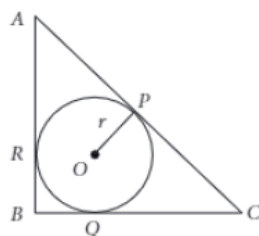


- (i) A line that intersects a circle exactly at two points is called  
 (a) Secant                      (b) Tangent                      (c) Chord                      (d) Both (a) and (b)
- (ii) Number of tangents that can be drawn on a circle is  
 (a) 1                      (b) 0                      (c) 2                      (d) Infinite
- (iii) Number of tangents that can be drawn to a circle from a point not on it, is  
 (a) 1                      (b) 2                      (c) 0                      (d) Infinite
- (iv) Number of secants that can be drawn to a circle from a point on it is  
 (a) infinite                      (b) 1                      (c) 2                      (d) 0
- (v) A line that touches a circle at only one point is called  
 (a) Secant                      (b) Chord                      (c) Tangent                      (d) Diameter

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### Triangular Backyard

A backyard is in the shape of a triangle with right angle at  $B$ ,  $AB = 6$  m and  $BC = 8$  m. A pit was dig inside it such that it touches the walls  $AC$ ,  $BC$  and  $AB$  at  $P$ ,  $Q$  and  $R$  respectively such that  $AP = x$  m.



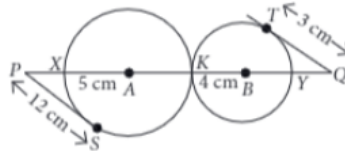
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Based on the above information, answer the following questions.

- (i) The value of  $AR =$   
 (a)  $2x$  m                      (b)  $x/2$  m                      (c)  $x$  m                      (d)  $3x$  m
- (ii) The value of  $BQ =$   
 (a)  $2x$  m                      (b)  $(6 - x)$  m                      (c)  $(2 - x)$  cm                      (d)  $4x$  m
- (iii) The value of  $CQ =$   
 (a)  $(4 + x)$  m                      (b)  $(10 - x)$  m                      (c)  $(2 + x)$  m                      (d) both (b) and (c)
- (iv) Which of the following is correct?  
 (a) Quadrilateral  $AROP$  is a square.                      (b) Quadrilateral  $BROQ$  is a square.  
 (c) Quadrilateral  $CQOP$  is a square.                      (d) None of these
- (v) Radius of the pit is  
 (a) 2 cm                      (b) 3 cm                      (c) 4 cm                      (d) 5 cm

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In a maths class, the teacher draws two circles that touch each other externally at point  $K$  with centres  $A$  and  $B$  and radii 5 cm and 4 cm respectively as shown in the figure.



Based on the above information, answer the following questions.

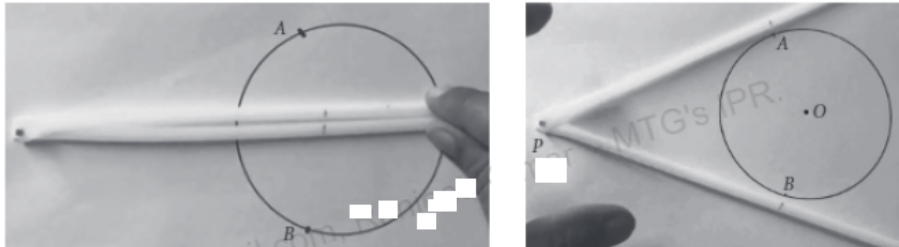
- (i) The value of  $PA =$   
 (a) 12 cm                      (b) 5 cm                      (c) 13 cm                      (d) Can't be determined
- (ii) The value of  $BQ =$   
 (a) 4 cm                      (b) 5 cm                      (c) 6 cm                      (d) None of these
- (iii) The value of  $PK =$   
 (a) 13 cm                      (b) 15 cm                      (c) 16 cm                      (d) 18 cm
- (iv) The value of  $QY =$   
 (a) 2 cm                      (b) 5 cm                      (c) 1 cm                      (d) 3 cm
- (v) Which of the following is true?  
 (a)  $PS^2 = PA \cdot PK$                       (b)  $TQ^2 = QB \cdot QK$                       (c)  $PS^2 = PX \cdot PK$                       (d)  $TQ^2 = QA \cdot QB$

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### Activity using Straws and Nail

Prem did an activity on tangents drawn to a circle from an external point using 2 straws and a nail for maths project as shown in figure.

