NAME: Astronomy Due Date:

Drawing mini Solar System using Kepler's Orbits of the Planets Activity

PURPOSE:

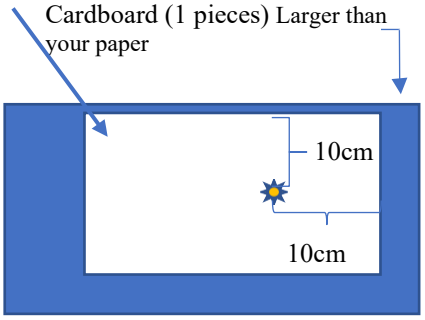
To draw scale models of the inner planets' orbits, asteroids and comets orbit around the sun.

MATERIALS

String (thread)
Scissors
Metric ruler
1 Dime
Pencil w/eraser

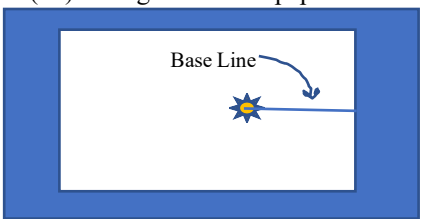
4 straight/push pins *(optional supply push pins for bulletin board sewing needles, safety pins)*
6 different colored Pencils or pens, or highlighters, or crayons (helpful but not needed)

Plain White 8½" x 11" Paper NO lines
Cardboard (1 pieces) Larger than your paper



PROCEDURE

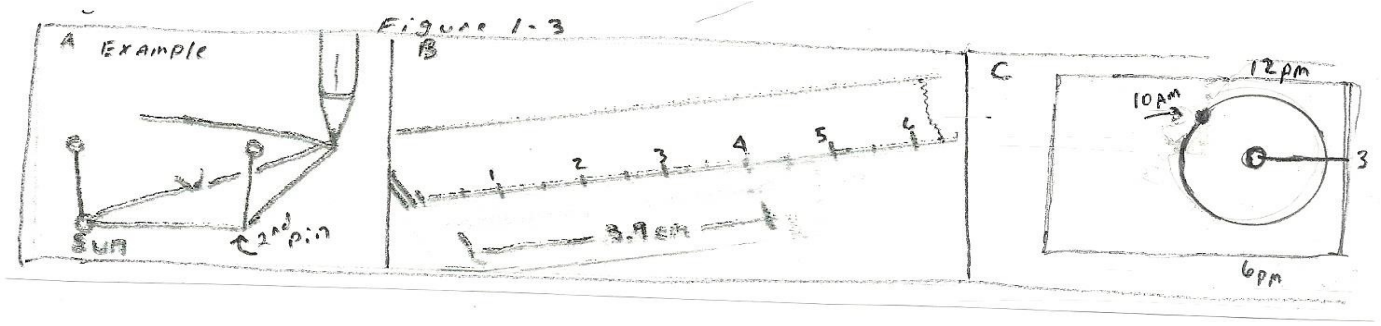
1. Place a sheet of paper over the cardboard, Landscape style.
2. Place a small piece of tape at lease on two corners of the white paper to hold it in place.
3. From the RIGHT side of the paper line up the ruler so that you can measure 10 centimeters (cm) down from the top and 10 cm in from the right side. (see diagram). Where these two points meet place a small dot (like a period) in pencil.
4. Center the dime over the dot and trace the dime on to the paper. This represents the Sun. Use a Yellow or Orange highlighter to color it in.
5. Through the center of the dot (which should be the center of the SUN), press a pin (#1) through the white paper & the cardboard to anchor it well.
6. Line up your ruler from the Sun to the Right side and Draw a permanent line (in ink). All measurements are based on this line which we will call "BASE LINE"
7. When making the orbits, **DO NOT** remove THE SUN pin (#1).
8. Move only the 2nd pin the proper distance (see Column 3 of Data Table) each time along the Base Line unless told differently.



9. You MUST include everything on the map into your KEY. You should also have your name and Title of project.

Making the PLANET String:

10. To make the planet string loop, starting with the number given, for the first planet in Column 1, place 2 pins (somewhere in the cardboard NOT on the white paper) the distance indicated on the DATA TABLE. For example, for Venus is 3.9 cm apart.
11. Loop the string around both pins and bring the ends of the string together at the proper distance and tie a knot.
    - i For example, for Venus, you cut a piece of string approximately shoulder width long.
    - ii Loop the string around BOTH pins and tie the two ends together that makes a loop 3.9 centimeters
    - iii Check the knot to make sure its holds. (See Fig. 1-3 (b)).
    - iv Trim the excesses string off making sure you have some space before the knot.



