

The Scientific Method

Every year in the spring, large numbers of frogs appear in the mud near the river Nile. They aren't there in dry weather, so in the past ancient Egyptians used to believe that the mud produced the frogs. The problem is they didn't test their belief scientifically.

The first step in the scientific method is to **observe** the world around you. For example, Newton noticed that an apple fell down, not up. The Egyptians did this part alright. Not all observations can be done directly by your senses. Some observations require the use of an instrument.

Step two is to ask yourself a question based on observations. "Why does the apple go down?" "Where do the frogs come from?" Then you start interpreting your observations, deducing or making an **inference**. One day you may find a possible answer - a **hypothesis**. "Objects are pulled to the ground by an invisible force." "Mud produces frogs."

To continue, use one of the following words to fill in the gaps.

conduct conclusions confirmed enough found masses may rate

But it isn't ¹ _____ just to think of an answer to a question and believe it's true. You have to discover some evidence that confirms your hypothesis. So, next step is to **test your ideas with experiments** and more observations. Galileo believed that two objects with different ² _____ would fall at the same ³ _____. So, the story goes, he carried out an experiment. He dropped a heavy ball and a light ball from the Leaning Tower of Pisa, and ⁴ _____ his belief. The Egyptians never did any experiments on their mud-frog hypothesis, so they never ⁵ _____ out it was false.

If you do an experiment only once, you ⁶ _____ make a mistake. So you need to repeat your experiments to make sure you get the same results, and **analyze** your findings statistically to check they are significant. You also need to make any necessary changes to your hypothesis and ⁷ _____ more experiments. Carefully record everything you do so other scientists can duplicate your work and check your ⁸ _____.

Here are some more words to complete the last part of this text:

Accept evidence field float law predictions

A hypothesis with lots of experimental ¹ _____ becomes a **theory**. A theory which has been confirmed many times is a **scientific law**. The great thing about hypotheses, theories and laws is that you can use them to make ² _____. The ³ _____ of gravity predicts that astronauts should ⁴ _____ in space. And they do.

Chemists and physicists, geologists and biologists, researchers in every laboratory in every ⁵ _____ of research use the scientific method. They do not ⁶ _____ untested observations.

Task: Name some instruments which are used in your field.

Adapted partly from the text in Maturita Activator, Pearson Education Limited, 2009

How Did We Find Out the Earth Is Round?

1 Through the ages, the earth has been thought to be flat, **pear shaped**, and perfectly round. What **evidences** led to the conclusion that the earth is round?

2 Back in the fourth century B.C., Aristotle offered the earth's shadow during a lunar **eclipse** as evidence that the earth is round. When a lunar eclipse **takes place**, the earth passes between the sun and the moon. This causes a shadow of the earth to appear on the surface of the moon. Aristotle noticed that the earth's shadow is **curved**.

3 Aristotle **obtained** another evidence of the earth's roundness by observing stars from different places. If, for example, you observe a star at an **angle** of 45° above the northern horizon and then move south, the star will appear to get lower in the sky. If the earth's surface were flat, then the star would always appear at 45° above the horizon.

4 Based on Aristotle's **assumptions**, Eratosthenes **actually determined** the **circumference** of the earth in the second century B.C. He did this by comparing the length of shadows in two different places at the same time.

5 Even much later, in Columbus's time, there was still **doubt** about the earth's shape. One argument used to support the earth's roundness had to do with a ship's "disappearing" over the horizon.

As a ship sailed away from an observer, the ship **gradually** disappeared, with the lower parts disappearing before the **sails** and **masts**.

6 Many other evidences of the earth's shape have, of course, been offered between Aristotle's lifetime and the present day. Depending on your interest, you might **research** some of these other evidences on your own.



Text from Addison-Wesley Earth Science

Vocabulary and grammar - tasks

1. Explain the words in bold type in English for those who did not know them, then check their translation. You can use synonyms, but sometimes you will need to word definitions:

eclipse =

angle =

circumference =

sail =

mast =

2. Say the opposite:

round

curved (2)

above horizon (3)

later (5)

there is doubt (5)

3. Note the underlined grammar features:

- Vazba akuzativu s infinitivem

This causes a shadow of the earth to appear on the surface of the moon.

Takto se převádějí přání typu: Chci, **aby** sis to pamatoval.

I want you to remember this.

Word your sentence and say it to your classmate:

- Conditional 2

If the earth's surface were flat, then the star would appear

Kdybybyl.....by se jevila

If I (observe) the stars in a big city,

I would not see them because of light pollution.

If I(want), I would do it without having been asked.

- Note 3 ways of used to :

1. I used to support poor people. I used to play the piano. (opakovaně v minulosti, teď už ne)

2. I am used to supporting missions / to swimming long distances. (být na něco zvyklý)

3. One argument used to support the earth's roundness had to do with a ship's "disappearing" over the horizon. (par. 5) - používáný za nějakým účelem

Form similar sentences:

- 1.
- 2.
- 3.