

Chapter 10 Triangles and Quadrilaterals

Teacher Guide and Diagnostic Answer Key

Teacher Guide

Teacher Chapter-at-a-Glance

None required
Pacing
Talk Prompt

Mastery Decision Guide

A missed Tripwire does not automatically mean “redo the chapter.” Confirm the likely misconception, reteach the smallest prerequisite or representation that addresses it, and then use a fresh item before moving on.

Missed Tripwire #1 → The remaining angle sum is not being shared between the two equal base angles. Next move: After subtracting the top angle, divide the remainder by 2.

Confirmation and Fresh Recheck

Confirm with: Ask the student to mark only the facts that are given, then state the relevant angle total or shape property.

Fresh recheck: Use a differently oriented isosceles triangle and one unmarked quadrilateral; require evidence-based reasoning.

Decision rule: Move forward only when the fresh response is secure and the reasoning survives the changed representation or context.

Diagram Production Notes — Chapter 10

Use the diagram master IDs:

Ch10-D01 — Triangle Basics

Ch10-D02 — Triangles by Sides

Ch10-D03 — Triangles by Angles

Ch10-D04 — Triangle Angle Sum

Ch10-D05 — Isosceles Base Angles

Ch10-D06 — Quadrilateral Family Chart

Ch10-D07 — Parallelogram Angles

Diagrams must use markings, not visual assumptions. Equal sides need tick marks. Equal angles need matching arc marks. The isosceles triangle diagram must clearly show the two equal sides and the two equal base angles. The quadrilateral family chart should be clean and not overcrowded.

Ready to Learn Check

Quick check before starting. A wrong response below points to a prerequisite worth confirming before the chapter builds on it.

1. What do the angles inside a triangle add to?

Correct answer: 180°

Likely wrong answer: 360°

Possible misconception: Triangle and quadrilateral angle sums are being confused.

Next move: Use a paper triangle and connect its three corners to a straight angle.

2. What do the angles inside a quadrilateral add to?

Correct answer: 360°

Likely wrong answer: 180°

Possible misconception: Quadrilateral angle sum is not secure.

Next move: Split a quadrilateral into two triangles: $2 \times 180^\circ$.

3. What does it mean if two sides have matching tick marks?

Correct answer: The marked sides are equal.

Likely wrong answer: They only look equal.

Possible misconception: Diagram marks are not being interpreted as mathematical information.

Next move: Compare a marked isosceles triangle with an unmarked look-alike.

Ready-to-Learn item 1

Correct answer: 180°

Likely wrong answer: 360°

Misconception: Triangle and quadrilateral angle sums are being confused.

Next move: Use a paper triangle and connect its three corners to a straight angle.

Ready-to-Learn item 2

Correct answer: 360°

Likely wrong answer: 180°

Misconception: Quadrilateral angle sum is not secure.

Next move: Split a quadrilateral into two triangles: $2 \times 180^\circ$.

Ready-to-Learn item 3

Correct answer: The marked sides are equal.

Likely wrong answer: They only look equal.

Misconception: Diagram marks are not being interpreted as mathematical information.

Next move: Compare a marked isosceles triangle with an unmarked look-alike.

Practice

Assign the full set or select items for targeted review. Teacher solutions follow each question.

1. Triangle angles: 40° , 60° , x

Solution: 1. $40^\circ + 60^\circ = 100^\circ$ $180^\circ - 100^\circ = 80^\circ$

2. Triangle angles: 35° , 75° , x

Solution: 2. $35^\circ + 75^\circ = 110^\circ$ $180^\circ - 110^\circ = 70^\circ$

3. Triangle angles: 90° , 30° , x

Solution: 3. $90^\circ + 30^\circ = 120^\circ$ $180^\circ - 120^\circ = 60^\circ$

4. Triangle angles: 105° , 25° , x Classify each triangle by angles.

Solution: 4. $105^\circ + 25^\circ = 130^\circ$ $180^\circ - 130^\circ = 50^\circ$

5. 50° , 60° , 70°

Solution: 5. acute triangle

6. 90° , 35° , 55°

Solution: 6. right triangle

7. 110° , 40° , 30°

Solution: 7. obtuse triangle

8. An isosceles triangle has a top angle of 30° . Find each base angle.

Solution: 8. $180^\circ - 30^\circ = 150^\circ$ $150^\circ \div 2 = 75^\circ$ Each base angle is 75° .

