

Unit 04 Review (Forces & Newton's Laws)

$$F_{NET} = ma \qquad F_{NET} = \pm F_1 \pm F_2 \pm \dots \qquad F_G = mg \qquad g = 9.8 \text{ m/s}^2$$

1. A penguin by the name of Pickles ($m = 23 \text{ kg}$) is standing on a scale in an elevator on the top floor of a building. The elevator begins to go down towards the ground floor and does so by accelerating downward at 2.7 m/s^2 . What is the normal force?
2. A new sports car ($m = 980 \text{ kg}$) is capable of applying a force of 5500 N with its engine. If the force of friction on the car is 500 N , what is the car's acceleration (assume no air resistance)?
3. You are pushing a large tub of chocolate, which has a mass of 455 kg , with an acceleration of 0.4 m/s^2 . The force of friction is 88 N . What is the force with which you are pushing the tub?
4. A fish ($m = 9.1 \text{ kg}$) is pulled straight up out of the water by a fisherman. What is the acceleration of the fish if the force applied by the fisherman is 120 N ?

Answers: (1) 163.3 N; (2) 5.10 m/s²; (3) 270 N; (4) 3.39 m/s²

Name:

Number:

Date:

5. Definitions:

(a) mechanical equilibrium

(b) inertia

(c) weight

(d) mass

(e) F_G

(f) g

6. List each of Newton's Laws

7. If Newton's third law is correct, then a tiny smart car feels the same force as a huge semi-truck when the two have a head on collision. Why would you rather be riding in the semi-truck?

8. Explain which of Newton's 3 laws best describes the situation.

(a) You are drinking a cup of coffee while driving. When you slam on the brakes, your coffee spills out.

(b) If you are standing in a boat, and step out onto the dock, the boat moves away from you.

(c) As you add more items to a grocery cart, you notice its acceleration decreases.

(d) You are wearing roller blades and stand facing a brick wall. You push forward, against the wall, but end up traveling backwards. Why?