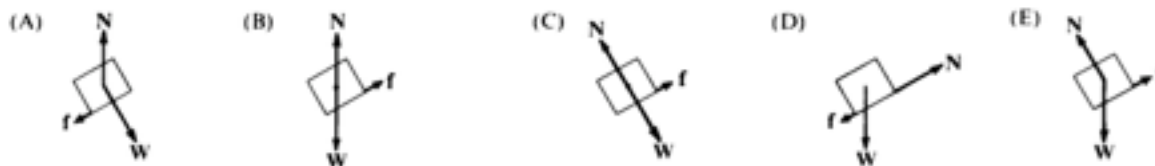1. A 2-kilogram block slides down a 30° incline with an acceleration of 2 meters per second squared.
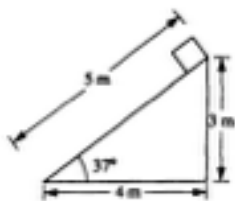

Which of the following diagrams best represents the gravitational force W. the frictional force f, and the normal force N that act on the block?

2. The magnitude of the frictional force along the plane is most nearly
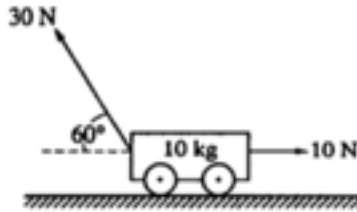   (A) 2.5 N   (B) 5 N   (C) 6 N   (D) 10 N   (E) 16 N

A plane 5 meters in length is inclined at an angle of 37°, as shown above. A block of weight

20 newtons is placed at the top of the plane and allowed to slide down.

3. The mass of the block is most nearly
    (A) 1.0 kg (B) 1.2 kg (C) 1.6 kg (D) 2.0 kg (E) 2.5 kg

4. The magnitude of the normal force exerted on the block by the plane is most nearly (A) 10 N
    (B) 12 N (C) 16 N (D) 20 N (E) 33 N

DON'T PANIC

5. The cart of mass 10 kg shown above moves without frictional loss on a level table. A 10 N force pulls on the cart horizontally to the right. At the same time, a 30 N force at an angle of 60° above the horizontal pulls on the cart to the left. What is the magnitude of the horizontal acceleration of the cart?

(A) 0.5 m/s^2 (B) 1.6 m/s^2 (C) 2.0 m/s^2 (D) 2.5 m/s^2 (E) 2.6 m/s^2

6. Two people are pulling on the ends of a rope. Each person pulls with a force of 100 N. The tension in the rope is:

(A) 0 N (B) 50 N (C) 100 N (D) 141 N (E) 200 N

7. One end of a massless rope is attached to a mass m; the other end is attached to a mass of 1.00 kg. The rope is hung over a massless frictionless pulley as shown in the accompanying figure. Mass m accelerates downward at 5.0 m/s^2. What is m?

(A) 3.0 kg (B) 2.0 kg (C) 1.5 kg D. 1.0 kg (E) 0.5 kg

8. A string with masses of 1.5kg and 3.0kg on its ends is hung over a frictionless, massless pulley as shown to the right. What is the approximate magnitude of the acceleration of the masses?

(A) 1.5 m/s^2 (B) 3.0 m/s^2 (C) 3.3 m/s^2 (D) 6.7 m/s^2 (E) 10 m/s^2

9. Two blocks of mass 1.0 kg and 3.0 kg are connected by a string which has a tension of 2.0 N. A force F acts in the direction shown to the right.
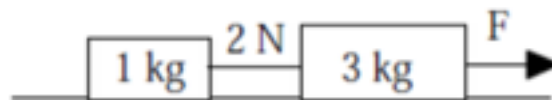

Assuming friction is negligible, what is the value of F?
(A) 1.0 N (B) 2.0 N (C) 4.0 N (D) 6.0 N (E) 8.0 N

10. A student weighing 500N stands on a bathroom scale in the school's elevator. When the scale reads 520N, the elevator must be :
(A) accelerating upward. (B) accelerating downward. (C) moving upward at a constant speed. (D) moving downward at a constant speed. (E) at rest.

DON'T PANIC

11. A rope of negligible mass passes over a pulley of negligible
mass attached to the ceiling, as shown above. One end of
the rope is held by Student A of mass 70 kg, who is at rest
on the floor. The opposite end of the rope is held by Student
B of mass 60 kg, who is suspended at rest above the floor.
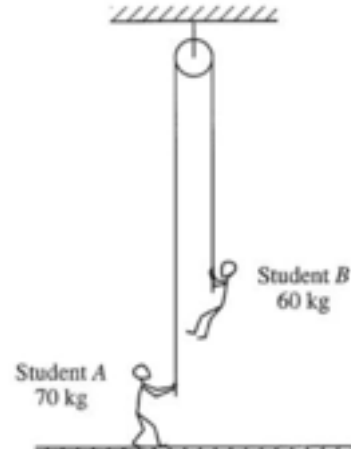
a) Draw and label 2 free-body diagrams showing the
forces on Student A and on Student B.

b) Calculate the magnitude of the force exerted by the
floor on Student A.

Student B
60 kg

Student A
70 kg

12. Two boxes are attached by a massless rope. On box rests
on the inclined surface of a ramp at 35°. The other box
hangs freely over the other side of the ramp.
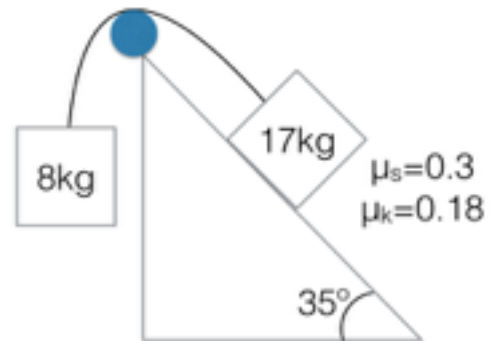
a) Draw and label 2 free body diagrams, one for each box.

b) Determine the acceleration (if any) of the system.

c) Determine the tension in the rope that connects the
boxes.

8kg

17kg
$\mu_s = 0.3$
$\mu_k = 0.18$

35°

13. Three boxes rest on a frictionless table like those in the
picture below. Determine the tension in each of the ropes connecting the boxes.

40N ← 5kg — 10kg — 15kg

DON'T PANIC