9. An isosceles triangle has a top angle of 80° . Find each base angle.

Solution: 9. $180^\circ - 80^\circ = 100^\circ$ $100^\circ \div 2 = 50^\circ$ Each base angle is 50° .

10. An isosceles triangle has each base angle equal to 65° . Find the top angle. Find the missing angle.

Solution: 10. $65^\circ + 65^\circ = 130^\circ$ $180^\circ - 130^\circ = 50^\circ$ The top angle is 50° .

11. Quadrilateral angles: 70° , 90° , 110° , x

Solution: 11. $70^\circ + 90^\circ + 110^\circ = 270^\circ$ $360^\circ - 270^\circ = 90^\circ$

12. Quadrilateral angles: 85° , 95° , 100° , x

Solution: 12. $85^\circ + 95^\circ + 100^\circ = 280^\circ$ $360^\circ - 280^\circ = 80^\circ$

13. Quadrilateral angles: 120° , 60° , 100° , x

Solution: 13. $120^\circ + 60^\circ + 100^\circ = 280^\circ$ $360^\circ - 280^\circ = 80^\circ$

14. One angle of a parallelogram is 75° . Find the adjacent angle.

Solution: 14. $180^\circ - 75^\circ = 105^\circ$

15. One angle of a parallelogram is 115° . Find the opposite angle.

Solution: 15. The opposite angle is 115° .

16. One angle of a parallelogram is 68° . Find all four angles.

Solution: 16. Opposite angles are equal and adjacent angles add to 180° . $180^\circ - 68^\circ = 112^\circ$ The four angles are: 68° , 112° , 68° , 112°

17. A triangle looks equilateral, but no side marks or angle marks are shown. A student says each angle must be 60° . Explain the mistake.

Solution: 17. The student cannot assume the triangle is equilateral from appearance. Equal sides or equal angles must be marked or stated.

18. A student says every quadrilateral has four right angles. Explain the mistake.

Solution: 18. Not every quadrilateral has four right angles. Rectangles and squares do, but many quadrilaterals do not.

19. A student finds the missing angle in a quadrilateral by subtracting from 180° . Explain the mistake.

Solution: 19. A quadrilateral has angle sum 360° , not 180° . The student used the triangle angle sum by mistake.

Chapter Answer Key

Tripwire Check

The student is not correct.

The student found the total left for both base angles:

$$180^\circ - 40^\circ = 140^\circ$$

Since the base angles are equal, divide by 2:

$$140^\circ \div 2 = 70^\circ$$

Each base angle is:

$$70^\circ$$

Worksheet 1: Guided Practice

1.

a.

$$x = 70^\circ$$

b.

$$x = 50^\circ$$

2.

a.

$$x = 90^\circ$$

b.

$$x = 85^\circ$$

3.

$$180^\circ - 60^\circ = 120^\circ$$

$$120^\circ \div 2 = 60^\circ$$

Each base angle is 60° .

4.

a. 180°

b. 360°

c. right

d. equal

Worksheet 2: Independent Practice

1.

a.

$$55^\circ + 65^\circ = 120^\circ$$

$$180^\circ - 120^\circ = 60^\circ$$

b.

$$20^\circ + 80^\circ = 100^\circ$$

$$180^\circ - 100^\circ = 80^\circ$$

c.

$$90^\circ + 25^\circ = 115^\circ$$

$$180^\circ - 115^\circ = 65^\circ$$

d.

$$115^\circ + 35^\circ = 150^\circ$$

$$180^\circ - 150^\circ = 30^\circ$$

e.

$$70^\circ + 70^\circ = 140^\circ$$

$$180^\circ - 140^\circ = 40^\circ$$

2.

a.

$$90^\circ + 90^\circ + 80^\circ = 260^\circ$$

$$360^\circ - 260^\circ = 100^\circ$$

b.

$$100^\circ + 70^\circ + 110^\circ = 280^\circ$$

$$360^\circ - 280^\circ = 80^\circ$$

c.

