

Name: \_\_\_\_\_ Date: \_\_\_\_\_

$m_r^\beta$  **Physics Practice: Gravity and distance**

Gravity exists between any two masses. As the distance between the masses increases, what happens to the force between the masses? We can come up with a good answer by thinking about the problem and making some reasonable assumptions.

1. Consider the sun. It contains most of the mass in our solar system, and all of the planets revolve around it. It also gives off light. As you get farther from the sun, it appears fainter. However, the light is not being absorbed by space. Why is it getting fainter?

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2. You have two cubes of different sizes.

a. If one has twice the side length of the other, how much more surface area does the larger cube have?

b. If one has three times the side length of the other, how much more surface area does the larger cube have?

c. If one has  $n$  times the side length of the other, how much more surface area does the larger box have?

**3.** Think of a transparent spherical shell centered at the sun, with a radius of 93 million miles (about the size of earth's orbit). In a given amount of time, a certain amount of light energy (say,  $E$ ) passes through that shell.

a. In the same amount of time, how much energy do you think passes through a shell with three times the radius?

b. Consider a  $1\text{m}^2$  area on the surface of each sphere. What is the relationship between the amount of energy passing through the area on each sphere?

**4.** Suppose gravitational force diminishes with distance like light. If the force between two objects at a distance of  $1\text{m}$  is  $k$ , what is the force at a distance  $d$  meters?

**5.** Gravity and light from the sun follow an *inverse square law*. What other phenomena do you suppose follows such a law?

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