Geometry

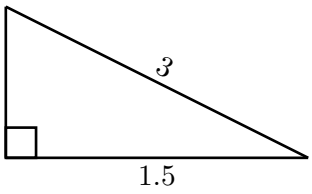
Triangles I

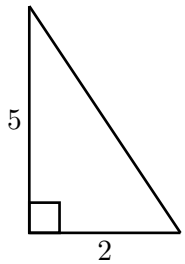
Prepared by Mark on May 6, 2025

Section 1: Basics

Problem 1:
What is the triangle inequality?

Problem 2:
Find all missing sides in the following figures:





Section 2: Similar Triangles

Problem 3:
What three properties can we use to show that two triangles are congruent?

Problem 4:
What three properties can we use to show that two triangles are similar?

Definition 5:
A *middle line* of a triangle is a line that connects the midpoints of two sides.

Problem 6:
Consider a triangle ABC.
let c be the midpoint of AB, and b the midpoint of AC.
Draw the middle line bc

Now, show that bc is parallel to BC, and has half its length.

Problem 7:
Let ABC be a triangle with no obtuse angles. Draw heights AA_1 and BB_1.
Show that $A_1C \times BC = B_1C \times AC$
Hint: A *height* is a line through a vertex that is perpendicular to the opposite side.

Problem 8:
Does the conclusion of the previous problem hold if our triangle has an obtuse angle?

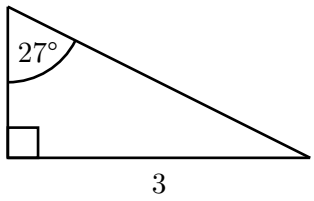
Problem 9:
Squares $ABCD$ and $AEFG$ share a vertex A.

- Show that triangles ABE and ADG are congruent
- Show that triangles ACF and ABE are similar

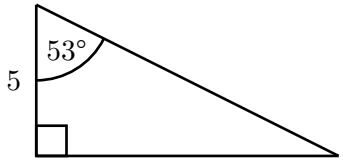
Section 3: Trigonometry

Problem 10:
Find all missing sides in the triangle below.
You may need a calculator [numbat.dev]

$$a = \frac{o}{\tan}$$



Problem 11:
Find all missing sides in the triangle below You may need a calculator [numbat.dev]



Problem 12:
Find all missing sides and angles in the triangle below You may need a calculator [numbat.dev]