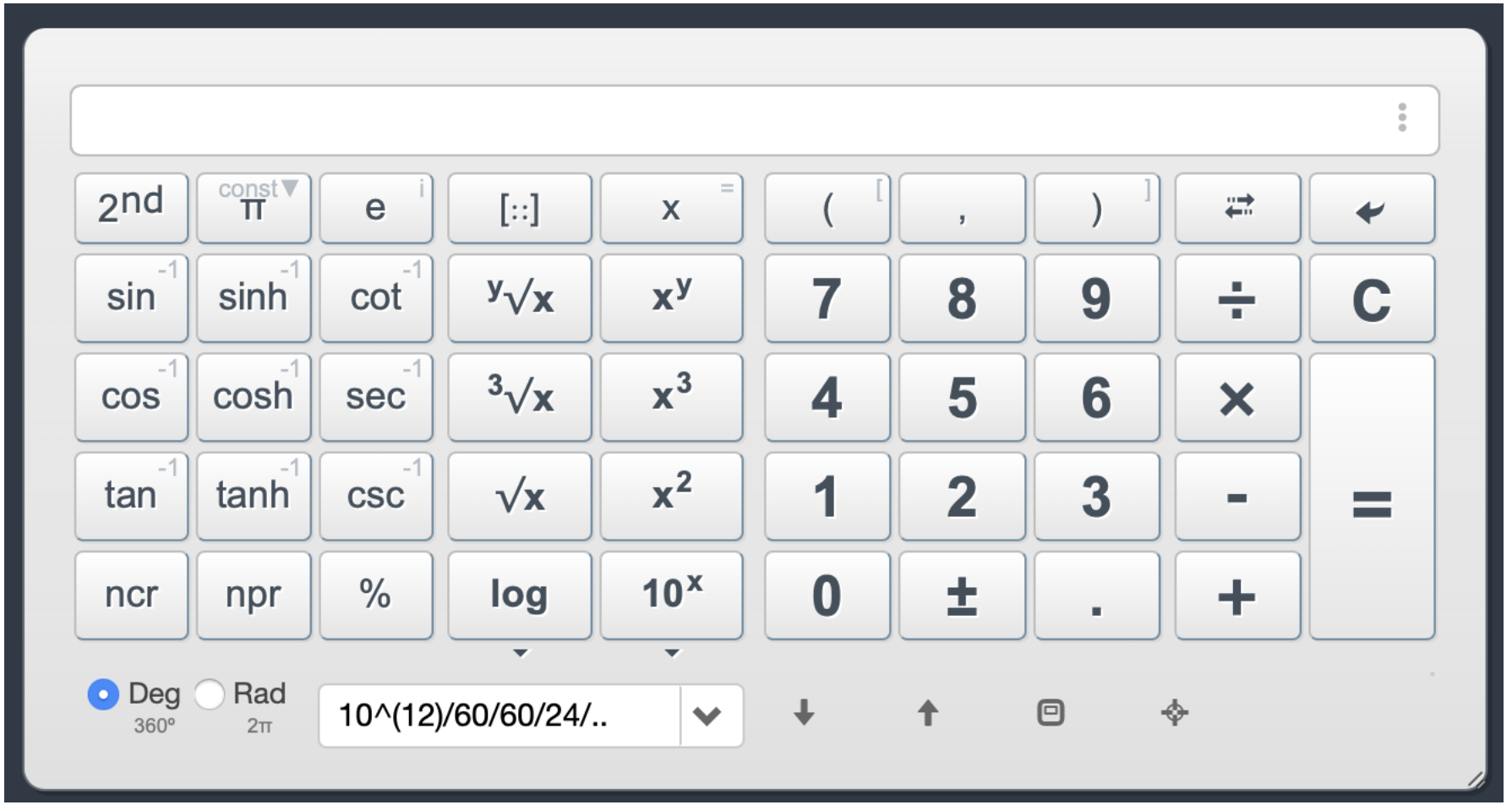
From One to One Trillion
1,000,000,000,000



This unit can be taught in the early grades, but it requires a scientific calculator. We found the one above online and decided to use it. https://web2.0calc.com

Common name:	Decimal:	Scientific notation:	our online calculator https://web2.0calc.com
one	1	E0	10^(0)
one thousand	1,000	E3	10^(3)
one million	1,000,000	E6	10^(6)
one billion	1,000,000,000	E9	10^(9)
one trillion	1,000,000,000,000	E12	10^(12)

In scientific notation, E12 means 10^{12} or 10^(12) (10 to the 12^{th} power), or simply 1 followed by 12 zeros.

