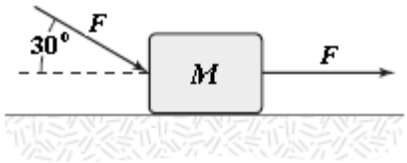
Webreview 4.3 - practice test. Forces (again)

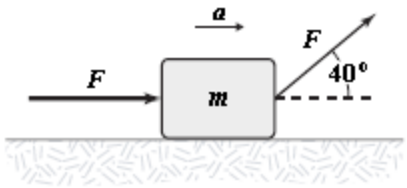
Multiple Choice

Identify the choice that best completes the statement or answers the question.

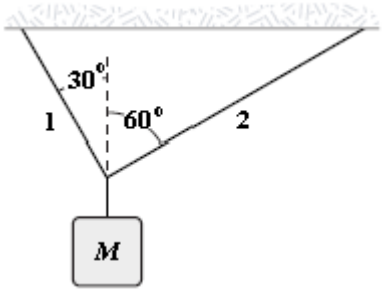
1. A 5.0-kg mass is suspended by a string from the ceiling of an elevator that is moving upward with a speed which is decreasing at a constant rate of 2.0 m/s in each second. What is the tension in the string supporting the mass?
   a. 49 N
   b. 39 N
   c. 59 N
   d. 10 N
   e. 42 N
2. The horizontal surface on which the block slides is frictionless. If F = 20 N and M = 5.0 kg, what is the magnitude of the resulting acceleration of the block?



   a. 5.3 m/s^2
   b. 6.2 m/s^2
   c. 7.5 m/s^2
   d. 4.7 m/s^2
   e. 3.2 m/s^2
3. If F = 4.0 N and m = 2.0 kg, what is the magnitude a of the acceleration for the block shown below? The surface is frictionless.



   a. 5.3 m/s^2
   b. 4.4 m/s^2
   c. 3.5 m/s^2
   d. 6.2 m/s^2
   e. 8.4 m/s^2
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. 11 m/s^2 upward
   b. 1.2 m/s^2 upward
   c. 1.2 m/s^2 downward
   d. 10 m/s^2 upward
   e. 2.4 m/s^2 downward
5. If M = 6.0 kg, what is the tension in string 1?



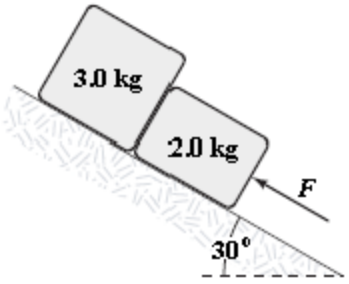
   a. 39 N
   b. 34 N
   c. 29 N
   d. 44 N
   e. 51 N
6. A 2.0-kg block slides on a frictionless 15° inclined plane. A force acting parallel to the incline is applied to the block. The acceleration of the block is 1.5 m/s^2 down the incline. What is the applied force?
   a. 8.1 N down the incline
   b. 3.0 N down the incline
   c. 2.1 N up the incline
   d. 3.0 N up the incline
   e. 8.1 N up the incline

7. A book is placed on a chair. Then a videocassette is placed on the book. The floor exerts a normal force
   a. on all three.
   b. only on the book.
   c. only on the chair.
   d. upwards on the chair and downwards on the book.
   e. only on the objects that you have defined to be part of the system.

8. The first of two identical boxes of mass m is sitting on level ground. The second box is sitting on a ramp that makes a 20° angle with the ground. The normal force of the level ground on the first box is $\mathbf{N}_L$; the normal force of the ramp on the second box is $\mathbf{N}_R$. Which statement is correct?
   a. $N_R = N_L = mg$.
   b. $N_L = mg$; $N_R = mg \sin 20°$.
   c. $N_L = mg$; $N_R = mg \cos 20°$.
   d. $N_L = mg$; $N_R = -mg \cos 20°$.
   e. $N_R = -N_L = -mg$.

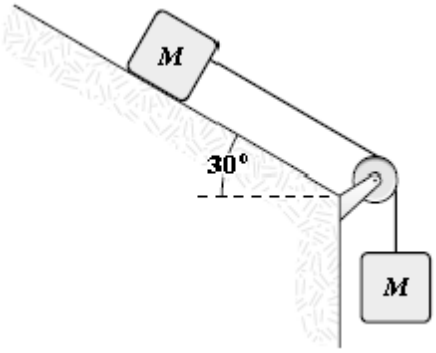
9. Two people, each of 70 kg mass, are riding in an elevator. One is standing on the floor. The other is hanging on a rope suspended from the ceiling. Compare the acceleration $\vec{\mathbf{a}}_F$ of the first person to the acceleration $\vec{\mathbf{a}}_R$ of the second person. Which statement is correct?
   a. They are equal and opposite in direction.
   b. They are equal and have the same direction.
   c. The acceleration $\vec{\mathbf{a}}_R$ is greater than $\vec{\mathbf{a}}_F$, but they have the same direction.
   d. The acceleration $\vec{\mathbf{a}}_R$ is greater than $\vec{\mathbf{a}}_F$, but they have opposite directions.
   e. The acceleration $\vec{\mathbf{a}}_R$ is less than $\vec{\mathbf{a}}_F$, but they have the same direction.

