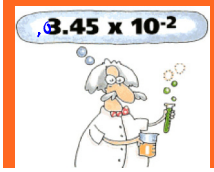
.0345



Distances in Space

The scientific notation allows us to write very large or small numbers using mathematical abbreviations. Using this notation, a number is written with a digit between 1 and 9 before the decimal, followed by a power of 10.

Example:

32 000 000km = 3.2 x 10^7 km

43 000 = 4.3×10^4

0.00000857 = 8.57×10^{-6}

10000 = 1 x 10^4	24327 = 2.4327 x 10^4
1000 = 1 x 10^3	7354 = 7.354 x 10^3
100 = 1 x 10^2	482 = 4.82 x 10^2
10 = 1 x 10^1	89 = 8.9 x 10^1 (not usually done)
1 = 10^0	
1/10 = 0.1 = 1 x 10^{-1}	0.32 = 3.2 x 10^{-1} (not usually done)

1/100 = 0.01 = 1 x 10^{-2}	0.053 = 5.3 x 10^{-2}
1/1000 = 0.001 = 1 x 10^{-3}	0.0078 = 7.8 x 10^{-3}
1/10000 = 0.0001 = 1 x 10^{-4}	0.00044 = 4.4 x 10^{-4}

In scientific notation, the digit term indicates the number of significant figures in the number. The exponential term only places the decimal point. As an example,

46600000 = 4.66 x 10^7

This number only has 3 significant figures. The zeros are not significant; they are only holding a place. As another example,

0.00053 = 5.3 x 10^{-4}

This number has 2 significant figures. The zeros are only place holders.

More practice

Scientific notation

1) 10 x 10 x 10 x 10 10^4 2) 10 x 10 x 10 x 10 x 10 _____
3) 3 x 10 x 10 x 10 3×10^3 4) 7 x 10 x 10 x 10 x 10 _____
5) 1 000 000 000 000 10^{12} 6) .00000000000000002 _____
7) 34 800 000 3.48×10^7

Please write the expanded number

8) 1 x 10^4 10000 9) 1 x 10^{-7} _____
10) 3 x 10^{-3} 0.003 11) 9 x 10^4 _____
12) 8.21 x 10^2 _____ 13) 6.45 x 10^{-5} _____

Scientific notation

1) 10 x 10 x 10 x 10 10^4 2) 10 x 10 x 10 x 10 x 10 10^5
3) 3 x 10 x 10 x 10 3×10^3 4) 7 x 10 x 10 x 10 x 10 7×10^4
5) 1 000 000 000 000 10^{12} 6) .00000000000000002 2×10^{-18}
7) 34 800 000 $3,48 \times 10^7$

Please write the expanded number

8) 1 x 10^4 10000 9) 1 x 10^{-7} 0,0000001
10) 3 x 10^{-3} 0,003 11) 9 x 10^1 90
12) 8.21 x 10^2 821 13) 6.45 x 10^{-5} 0,0000645

$0.0056 = 5.6 \times 10^{-3}$

$24010 = 2.401 \times 10^{4}$

$4085 = 4.085 \times 10^{3}$

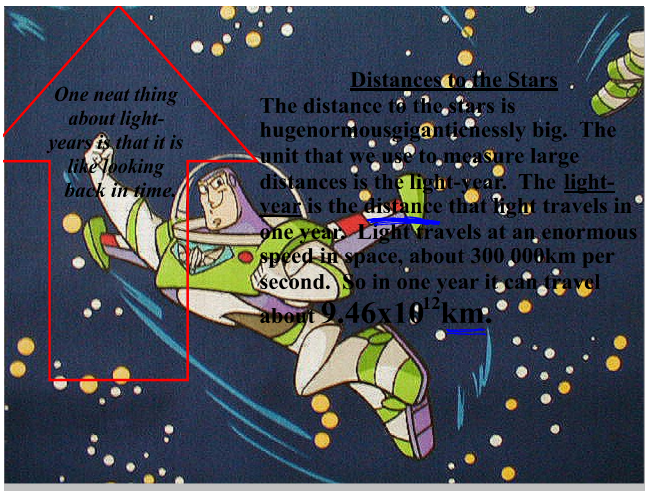
4.085×1000

$3.12 \times 10^{-1} = 0.312$

$2.445 \times 10^{3} = 2445$

$2.0104 \times 10^{-4} = 0.000104$

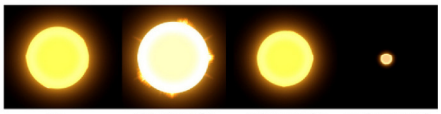
$6.5 \times 10^{4} = 65000$



http://planetquest.jpl.nasa.gov/system/interactable/5/index.html

Fun Note:
The light that we see from the star Alpha Centauri tonight left the star 4.3 years ago. So the light takes 4.3 years to reach earth.

