

# Grade 10 Geometry Quiz: Triangles and Circles

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Instructions: Answer all questions. Show your work where applicable.

**Question 1:** What defines two figures as similar?

- A) Same shape and same size.
- B) Same shape, but not necessarily the same size.
- C) Same size, but not necessarily the same shape.
- D) Different shapes and different sizes.

**Question 2:** Which statement is always true regarding congruent and similar figures?

- A) All similar figures are congruent.
- B) All congruent figures are similar.
- C) A circle and a square can be similar.
- D) Similar figures must have the same area.

**Question 3:** A line that intersects a circle at exactly one point is called a:

- A) Secant
- B) Chord
- C) Tangent
- D) Radius

**Question 4:** What is the angle formed between a tangent to a circle and the radius drawn to the point of contact?

- A)  $45^\circ$
- B)  $60^\circ$
- C)  $90^\circ$
- D)  $180^\circ$

**Question 5:** From an external point P, two tangents PA and PB are drawn to a circle. If PA = 7 cm, what is the length of PB?

- A) 3.5 cm

- B) 7 cm
- C) 14 cm
- D) Cannot be determined

**Question 6:** In triangles ABC and DEF, if  $\angle A = \angle D$  and  $\angle B = \angle E$ , what can be concluded about the triangles?

- A) They are congruent by AAS criterion.
- B) They are similar by AA criterion.
- C) They are similar by SAS criterion.
- D) They are neither congruent nor similar.

**Question 7:** Triangle ABC has sides AB=6 cm, BC=8 cm, CA=10 cm. Triangle PQR has sides PQ=3 cm, QR=4 cm, RP=5 cm. Are the triangles similar? If so, state the similarity criterion.

Answer: \_\_\_\_\_

**Question 8:** A tangent of length 8 cm is drawn from an external point P to a circle. If the distance from P to the center O of the circle is 10 cm, find the radius of the circle.

Answer: \_\_\_\_\_

**Question 9:** Two concentric circles have radii 5 cm and 3 cm. Find the length of the chord of the larger circle which touches the smaller circle.

Answer: \_\_\_\_\_

**Question 10:** In triangles XYZ and MNO, XY = 4 cm, YZ = 6 cm,  $\angle Y = 50^\circ$ . Also, MN = 8 cm, NO = 12 cm,  $\angle N = 50^\circ$ . Are the triangles similar? If yes, state the criterion.

Answer: \_\_\_\_\_

**Question 11:** How many tangents can be drawn to a circle from a point lying inside the circle?

- A) One
- B) Two
- C) Infinitely many
- D) Zero

**Question 12:** A quadrilateral ABCD is drawn to circumscribe a circle. If AB = 6 cm, BC = 7 cm, and CD = 4 cm, find the length of AD.

Answer: \_\_\_\_\_

**Question 13:** Two tangents PA and PB are drawn to a circle with center O from an external point P. If  $\angle APB = 70^\circ$ , what is the measure of  $\angle AOB$ ?

- A)  $70^\circ$
- B)  $110^\circ$
- C)  $140^\circ$
- D)  $35^\circ$

**Question 14:** In triangle ABC, a line DE is drawn parallel to BC, intersecting AB at D and AC at E. If  $AD/DB = 2/3$  and  $AE = 4$  cm, what is the length of AC?

Answer: \_\_\_\_\_

**Question 15:** A sector of a circle has a radius of 7 cm and an angle of  $60^\circ$ . What is the area of the sector? (Use  $\pi = 22/7$ )

Answer: \_\_\_\_\_

# Answer Key

## Question 1: B

*Explanation:* Similar figures have the same shape but can differ in size. Congruent figures have both the same shape and size.

## Question 2: B

*Explanation:* If two figures are congruent, they have the same shape and size, which means they also have the same shape and are therefore similar. However, similar figures do not necessarily have the same size, so they are not always congruent.

## Question 3: C

*Explanation:* A tangent is a line that touches the circle at exactly one point, known as the point of contact. A secant intersects at two points, and a chord is a segment connecting two points on the circle.

## Question 4: C

*Explanation:* Theorem 10.1 states that the tangent at any point of a circle is perpendicular to the radius through the point of contact, meaning the angle formed is  $90^\circ$ .

