Name _____ Class _____ Date _____

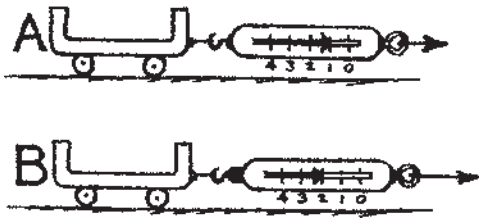
Concept-Development Practice Page **6-3**

Racing Day with a = F/m

In each situation below, Cart A has a mass of **1 kg**. *Circle the correct answers* (A, B, or Same for both).

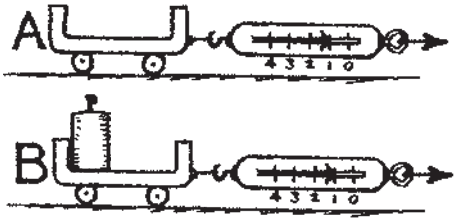
1. Cart A is pulled with a force of **1 N**.
   Cart B also has a mass of **1 kg** and is pulled with a force of **2 N**.
   Which undergoes the greater acceleration?

   (A) (B) (Same for both)



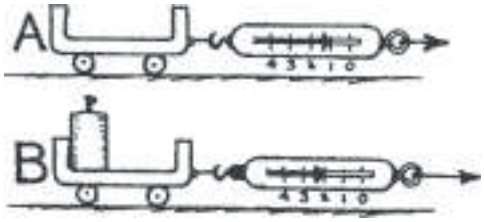
2. Cart A is pulled with a force of **1 N**.
   Cart B has a mass of **2 kg** and is also pulled with a force of **1 N**.
   Which undergoes the greater acceleration?

   (A) (B) (Same for both)



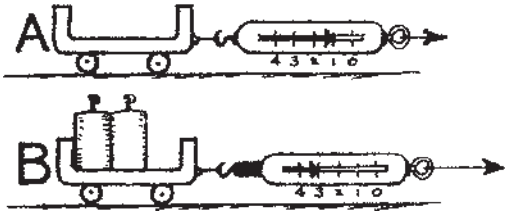
3. Cart A is pulled with a force of **1 N**.
   Cart B has a mass of **2 kg** and is pulled with a force of **2 N**.
   Which undergoes the greater acceleration?

   (A) (B) (Same for both)



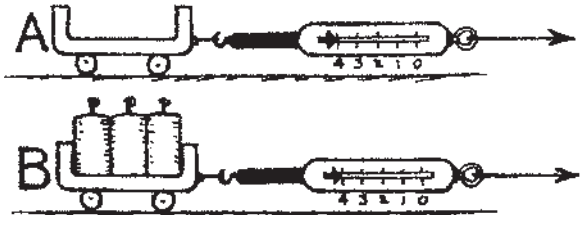
4. Cart A is pulled with a force of **1 N**.
   Cart B has a mass of **3 kg** and is pulled with a force of **3 N**.
   Which undergoes the greater acceleration?

   (A) (B) (Same for both)



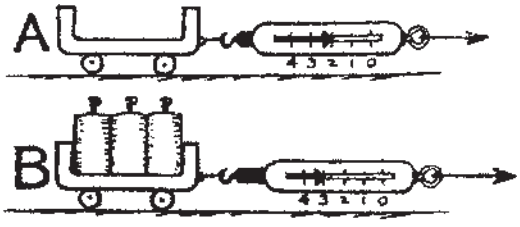
5. This time Cart A is pulled with a force of **4 N**.
   Cart B has a mass of **4 kg** and is pulled with a force of **4 N**.
   Which undergoes the greater acceleration?

   (A) (B) (Same for both)



6. Cart A is pulled with a force of **2 N**.
   Cart B has a mass of **4 kg** and is pulled with a force of **3 N**.
   Which undergoes the greater acceleration?

   (A) (B) (Same for both)



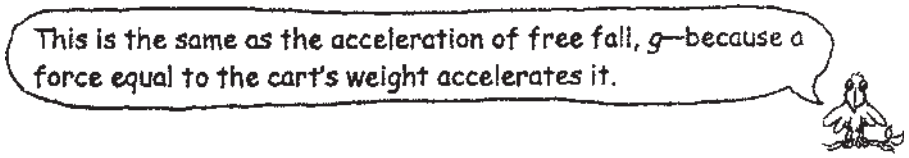
thanx to Dean Baird

CONCEPTUAL PHYSICS

Drop and Pull

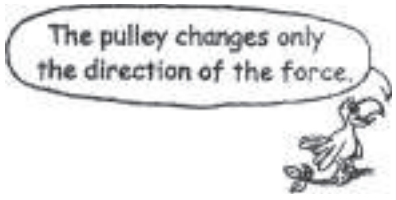
1. Consider a 1-kg cart being pulled by a 10-N applied force. According to Newton's second law, acceleration of the cart is

