Next to the Big Dipper (Ursa Major) and Scorpius, the Orion is the most widely recognized of all the 89 constellations in the sky. It is also one of the oldest known to humans. The Ancient Egyptians called it Osiris as long ago as 2000 BC!

The brilliant stars that make up this rectangular star pattern seem to be close-by because they are so bright, but in fact they are very far away. Astronomers measure distances using a unit called the **light year**, which equals about 9.5 trillion kilometers, or 63,240 times the distance from Earth to the Sun!

**Problem 1** – Light travels at a speed of 300,000 km/sec. How long does it take light to travel:

A) To the moon at a distance of 380,000 km?
B) To the sun at a distance of 150 million km?
C) To Neptune at a distance of 4.5 billion kilometers?
D) To the star Alpha Centauri at a distance of 41 trillion km?

**Problem 2** – How far does light travel in one year, if 1 Earth year = 31,000,000 seconds? (Note: Astronomers call this distance one light year.)

**Problem 3** – The bright star in Orion called Betelgeuse is located 650 light years from Earth. What is this distance in kilometers? Write your answer using words like thousand or trillion where appropriate, and round the answer to the nearest 1000 trillion.

**Problem 4** – Betelgeuse is expected to blow up as a supernova sometime in the next 1 million years. Suppose this happened in the year 3000 AD. In what year would someone on earth see this explosion?

**Problem 5** – The star Bellatrix is located 300 light years from Earth and closer to Betelgeuse. In what year would colonists there first see Betelgeuse explode?

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**Problem 1** – Light travels at a speed of 300,000 km/sec. How long does it take light to travel: A)To the moon at a distance of 380,000 km?; B) To the sun at a distance of 150 million km? C) To Neptune at a distance of  4.5 billion kilometers? D) To the star Alpha Centauri at a distance of 41 trillion km?

Answer:  Time = Distance/speed, so
**A)** Time = 380,000 km/300,000 =  **1.3 seconds**.  B) Time = 150,000,000/300,000 = 500 seconds or **8 1/3 minutes**.  C) Time = 4,500,000,000 km/300,000 = 15,000 seconds or **4 1/6 hours**.   D) 41,000,000,000,000 km/300,000 = 136,666,666 seconds or **4 1/3 years.**

**Problem 2** – How far does light travel in one year, if 1 Earth year = 31,000,000 seconds? (Note: Astronomers call this distance one light year.)

Answer:   Distance = speed x Time,
Distance = 300,000 km/s x 31,000,000 sec
Distance = **9.3 trillion kilometers**.

**Problem 3** – The bright star in Orion called Betelgeuse is located 650 light years from Earth. What is this distance in kilometers?  Write your answer using words like thousand or trillion where appropriate, and round the answer to the nearest 1000 trillion.

Answer:   1 light year is 9.3 trillion kilometers, so multiply this by 650 to get the distance to Betelgeuse of    650 x 9.3 = 6045 trillion kilometers, which we can re-write as **6 thousand trillion kilometers**.  The actual name for one thousand trillion is one quadrillion, so we might also write Betelgeuse's distance as 6 quadrillion kilometers.

**Problem 4** – Betelgeuse is expected to blow up as a supernova sometime in the next 1 million years.  Suppose this happened in the year  3000 AD. In what year would someone on earth see this explosion?

Answer:  Betelgeuse is 650 light years from Earth so it takes light 650 years to reach us .If the explosion happened in the  Year 3000 AD, then we will see the light arrive in the year **3650 AD**, 650 years AFTER the event occurred.

**Problem 5** – The star Bellatrix is located 300 light years from Earth and closer to Betelgeuse. In what year would colonists there first see Betelgeuse explode?

Answer:  Light from the explosion has to travel from Betelgeuse to Bellatrix, which is a distance of 650-300 = 350 light years. That means that colonists near Bellatrix will see the event in the year 3000 AD + 350 = **3350 AD**, or about 300 years <u>sooner</u> than the most distant earthlings!