LESSON MAKER PRO

Triangle Possibilities

Use side and angle clues to decide what triangle can be made.

GRADE 7 · NY-7.G.2

NY-7.G.2 "Draw triangles when given measures of angles and/or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle."

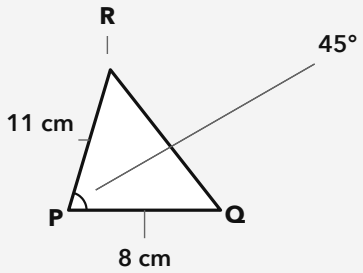
NAME _____ DATE _____

CHECK THE CLUES

The side lengths must pass the triangle inequality, any two side lengths must add to more than the third. SSS, SAS, or two angles and a side determine one triangle. Three angles alone can make different-size triangles, and SSA can make zero, one, or two triangles.

WORKED EXAMPLE

Use the measures in the figure. Do they determine one triangle, more than one triangle, or no triangle?



1. Two sides and their included angle are given.
2. SAS fixes the third vertex in one place.
3. Only one triangle can be drawn.

Answer: Exactly one unique triangle.

PRACTICE 4 problems

1 Side lengths are 5 cm, 7 cm, and 12 cm. Decide what can be drawn. Show why.

ANSWER _____

2 A triangle has angles 50°, 60°, and 70°. Decide what can be drawn.

ANSWER _____

3 A triangle has side lengths 6 cm, 9 cm, and 10 cm. Decide what can be drawn.

ANSWER _____

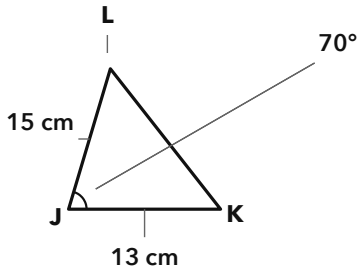
4 Triangle ABC has angle A = 30°, side a = 7 cm opposite angle A, and side b = 10 cm. Decide what can be drawn. Give a short reason.

ANSWER _____

_____

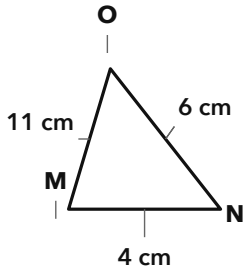
APPLY IT Show your work

1 A robotics team needs a triangular brace. The design is shown. Will every correct brace have the same shape?



ANSWER _____

2 Maya wants to make a triangular flag for her game club using strips with the lengths shown. Can she make the flag?



ANSWER _____

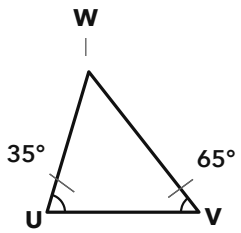
3 Your teacher supplies a ruler, protractor and drawing paper. Construct triangle ABC: draw AB = 6 cm; at A draw a 60° ray above AB, and at B draw a 60° ray above BA. Mark their intersection C and draw AC and BC. Label the given measurements. Measure all three sides and angles to check the result, then explain whether the given conditions determine a unique triangle (up to moving, rotating or reflecting it). Attach your actual construction and measurements.

WORK SPACE

ANSWER _____

CHALLENGE One step up

The badge template shows two angles. Can these clues make exactly one triangle? Explain, then name one extra measurement that would make the triangle unique.



WORK SPACE AND ANSWER

ANSWER KEY

Triangle Possibilities

GRADE 7 · NY-7.G.2

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Side lengths are 5 cm, 7 cm, and 12 cm. Decide what can be drawn. Show why.	**No triangle. 5 + 7 = 12, which is not greater than 12.**
2	A triangle has angles 50°, 60°, and 70°. Decide what can be drawn.	**More than one triangle can be drawn.**
3	A triangle has side lengths 6 cm, 9 cm, and 10 cm. Decide what can be drawn.	**Exactly one unique triangle can be drawn.**
4	Triangle ABC has angle A = 30°, side a = 7 cm opposite angle A, and side b = 10 cm. Decide what can be drawn. Give a short reason.	**Two triangles can be drawn. This is an SSA case with two possible positions for the third vertex.**

PART 2 · APPLY IT

1. **Yes. Exactly one unique brace can be made.** The design gives two sides and their included angle. SAS determines one triangle.
2. **No. She cannot make a triangle.** The two shorter strips total 10 cm. Since 10 cm is less than 11 cm, the triangle inequality fails.
3. **One unique triangle: an equilateral triangle with all three sides 6 cm and all three angles 60°.** The third angle is 180° - 60° - 60° = 60°. Equal angles imply equal sides, so AC = BC = AB = 6 cm. Check a genuine ruler/protractor construction, labels and measured values, allowing reasonable drawing tolerance. The specified base and its two endpoint angles determine the third vertex on the chosen side of AB; a reflected copy is congruent, not a different triangle.

CHALLENGE

No. The third angle is 80°, but different-size similar triangles are possible. One side length, such as UV = 6 cm, would make the triangle unique.

Accept “one triangle” for “exactly one unique triangle” and “many triangles” for “more than one triangle.” For the challenge, accept any positive length for any one side as the extra measurement. Apply 3 requires the actual attached measured construction, not only the uniqueness label. Provide instruments and drawing paper before class; check a 6 cm base and two 60° endpoint angles within reasonable measuring tolerance.

Apply 3: completed schematic ABC, all sides 6 cm and all angles 60°; student draws using instruments.

