

Similar Triangles

Level: Key Stage 3

Dimension: Measures, Shape and Space

Module: Learning Geometry through an Intuitive Approach

Unit: Congruence and Similarity

Student ability: Average

Content Objectives:

After completing the activity, students should be able to (i) recognize the properties of similar triangles, (ii) understand the conditions for two triangles to be similar, and (iii) identify whether two triangles are similar.

Language Objectives:

After completing the activity, students should be able to

- recognize and understand the English key words used in describing similar triangles (e.g., *similar figures, enlargement, reduction, different size, same shape, original, similar triangles, equal angles, proportional sides, sufficient conditions*);
- understand the English expressions for explaining the properties for two figures to be similar (e.g., *When a figure is obtained from another figure by means of enlargement or reduction, its size will be different from the original one, but it remains the same shape. The enlarged or reduced figure is similar to the original one.*);
- understand the English expressions for explaining the conditions for two triangles to be similar, e.g.,
 - *The corresponding angles are the same. (AAA)*
 - *Three pairs of corresponding sides are proportional. (3 sides prop)*
 - *Two pairs of corresponding sides are proportional and the included angles are the same. (ratio of 2 sides, inc. \angle); and*
- Identify pairs of similar triangles by stating the conditions in English; and
- follow English instructions on solving problems concerning this topic and work on related problems written in English.

Prerequisite knowledge:

Students should have learned about congruent triangles through the medium of Chinese.

Time: 1 lesson (40 minutes)

Procedure:

1. The teacher should first introduce the idea of similar figures and give some examples of similar figures.
2. Using appropriate software (such as Wingeom / Sketchpad), the teacher should construct a triangle and enlarge it to form another one. The images of the 2 triangles should be projected on the screen. The teacher should measure the lengths of the sides and the angles and show the values to the whole class.
3. The teacher should ask students what they have noticed about the triangles (e.g. the angles are equal, the sides are proportional).
4. The teacher should then discuss with the students and point out that the shape of a triangle is determined by its angles. Thus, the angles will not change when the triangle is enlarged or reduced in size. The teacher can then introduce the condition “AAA”.
5. Using the software, the teacher should draw triangles with proportional sides. Then, he/she should measure the angles to see if the corresponding angles are equal. This is intended to demonstrate another condition for triangles to be similar, i.e. that they have “3 sides proportional”.
6. The teacher should then ask students to form groups of 4. Then the students discuss among themselves to see if there are other sufficient conditions for two triangles to be similar. If the teacher finds that the students do not understand the term “sufficient condition”, the teacher should explain to the students first.
7. After the discussion time, the teacher should ask some groups to present their findings.
8. The teacher should then conclude that there are 3 conditions for similar triangles and ask the students to write them down in the summary.
9. Finally, the teacher should ask the students to complete the exercise to test their understanding.

Explanatory Notes for Teachers:

1. The teacher may consider carrying out this activity in a computer room. In this case, each student could have a computer and draw triangles and measure the sides and angles themselves.
2. If the classroom does not have a computer / suitable software, the teacher may consider using a visualizer to project the triangles on the screen. By “zooming-in” and “zooming-out”, similar triangles of different sizes can be obtained.
3. During the group discussion, the teacher may give some hints regarding conditions, for students to consider. e.g. the conditions similar to those for congruent triangles, AAS, SAS, RHS.
4. It is important to remind students that, the “S” (side) used in congruent triangles means the length is the same, while the side mentioned in similar triangles means that the sides are proportional.

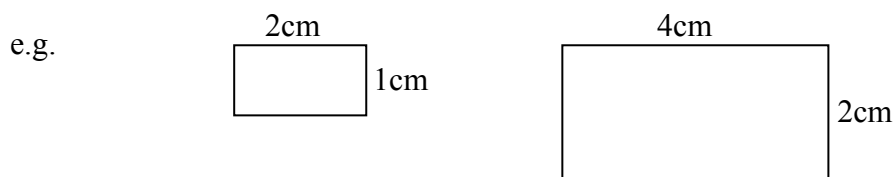
Similar Triangles

Name: _____

Class: _____ ()

Similar Figures:

When a figure is obtained from another figure by means of enlargement (放大) or reduction (缩小), its size will be different from the original one, but it remains the same shape. The enlarged or reduced figure is similar to the original one.



Similar Triangles:

The teacher will provide you with two triangles. $\triangle ABC$ is enlarged to form $\triangle PQR$. Thus, they are similar triangles.

a) Angles

$$\angle A = \text{_____}^\circ \qquad \angle P = \text{_____}^\circ$$

$$\angle B = \text{_____}^\circ \qquad \angle Q = \text{_____}^\circ$$

$$\angle C = \text{_____}^\circ \qquad \angle R = \text{_____}^\circ$$

$\angle A$ matches \angle _____, $\angle B$ matches _____, $\angle C$ matches _____

What conclusion can you draw from the result?