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Based on the above information, answer the following questions.

- (i) Number of tangents that can be drawn to a circle from an external point is  
 (a) 1 (b) 2  
 (c) infinite (d) any number depending on radius of circle
- (ii) On the basis of which of the following congruency criterion,  $\triangle OAP \cong \triangle OBP$ ?  
 (a) ASA (b) SAS (c) RHS (d) SSS
- (iii) If  $\angle AOB = 150^\circ$ , then  $\angle APB =$   
 (a)  $75^\circ$  (b)  $30^\circ$  (c)  $60^\circ$  (d)  $100^\circ$
- (iv) If  $\angle APB = 40^\circ$ , then  $\angle BAO =$   
 (a)  $40^\circ$  (b)  $30^\circ$  (c)  $50^\circ$  (d)  $20^\circ$
- (v) If  $\angle ABO = 45^\circ$ , then which of the following is correct option?  
 (a)  $AP \perp BP$  (b)  $PAOB$  is square (c)  $\angle AOB = 90^\circ$  (d) All of these

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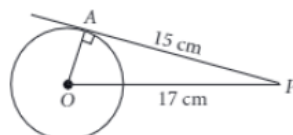
### Online Test

In an online test, Ishita comes across the statement - If a tangent is drawn to a circle from an external point, then the square of length of tangent drawn is equal to difference of squares of distance of the tangent from the centre of circle and radius of the circle.



Help Ishita, in answering the following questions based on the above statement.

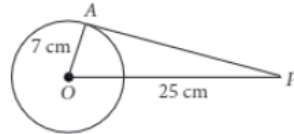
- (i) If  $AB$  is a tangent to a circle with centre  $O$  at  $B$  such that  $AB = 10$  cm and  $OB = 5$  cm, then  $OA =$   
 (a)  $3\sqrt{5}$  cm (b)  $5\sqrt{5}$  cm (c)  $4\sqrt{5}$  cm (d)  $6\sqrt{5}$  cm
- (ii) In the adjoining figure, radius of the circle is



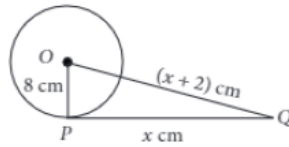
- (a) 8 cm (b) 7 cm (c) 9 cm (d) 10 cm

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(iii) In the adjoining figure, length of tangent  $AP$  is



- (a) 12 cm                      (b) 24 cm                      (c) 30 cm                      (d) None of these
- (iv)  $PT$  is a tangent to a circle with centre  $O$  and diameter = 40 cm. If  $PT = 21$  cm, then  $OP =$
- (a) 33 cm                      (b) 29 cm                      (c) 37 cm                      (d) None of these
- (v) In the adjoining figure, the length of the tangent is



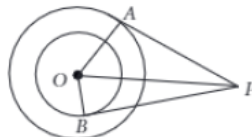
- (a) 15 cm                      (b) 9 cm                      (c) 8 cm                      (d) 10 cm

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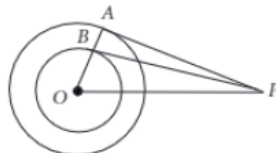
### Theorem on Circles

If a tangent is drawn to a circle from an external point, then the radius at the point of contact is perpendicular to the tangent. Answer the following questions using the above condition.

