# CHAPTER 3 FREESTANDING PRACTICE QUESTIONS

1. The gravitational force the Sun exerts on the Earth is F. Mars is 1.5 times further from the Sun than the Earth and its mass is $\frac{1}{6}$ of the Earth's mass. What is the gravitational force that the Sun exerts on Mars?

A) $\frac{2}{27}F$

B) $\frac{1}{9}F$

C) $9F$

D) $\frac{27}{2}F$

2. You have four frictionless, massless pulleys, arranged as shown below. If you have enough force to lift a 40 kg object without any pulleys, what is the maximum mass of the couch that can be raised with the pulley system?
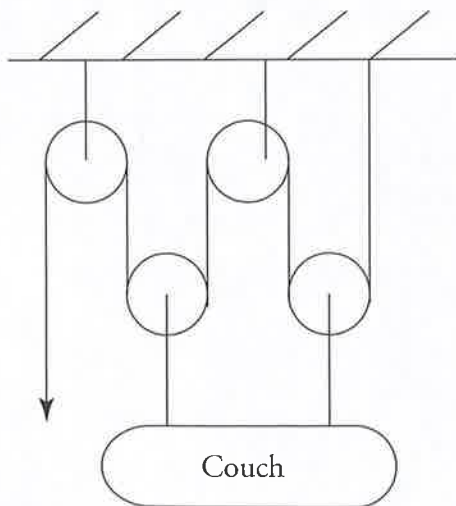
A) 80 kg
B) 120 kg
C) 160 kg
D) 240 kg

3. When an object falls from a very large height, it accelerates towards the Earth because of the force of gravity. Air resistance also acts on the object as it falls, and the air resistance increases as the speed of the object increases. Eventually, the force due to air resistance equals that of gravity and the object reaches terminal velocity. What best describes this situation?

A) The acceleration of the object at terminal velocity is the largest is will ever be.
B) The speed of the object increases until it hits the ground.
C) The speed of the object at terminal velocity is zero.
D) The acceleration of the object at terminal velocity is zero.

4. A box of mass m is sitting on an incline of 45° and it requires an applied force F up the incline to get the box to begin to move. What is the maximum coefficient of static friction?

A) $\left(\frac{\sqrt{2}F}{mg}\right)-1$

B) $\left(\frac{\sqrt{2}F}{mg}\right)$

C) $\left(\frac{\sqrt{2}F}{mg}\right)+1$

D) $\left(\frac{2F}{mg}\right)-1$

5. A 100 g block is sitting at rest on a horizontal table. According to Newton's third law, which of the following indicates the correct action-reaction pair of the two forces?

A) The gravitational force exerted by the table on the block and the normal force exerted by the block on the table
B) The gravitational force exerted by the block on Earth and the normal force exerted by the table on the block
C) The weight of the block and the normal force exerted by the table on the block
D) The weight of the block and the gravitational force exerted by the block on Earth