

Triangle Condition Lab

Test the measures before you draw.

GRADE 7 • 7.G.A.2

CCSS.Math.Content.7.G.A.2 "Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle..."

NAME _____

DATE _____

CHECK THE CONDITIONS

Before drawing, test the measures. For three side lengths, the two shorter lengths must add to more than the longest length, and valid side lengths make one unique triangle. Three angles must total 180 degrees, but angles alone can make more than one triangle because the size can change. Two side lengths and the angle between them determine one unique triangle.

WORKED EXAMPLE

Can side lengths 6 cm, 8 cm, and 11 cm make a triangle?

1. Order the side lengths: 6, 8, 11.
2. Add the two shorter lengths: $6 + 8 = 14$.
3. Compare: $14 > 11$, so the side-length condition works.

Answer: Yes. One unique triangle can be drawn.

PRACTICE 6 problems

- 1** Can side lengths 2 cm, 4 cm, and 5 cm make a triangle? Classify the result.

ANSWER _____

- 2** Can side lengths 3 cm, 4 cm, and 8 cm make a triangle? Classify the result.

ANSWER _____

- 3** A triangle has angles 40 degrees, 60 degrees, and 80 degrees. Classify the number of possible triangles.

ANSWER _____

- 4** A triangle has angles 70 degrees, 50 degrees, and 50 degrees. Classify the number of possible triangles.

ANSWER _____

- 5** A triangle has sides 9 cm and 12 cm with a 45-degree angle between them. Classify the number of possible triangles.

ANSWER _____

- 6** Can side lengths 10 cm, 10 cm, and 21 cm make a triangle? Classify the result.

ANSWER _____

APPLY IT Show your work

- 1** Jalen is making a triangular frame for a gaming-stream backdrop. The three rods are 13 inches, 14 inches, and 18 inches long. Can he make a triangle, and if so, how many different triangles do those rod lengths determine?

WORK SPACE

ANSWER _____

- 2** An art club wants a triangular pennant with angles of 35 degrees, 65 degrees, and 80 degrees. No side length is set. Can the club make a triangle, and how many different triangles fit these angle measures?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

A triangle has side lengths 14 units, 19 units, and x units, where x is a whole number. Find all possible values of x . Explain why.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Can side lengths 2 cm, 4 cm, and 5 cm make a triangle? Classify the result.	Yes. One unique triangle can be drawn.
2	Can side lengths 3 cm, 4 cm, and 8 cm make a triangle? Classify the result.	No triangle can be drawn.
3	A triangle has angles 40 degrees, 60 degrees, and 80 degrees. Classify the number of possible triangles.	More than one triangle can be drawn.
4	A triangle has angles 70 degrees, 50 degrees, and 50 degrees. Classify the number of possible triangles.	More than one triangle can be drawn.
5	A triangle has sides 9 cm and 12 cm with a 45-degree angle between them. Classify the number of possible triangles.	One unique triangle can be drawn.
6	Can side lengths 10 cm, 10 cm, and 21 cm make a triangle? Classify the result.	No triangle can be drawn.

PART 2 • APPLY IT

- Yes. One unique triangle can be made.** Add the two shorter rods: $13 + 14 = 27$. Since $27 > 18$, the rods make a triangle, and three side lengths determine one unique triangle.
- Yes. More than one triangle can be made.** The angles add to $35 + 65 + 80 = 180$ degrees. The same angles can be used with different side lengths, so more than one triangle fits.

CHALLENGE

x can be any whole number from 6 through 32, inclusive. There are 27 possible values.

Accept "one triangle" for "one unique triangle" and "infinitely many triangles" for valid angle-only conditions. For the challenge, accept $5 < x < 33$ together with the whole-number restriction.