Question: How long does one trillion seconds last? (measured in years or centuries)

The question again:

How long does one trillion seconds last? (measured in years or centuries)

What do you guess? How about discussing it before we proceed?

Discussion time!

Let's start with 1000 seconds and build from there.

One thousand seconds
Conversion to minutes and seconds
1000 seconds/60 seconds/minute

On the calculator (available at https://web2.0calc.com):
10^(3)/60 ENTER 16.666666667 minutes
16 minutes 40 seconds (.666666667 is 2/3 of a minute, namely, 40 seconds)

One million seconds

Conversion to days and hours
1000000 seconds/60 seconds/minute/60 minutes/hour/24 hours/day

On the calculator:
10^(6)/60/60/24 = 11.57407407 11 days
- 11 = * 24 = 13.77777778 13.7 hours
11 days 14 hours (rounded to the nearest hour)

Remark.
Do not write this expression as 10^(6)/(60*60*24). Students need to learn how to use chain division.

One billion seconds

Conversion to years and months
1000000000 seconds/60 seconds/minute/60 minutes/hour/24 hours/day/365 days/year

On the calculator:

10^(9)/60/60/24/365	=	31.70979198	31 years
- 31 = * 12	=	8.517503805	8.5 months

31 years and about 8.5 months

One trillion seconds

1000000000000 seconds/60 seconds/minute/60 minutes/hour/24 hours/day/365 days/year
Rounded to one hundred years

On the calculator:
10^(12) /60/60/24/365 =
31709.79198
31 thousand 7 hundred years.
Or, if we want the time in centuries,
/100 =
317.0979198
317 centuries and 10 years

So, if we paid back one trillion dollars at one dollar per second, it would take 317 centuries and 10 years.

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What is the current US National Debt?
Let's take a look.

https://www.usdebtclock.org

So, if we paid back one trillion dollars at one dollar per second, it would take 317 centuries and 10 years.

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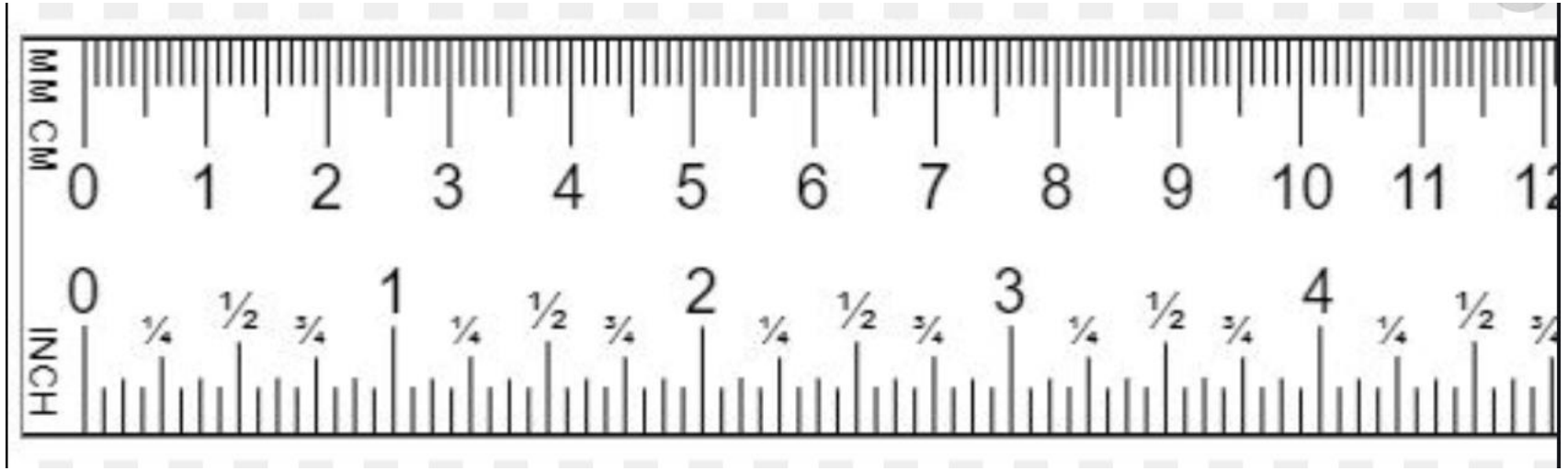
If we paid back 33 trillion dollars at one dollar per second, it would take about 317.1*33= 10,465 centuries.

