Fig. 9.1.1 A theodolite used for surveying.

Surveyors and scientists sometimes have a very difficult job measuring where objects are because they cannot directly measure them (Figure 9.1.1).

However, because the laws of mathematics are set in stone, if you know enough about angles and distance, it is simple to calculate exactly how far away an object is.

The answer can be determined via trigonometry.

Scientists measure the angle of a star in relation to the Earth on a certain day. Then they take the same measurement again six months later when the Earth is on the other side of its orbit (Figure 9.1.2).

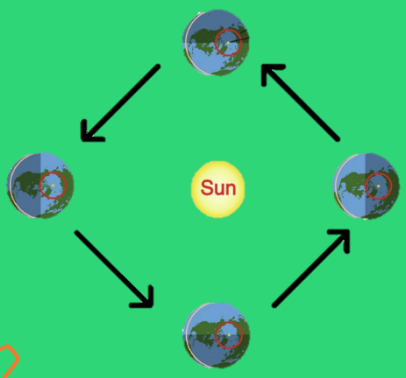

Fig. 9.1.2 Earth's orbit around the sun.

Fig. 9.1.3 Proxima Centauri

One of the nearest stars to Earth is Proxima Centauri (Figure 9.1.3). Using this method, the textbook will tell you that this star is about 4.22 light-years away. That is about 24,807,800,000,000 miles or 24.8 trillion miles.

The distance between Earth at measurement one and measurement two is about 185,911,614 miles or 185.9 million miles.

If we were to put this as an isosceles triangle, this would put the two sides at 24.8 trillion miles and the base of the triangle at 185.9 million miles (Figure 9.1.4).

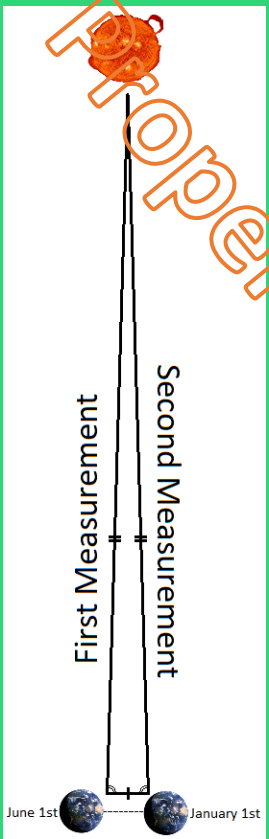

Fig. 9.1.4 The isosceles triangle (not to scale)

Now that we have that information, we can make a relative comparison. If two surveyors were one inch apart, they would both be looking at an object 133,438.7 inches or a little over 25 miles away. That is the distance of 813 Olympic swimming pools or 445 football fields away.

The margin of error here is incredible. It is unimaginable that anyone could get even a slightly accurate number with such skewed information.

Therefore, it is unquestionable that due to the large margin for error, these stellar measurements should not be taken at face value.

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