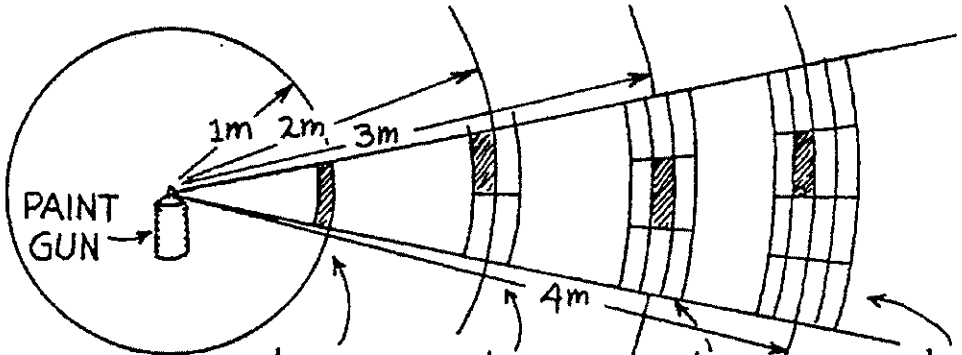
Name _____ Date _____

CONCEPTUAL Physics PRACTICE PAGE

Chapter 9 Gravity

Inverse-Square Law and Weight

1. Paint spray travels radially away from the nozzle of the can in straight lines. Like gravity, the strength (intensity) of the spray obeys an inverse-square law. Complete the diagram by filling in the blank spaces.

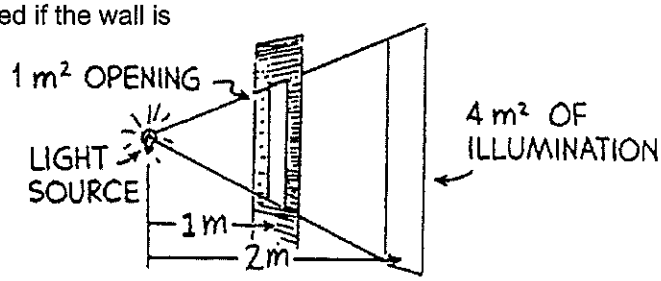


	1 AREA UNIT	4 AREA UNITS	( ) AREA UNITS	( ) AREA UNITS
PAINT SPRAY	1 mm THICK	¼ mm THICK	( ) mm THICK	( ) mm THICK

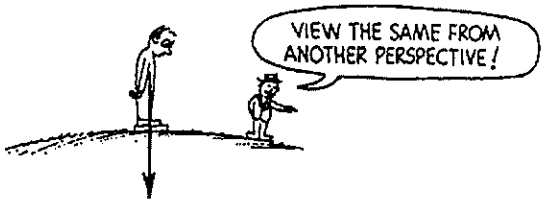
2. A small light source located 1 m in front of an opening of area 1 m^2 illuminates a wall behind. If the wall is 1 m behind the opening (2 m from the light source), the illuminated area covers 4 m^2. How many square meters will be illuminated if the wall is

5 m from the source? _____

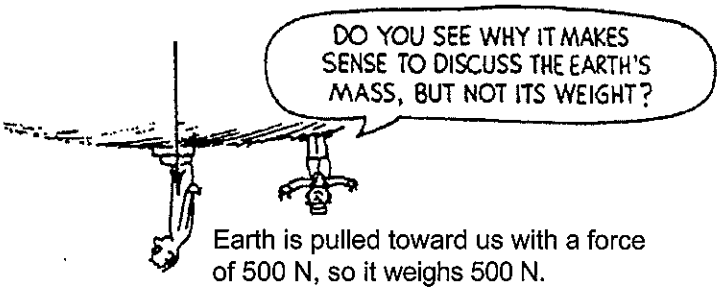
10 m from the source? _____



3. If we stand at rest on a weighing scale and find that we are pulled toward Earth with a force of 500 N, then we weigh _____ N. Strictly speaking, we weigh _____ N relative to Earth. How much does Earth weigh? If you tip the scale upside down and repeat the weighing process, we can say that we and Earth are still pulled together with a force of _____ N, and therefore, relative to us, the whole 6,000,000,000,000,000,000,000,000-kg Earth weighs _____ N! Weight, unlike mass, is a relative quantity.