Another way to look at one trillion

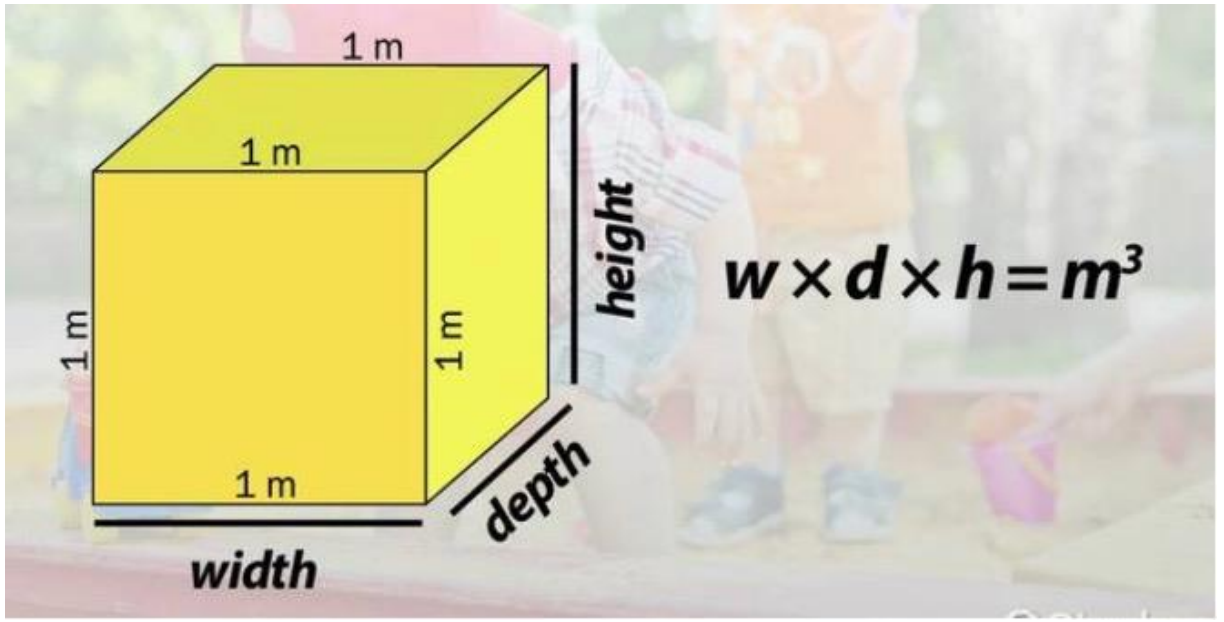
One way to better understand large numbers is to compare some volumes.

Let’s do some math. I want to know how big one trillion cubic millimeters is.

First, how big is a millimeter? It is one tenth of a centimeter.



Here is a ruler with centimeters and millimeters. Do you see how big a mm is?
And there are 1000 of them in a meter.



Now think of a cubic mm: one mm long, one mm wide, and one mm high. There are 1000*1000*1000 = 1 billion of them in a cubic meter.

Imagine a cubic meter: one meter by one meter by one meter. Do you have an image of it in your head?

Here is a meter stick. There are about 39.37 inches in a meter.

We want to compute how big one trillion cubic mm is.

We know how big one billion (1,000,000,000) cubic mm is. So we multiply one billion by 10*10*10 to get a trillion (one trillion has twelve zeroes!).

Then one trillion cubic mm is the same volume as a structure that is 10 meters by 10 meters by 10 meters.

How big is a house? A small house has a volume of about 300 cubic meters.

So one trillion cubic mm has about the same volume as three houses! Imagine three houses filled with one trillion cubic millimeters!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