When a triangle is enlarged or reduced to form another triangle, they are _____ triangles. The corresponding _____ are the same.

We call this condition “_____”.

b) Sides

AB = _____ cm BC = _____ cm CA = _____ cm

PQ = _____ cm QR = _____ cm RP = _____ cm

$$\frac{AB}{PQ} =$$

$$\frac{BC}{QR} =$$

$$\frac{CA}{RP} =$$

What conclusion can you draw from the result?

When a triangle is enlarged or reduced to form another triangle, they are _____ triangles. The corresponding _____ are proportional (成比例).

We call this condition “_____”.

Group discussion:

Question: Can you find other sufficient conditions for two similar triangles?

(Hints: We learned some conditions for congruent triangles. Are they applicable in the case of similar triangles? Remember, when we say “A”, it means the angles are the same, but in similar triangles, the sides are proportional.)

Summary:

The conditions for two triangles to be similar include:

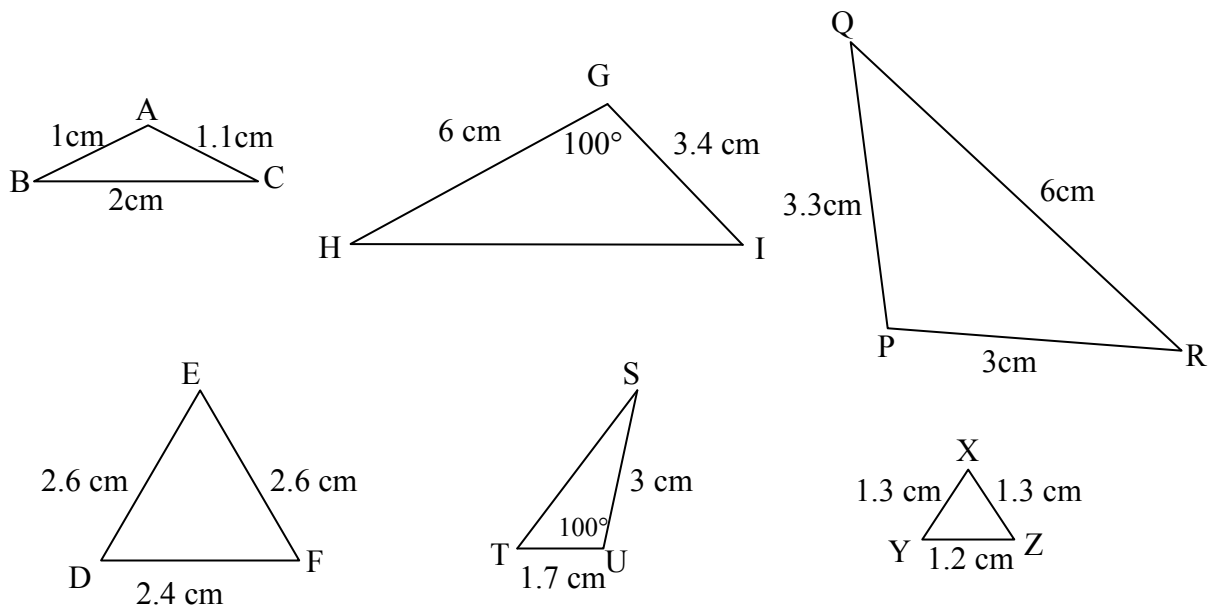
1. _____
2. _____
3. _____

When two triangles are similar, we use the symbol “ \sim ” to represent “is similar to”.

Thus, we can say that $\triangle ABC \sim \triangle PQR$.

Exercise:

Name the pairs of similar triangles and the conditions in the space provided.



- 1) \triangle _____ \sim \triangle _____ (_____ 3 sides prop. _____)
- 2) _____ (_____)
- 3) _____ (_____)

Suggested Answers

a) Angles

What conclusion can you draw from the result?

The corresponding angles are the same.

When a triangle is enlarged or reduced to form another triangle, they are similar triangles. The corresponding angles are the same.

We call this condition "AAA".

b) Sides

What conclusion can you draw from the result?

The ratios of the sides of the two triangles are the same.

When a triangle is enlarged or reduced to form another triangle, they are similar triangles. The corresponding sides are proportional (成比例).

We call this condition "3 sides prop.".

Summary:

The conditions for two triangles to be similar include:

1. AAA
2. 3 sides prop.
3. ratio of 2 sides, inc. \angle

Exercise:

1) Δ EDF \sim Δ XYZ / XZY (3 sides prop.)

2) $\Delta ABC \sim \Delta PRQ$ (3 sides prop.)

3) $\Delta GHI \sim \Delta UST$ (ratio of 2 sides, inc. \angle)