

Name: _____ Date: _____

m_r^β **Physics Practice: Acceleration, $F = ma$, and external forces**

Recall that for initial velocity v_i , final velocity v_f , and time Δt , average acceleration is the change in velocity divided by the change in time, or

$$\bar{a} = \frac{v_f - v_i}{\Delta t}.$$

1. A roller coaster car rapidly picks up speed as it rolls down a straight slope. As it starts down the slope, its speed is 4 m/s. But 3 seconds later, at the bottom of the slope, its speed is 22 m/s. What is its average acceleration?

2. What are the external forces acting on the roller coaster? What are the forces exerted by the roller coaster? Illustrate your answer with a sketch, using arrows to indicate the direction of forces, and label each force.

3. If a race car, with an initial velocity of 10 m/s, accelerates at a rate of 8m/s^2 for 3 seconds, what will its final velocity be?

4. What are the external forces exerted on the race car as it accelerates? What forces are exerted by the race car? Sketch and label all forces.

5. At the grocery store, you have a shopping cart with a mass of 18kg. You shove the cart, and it accelerates at 3 m/s^2 . Neglecting friction, how much force are you exerting on the cart?

6. The two masses in the diagram below are being accelerated on a frictionless surface by a force. What is the acceleration of the two masses? What is the external force on the smaller mass? What is the external force on the larger mass?