10. The surface of the inclined plane shown is frictionless. If F = 30 N, what is the magnitude of the force exerted on the 3.0-kg block by the 2.0-kg block?



   a. 18 N
   b. 27 N
   c. 24 N
   d. 21 N
   e. 15 N

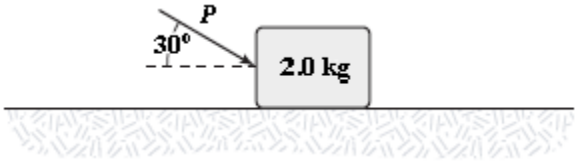
11. If M = 2.2 kg, what is the tension in the connecting string? The pulley and all surfaces are frictionless.



   a. 6.4 N
   b. 5.9 N
   c. 5.4 N
   d. 6.9 N
   e. 8.3 N

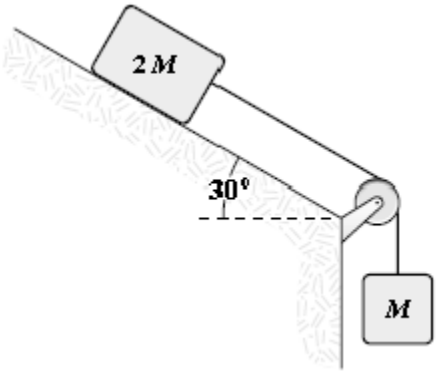
12. A 4.0-kg block is pushed up a 36° incline by a force of magnitude P applied parallel to the incline. When P is 31 N, it is observed that the block moves up the incline with a constant speed. What value of P would be required to lower the block down the incline at a constant speed?
    a. 27 N
    b. 15 N
    c. 13 N
    d. 17 N
    e. 19 N

13. A 2.0-kg block slides on a rough horizontal surface. A force (P = 6.0 N) is applied to the block as shown. The magnitude of the block's acceleration is 1.2 m/s^2. What is the magnitude of the force of friction acting on the block?



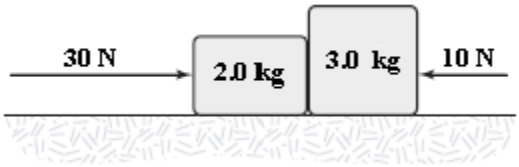
    a. 2.0 N
    b. 1.4 N
    c. 1.6 N
    d. 2.8 N
    e. 3.4 N

14. In the figure shown, the coefficient of kinetic friction between the block and the incline is 0.29. What is the magnitude of the acceleration of the suspended block as it falls? Disregard any pulley mass or friction in the pulley.



    a. 5.4 m/s^2
    b. 5.2 m/s^2
    c. 4.9 m/s^2
    d. 5.6 m/s^2
    e. 7.9 m/s^2

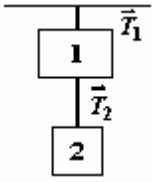
15. Two blocks in contact with each other are pushed to the right across a rough horizontal surface by the two forces shown. If the coefficient of kinetic friction between each of the blocks and the surface is 0.30, determine the magnitude of the force exerted on the 2.0-kg block by the 3.0-kg block.



    a. 15 N
    b. 25 N
    c. 11 N
    d. 22 N
    e. 33 N

16. Two experiments are performed. In (A), an 18.0 N force pushes horizontally on a 2.00 kg block that then pushes on a 4.00 kg block. In (B), an 18.0 N force pushes on a 4.00 kg block that then pushes on a 2.00 kg block. Which statement is correct?
    a. The acceleration is 3.00 m/s^2 in both (A) and (B).
    b. The acceleration is 4.50 m/s^2 in both (A) and (B).
    c. The acceleration is 6.00 m/s^2 in both (A) and (B).
    d. The acceleration is 9.00 m/s^2 in both (A) and (B).
    e. The 2.00 kg block has a 9.00 m/s^2 acceleration. The 4.00 kg block has a 4.50 m/s^2 acceleration.

Exhibit 5-2
A 4.00 kg block is suspended from the roof of an elevator. A 2.00 kg block is suspended from the 4.00 kg block. The tensions in strings 1 and 2 are labeled $\vec{T}_1$ and $\vec{T}_2$.



Use this exhibit to answer the following question(s).

17. Refer to Exhibit 5-2. When the elevator accelerates upwards with an acceleration of 2.20 m/s^2, the magnitudes of $\vec{T}_1$ and $\vec{T}_2$ are
    a. 30.4 N; 15.2 N.
    b. 39.2 N; 19.6 N.
    c. 45.6 N; 15.2 N.
    d. 48.0 N; 24.0 N.
    e. 72.0 N; 24.0 N.

18. Refer to Exhibit 5-2. When the elevator accelerates downwards with an acceleration of 2.20 m/s^2, the magnitudes of $\vec{T}_1$ and $\vec{T}_2$ are
    a. 30.4 N; 15.2 N.
    b. 39.2 N; 19.6 N.
    c. 45.6 N; 15.2 N.
    d. 48.0 N; 24.0 N.
    e. 72.0 N; 24.0 N.

Webreview 4.3 - practice test. Forces (again)
Answer Section

MULTIPLE CHOICE

1. B
2. C
3. C
4. B
5. E
6. C
7. C
8. C
9. B
10. A
11. C
12. B
13. D
14. C
15. D
16. A
17. E
18. C