We are pulled to Earth with a force of 500 N, so we weigh 500 N.



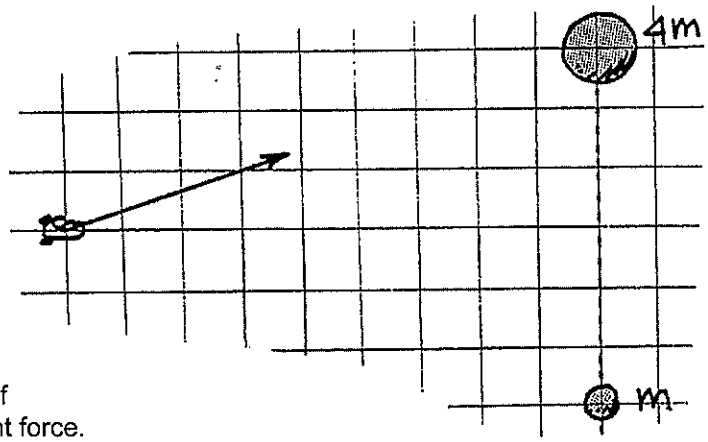
Earth is pulled toward us with a force of 500 N, so it weighs 500 N.

Hewitt Drew It!

Chapter 9 Gravity

***Inverse-Square Law and Weight*—continued**

4. The spaceship is attracted to both the planet and the planet's moon. The planet has four times the mass of its moon. The force of attraction of the spaceship to the planet is shown by the vector.

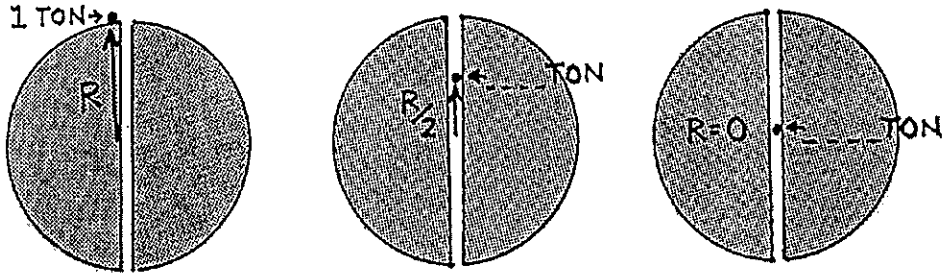


   a. Carefully sketch another vector to show the spaceship's attraction to the moon. Then apply the parallelogram method of Chapter 5 and sketch the resultant force.

   b. Determine the location between the planet and its moon (along the dotted line) where gravitational forces cancel. Make a sketch of the spaceship there.

5. Consider a planet of uniform density that has a straight tunnel from the North Pole through the center to the South Pole. At the surface of the planet, an object weighs 1 ton.

   a. Fill in the gravitational force on the object when it is half way to the center, then at the center.



   b. Describe the motion you would experience if you fell into the tunnel.

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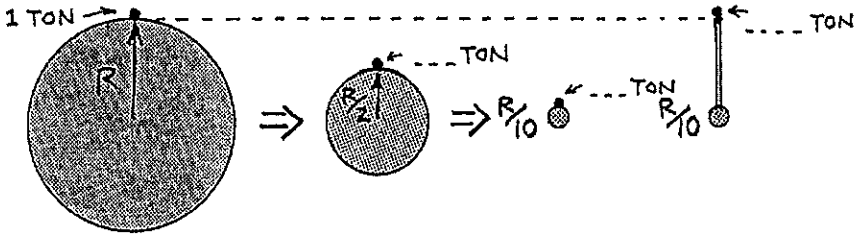
6. Consider an object that weighs 1 ton at the surface of a planet, just before the planet gravitationally collapses. (The mass of the planet remains the same during collapse.)

   a. Fill in the weights of the object on the planet's shrinking surface at the radial values shown.



   b. When the planet has collapsed to one-tenth of its initial radius, a ladder is erected that puts the object as far from its center as the object was originally. Fill in its weight at this position.