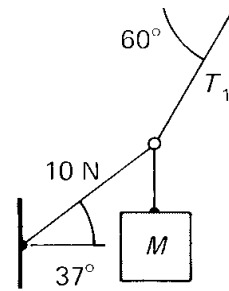# REVIEW PROBLEMS – FORCES I

PROBLEM 1
A hanging mass of mass M is attached to two ropes as shown in the figure to the right. Determine the unknown mass.

PROBLEM 2
The system to the right is held in place by a student and then released. (M_1 = 10 kg, M_2 = 8 kg, M_3 = 40 kg.) Both M_1 and M_2 experience a frictional force of 14 N as they slide across the table.
   A. What is the acceleration of M_2?
   B. Determine the tension in both ropes that act on M_2.
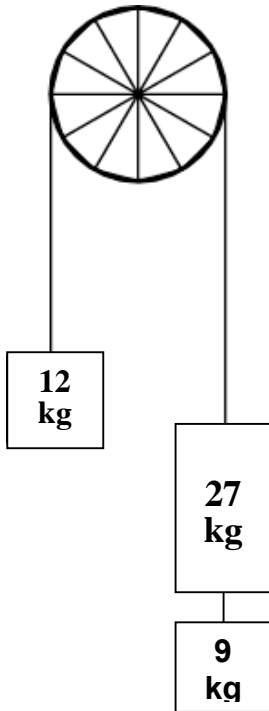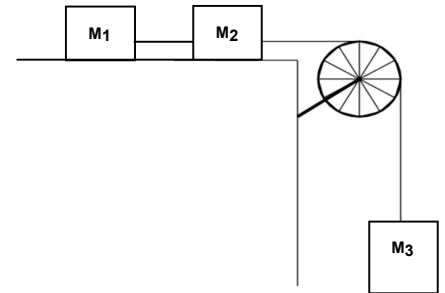
PROBLEM 3
   A. Determine the acceleration of the 12-kg mass.
   B. Find the tension in both ropes that act on the 27 kg mass.

PROBLEM 4
A woman drags a 50-kg box on the floor with a rope at an angle of 40° above the horizontal. The tension in the rope is 220 N. The box accelerates at 1.5 m/s² to the right. Draw a FBD for the box.
   A. What is the normal force acting on the box?
   B. What is the force of friction acting on the box?

PROBLEM 5
Determine what a scale would record for a 60-kg passenger in an elevator if the elevator was doing the following:
   *For simplicity, let's say every time the elevator is accelerating, the magnitude of acceleration is 3 m/s².
   A. Moving up at increasing speed
   B. Moving up at constant speed
   C. Moving up at decreasing speed
   D. Moving down at increasing speed
   E. Moving down at constant speed
   F. Moving down at decreasing speed

PROBLEM 6

One 3 kg paint bucket is hanging by a massless cord from another 3 kg paint bucket, also hanging by a massless cord.

    A. If the buckers are at rest, what is the tension in each cord?

    B. If the buckets are pulled upward with an acceleration of 1.6 m/s/s by the upper cord, calculate the tension in each cord.

```
        3
        kg


        3
        kg
```
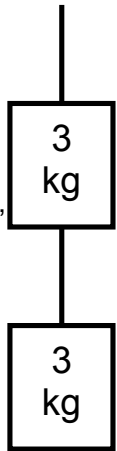
PROBLEM 7

A landing craft approaches the surface of Callisto, one of the moons of Jupiter. If an upward thrust of 3260 N is supplied by the rocket engine, the craft descends with a constant speed. Callisto has no atmosphere. If the upward thrust is 2200 N, the craft accelerates downward at 0.39 m/s/s.

    A. What is the weight of the landing craft in the vicinity of Callisto's surface?

    B. What is the mass of the craft?

    C. What is the acceleration due to gravity near the surface of Callisto?

PROBLEM 8

Three blocks are in contact with each other on a frictionless horizontal surface. A horizontal force F = 24 N is applied as shown.

```
 24 N
  ──────►  1 kg  2 kg  3 kg
```
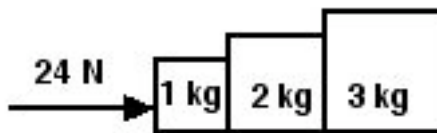
    A. What is the acceleration of the 2 kg block?

    B. What is the contact force between the 1 kg and 2 kg mass?

    C. What is the contact force between the 2 kg and 3 kg mass?

PROBLEM 9

A 2-kg object's acceleration as a function of time is given by the following function:

$$a(t) = 4t - 6$$

At time t = 0, the object has a velocity of 5 m/s. What is the net force acting on the object when its velocity = 13 m/s?

PROBLEM 10

    A. In Problem 2, how far does M_3 fall during the first 2 seconds?

    B. In Problem 3, what is the speed of the 12 kg mass after it rises 4 m?

ANSWERS

1. 0.8 kg **2.** 6.3 m/s^2 right, 77 N left, 141 N right **3.** 4.9 m/s^2 up, 176 N up, 44 N down
4. 349 N up, 94 N left **5.** A&F: 768 N, B&E: 588 N, C&D: 408 N **6.** 58.8 N, 29.4 N, 68.4 N, 34.2 N
7. 3260 N, 2718 kg, -1.2 m/s^2 **8.** 4 m/s^2, 20 N, 12 N **9.** 20 N **10.** 12.6 m, 6.3 m/s