

SCORE
(5 pts max)

ASTRONOMY 5
THIRD HOUR SESSION "A"

ACTIVITY: Cosmic Scales

NAME

DATE

ID#

Answer the following questions about scales (the objects in the blanks will be given in class):

1. If one edge of cube A is 5 times longer than one edge of cube B, and one edge of cube B is 7 times longer than cube C (exhibited on front desk), then how long is one edge of cube A? Would it fit in the classroom?

3500 mm (350 cm) i.e. factor 1 x factor 2 x cube C length	no
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2. What is the volume of cube A?

$(\text{factor 1} \times \text{factor 2})^3 \times (100 \text{ mm})^3 = 4.2875 \times 10^{10} \text{ mm}^3$

3. What is the diameter of the marble? What is its radius? What is its volume?

16 mm	8 mm	$(4/3)\pi \times (8 \text{ mm})^3 \sim 2144.6 \text{ mm}^3$
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4. About how many marbles would fit in cube A? (Disregard the effects of air gaps between marbles.) Considering the accuracy of your ability to measure the size of your marble, what might be a more realistic guess for how many marbles could fit in cube A?

1.9992×10^7	$2.0 \times 10^7 = 20,000,000$
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5. What is the ratio of diameters between the planets Venus and Mars? Suppose the marble you were given in class represented the size of the planet Venus. What diameter (mm) marble would be required to represent the size of the planet Mars?

1.78	marble diameter (mm)/1.78 = 8.97 mm~9.0 mm
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6. Estimate how many people set end-to-end would reach from the Earth to the Moon ? Do we have enough people in the U.S to do this?

200 to 250 million

yes

7. Rewrite your first answer from question #6 in scientific (exponential) notation.

2.0×10^8 to 2.5×10^8

8. The distance from the Earth to the Sun is 1 Astronomical Unit (AU). What is the distance from the Sun to (current position of) Voyager 1 in AU's? Give Voyager 1 distance to students= 21,648,000,000 km . 1 AU = Find in Appendix A

144.7 AU

Open the web site <http://htwins.net/scale2/scale2.swf?bordercolor=white> and click "START." Notice the grey ring that is 1 meter in diameter.

9. Slowly drag the slider near the bottom of the screen to the left until you see another circle appear. What size does this circle represent?

10^{-3} m = 0.001 m = 1 mm

10. Drag the slider to the left, until another 5 grey rings appear; the number in the lower-right part of the screen should be 10^{-15} . What objects are approximately this size?

Proton or neutron

11. Drag the slider to the right, until the number in the lower-right part of the screen reads 10^6 . What is the smallest astronomical body just outside the grey ring?

Ceres

12. Drag the slider until the number in the lower-right part of the screen reads $10^{19.4}$; you will start to see the smallest galaxies. Continue moving the slider to the right until you see The Milky Way. How large is it in meters?

10^{21} meters (Zettameter) or 1.2×10^{21} meters (if clicked on)