$$85^\circ + 95^\circ + 105^\circ = 285^\circ$$

$$360^\circ - 285^\circ = 75^\circ$$

d.

$$120^\circ + 80^\circ + 75^\circ = 275^\circ$$

$$360^\circ - 275^\circ = 85^\circ$$

3.

a.

$$180^\circ - 20^\circ = 160^\circ$$

$$160^\circ \div 2 = 80^\circ$$

b.

$$180^\circ - 70^\circ = 110^\circ$$

$$110^\circ \div 2 = 55^\circ$$

c.

$$55^\circ + 55^\circ = 110^\circ$$

$$180^\circ - 110^\circ = 70^\circ$$

d.

$$72^\circ + 72^\circ = 144^\circ$$

$$180^\circ - 144^\circ = 36^\circ$$

4.

a.

$$180^\circ - 80^\circ = 100^\circ$$

b. 80°

c.

$$180^\circ - 130^\circ = 50^\circ$$

d. 130°

Worksheet 3: Mixed Practice & Application

1.

a. Triangle angle sum.

$$32^\circ + 88^\circ = 120^\circ$$

$$180^\circ - 120^\circ = 60^\circ$$

b. Quadrilateral angle sum.

$$95^\circ + 115^\circ + 75^\circ = 285^\circ$$

$$360^\circ - 285^\circ = 75^\circ$$

c. Isosceles triangle base angles.

$$180^\circ - 34^\circ = 146^\circ$$

$$146^\circ \div 2 = 73^\circ$$

Each base angle is 73° .

d. Parallelogram adjacent angles are supplementary.

$$180^\circ - 104^\circ = 76^\circ$$

2.

The student is assuming from appearance. Without equal side marks or equal angle marks, the triangle cannot be treated as equilateral.

3.

No.

A quadrilateral must have angle sum 360° .

$$90^\circ + 90^\circ + 90^\circ + 100^\circ = 370^\circ$$

That is too large.

4.

a. The student forgot to divide the remaining angle amount between the two equal base angles.

b.

$$180^\circ - 46^\circ = 134^\circ$$

$$134^\circ \div 2 = 67^\circ$$

Each base angle is 67° .

5.

a. The opposite angle is 65° .

b.

$$180^\circ - 65^\circ = 115^\circ$$

Each adjacent angle is 115° .

c.

$$65^\circ, 115^\circ, 65^\circ, 115^\circ$$

6.

a. square

b. Four right angles make it a rectangle-type quadrilateral. All four sides equal make it a square.

Diagnostic Key — High-Leverage Items

Tripwire Check

Correct answer: No. $180^\circ - 40^\circ = 140^\circ$ is the total for both equal base angles, so each is 70° .

Likely wrong answer: 140° for each base angle.

Misconception: The remaining angle sum is not being shared between the two equal base angles.

Next move: After subtracting the top angle, divide the remainder by 2.

Tripwire Diagnostic

Correct answer: No. $180^\circ - 40^\circ = 140^\circ$ is the total for both equal base angles, so each is 70° .

Likely wrong answer: 140° for each base angle.

Misconception: The remaining angle sum is not being shared between the two equal base angles.

Next move: After subtracting the top angle, divide the remainder by 2.

Exit Ticket Diagnostic — High-Leverage Item

Correct answer: 72° for each base angle.

Likely wrong answer: 144° for each base angle.

Misconception: The remaining 144° was not shared equally between the two base angles.

Next move: Subtract the top angle from 180° , then divide the remainder by 2.

Variation Lab — Expected Ideas

1. Triangle total 180° ; quadrilateral total 360° ; use the matching total for the shape.
2. In an isosceles triangle, subtract the top angle from 180° then split the remainder equally.
3. A diagram that only looks like a rectangle/parallelogram is insufficient without marked or stated properties.

Transfer Check — Suggested Responses

Familiar: 70° . Altered: 70° . Non-routine: $180 - 128 = 52^\circ$. Repair: equal side/angle markings or a stated property are required; appearance alone is not evidence.

Exit Ticket — Answers

1. 67°
2. 72°
3. A drawing alone does not prove right angles; use marked/stated properties.