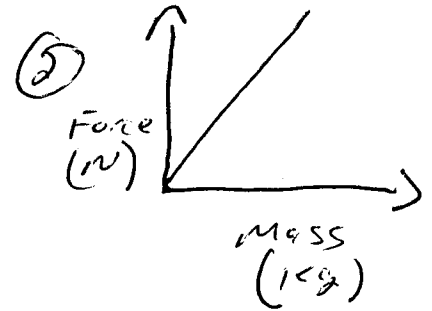


SECTION 2-2

ENRICH

Force, Acceleration, and Proportions

Because mass, force, and acceleration are related by an equation, they are *proportional*. You have learned that an increase in one of the values in a proportional relationship will cause one or more of the other values to increase or to decrease. These relationships between proportional values are often seen in the natural world. For this reason, they have special names.



Directly proportional: When acceleration increases, force also increases. Any two values that increase or decrease in the same way are directly proportional. In this case, to increase the acceleration of an object, you increase the force on it. Figure 1 shows a graph of this relationship.

Inversely proportional: Whenever an increase in one value results in a decrease in another value (and vice versa), the two values are inversely proportional. Figure 2 shows an inverse relationship between acceleration and mass. Note, however, that the mass of any object is generally constant; it cannot be changed by changing its acceleration or the force applied to it. Therefore, as acceleration increases, objects of lesser mass must be used to maintain constant force.

Figure 1

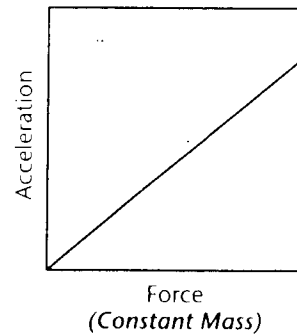
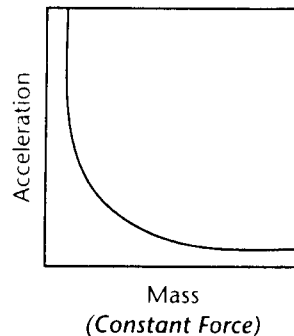


Figure 2



Now explore the relationship between mass and force when acceleration does not change.

If acceleration is:	and mass is:	force must be:
1 m/s ²	0.1 kg	0.1 N
1 m/s ²	0.2 kg	0.2 N
1 m/s ²	0.5 kg	0.5 N
1 m/s ²	0.7 kg	0.7 N
1 m/s ²	1.0 kg	1.0 N

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- Fill in the blank squares in the table above.
- On graph paper, plot each pair of values for mass and force from the table. Let the horizontal axis represent mass, and the vertical axis represent force. Connect the points with lines.
- When acceleration is held constant and objects of different mass are observed, are mass and force directly proportional or inversely proportional? Explain.
- You are in a room with only one light bulb lit. As you approach the light, it appears brighter. As you move away, it appears dimmer. Are the brightness and distance from the bulb directly proportional or inversely proportional?

③ Directly proportional
 Force ↑ objects
 of greater mass must
 be used to
 maintain constant
 acceleration. As
 force ↓ vice versa.

④ Brightness and distance from the bulb are inversely proportional because as one value becomes greater the other becomes less.