

# Triangles and Circles

Mathematics · Class 10 · Topic-wise Practice Worksheet

|                    |                 |                   |                        |
|--------------------|-----------------|-------------------|------------------------|
| TIME<br>45 minutes | QUESTIONS<br>18 | TOTAL MARKS<br>24 | MAX. SCORE<br>___ / 24 |
|--------------------|-----------------|-------------------|------------------------|

Name: \_\_\_\_\_ Class/Sec: \_\_\_\_\_ Date: \_\_\_\_\_

## INSTRUCTIONS

- There are **18 questions** in this worksheet. All questions are compulsory.
- Each question has four options (A), (B), (C) and (D). Exactly **one** option is correct.
- Questions 1–15 carry **1 mark** each. Questions 16–18 (Achievers Section) carry **3 marks** each.
- There is no negative marking. Use of a calculator is **not** allowed.
- Figures are not drawn to scale unless stated. Rough work may be done at the side of each page.

## Section A — Mathematical Reasoning

Q1–Q8 · 1 mark each

- Two triangles are similar if their corresponding angles are equal and their corresponding sides are \_\_\_\_\_.  
 (A) In the same ratio (B) Equal  
 (C) Perpendicular (D) Parallel
- Which of the following is a valid criterion for the **similarity** of two triangles?  
 (A) SSA (B) RHS  
 (C) ASA (D) AA
- The Basic Proportionality Theorem states that a line drawn parallel to one side of a triangle divides the other two sides \_\_\_\_\_.  
 (A) In the same ratio (B) Equally  
 (C) Perpendicularly (D) In the ratio 1 : 2
- The ratio of the areas of two similar triangles equals the ratio of \_\_\_\_\_.  
 (A) Their corresponding sides (B) The squares of their corresponding sides  
 (C) The cubes of their corresponding sides (D) Their perimeters
- In a right-angled triangle, the square of the hypotenuse equals \_\_\_\_\_.  
 (A) The sum of the other two sides (B) The product of the other two sides  
 (C) The sum of the squares of the other two sides (D) Twice the area
- A tangent to a circle is \_\_\_\_\_ to the radius drawn at the point of contact.  
 (A) Parallel (B) Inclined at  $45^\circ$   
 (C) Equal in length (D) Perpendicular
- The number of tangents that can be drawn to a circle from a point outside it is \_\_\_\_\_.  
 (A) 2 (B) 1  
 (C) 0 (D) Infinitely many

8. The lengths of the two tangents drawn from an external point to a circle are \_\_\_\_\_.

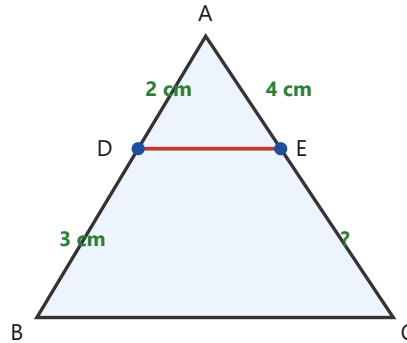
- (A) In the ratio 1 : 2  
(C) Always different

- (B) Equal  
(D) Equal to the radius

**Section B — Everyday Mathematics and Reasoning**

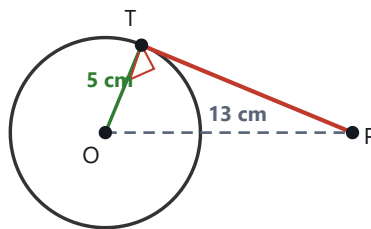
Q9–Q15 · 1 mark each

9. In the figure, DE is parallel to BC. If AD = 2 cm, DB = 3 cm and AE = 4 cm, then EC = \_\_\_\_\_.



*$\triangle ABC$  with DE parallel to BC*

- (A) 5 cm  
(C) 6 cm
- (B) 7 cm  
(D) 8 cm
10. The areas of two similar triangles are in the ratio 9 : 16. The ratio of their corresponding sides is \_\_\_\_\_.
- (A) 9 : 16  
(C) 81 : 256
- (B) 4 : 3  
(D) 3 : 4
11. In a right-angled triangle the two shorter sides measure 7 cm and 24 cm. The hypotenuse is \_\_\_\_\_.
- (A) 25 cm  
(C) 31 cm
- (B) 26 cm  
(D) 23 cm
12. In the figure, PT is a tangent to the circle with centre O. If OP = 13 cm and the radius OT = 5 cm, then PT = \_\_\_\_\_.