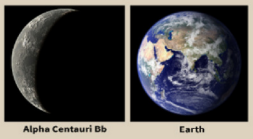
STARS COMPARED



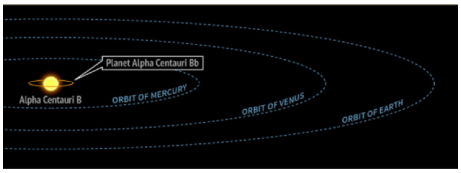
	Sun	Alpha Centauri A	Alpha Centauri B	Proxima Centauri
SPECTRAL TYPE (SUN = G2 V):		G2 V	K1 V	M5.5 Ve
MASS (SUN = 1):		1.1	0.97	0.12
LUMINOSITY (SUN = 1):		1.52	0.5	0.0017
DISTANCE FROM EARTH (LIGHT-YEARS):		4.37	4.37	4.24

ALPHA CENTAURI B's EARTH-SIZE PLANET

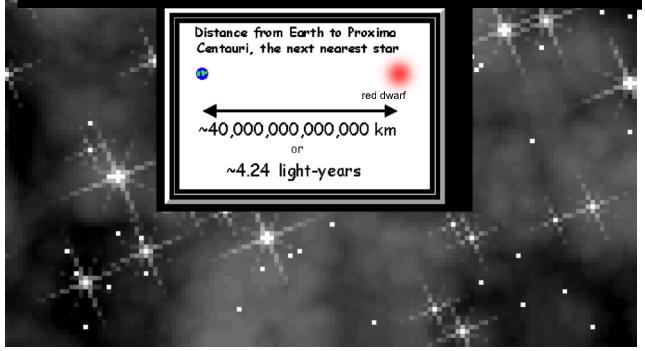
Astronomers at the European Southern Observatory announced in Oct., 2012 the discovery of a planet similar in size to the Earth orbiting Alpha Centauri B. The planet, called Alpha Centauri Bb, is too close to its star to be habitable, but it is the closest alien world yet found.

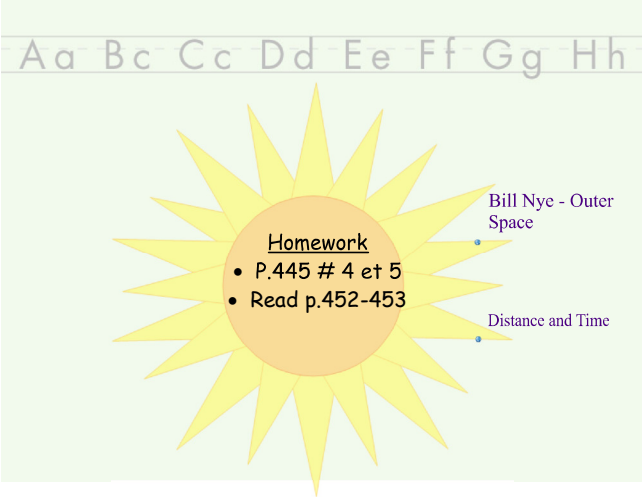


	Alpha Centauri Bb	Earth
MASS (EARTH = 1):	1.13	1.0
DISTANCE FROM PARENT STAR:	3.6 million miles (6 million kilometers)	93 million miles (150 million km)
LENGTH OF YEAR (EARTH DAYS):	3.2	365.3



- The Crab supernova remnant is about 4,000 light-years away.
- The Milky Way Galaxy is about 150,000 light-years across.
- The Andromeda Galaxy is 2.3 million light-years away.





Convert the following light years to km

4.3 $\times 9.46 \times 10^{12} = 4.0678 \times 10^{13}$

8.8 $\times 9.46 \times 10^{12} = 8.3248 \times 10^{13}$ km

26 $\times 9.46 \times 10^{12} = 2.45 \times 10^{14}$

36 $\times 9.46 \times 10^{12} = 3.4056 \times 10^{14}$

700

900

1400 1.5×10^{10}

15 000 000 000, $\times 9.46 \times 10^{12} = 1.419 \times 10^{23}$

What is the difference between a light year and a year?

A light year is a measure of distance, 9.46×10^{12} km that light can travel in one year.

A year is 365.2422 days, a measure of time. This is the length of time it takes the Earth to make one revolution around the sun.

If we know that Sirius, the brightest star in the sky is 8.8 light years away, we can multiply by 9.46×10^{12} and determine that is is 8.3248×10^{13} km away from Earth.

Because it is 8.8 light years away, we also know that it takes 8.8 years for the light from Sirius to actually reach us on Earth and become visible to us.