- (i) Two concentric circles are of radii 5 cm and 3 cm. Find the length of the chord of the larger circle which touches the smaller circle.
- (a) 8 cm                      (b) 4 cm                      (c) 10 cm                      (d) 6 cm
- (ii) In the given figure,  $O$  is the centre of two concentric circles of radii 5 cm and 3 cm. From an external point  $P$  tangents  $PA$  and  $PB$  are drawn to these circles. If  $PA = 12$  cm, then  $PB =$

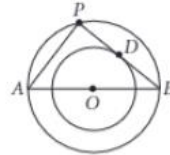


- (a)  $2\sqrt{10}$  cm                      (b)  $2\sqrt{5}$  cm                      (c)  $4\sqrt{10}$  cm                      (d)  $4\sqrt{5}$  cm
- (iii) In the given figure,  $O$  is the centre of two concentric circles. From an external point  $P$  tangents  $PA$  and  $PB$  are drawn to these circles such that  $PA = 6$  cm and  $PB = 8$  cm. If  $OP = 10$  cm, then  $AB =$



- (a) 1 cm                      (b) 2 cm                      (c) 4 cm                      (d) Can't be determined
- (iv) The diameter of two concentric circles are 10 cm and 6 cm.  $AB$  is a diameter of the bigger circle and  $BD$  is the tangent to the smaller circle touching it at  $D$  and intersecting the larger circle at  $P$  on producing. Find the length of  $BP$ .

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- (a) 4 cm                      (b) 16 cm                      (c) 10 cm                      (d) 8 cm
- (v) Two concentric circles are such that the difference between their radii is 4 cm and the length of the chord of the larger circle which touches the smaller circle is 24 cm. Then the radius of the smaller circle is
- (a) 16 cm                      (b) 20 cm                      (c) 18 cm                      (d) None of these

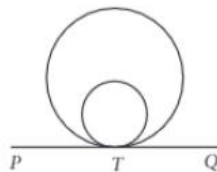
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### Assessment Test on Circles

Following are questions of section-A in assessment test on circle that Eswar attend last month in school. He scored 5 out of 5 in this section. Answer the questions and check your score if 1 mark is allotted to each question.



- (i) If two tangents  $AB$  and  $CD$  drawn to a circle with centre  $O$  at  $P$  and  $Q$  respectively, are parallel to each other, then which of the following is correct?
- (a)  $\angle POQ = 180^\circ$                       (b)  $PQ$  is a diameter  
(c)  $\angle APQ = \angle PQD = 90^\circ$                       (d) All of these
- (ii) If  $l$  is a tangent to the circle with centre  $O$  and line  $m$  is passing through  $O$  intersects the tangent  $l$  at point of contact, then
- (a)  $l \parallel m$                       (b)  $l \perp m$   
(c) line  $l$  and line  $m$  intersects and makes an angle of  $60^\circ$   
(d) can't be determined
- (iii) Number of tangents that can be drawn to a circle from a point inside it, is
- (a) 1                      (b) 2                      (c) infinite                      (d) 0
- (iv) Which of the following is true?



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- (a)  $PQ$  is a tangent to both the circles  
 (b) Two circles are concentric  
 (c)  $PQ$  is a tangent to bigger circle only  
 (d)  $PQ$  is a tangent to smaller circle only
- (v) A parallelogram circumscribing a circle is called a  
 (a) rhombus  
 (b) rectangle  
 (c) square  
 (d) none of these

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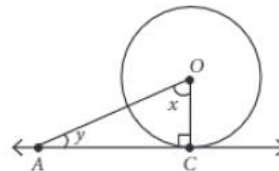
### Teaching through Play-Way Method

For class 10 students, a teacher planned a game for the revision of chapter circles with some questions written on the board, which are to be answered by the students. For each correct answer, a student will get a reward. Some of the questions are given below.

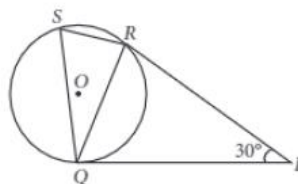


Answer these questions to check your knowledge.

