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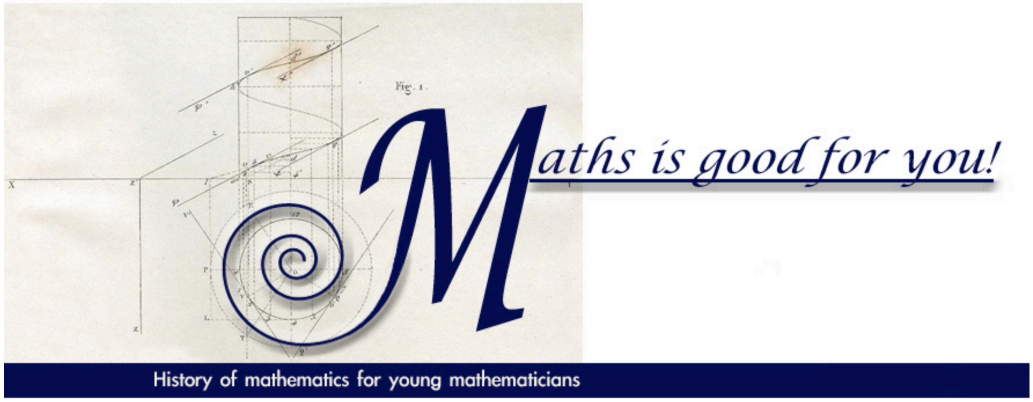
Worksheet NosM1

Teacher

Student

Class



Big numbers

Archimedes was, among other things, interested in big numbers. He toyed with the idea of how many grains of sand there are in the world. He came to the number 10 to the power of 63. This means that he thought there are

10 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000

grains of sand in the universe. Try counting to 100 – how long does it take you? How long would it take you to count to 10^{63}?

This was, for a long time, the largest number that anyone described. Although it is a great underestimate of the size of the universe, Archimedes still introduced an easy way to imagine and write large numbers.

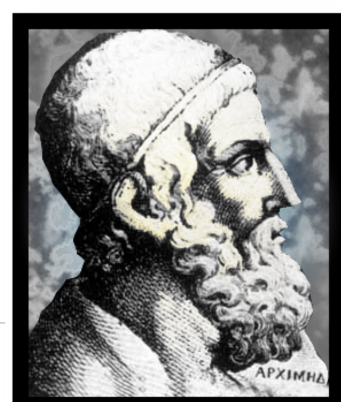
He started by counting the number of grains of sand that would fit into a poppy seed. Then he counted the number of poppy seeds that would fit into a shape size of a human finger. He then calculated how many shapes like that would fit into a stadium. He compared the stadium to what he was the size of the universe and got his number 10^{63}!

Using the same principle try to see how many sweets you would have to have to fill in your classroom.

See further instructions/help how to do this on the next page.

Some other (and modern!) large numbers
One day in 1938 an American mathematician, by the name of Edward Kasner (1878-1955), a professor at Columbia University, asked his nine-year-old nephew Milton Sirotta to name the biggest number that Edward wrote. Milton named it googol. When, later, Edward wrote 10 to the power of googol, this became known as googolplex. See on the second page how big googol and googolplex really are.

Archimedes
Archimedes was born around 287 BC in Syracuse, Sicily. Syracuse at the time belonged to Greece, and Archimedes was a Greek mathematician and scientist. He died in 212 or 211 BC in the same town being assassinated by a Roman soldier of the advancing Roman army. Archimedes was apparently



so involved in his mathematical work that he did not run even when the solder came to him.

It is believed that Archimedes learnt his mathematical art in Egypt, Alexandria, from the followers of Euclid.

He came from an aristocratic family and during his long life invented a number of war devices. He is generally thought of as one of the most important mathematicians/scientists of antiquity.

Maths is Good For You Worksheets

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Googol and Googolplex

Let us see what Googol is. It is a number equal to $10^{10^{10}} = 10^{10000000000}$. If we wrote all the zeros, it would look like this:

10 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000.

How much larger is googol from Archimedes' largest number?

Googolplex is another, even larger number equal to $10^{10^{10000000000}}$ (i.e., 1 with a googol number of 0s written after it). How many zeros is that altogether? Try to work it out for yourself.

Investigation – volume and number

1. Make a guess of how many sweets you need to fill your classroom from top to bottom.
2. Start the investigation. Make a plan for your investigation.
3. Make a net for a square box – start from a square of appropriate size (depending how large piece of card you have). You can use another worksheet for this, find it on mathsisgoodforyou.com worksheets page.
4. Make the box.
5. Fill it with the sweets – count how many took to fill this box.
6. Calculate the volume of your box. See how many sweets you managed to put into a box of that size.
7. Measure your classroom and calculate its volume.
8. Now compare the size of your box with the size of the classroom.
9. How many boxes will fit into your classroom?
10. How many sweets will you need to fill your classroom from top to bottom?