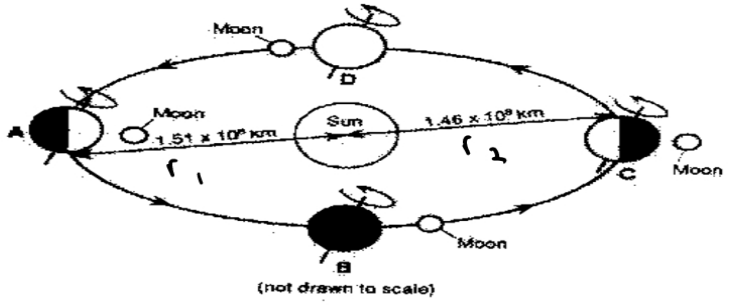
Name_____

Orbits Worksheet

The diagram shows the earth's position in its orbit around the sun at the beginning of each season. The moon is shown at various positions as it revolves around the earth. Assume the line from A to C is the major axis.



1. The earth's orbit around the sun is best described as
   a. A perfect circle
   b. An oblate spheroid
   c. A very eccentric ellipse
   d. A slightly eccentric ellipse

2. The phase of the moon at A would be
   a. Full
   b. New
   c. Quarter

3. Determine the value of the semi major axis "a".

$r_1 + r_2 = 2a \qquad a = \frac{r_1 + r_2}{2} = 1.485 \times 10^8 \text{ km}$

4. If e= 0.0167, determine the value of the focus length "c".

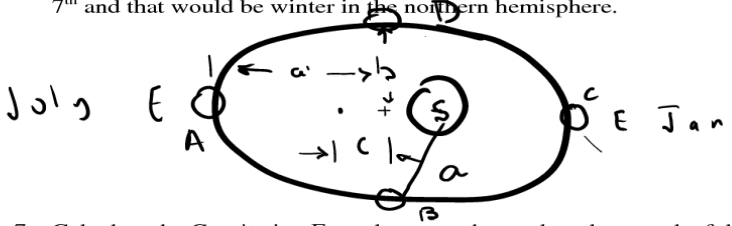
$e = c/a \qquad c = ea = 2.47 \times 10^6 \text{ km}$

5. Determine the value of the semi major axis "b".

$a^2 = b^2 + c^2 \qquad b = \sqrt{a^2 - c^2} = 1.485 \times 10^8$

no difference to 4 sig figs.

6. Draw a better picture of earth's orbit of the sun which includes "a', "b" and "c". Label the approximate season that would correspond to A, B, C, and D. Remember that the earth's is closest to the sun on January 7th and that would be winter in the northern hemisphere.



7. Calculate the Gravitation Force between the earth and sun at the following locations

A. $r = a + c$ (meters) $\qquad F = G\frac{m_1 m_2}{r^2} = 3.51 \times 10^{22} \text{ N}$

B. $r = a$ meters $= 1.485 \times 10^{11} \text{ m} \qquad F = 3.63 \times 10^{22} \text{ N}$

8. Calculate the speed of Earth's orbit at the following locations

A. $r = a + c$ (meters) $\qquad v = \sqrt{\frac{GM_s}{r}} = 2.97 \times 10^4 \text{ m/s}$

B. $r = a \qquad v = 2.12 \times 10^4 \text{ m/s}$

9. Determine the value of the Kepler's 3rd law constant for the earth in m^3/s^2.

$\frac{r^3}{T^2} = \frac{GM_s}{4\pi^2} = 3.38 \times 10^{18} \frac{m^3}{s^2}$