Analyzing

The Pythagorean theorem – the students check whether the walls in the classroom are built at right angle.

Prepare a stick or a piece of string, about 100 cm long.

Stand in the corner of the room.
Measure 3 lengths of the stick from the corner along one of the walls. Mark the designated point.
Measure 4 lengths of the stick from the corner along the other wall. Mark the designated point.
Check whether the distance between the marked points is 5 lengths of the stick.
Draw conclusions.

If the students find out that:

- the distance between the marked points is 5 lengths of the stick, then we have a right angle,

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- the distance is greater, then we have an obtuse angle,

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- the distance is smaller, then we have an acute angle.

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Counting
The similar triangles – the students measure the height of a window.

1. Take an object, about 15–20 cm long (it can be a pen, a pencil, etc.) in your hand and measure its exact length.
2. Straighten your hand in front of you and measure the distance between the object and your eyes.

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3. While still holding the object in your straightened hand, approach the window and stand in front of it.
4. Position yourself at such a distance from the window that the object coincides with the height of the window.

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5. Mark the point on the floor where you are standing. Measure the distance from the window.
6. Perform the following calculations:

length of the object × distance from the window / distance between object and your eyes

Now measure the height of the window to check whether your calculations are correct.
Compare the calculation result with the measured height of the window.

Note:
The result of the calculations and the actual height of the window may differ because the tools we used for taking measurements were not accurate. Nevertheless, participants of the experiment should note the relation between the respective quantities and thus confirm (and understand) the theorem about the similarity of triangles.

Analyzing
The similar triangles: the students measure shadows.

1. Darken a classroom and position a flashlight or a light (switched on) in such a way that the emitted light is directed downward, at an angle (simulating the Sun) – you can ask someone to hold the flashlight.
2. Take a few items and place them on a table or put them on the floor, so that their shadows' ends form one line.
3. Measure the heights of the objects and the lengths of their shadows.
4. Write down the results as a table.

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Complete the last row of the table by dividing the height of an item by the length of its shadow.

What have you noticed? Are the results similar?

Counting
Congruent triangles: measuring the width of a road or a river.

You will need a real road or river. You can also go out to the school yard and draw an imaginary road or river with chalk.

Find a road sign at the edge of the street or a tree on the riverbank. In the yard, it can be a basketball post, for example.

You will also need one stick, about 2 m long.

Go to the other side of the road (river), stand right in front of the road sign (tree or post) and mark that point (for example, another person can stand there).

Take about 20 steps along the road. The person holding the stick should stand there.

Take the same number of steps again, in the same direction. Mark that point (another person can stand here) and make a 90 degrees turn.

Keep moving away from the road until you see that the stick held by your friend coincides with the road sign (tree or post).

Measure the distance from the last point you have marked to the current point.

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The distance from the last mark to the current point equals the width of the road (river).

If possible, verify your calculations by measuring the width of the road (river).

Counting
The Thales's theorem: measuring the height of a tree.

You will need: a stick, about 2 m long.

Find an object, for example a tree, a mast or a tall building.

One person lies down on the ground with his or her legs directed at the object.

Another person moves the stick about 2 m along the line between the person lying down and the object until the person lying down sees that the end of the stick and the tip of the object form one line.

Measure the length of the stick, the distance between the stick and the eyes of the person lying down, and the distance between the object and the eyes of the person lying down.

The following formula can be used to calculate the height of an object:

height of the object = height of the stick × distance between your eyes and the object / distance between your eyes and the stick