

Big numbers

Overview Numbers really can be huge – some are too big to even imagine! Have you ever seen a million pieces of candy? Or have you ever even tried to count to one million? We'll try to figure out about how long it would take just to count to one million. I'll also show you how to write some really big numbers!

Materials

- Pencil
- Paper

Activity: When I was a math student in fourth grade, a friend of mine came over and told me she could prove that there was no such thing as a big number. I was interested, because I was *sure* there was (I mean, a million sure seemed big to me). So she asked me to think of any number. I came up with 8.

Then she asked if "1" was a big number.

I said no.

"Great," she said. "Now add 1 to your 8. What do you get?"

"Nine," I said.

"Is 9 a big number?"

"No," I said.

"Okay, now add 1 to 9. What do you get now?"

"10."

"What if you add 1 to 10?"

I wasn't seeing where this was going. "11," I said.

"So," she said carefully, "if you can just creep up on the numbers, like we did by adding 1 to the previous number like we did with the 9, 10 and 11, and each one isn't really that big after we add 1, then there's no such thing as a big number."

Her look was so triumphant I couldn't think of what to say. But I *knew* something wasn't right about her logic. According to her thinking, there could never be a 'big number' because it was only one unit larger than the previous one.

At what point does a number become a "big number?"

Her thinking was logical, but it wasn't right. Can you figure it out?

How big is big? Have you ever counted to a million? I know I tried. I didn't get very far!

Can you imagine a million candy bars? How about a million pennies? A million sheets of toilet paper?

A million is a big number, but compared to what? If you had a book with a million words, it would be larger than any book you've ever held. In fact, a book can never even have a half million words. The secret behind whether a number is large or not is what it's compared to. The number 1 can seem gigantic if you're measuring UV light wave frequencies, whereas 1 million can be teensy if you're measuring the miles between stars. So always ask: compared to what?

Okay, so let's imagine that we really wanted to count to a million. How long would it take?

There are 60 seconds in one minute: $\frac{60 \text{ sec}}{1 \text{ min}}$

There are 60 minutes in one hour: $\frac{60 \text{ sec}}{1 \text{ min}} \times \frac{60 \text{ min}}{1 \text{ hr}} = \frac{3600 \text{ sec}}{1 \text{ hr}}$

There are 24 hours in each day: $\frac{3600 \text{ sec}}{1 \text{ hr}} \times \frac{24 \text{ hr}}{1 \text{ day}} = \frac{86,400 \text{ sec}}{1 \text{ day}}$

And there are 365 days in a year: $\frac{86,400 \text{ sec}}{1 \text{ day}} \times \frac{365 \text{ days}}{1 \text{ yr}} = \frac{31,536,000 \text{ sec}}{1 \text{ yr}}$

There are 31,536,000 seconds in a year. But you couldn't spend all of your time counting (you'll need to eat, sleep and use the bathroom!) And larger numbers take much longer than a second to say out loud. Taking all this into account, it would take more than a year to count to a million, and most people get bored with counting way before that.

Exercises

1. How many seconds are there in one hour?
2. How many seconds are there in a day?
3. How many days does a leap year have?
4. Write a number greater than but closer to a billion.(Note the difference between the two should be less than 50)
5. Write a number lesser than but closer to a billion.(Note the difference between the two should be less than 50)

Write the following numbers out numerically:

6. A thousand billion
7. A thousand million
8. A hundred hundred
9. Write a number that is 1 less than 100,000,000,000

Answers to Exercises: Big Numbers

1. 3,600
2. 86,400
3. 365
4. A number should be between 1,000,000,050 and 1,000,000,000
5. A number should be between 1,000,000,000 and 999,999,950
6. 1,000,000,000,000
7. 1,000,000,000
8. 10,000
9. 99,999,999,999