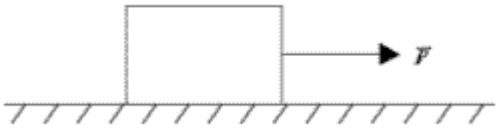
1. A mass m is traveling at an initial speed $v_0 = 25.0$ m/s. It is brought to rest in a distance of 62.5 m by a force of 15.0 N. The mass is
   A) 37.5 kg
   B) 3.00 kg
   C) 1.50 kg
   D) 6.00 kg
   E) 3.75 kg

2. A fat cat, ever conscious of its weight, walks into an elevator and steps on a scale. The elevator begins to accelerate downward. While the elevator is accelerating, the scale reads
   A) more than when the elevator is stationary.
   B) more than if the elevator were accelerating upward.
   C) less than when the elevator is stationary.
   D) a negative value.
   E) Insufficient information is given to answer correctly.

3. Spiral springs A and B are identical. When a weight of 12 N is fastened to the hook on A, the hook is lowered 2 cm. If a weight of 18 N is fastened to the hook on B, that hook is lowered
   A) 8 cm
   B) 6 cm
   C) 3 cm
   D) 4 cm
   E) 5 cm

4. A 50-kg block rests on a horizontal surface. The coefficient of static friction $\mu_s = 0.50$. The coefficient of kinetic friction $\mu_k = 0.35$. A force P of 250 N is applied as shown.



   A) The block remains at rest.
   B) The block moves and continues to move at constant velocity.
   C) The block accelerates to the right.
   D) The block does not move until P is increased to greater than 490 N.
   E) No conclusions can be drawn concerning the movement of the block from the information given.

5. A particle is moving uniformly in a circle with radius 50 cm. The linear speed of the particle is 60 cm/s. The acceleration of the particle has a magnitude of
   A) zero
   B) 36 m/s^2
   C) 1.8×10^5 cm/s^2
   D) 72 cm/s^2
   E) 3.6 m/s^2

6. The work expended to accelerate a car from 0 to 30 m/s
   A) is more than that required to accelerate it from 30 m/s to 60 m/s.
   B) is equal to that required to accelerate it from 30 m/s to 60 m/s.
   C) is less than that required to accelerate it from 30 m/s to 60 m/s.
   D) can be any of the preceding, depending on the time taken.
   E) is described by none of these statements.

7. A 5-kg object slides down a frictionless surface inclined at an angle of 30º from the horizontal. The total distance moved by the object along the plane is 10 meters. The work done on the object by the normal force of the surface is
   A) zero
   B) 0.50 kJ
   C) 0.43 kJ
   D) 0.58 kJ
   E) 0.25 kJ

8. A 5-kg object undergoes a displacement $\vec{\Delta s} = 2\hat{i} + 3\hat{j}$. During the displacement, a constant force $\vec{F} = 4\hat{i} - 2\hat{j}$ acts on the object. All values are given in SI units. The work done by the force $\vec{F}$ on this object is
   A) 8 J
   B) –6 J
   C) 2 J
   D) 14 J
   E) –2 J

9. Two unequal masses hang from either end of a massless cord that passes over a frictionless pulley. Which of the following is true about the gravitational potential energy (U) and the kinetic energy of the system (K) after the masses are released from rest?
   A) $\Delta U < 0$ and $\Delta K > 0$
   B) $\Delta U = 0$ and $\Delta K > 0$
   C) $\Delta U < 0$ and $\Delta K = 0$
   D) $\Delta U = 0$ and $\Delta K = 0$
   E) $\Delta U > 0$ and $\Delta K < 0$

10. A block with a mass $M = 4.85$ kg is resting on a slide that has a curved surface. There is no friction. The speed of the block after it has slid along the slide sufficiently far for its vertical drop to be 19.6 m is
    A) 19.6 m/s
    B) 384 m/s
    C) 73 m/s
    D) 43.2 m/s
    E) The problem cannot be solved because the shape of the curved slide is not given.

11. **Show all work :** A ball of mass 2.0 kg is acted on by two forces, $\vec{F}_1 = 3.0N\,\hat{i} + 4.0N\,\hat{j}$ and $\vec{F}_2 = -5.0N\,\hat{i} + 6.0N\,\hat{j}$. At t = 0 s, the ball is at rest at the origin.

a)The net force (in vector notation) on the ball is

b) The vector acceleration is

c) The position vector of the ball at t=2sec. is

Answer Key

1. B $0^2 = 25^2 + 2\,(-15/m)62.5$ $\quad m = 2\,(15)62.5/25^2 = 3$ kg
2. C less than when the elevator is stationary
3. C $k = 12N/2cm = 6N/cm$ $\quad \Delta x = 18N/6n/cm = 3cm$
4. C $f_{max} = 0.50 \cdot 50kg \cdot 9.81m/s^2 = 245.25N$: less than P, thus accelerates
5. D $(60cm/s)^2/50cm = 72cm/s^2$
6. C $K_1 = \frac{1}{2} \cdot m(30)^2 = 450m$ $\quad K_2 = \frac{1}{2} \cdot m[60^2 - 30^2] = 1350m$ $\quad$ is less than
7. A zero: force is perpendicular to displacement
8. C $\mathbf{F} \cdot \Delta\mathbf{s} = 2(4) + 3(-2) = 2$ J
9. A $\Delta U + \Delta K = 0$, but $\Delta K > 0$ thus $\Delta U < 0$
10. A $m(9.81m/s^2)(19.6m) = \frac{1}{2} \cdot mv^2$ $\quad v = \sqrt{[2(9.81m/s^2)(19.6m)]} = 19.6m/s$
11. a) $\mathbf{F} = \mathbf{F_1} + \mathbf{F_2} = (3\mathbf{i} + 4\mathbf{j})N + (-5\mathbf{i} + 6\mathbf{j})N = (-2\mathbf{i} + 10\mathbf{j})N$
    b) $\mathbf{a} = \mathbf{F}/m = (-2\mathbf{i} + 10\mathbf{j})N/2kg = (-\mathbf{i} + 5\mathbf{j})m/s^2$
    c) $\mathbf{r} = \frac{1}{2} \cdot \mathbf{a}t^2 = \frac{1}{2}(-\mathbf{i} + 5\mathbf{j})m/s^2 \cdot 2^2 = (-2\mathbf{i} + 10\mathbf{j})m$