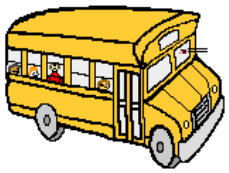
Practice Exam

1. When a certain force is applied to an object with a mass of 2 kg, its acceleration is 10.0 m/s^2. When the same force is applied to a different object, its acceleration is 4.0 m/s^2. The mass of second object is:

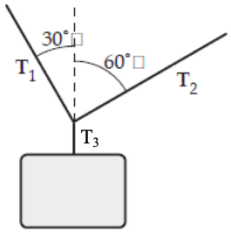
A) 10.0 kg
B) 8.0 kg
C) 5.0 kg
D) 2.5 kg
E) 1.25 kg

2. If a firefly collides with the windshield of a fast-moving bus, which statement is correct?



A) The firefly experiences an impact force with a larger magnitude
B) The bus experiences an impact force with a larger magnitude
C) The firefly and bus experience forces with same direction
D) The firefly and bus experience forces with same magnitude
E) None of the above

3. A stationary box is suspended by joined, massless cables that exert tensions of **magnitude** T_1, T_2, and T_3, as seen in the figure below. Which statement is correct?



A) $T_1 = T_2$
B) $T_1 > T_2$
C) $T_1 < T_2$
D) $T_3 = T_1 + T_2$
E) We need the mass of the box to determine the correct answer

4. The tension in a string from which a 4.0-kg object is suspended in an elevator is equal to 44 N. What is the acceleration of the elevator?

A) 1.2 m/s^2 upward
B) 1.2 m/s^2 downward
C) 4.8 m/s^2 upward
D) 4.8 m/s^2 downward
E) 2.4 m/s^2 downward

5. A pump is required to lift a mass of 850 kg of water per minute from a well of depth 13.8 m and eject it with a speed of 17.2 m/s. What must be the power output of the pump?

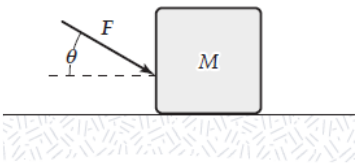
A) 5056.6 W
B) 4016.7 W
C) 3800.8 W
D) 2534.9 W
E) 1200 W

6. In a game of shuffleboard (played on a horizontal surface), a puck is given an initial speed of 6.0 m/s. It slides a distance of 9.0 m before coming to rest. What is the coefficient of kinetic friction between the puck and the surface?

A) 0.20
B) 0.18
C) 0.15
D) 0.13
E) 0.27

7. A block is pushed across a horizontal surface by the force F with **constant velocity**. F = 20 N, θ = 30°, and M = 10 kg. What is the magnitude of the normal force on the block?

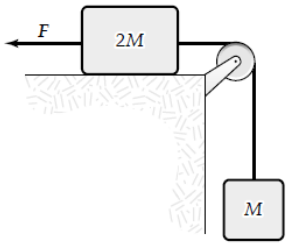
A) 20 N
B) 88 N
C) 94 N
D) 98 N
E) 108 N



8. If the coefficient of static friction between the tires and road on a rainy day is 0.5, what is the fastest speed at which a car can make a turn with a radius of 80.0 meters? The road is flat.

A) 7 m/s
B) 11 m/s
C) 14 m/s
D) 20 m/s
E) 25 m/s

9. F = 40 N and M = 1.5 kg, what is the tension in the string connecting M and $2M$? Assume that all surfaces are frictionless.



A) 13 N
B) 23 N
C) 36 N
D) 15 N
E) 28 N

10. A constant force of 12 N in the positive x direction acts on a 4.0-kg object as it moves from the origin to the point $(6\hat{i} - 8\hat{j})$ m. How much work is done by the given force during this displacement?

A) +60 J
B) +84 J
C) +72 J
D) +48 J
E) +57 J

11. A force in the + x-direction with magnitude$F(x) = 18.0N - (0.530N/m)x$ is applied to a 9.00-kg box that is sitting on the horizontal, frictionless surface of a frozen lake. $F(x)$ is the only horizontal force on the box. If the box is initially at rest at $x = 0$, use the work-energy theorem to determine its speed after it has travelled 14.0 m?

A) 9.58 m/s
B) 8.70 m/s
C) 7.12 m/s
D) 6.67 m/s
E) 5.32 m/s

12. A baseball is thrown from the roof of a 22 m tall building with an initial velocity of magnitude 12 m/s and directed at an angle of 60° above the horizontal. What is the speed of the baseball just before it strikes the ground. Use energy conservation and ignore air resistance.

A) 24 m/s
B) 20 m/s
C) 14 m/s
D) 10 m/s
E) 6 m/s

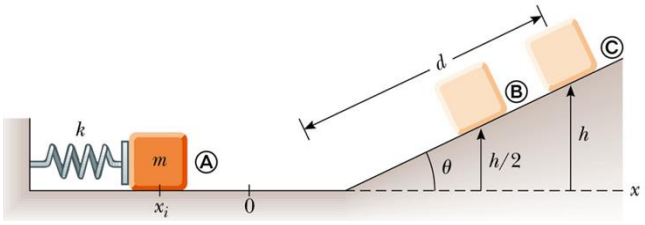
13. In a given displacement of a particle, its kinetic energy increases by 25 J while its potential energy decreases by 10 J. Determine the work of the nonconservative forces acting on the particle during this displacement.

A) -15 J
B) +35 J
C) +55 J
D) -35 J
E) +15 J

14. A 1.0 kg box moving at 3.0 m/s on a horizontal, frictionless surface runs into one end of a light horizontal spring with a spring constant of 144 N/m that is fixed at the other end. What is the maximum compression of the spring?

A) 6 cm
B) 9 m
C) 25 cm
D) 10 cm
E) 14 cm

For the following 2 problems use the right figure: a 0.5-kg block rests on a horizontal, frictionless surface. The block is pressed back against a spring with a constant of $k = 625$ N/m, compressing the spring by 10 cm to point A. Then the block is released.



15. Find the maximum distance d the block travels up the frictionless incline if $\theta = 30°$.

A) 0.21 m
B) 0.32 m
C) 0.42 m
D) 0.64 m
E) 1.28 m

16. How fast is the block going when it travels halfway to its maximum height $h/2$?

A) 1.2 m/s
B) 1.7 m/s
C) 2.5 m/s
D) 4.3 m/s
E) 5.0 m/s