*Tangent PT from an external point P to a circle with centre O*

- (A) 8 cm  
(C) 10 cm
- (B) 12 cm  
(D) 18 cm
13. Two circles are concentric, with radii 5 cm and 3 cm. The length of the chord of the larger circle that touches the smaller circle is \_\_\_\_\_.
- (A) 4 cm  
(C) 8 cm
- (B) 6 cm  
(D) 10 cm

14. One row of the table below is **incorrectly** matched. Which row is it?

| Row | Statement                                                                                  | Correct name                       |
|-----|--------------------------------------------------------------------------------------------|------------------------------------|
| (A) | Tangents drawn from an external point are equal in length                                  | Angle sum property                 |
| (B) | The ratio of areas of similar triangles is the ratio of the squares of corresponding sides | Area theorem for similar triangles |
| (C) | A line parallel to one side divides the other two sides in the same ratio                  | Basic Proportionality Theorem      |
| (D) | The square on the hypotenuse equals the sum of the squares on the other two sides          | Pythagoras theorem                 |

Table 4.1 — Results about triangles and circles

- (A) (A) (B) (B)  
(C) (C) (D) (D)

15. A vertical pole 6 m high casts a shadow 4 m long. At the same moment a nearby tower casts a shadow 28 m long. The height of the tower is \_\_\_\_\_.

- (A) 18 m (B) 36 m  
(C) 48 m (D) 42 m

### Achievers Section

Q16–Q18 · 3 marks each

16. Two tangents PA and PB are drawn from an external point P to a circle with centre O, and the angle between them is  $80^\circ$ . The measure of  $\angle AOB$  is \_\_\_\_\_.

- (A)  $100^\circ$  (B)  $90^\circ$   
(C)  $80^\circ$  (D)  $160^\circ$

17. In right-angled  $\triangle ABC$ , the right angle is at A and AD is the altitude drawn to the hypotenuse BC. If AD = 6 cm and BD = 4 cm, then DC = \_\_\_\_\_.

- (A) 6 cm (B) 9 cm  
(C) 8 cm (D) 12 cm

18. Consider the three statements below.

- (i) All squares are similar to one another.  
(ii) Two triangles with equal areas must be similar.  
(iii) A tangent to a circle meets it at exactly one point.

Which of them are **true**?

- (A) (i) and (ii) only (B) (i) and (iii) only  
(C) (ii) and (iii) only (D) All three

# Answer Key

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|    |   |    |   |    |   |    |   |    |   |
|----|---|----|---|----|---|----|---|----|---|
| 1  | A | 2  | D | 3  | A | 4  | B | 5  | C |
| 6  | D | 7  | A | 8  | B | 9  | C | 10 | D |
| 11 | A | 12 | B | 13 | C | 14 | A | 15 | D |
| 16 | A | 17 | B | 18 | B |    |   |    |   |

## Solutions

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**1. Answer: (A)** In the same ratio

Similar figures have the same shape but not necessarily the same size, so corresponding sides are **in the same ratio**. Equal corresponding sides would make the triangles congruent, a special case of similarity.

**2. Answer: (D)** AA

If two angles of one triangle equal two angles of another, the third angles match automatically and the triangles are similar — this is the **AA** criterion. RHS and ASA are congruence criteria, and SSA proves neither.

**3. Answer: (A)** In the same ratio

This is Thales' theorem: such a line cuts the other two sides **in the same ratio**. Its converse is equally useful for proving that two lines are parallel.

