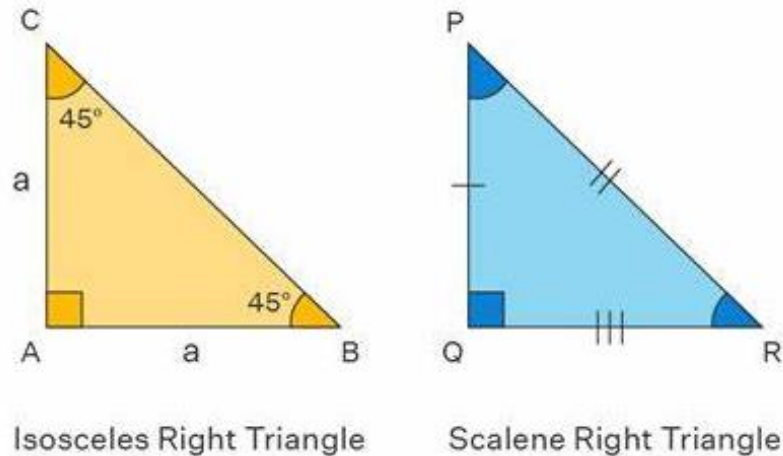


SIMILAR RIGHT TRIANGLES

In geometry, **right triangles** are triangles that have one angle measuring 90° . When we talk about **similar right triangles**, we're discussing two or more right triangles that have the same shape, but possibly different sizes. **Similarity** in geometry means that two figures have the same shape but may differ in size.



What Does It Mean for Triangles to Be Similar?

Two triangles are **similar** if:

1. **Corresponding angles are equal:** The angles of one triangle are the same as the angles of the other triangle.
2. **Corresponding sides are proportional:** The lengths of the sides of one triangle are in the same ratio as the lengths of the sides of the other triangle.

In the case of **right triangles**, the right angle (90°) is always the same in both triangles, and this can help us understand the similarity condition more easily.

How to Identify Similar Right Triangles

For right triangles, similarity can be determined using the following criteria:

1. AA (Angle-Angle) Criterion for Similarity

The most basic and useful criterion to prove that two right triangles are similar is the **AA Criterion** (Angle-Angle). This rule states that:

- If two angles of one triangle are equal to two angles of another triangle, then the triangles are similar.

In the case of right triangles:

- Since both triangles will already have one 90° angle, we only need to show that the other two angles of the two triangles are equal.

For example:

- If one right triangle has angles of 90° , 30° , and 60° , and another right triangle has angles of 90° , 30° , and 60° , then the two triangles are similar.

2. SSS (Side-Side-Side) Similarity

The **SSS Similarity Criterion** says that if the **corresponding sides of two triangles are proportional**, the triangles are similar. In other words, the ratio of the lengths of the corresponding sides is the same.

For right triangles:

- If the ratio of the lengths of the sides of one triangle is the same as the ratio of the corresponding sides of another triangle, then the triangles are similar.

For example:

If one right triangle has sides of lengths 3, 4, and 5, and another has sides of lengths 6, 8, and 10, the triangles are similar because:

$$3/6 = 4/8 = 5/10 = 1/2$$

- Therefore, the triangles are similar.

3. SAS (Side-Angle-Side) Similarity

The **SAS Similarity Criterion** works for right triangles if one angle is common (which is the right angle, 90°), and the sides that include the right angle (the legs) are proportional.

- If the ratio of the lengths of the legs of one right triangle is equal to the ratio of the corresponding legs of another right triangle, the triangles are similar.

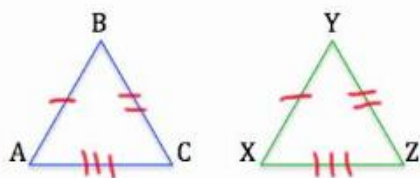
For example:

- If the legs of the first right triangle are 3 and 4, and the legs of the second right triangle are 6 and 8, the ratio of corresponding sides is:

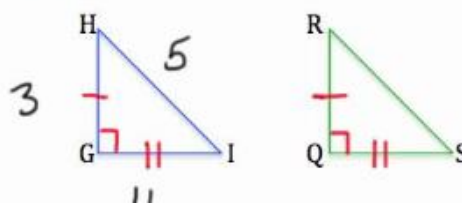
$$3/6 = 4/8 = 1/2$$

Since the sides are proportional, the two triangles are similar.

SSS – Side-Side-Side



SAS – Side-Angle-Side



Key Properties of Similar Right Triangles

- **Proportional Sides:** In similar right triangles, the ratio of the lengths of corresponding sides is the same.
- **Corresponding Angles:** The angles of similar right triangles are congruent. Since right triangles have a 90° angle, the other two angles are always equal if the triangles are similar. For example, if one right triangle has angles 90° , 30° , and 60° , and another right triangle has angles 90° , 30° , and 60° , the triangles are similar.
- **Area:** The ratio of the areas of two similar right triangles is the square of the ratio of their corresponding sides.

Similar right triangles are triangles that have the same shape but possibly different sizes. They have corresponding angles that are equal, and their sides are proportional. Understanding the properties of similar triangles is important in solving geometric problems, especially when dealing with scale, proportions, and areas.

By using the **AA**, **SSS**, and **SAS** criteria, you can easily determine if two right triangles are similar and solve for missing side lengths or areas when necessary.