Name Period Date

Concept-Development Practice Page 13-1

Force and Weight

1. An apple that has a mass of 0.1 kilogram has the same mass wherever it is. The amount of matter that makes up the apple

   (depends upon) (does not depend upon)

   the location of the apple. It has the same resistance to acceleration wherever it is — its inertia everywhere is

   (the same) (different).

   The weight of the apple is a different story. It may weigh exactly 1 N in San Francisco and slightly less in mile-high Denver, Colorado. On the surface of the moon the apple would weigh 1/6 N, and far out in outer space it may have almost no weight at all. The quantity that doesn't change with location is

   (mass) (weight),

   and the quantity that may change with location is its

   (mass) (weight).

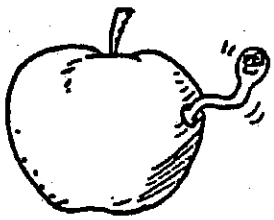
   That's because

   (mass) (weight)

   is the force due to gravity on a body, and this force varies with distance. So weight is the force of gravity between two bodies, usually some small object in contact with the earth. When we refer to the

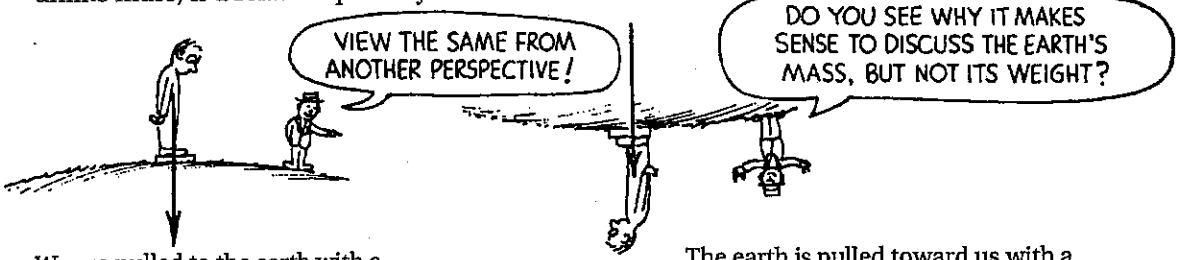
   (mass) (weight)

   of an object we are usually speaking of the gravitational force that attracts it to the earth.



Fill in the blanks:

2. If we stand on a weighing scale and find that we are pulled toward the earth with a force of 500 N, then we weigh _____ N. Strictly speaking, we weigh _____ N relative to the earth. How much does the earth weigh? If we tip the scale upside down and repeat the weighing process, we can say that we and the 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.

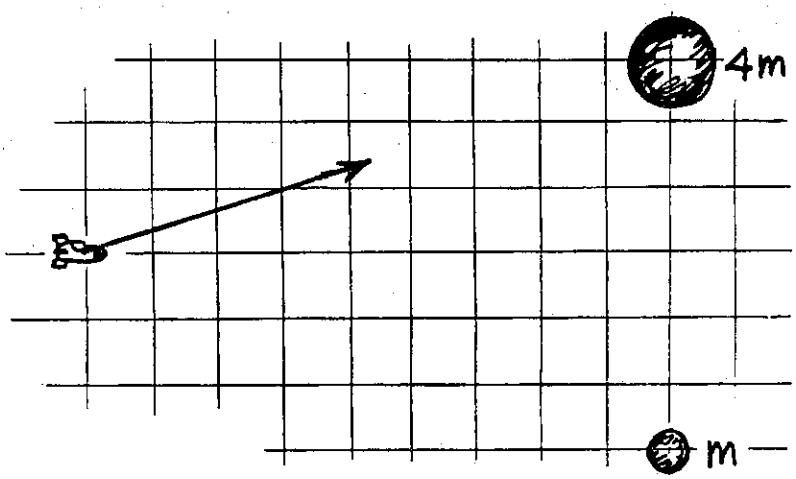


We are pulled to the earth with a force of 500 N, so we weigh 500 N.

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

Conceptual PHYSICS

3. 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.

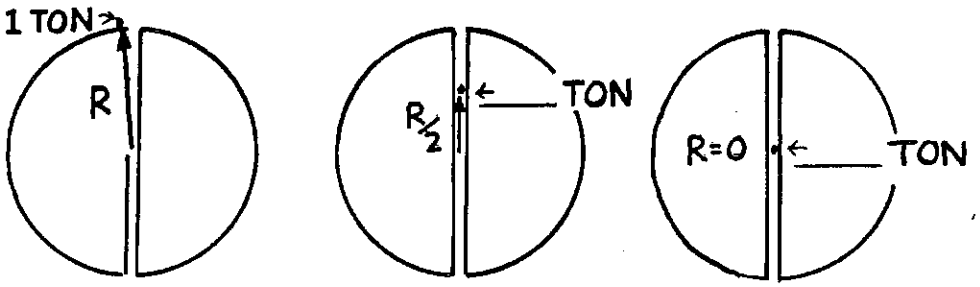


a. Carefully sketch another vector to show the spaceship's attraction to the moon. Then use the parallelogram method of Chapter 6 and sketch the resultant force.

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.

4. 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.

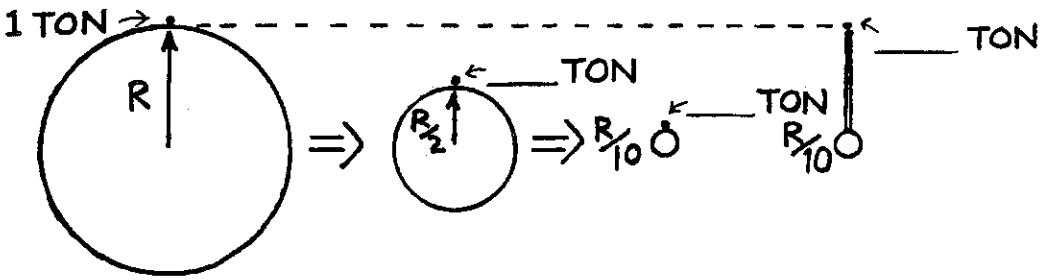


b. Describe the motion you would experience if you fell into the tunnel.

_____

5. 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 1/10 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.