

Building Triangles from Sides and Angles

Grade 7 math · Worksheet · Standards: 7.G.A.2

Name: _____ Date: _____ Class: _____

These problems train standard 7.G.A.2: drawing geometric shapes with given conditions, especially triangles. They cover the triangle inequality and decide when three given measures give one triangle, more than one, or none.

Test the side lengths before you try to draw, add the angles to check for 180° , and think of the ruler and protractor steps. The last problems use realistic frames, trails and surveys.

Standards: 7.G.A.2 · **Level:** Grade 7

Problem 1 Three Poles, First Test (easy)

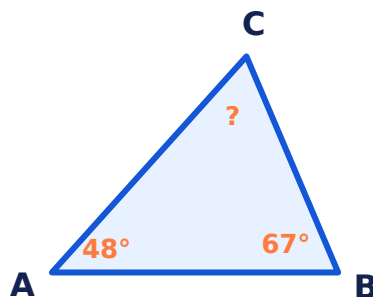
Can segments of 5 in, 6 in and 12 in form a triangle? Explain.

Problem 2 Three Poles, Second Test (easy)

Can segments of 7 in, 9 in and 12 in form a triangle? Explain.

Problem 3 Find the Third Angle (easy)

A triangle has angles of 48° and 67° . Find the third angle.



Find the unknown angle.

Problem 4 Which Set Works (easy)

Which set of lengths forms a triangle: (a) 8, 8, 15; (b) 6, 9, 16; (c) 10, 10, 20?

Problem 5 Range of the Third Side (medium)

Two sides of a triangle are 7 in and 11 in. Between which two numbers must the third side lie?

Problem 6 A Flat Triangle (medium)

Explain why sides of 6, 9 and 15 cannot make a triangle. Describe what happens when you try to draw it.

Problem 7 Count the Triangles (medium)

Decide whether each set of conditions gives exactly one triangle, more than one, or none: (a) angles 30° , 60° , 90° ; (b) angles 70° , 80° , 50° ; (c) sides 5 in and 7 in with a 55° angle between them; (d) sides 4 in, 4 in and 9 in.

Problem 8 ASA Conditions (medium)

A triangle has angles of 35° and 80° and the side between them is 6 in. Find the third angle and decide whether the triangle is unique.

Problem 9 Classify by Angles (medium)

A triangle has angles of 112° and 41° . Find the third angle and say whether the triangle is acute, right or obtuse.

Problem 10 Base of an Isosceles Triangle (medium)

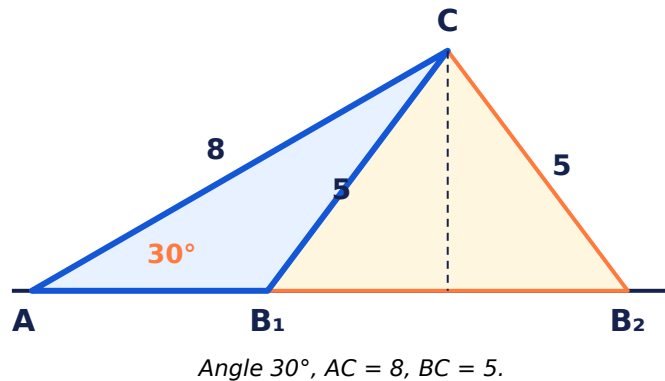
An isosceles triangle has two sides of 9 in. Which whole-number lengths can the base have?

Problem 11 Longest Side Known (medium)

The longest side of a triangle is 14 in and another side is 6 in. Which whole-number lengths can the third side have?

Problem 12 Two Triangles from SSA (hard)

In triangle ACB, angle $A = 30^\circ$, $AC = 8$ and $BC = 5$. The height from C to line AB is 4. Show that two triangles are possible and find both lengths of AB.

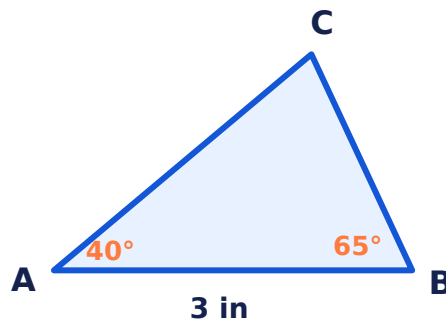


Problem 13 Same Angles, Different Sizes (hard)

Maya draws a triangle with angles of 50° and 60° and a side of 4 in between them. Zane draws one with the same two angles and a side of 8 in between them. Are the triangles identical? Explain.

Problem 14 Draw and Compare (hard)

Draw $AB = 3$ in with angle $A = 40^\circ$ and angle $B = 65^\circ$. Find angle C and decide which side of the triangle is the longest.



Triangle to draw.

Problem 15 Poles for a Tent Frame (medium)

A camp leader has poles of 9 ft, 12 ft and 21 ft. Can they form a triangular frame?

Problem 16 Roof Truss Beams (medium)

Two rafters of a roof truss are 10 ft and 14 ft. The tie beam is cut to a whole number of feet. How many different lengths can the tie beam have?

Problem 17 Hiking Triangle (medium)

A hiker walks 3 mi east, turns and walks 4.5 mi in a different direction, and then walks straight back to the start. What are the possible lengths of the walk back?

Problem 18 Sail Angles (medium)

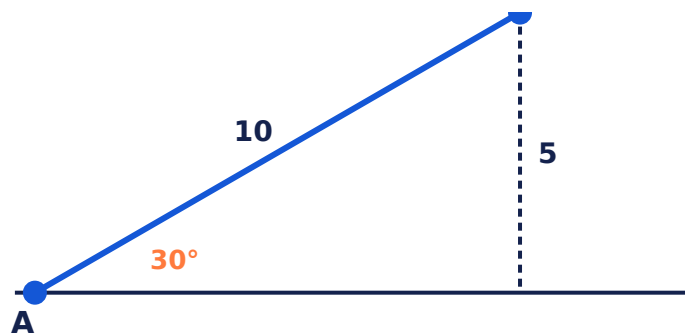
A triangular sail has angles of 74° and 58° . Find the third angle and classify the triangle by its angles.

Problem 19 Stained Glass Piece (hard)

A glass cutter needs a triangle with angles 40° and 85° and a 5 in side between them. Find the third angle, say whether the piece is unique, and list the steps to draw it.

Problem 20 Surveyor and the Tree (hard)

A surveyor stands at A with a line AB. A tree at C is 10 ft from A, and angle A = 30° . The height of C above line AB is 5 ft. How many triangles ACB are possible when BC is 3 ft, 5 ft, 7 ft or 12 ft?



Angle A = 30° , AC = 10 ft, height 5 ft.