12. Remove the two pins that you used to make the loop of the planet, placing them off to the side, along with your "loop string"
13. Now look at Column 3 on the data table (on the next page) and set another pin from the Sun along the BASE LINE with is toward the right or at 3:00pm. (See Fig. 1-3 (a)).
14. Loop the string over BOTH PINS. Then use this method shown in the figure Fig. 1-3 (a) to draw the elliptical orbit of the planet Venus.
    - A Place the tip of the pencil, inside the loop and pull the string tight. Now move the pencil to make the elliptical orbit. You may wish to practice once or twice on a separate sheet of paper.
    - B Trace over the elliptical orbit, with the color pencil that is indicated for the planet carefully

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15. Placing a dot (to represent the planet) and place the planet's proper symbol on the correct orbit. This will be done by looking at the 4th column.
    A This is done by imaginary clock with the BASE LINE being 3pm. Look at Fig. 1-3 (a): if the pin is 3PM; then the tip of the pencil would be 2pm.
    B Venus is at 10:00am (SEE fig 1-3 c)
16. Remove the "VENUS" pin NOT THE SUN PIN before starting the next object.
17. Continue this activity by repeating the steps for each planet in order including the asteroids and comet on your drawing.
18. Answer the Data Analysis and Conclusion

Distance for the string to make a loop (cm)	**Object** ***scale:*** ***1.0cm = 28,075,472 million km***	*Distance between Pins from the Sun (cm)*	*Location of object based on time.* ✧
3.9	**Venus (orbit in BROWN)**	**0.1**	**10 am**
5.3	**Earth (orbit in BLUE)**	**0.3**	**12 noon**
2.0	**Mercury (orbit in GREEN)**	**1.1**	**1 pm**
8.1	**Mars (orbit in RED/pink)**	**2.1**	**2 pm**
14.7	**Typical Asteroid Ceres** **(orbit in PURPLE/Violet)**	**0.6**	**8 pm**
8.5	**Asteroid Apollo** **(mars crosser)** *(orbit in ANY COLOR but if needed BLACK/PENCIL)*	**Place ruler 90° from base line with 2nd pin @ 6.0cm**	**7pm**
16.5	**Halley's Comet** **(***orbit in GRAY PENCILBUT DASHES***)**	**Place ruler 180° from base line with 2nd pin @ 14.5cm**	**10 am**

Continue what I started; Show your math work.
Confirming the scale is accurate

$$\frac{93{,}000{,}000\ miles}{1} \times \frac{1.6\ Km}{1\ mile} = \underline{\qquad} \ Km$$

Write your answer in the space provided

$$\frac{Km}{1} \times \frac{1.0\ cm}{28{,}075{,}472\ Km} =$$

Your answer is (don't forget units): _____ _____
Number **Unit**

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Data Analysis & Conclusion:

1. Describe the shapes of the orbits of the inner planets.
   They are Elliptical They are circular They are spherical

2. Which two planets seem almost identical? Meaning the orbit is similar.
   Mercury Venus Earth Mars

3. Select which Planet has an almost perfect circular orbit? Meaning which planet has an orbit that is close to be a perfect circle?
   Mercury Venus Mars

4. Select which celestial object orbit is more like the orbits of the planets that you created?
   Typical Asteroid Asteroid Apollo Comet Bob

5. Select which celestial object is more likely to collide with Mars?
   Typical Asteroid Asteroid Apollo Earth

6. Most asteroids follow a specific path. Select which celestial object has a path that is much closer to the sun other than the planet Mercury?
   Typical Asteroid Asteroid Apollo Venus

7. Select which celestial object has an orbital path that takes it much farther from the Sun than any other celestial object?
   Ceres Asteroid Apollo Comet Bob

8. Select which Planet *your scale of accuracy answer* (that is what you calculated for an answer) for BEST matches up with?
   Mercury Earth Ceres

   Venus Mars Comet Bob

9. Read each statement below and select the BEST that compares the path of Comet Bob to the path of Ceres (typical asteroid).
   Comet Bob has a more extreme ellipse than the Typical Asteroid which is MORE circular.
   Comet Bob has a less extreme ellipse than the Typical Asteroid which is MORE oval.
   Ceres has a more extreme ellipse than Comet Bob which is MORE circular in its orbit.