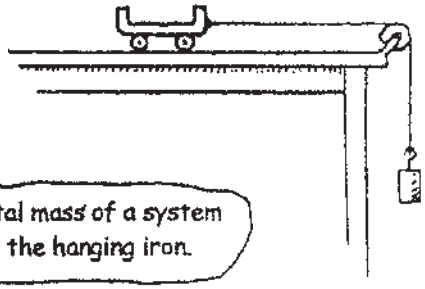
$$a = \frac{F}{m} = \frac{10\ \text{N}}{1\ \text{kg}} = 10\ \text{m/s}^2.$$

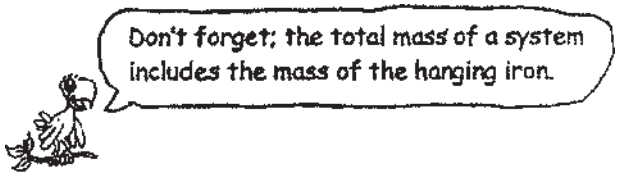


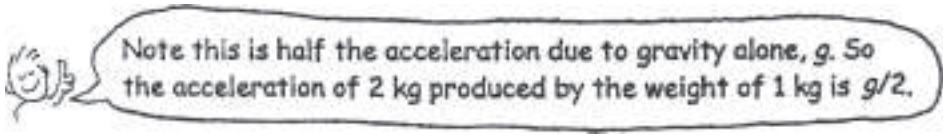
2. Consider the acceleration of the cart when the applied force is due to a 10-N iron weight attached to a string draped over a pulley. Will the cart accelerate as before, at 10 m/s^2? The answer is no, because the mass being accelerated is the mass of the cart *plus* the mass of the piece of iron that pulls it. Both masses accelerate. The mass of the 10-N iron weight is 1 kg—so the total mass being accelerated (cart + iron) is 2 kg. Then,

$$a = \frac{F}{m} = \frac{10\ \text{N}}{2\ \text{kg}} = 5\ \text{m/s}^2.$$



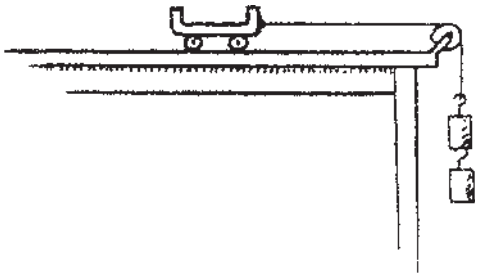


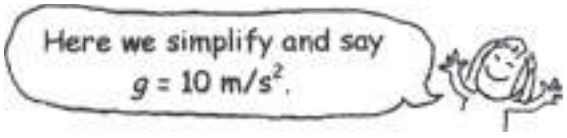




a. Find the acceleration of the 1-kg cart when two identical 10-N weights are attached to the string.

$$a = \frac{F}{m} = \frac{\text{applied force}}{\text{total mass}} = \frac{20\ \text{N}}{3\ \text{kg}} = 6.7\ \text{m/s}^2$$

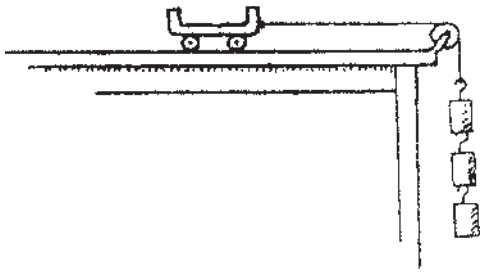




Name _____ Class _____ Date _____

Drop and Pull—continued

b. Find the acceleration of the 1-kg cart when three identical 10-N weights are attached to the string.

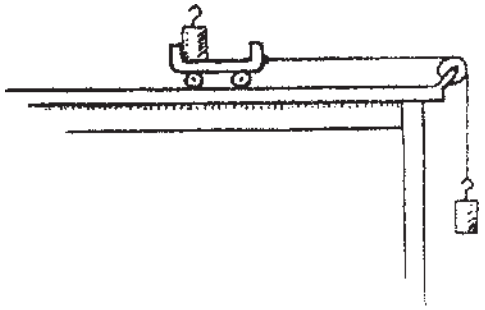


$$a = \frac{F}{m} = \frac{\text{applied force}}{\text{total mass}} = \frac{30\ \text{N}}{4\ \text{kg}} = \underline{\quad 7.5 \quad}\ \text{m/s}^2$$