- (i) In the given figure,  $x + y =$

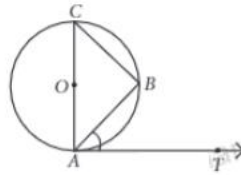


- (a)  $60^\circ$                       (b)  $90^\circ$                       (c)  $120^\circ$                       (d)  $145^\circ$
- (ii) If  $PA$  and  $PB$  are two tangents drawn to a circle with centre  $O$  from  $P$  such that  $\angle PBA = 50^\circ$ , then  $\angle OAB =$   
 (a)  $50^\circ$                       (b)  $25^\circ$                       (c)  $40^\circ$                       (d)  $130^\circ$
- (iii) In the given figure,  $PQ$  and  $PR$  are two tangents to the circle, then  $\angle ROQ =$



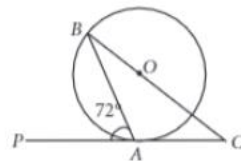
- (a)  $30^\circ$                       (b)  $60^\circ$                       (c)  $105^\circ$                       (d)  $150^\circ$
- (iv) In the adjoining figure,  $AB$  is a chord of the circle and  $AOC$  is its diameter such that  $\angle ACB = 55^\circ$ , then  $\angle BAT =$

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- (a)  $35^\circ$                       (b)  $55^\circ$                       (c)  $125^\circ$                       (d)  $110^\circ$

- (v) In the adjoining figure, if  $PC$  is the tangent at  $A$  of the circle with  $\angle PAB = 72^\circ$  and  $\angle AOB = 132^\circ$ , then  $\angle ABC =$



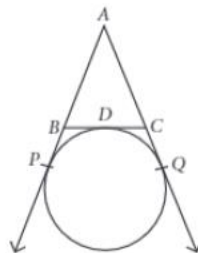
- (a)  $18^\circ$                       (b)  $30^\circ$                       (c)  $60^\circ$                       (d) can't be determined

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Raghav loves geometry. So he was curious to know more about the concepts of circle. His father is a mathematician. So, he reached to his father to learn something interesting about tangents and circles. His father gave him knowledge on circles and tangents and ask him to solve the following questions.



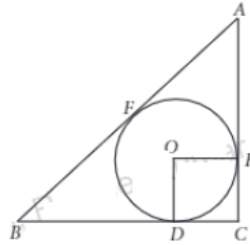
- (i) In the given figure,  $AP$ ,  $AQ$  and  $BC$  are tangents to the circle such that  $AB = 7$  cm,  $BC = 5$  cm and  $AC = 8$  cm, then  $AP$  is equal to



- (a) 12 cm                      (b) 15 cm                      (c) 13 cm                      (d) 10 cm

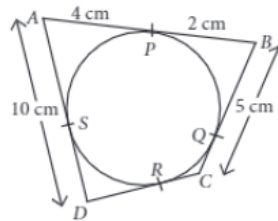
- (ii) A circle of radius 3 cm is inscribed in a right angled triangle  $BAC$  such that  $BD = 9$  cm and  $DC = 3$  cm. Find the length of  $AB$ .

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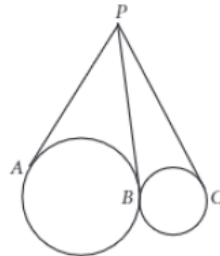


- (a) 6 cm                      (b) 12 cm                      (c) 15 cm                      (d) 10 cm

(iii) In the given figure, the length of  $CD$  is



- (a) 11 cm                      (b) 9 cm                      (c) 7 cm                      (d) 13 cm
- (iv) If  $PA$  and  $PB$  are two tangents to a circle with centre  $O$  from an external point  $P$  such that  $\angle OPB = 40^\circ$ , then  $\angle BPA =$
- (a)  $60^\circ$                       (b)  $50^\circ$                       (c)  $120^\circ$                       (d)  $80^\circ$
- (v) In the given figure,  $P$  is an external point from which tangents are drawn to two externally touching circles. If  $PA = 7$  cm, then  $PC =$



- (a) 3.5 cm                      (b) 4 cm                      (c) 7 cm                      (d) Can't be determined