## Question 5: B

*Explanation:* Theorem 10.2 states that the lengths of tangents drawn from an external point to a circle are equal. Therefore, if  $PA = 7$  cm, then  $PB$  must also be 7 cm.

## Question 6: B

*Explanation:* The AA (Angle-Angle) similarity criterion states that if two angles of one triangle are respectively equal to two angles of another triangle, then the two triangles are similar.

## Question 7: Yes, by SSS similarity criterion.

*Explanation:* Comparing the ratios of corresponding sides:  $AB/PQ = 6/3 = 2$ ,  $BC/QR = 8/4 = 2$ ,  $CA/RP = 10/5 = 2$ . Since all corresponding sides are in the same ratio (proportional), the triangles are similar by the SSS (Side-Side-Side) similarity criterion.

## Question 8: 6 cm

*Explanation:* Let the point of contact be T. Triangle OTP is a right-angled triangle with the right angle at T (radius is perpendicular to tangent). By Pythagoras Theorem,  $OT^2 + PT^2 = OP^2$ . So,  $r^2 + 8^2 = 10^2$ , which means  $r^2 + 64 = 100$ . Thus,  $r^2 = 36$ , and  $r = 6$  cm.

**Question 9: 8 cm**

*Explanation:* Let the chord of the larger circle touch the smaller circle at point T. The radius of the smaller circle (3 cm) to T is perpendicular to the chord. The radius of the larger circle (5 cm) forms the hypotenuse of a right-angled triangle with half the chord and the radius of the smaller circle. Let half the chord be  $x$ . Then  $x^2 + 3^2 = 5^2$ . So,  $x^2 + 9 = 25$ , which means  $x^2 = 16$ , and  $x = 4$  cm. The full length of the chord is  $2x = 2 * 4 = 8$  cm.

**Question 10: Yes, by SAS similarity criterion.**

*Explanation:* Compare the ratios of the sides including the equal angles:  $XY/MN = 4/8 = 1/2$  and  $YZ/NO = 6/12 = 1/2$ . Since the included angles  $\angle Y$  and  $\angle N$  are equal ( $50^\circ$ ) and the sides including these angles are proportional, the triangles are similar by the SAS (Side-Angle-Side) similarity criterion.

**Question 11: D**

*Explanation:* It is impossible to draw a tangent to a circle from a point lying inside the circle, as any line passing through an interior point will intersect the circle at two points (a secant).

**Question 12: 3 cm**

*Explanation:* For a quadrilateral circumscribing a circle, the sum of opposite sides are equal. So,  $AB + CD = AD + BC$ . Substituting the given values:  $6 + 4 = AD + 7$ . This simplifies to  $10 = AD + 7$ . Therefore,  $AD = 10 - 7 = 3$  cm.

**Question 13: B**

*Explanation:* The angle between the two tangents drawn from an external point to a circle ( $\angle APB$ ) and the angle subtended by the line-segment joining the points of contact at the centre ( $\angle AOB$ ) are supplementary. Thus,  $\angle APB + \angle AOB = 180^\circ$ . So,  $70^\circ + \angle AOB = 180^\circ$ , which means  $\angle AOB = 110^\circ$ .

**Question 14: 10 cm**

*Explanation:* By the Basic Proportionality Theorem (Thales Theorem), if a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio. So,  $AD/DB = AE/EC$ . Given  $AD/DB = 2/3$  and  $AE = 4$  cm, we have  $2/3 = 4/EC$ . Solving for  $EC$ ,  $2 * EC = 3 * 4 = 12$ , so  $EC = 6$  cm. The length of  $AC$  is  $AE + EC = 4$  cm +  $6$  cm =  $10$  cm.

**Question 15:  $77/3$  cm<sup>2</sup> or approximately 25.67 cm<sup>2</sup>**

*Explanation:* The area of a sector of a circle is given by the formula  $(\theta/360^\circ) * \pi r^2$ , where  $\theta$  is the angle of the sector and  $r$  is the radius. Substituting the given values:  $\text{Area} = (60/360) * (22/7) * 7^2 = (1/6) * (22/7) * 49 = (1/6) * 22 * 7 = (1/6) * 154 = 154/6 = 77/3$  cm<sup>2</sup>.