LESSON MAKER PRO

Triangle Relationship Lab

Use angle and side relationships to analyze triangles.

GRADE 7 · 7.G.A

CCSS.Math.Content.7.G.A "Draw, construct, and describe geometrical figures and describe the relationships between them."

NAME _____ DATE _____

TRIANGLE RULES

The three interior angles of every triangle have a total of 180 degrees. An exterior angle equals the sum of the two interior angles that are not next to it. To decide whether three side lengths can make a triangle, the two shorter lengths must add to more than the longest length.

WORKED EXAMPLE

A triangle has interior angles of 47 degrees, 68 degrees, and x degrees. Find x.

1. 47 + 68 = 115
2. 115 + x = 180
3. x = 65

Answer: 65 degrees

PRACTICE 6 problems

1 A triangle has interior angles of 52 degrees, 71 degrees, and x degrees. Find x.

ANSWER _____

2 The angles of a triangle are 2x + 18 degrees, x + 42 degrees, and 60 degrees. Find x.

ANSWER _____

3 Can a triangle have angle measures of 92 degrees, 44 degrees, and 44 degrees? If so, classify it by angles and sides.

ANSWER _____

4 Two interior angles of a triangle are 35 degrees and 79 degrees. Find the exterior angle at the third vertex.

ANSWER _____

5 On separate unlined paper, use a ruler and compass to construct a triangle with sides6cm,8cm,13cm. Keep the intersecting arcs. Explain why it is possible and compare your drawing with a partner's.

ANSWER _____

6 Try the same construction with sides4cm,7cm,11cm. Keep the arcs. Explain why touching circles do not produce a triangle.

ANSWER _____

APPLY IT Show your work

1 A gaming team banner is shaped like a triangle. Two interior angles measure 58 degrees and 66 degrees. What is the third angle, and is the banner an acute, right, or obtuse triangle? Then construct a triangle with an8cm base and base angles58°and66°using a ruler and protractor. Label all angles.

2 A robotics team has two metal rods that are 9 cm and 15 cm long. They want a third rod with a whole-number length to make a triangular support. What whole-number lengths can the third rod have?

CHALLENGE One step up

At one vertex of a triangle, the exterior angle is 3 times one remote interior angle. The other remote interior angle is 48 degrees. Find all three interior angles. Explain your reasoning.

ANSWER KEY

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A triangle has interior angles of 52 degrees, 71 degrees, and x degrees. Find x.	**57 degrees**
2	The angles of a triangle are 2x + 18 degrees, x + 42 degrees, and 60 degrees. Find x.	**x = 20**
3	Can a triangle have angle measures of 92 degrees, 44 degrees, and 44 degrees? If so, classify it by angles and sides.	**Yes, it is an obtuse isosceles triangle.**
4	Two interior angles of a triangle are 35 degrees and 79 degrees. Find the exterior angle at the third vertex.	**114 degrees**
5	On separate unlined paper, use a ruler and compass to construct a triangle with sides6cm,8cm,13cm. Keep the intersecting arcs. Explain why it is possible and compare your drawing with a partner's.	**Possible:6+8>13. Draw13cm base; circles of radii6and8 at its endpoints intersect. Either intersection gives congruent reflected triangles. Check all three lengths.**
6	Try the same construction with sides4cm,7cm,11cm. Keep the arcs. Explain why touching circles do not produce a triangle.	**4+7=11: circles touch on the base, leaving three collinear points and zero area. No nondegenerate triangle.**

PART 2 · APPLY IT

1. **56 degrees, acute triangle** Add the two known angles, then subtract their sum from 180 degrees. All three angles are less than 90 degrees, so the triangle is acute.
2. **Any whole number from 7 cm through 23 cm** The third length must be greater than 15 - 9 and less than 15 + 9. The whole-number lengths are 7 through 23.

CHALLENGE

The remote interior angles are 24 degrees and 48 degrees, and the third interior angle is 108 degrees. Let the unknown remote angle be x. Since the exterior angle equals the two remote angles, 3x = x + 48, so x = 24. The exterior angle is 72 degrees, so its adjacent interior angle is 108 degrees.

Accept angle measures written with or without the degree symbol. For the rod problem, accept an equivalent list of all whole numbers 7 through 23. Supply unlined paper, compass, ruler and protractor. Check the actual constructions, retained arcs, length labels and angle measures; verbal yes/no answers alone do not meet the construction task.