

Triangle Truth Track

Use triangle theorems to find missing measures and connections.

HIGH SCHOOL • HSG-CO.C.10

CCSS.Math.Content.HSG-CO.C.10 "Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent..."

NAME _____

DATE _____

TRIANGLE RULES

The three interior angles of a triangle total 180 degrees, and the angles opposite congruent sides in an isosceles triangle have equal measures. A segment joining the midpoints of two sides is parallel to the third side and is half its length. The three medians of a triangle meet at one point.

WORKED EXAMPLE

A triangle has interior angles of 47 degrees and 68 degrees. Find the third angle.

1. The angle measures total 180 degrees.
2. third angle = $180 - (47 + 68)$
3. third angle = $180 - 115$
4. third angle = 65

Answer: 65 degrees

PRACTICE 6 problems

- 1** A triangle has angles measuring 72 degrees and 39 degrees. Find the third angle.

ANSWER _____

- 2** The angles of a triangle measure x degrees, $x + 14$ degrees, and $2x + 6$ degrees. Find x and all three angle measures.

ANSWER _____

- 3** Triangle RST is isosceles with $RS = RT$. If angle SRT measures 44 degrees, find angle RST.

ANSWER _____

- 4** Triangle JKL is isosceles with $JK = JL$. If angle JKL = $3x + 7$ degrees and angle JLK = $5x - 17$ degrees, find x .

ANSWER _____

- 5** In triangle MNP, Q is the midpoint of MN and R is the midpoint of MP. If $QR = 16$ cm, find NP.

ANSWER _____

- 6** Triangle ABC has medians AD, BE, and CF. Medians AD and BE meet at point G. At what point does median CF meet the other medians?

ANSWER _____

APPLY IT Show your work

- 1** The esports club designs an isosceles triangular pennant. The two equal sides meet at a vertex angle of 38 degrees. What is the measure of each base angle?

WORK SPACE

ANSWER _____

- 2** A stage crew builds a triangular frame ABC. Point D is the midpoint of AB, and point E is the midpoint of AC. A support brace DE is 21 inches long. How long is side BC?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

In isosceles triangle ABC, $AB = AC$. Point D is the midpoint of AB, and point E is the midpoint of AC. Angle BAC measures 52 degrees, and $DE = 15$ cm. Explain why DE is parallel to BC, then find angle ABC and BC.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	A triangle has angles measuring 72 degrees and 39 degrees. Find the third angle.	69 degrees
2	The angles of a triangle measure x degrees, $x + 14$ degrees, and $2x + 6$ degrees. Find x and all three angle measures.	$x = 40$; the angles are 40 degrees, 54 degrees, and 86 degrees
3	Triangle RST is isosceles with $RS = RT$. If angle SRT measures 44 degrees, find angle RST.	68 degrees
4	Triangle JKL is isosceles with $JK = JL$. If angle JKL = $3x + 7$ degrees and angle JLK = $5x - 17$ degrees, find x .	$x = 12$
5	In triangle MNP, Q is the midpoint of MN and R is the midpoint of MP. If $QR = 16$ cm, find NP.	32 cm
6	Triangle ABC has medians AD, BE, and CF. Medians AD and BE meet at point G. At what point does median CF meet the other medians?	G

PART 2 • APPLY IT

- 71 degrees** The two base angles are equal. Subtract 38 from 180, then divide the remaining 142 degrees by 2.
- 42 inches** DE joins the midpoints of two sides, so it is half the length of BC. Double 21 to find BC.

CHALLENGE

DE is parallel to BC because D and E are midpoints of two sides of triangle ABC. Angle ABC = 64 degrees, and BC = 30 cm.

Accept equivalent angle notation, such as 69 degrees or 69° . For the challenge, students should state that the midpoint segment theorem makes DE parallel to BC and gives DE as half of BC.