How to Calculate a Light Year

Light Year

- Unit of astronomical distance equivalent to the distance that light travels in one year.

$$9.4607 \times 10^{12} \text{ km (nearly 6 trillion miles)}$$

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Formula:

Using the common physics formula: $d = r \times t$

Light Year = (speed of light) x (one year).

Speed of Light = c
Distance of a Light = d
Time = t

Equation: $d = c \times t$

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Light in a vacuum travels at a velocity of 186,000 miles per second

This is the equivalent:

299,792 kilometers per second

Or
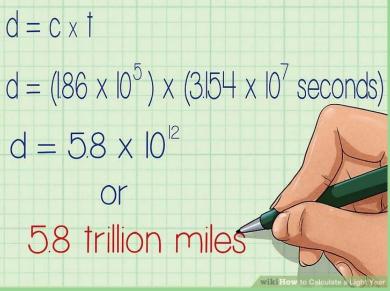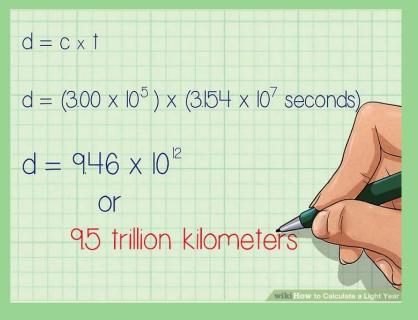
670,616,629 miles per hour.

Speed of light, c, equals 186,000 miles per second

Scientific Notation = 1.86×10^{5} miles per second

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1 year
x 365 days/year
x 24 hours/day
x 60 minutes/hour
x 60 seconds/minute

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= 31,536,000 seconds

$d = c \times t$

$d = (1.86 \times 10^5) \times (3.154 \times 10^7 \text{ seconds})$

$d = 5.8 \times 10^{12}$

or

5.8 trillion miles

$d = c \times t$

$d = (3.00 \times 10^5) \times (3.154 \times 10^7 \text{ seconds})$

$d = 9.46 \times 10^{12}$

or

9.5 trillion kilometers

Convert

- feet to miles: 5,280 feet = 1 mile:

$$x \text{ ft } (1 \text{ mile } / 5280 \text{ ft}) = \text{miles}$$

- meters to kilometers: divide by 1000:

$$x \text{ m } (1 \text{ km } / 1000 \text{ m}) = \text{km}$$

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Convert

- kilometers - light years:

$$1 \text{ light year}/(9.46 \times 10^{12} \text{ km})$$

- miles - light years:

$$1 \text{ light year}/(5.88 \times 10^{12} \text{ miles})$$

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Example:

If you knew that an object was approximately 14.2×10^{14} miles away from Earth, how many light years would that be?

Use the miles conversion factor: $1/(5.88 \times 10^{12})$

Multiply:

$$(14.2 \times 10^{14}) \times (1 \div (5.88 \times 10^{12}))$$
$$= 2.41 \times 10^{2}$$
$$= 241 \text{ light years}$$

The object is 241 light years away.

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