**4. Answer: (B)** The squares of their corresponding sides

Area depends on two dimensions, so scaling every length by  $k$  multiplies the area by  $k^2$ . The area ratio is therefore the ratio of **the squares of the corresponding sides**.

**5. Answer: (C)** The sum of the squares of the other two sides

This is the Pythagoras theorem: the square on the hypotenuse equals **the sum of the squares on the other two sides**. Its converse identifies right triangles from their side lengths.

**6. Answer: (D)** Perpendicular

The radius to the point of contact is the shortest distance from the centre to the tangent, and the shortest distance is always along the perpendicular. So the tangent is **perpendicular** to that radius.

**7. Answer: (A)** 2

From an external point exactly **2** tangents can be drawn. A point on the circle gives one tangent, and from a point inside the circle none can be drawn.

**8. Answer: (B)** Equal

Joining the centre to the external point makes two right triangles that share a hypotenuse and have equal radii, so they are congruent by RHS. Hence the two tangent lengths are **equal**.

**9. Answer: (C)** 6 cm

By the Basic Proportionality Theorem,  $\frac{AD}{DB} = \frac{AE}{EC}$ , so  $\frac{2}{3} = \frac{4}{EC}$ . Cross-multiplying,  $2 \times EC = 12$  and  $EC = \mathbf{6 \text{ cm}}$ .

**10. Answer: (D)** 3 : 4

Since the area ratio is the square of the side ratio, the sides are in the ratio  $\sqrt{9} : \sqrt{16} = \mathbf{3 : 4}$ .

**11. Answer: (A)** 25 cm

By Pythagoras, the hypotenuse is  $\sqrt{7^2 + 24^2} = \sqrt{49 + 576} = \sqrt{625} = \mathbf{25 \text{ cm}}$ .

**12. Answer: (B)** 12 cm

The tangent meets the radius at right angles, so  $\triangle OTP$  is right-angled at T. Hence  $PT = \sqrt{OP^2 - OT^2} = \sqrt{169 - 25} = \sqrt{144} = \mathbf{12 \text{ cm}}$ .

**13. Answer: (C)** 8 cm

The chord touches the inner circle, so the perpendicular from the common centre to the chord is 3 cm, and it bisects the chord. Half the chord is  $\sqrt{25 - 9} = 4$  cm, so the full chord is  $2 \times 4 = \mathbf{8 \text{ cm}}$ .

**14. Answer: (A)** (A)

Equal tangents from an external point is a theorem about circles; the angle sum property is the quite different statement that a triangle's angles add to  $180^\circ$ . So row **(A)** is wrong, while the other three names are correct.

**15. Answer: (D)** 42 m

The sun's rays make the same angle for both, so the two height–shadow triangles are similar:  $\frac{\text{height}}{\text{shadow}}$  is the same for each. Thus  $\frac{h}{28} = \frac{6}{4}$ , giving  $h = 28 \times 1.5 = \mathbf{42 \text{ m}}$ .

**16. Answer: (A)** 100°

OAPB is a quadrilateral whose angles at A and B are each 90°, since a radius meets a tangent at right angles. The four angles add to 360°, so  $\angle AOB = 360^\circ - 90^\circ - 90^\circ - 80^\circ = \mathbf{100^\circ}$ . The angle at the centre and the angle between the tangents are always supplementary.

**17. Answer: (B)** 9 cm

The altitude to the hypotenuse creates two triangles similar to each other, which gives  $AD^2 = BD \times DC$ . So  $36 = 4 \times DC$  and  $DC = \mathbf{9 \text{ cm}}$ . The hypotenuse is then  $4 + 9 = 13 \text{ cm}$ .

**18. Answer: (B)** (i) and (iii) only

Statement (i) is true: every square has four right angles and four equal sides, so any two are the same shape. Statement (ii) is false — a triangle with base 8 and height 3 has the same area as one with base 6 and height 4, yet the shapes differ. Statement (iii) is true and is the definition of a tangent. So **(i) and (iii)** hold.