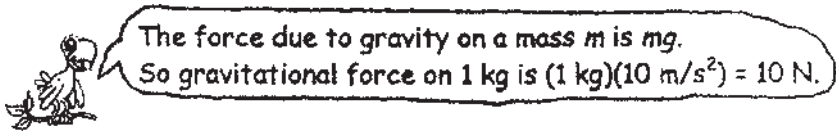
c. Find the acceleration of the 1-kg cart when four identical 10-N weights (not shown) are attached to the string.

$$a = \frac{F}{m} = \frac{\text{applied force}}{\text{total mass}} = \frac{40\ \text{N}}{5\ \text{kg}} = \underline{\quad 8 \quad}\ \text{m/s}^2$$

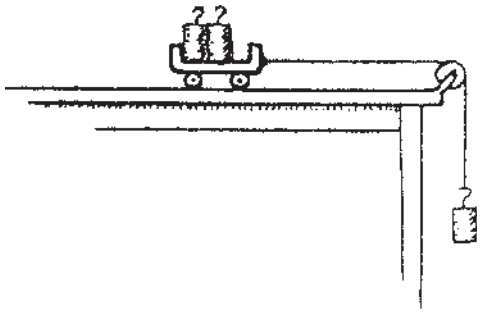
d. This time 1 kg of iron is added to the cart, and only one iron piece dangles from the pulley. Find the acceleration of the cart.



$$a = \frac{F}{m} = \frac{\text{applied force}}{\text{total mass}} = \frac{10\ \text{N}}{3\ \text{kg}} = \underline{\quad 3.3 \quad}\ \text{m/s}^2$$



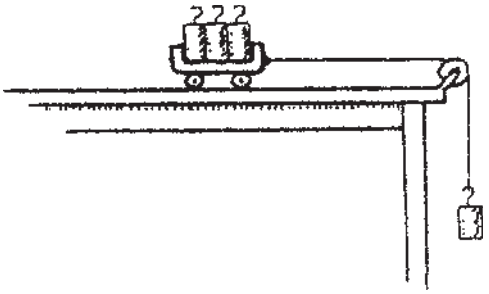
e. Find the acceleration of the cart when it carries two pieces of iron and only one iron piece dangles from the pulley.



$$a = \frac{F}{m} = \frac{\text{applied force}}{\text{total mass}} = \frac{10\ \text{N}}{4\ \text{kg}} = \underline{\quad 2.5 \quad}\ \text{m/s}^2$$

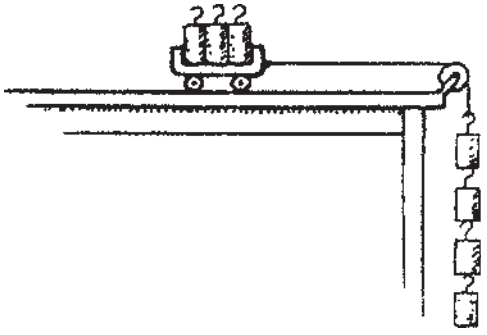
CONCEPTUAL PHYSICS

f. Find the acceleration of the cart when it carries 3 pieces of iron and only one iron piece dangles from the pulley.

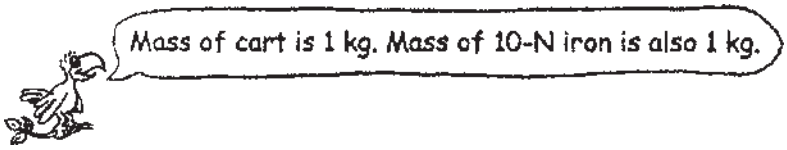


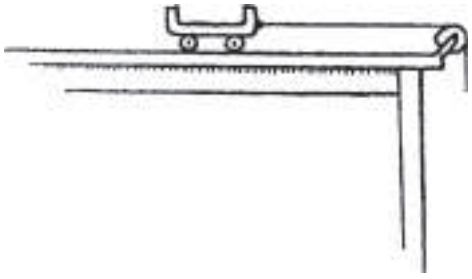
$$a = \frac{F}{m} = \frac{\text{applied force}}{\text{total mass}} = \frac{10\ \text{N}}{5\ \text{kg}} = \underline{\quad 2 \quad}\ \text{m/s}^2$$

g. Find the acceleration of the cart when it carries 3 pieces of iron and 4 pieces of iron dangle from the pulley.



$$a = \frac{F}{m} = \frac{\text{applied force}}{\text{total mass}} = \frac{40\ \text{N}}{8\ \text{kg}} = \underline{\quad 5 \quad}\ \text{m/s}^2$$





h. Draw your own combination of masses and find the acceleration.

$$a = \frac{F}{m} = \frac{\text{applied force}}{\text{total mass}} = \underline{\quad\quad}\ = \underline{\quad\quad}\ \text{m/s}^2$$