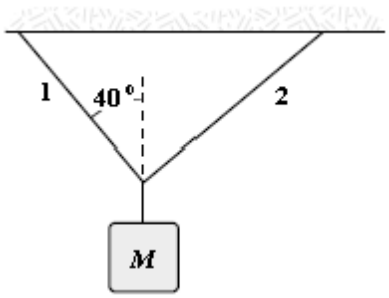
Webreview - 4.2 practice test. Forces

Multiple Choice

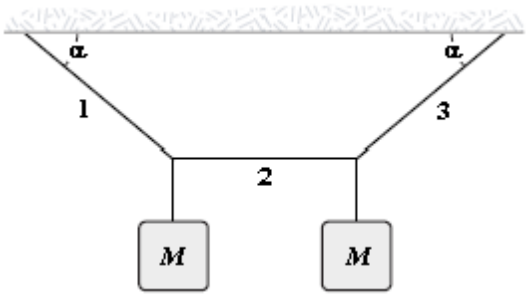
Identify the choice that best completes the statement or answers the question.

1. In the figure, if the tension in string 1 is 34 N and the tension in string 2 is 24 N, what is the mass of the object shown?



   a. 7.3 kg
   b. 5.5 kg
   c. 1.8 kg
   d. 3.7 kg
   e. 4.5 kg

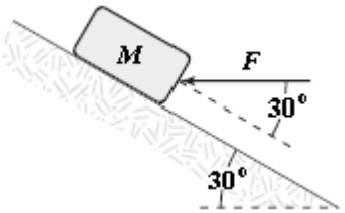
2. If $\alpha = 40°$ and the tension in string 2 is 30 N, determine *M*.



   a. 3.4 kg
   b. 3.6 kg
   c. 2.6 kg
   d. 4.9 kg
   e. 7.5 kg

3. The only two forces acting on a body have magnitudes of 20 N and 35 N and directions that differ by 80°. The resulting acceleration has a magnitude of 20 m/s^2. What is the mass of the body?
   a. 2.4 kg
   b. 2.2 kg
   c. 2.7 kg
   d. 3.1 kg
   e. 1.5 kg

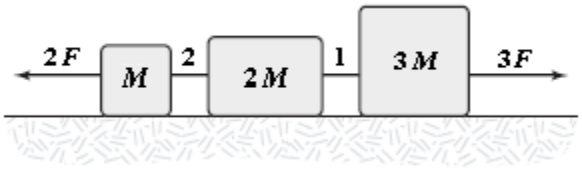
4. A block is pushed up a frictionless 30° incline by an applied force as shown. If $F = 25$ N and $M = 3.0$ kg, what is the magnitude of the resulting acceleration of the block?



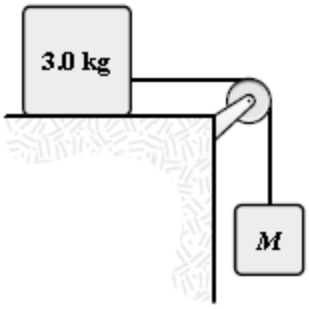
   a. 2.3 m/s^2
   b. 4.6 m/s^2
   c. 3.5 m/s^2
   d. 2.9 m/s^2
   e. 5.1 m/s^2

5. A 5.0-kg mass is attached to the ceiling of an elevator by a rope whose mass is negligible. What force does the mass exert on the rope when the elevator has an acceleration of 4.0 m/s^2 upward?
   a. 69 N downward
   b. 29 N downward
   c. 49 N downward
   d. 20 N downward
   e. 19 N downward

6. A 2.0-kg block slides on a frictionless 25° inclined plane. A force of 4.6 N acting parallel to the incline and up the incline is applied to the block. What is the acceleration of the block?
   a. 1.8 m/s^2 up the incline
   b. 2.3 m/s^2 up the incline
   c. 6.6 m/s^2 down the incline
   d. 1.8 m/s^2 down the incline
   e. 2.3 m/s^2 down the incline
7. Only two forces act on a 3.0-kg mass. One of the forces is 9.0 N east, and the other is 8.0 N in the direction of 62° north of west. What is the magnitude of the acceleration of the mass?
   a. 2.0 m/s^2
   b. 2.4 m/s^2
   c. 3.3 m/s^2
   d. 2.9 m/s^2
   e. 5.7 m/s^2
8. The vector sum of three co-planar forces
   a. must be zero.
   b. must be perpendicular to one of the three.
   c. must be parallel to one of the three.
   d. must be perpendicular to the plane.
   e. may have any direction in the plane.
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 force $\vec{\mathbf{F}}_F$ the floor exerts on the first person to the force $\vec{\mathbf{F}}_R$ the rope exerts on 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. $\vec{\mathbf{F}}_R$ is greater than $\vec{\mathbf{F}}_F$, but they have the same direction.
   d. $\vec{\mathbf{F}}_R$ is greater than $\vec{\mathbf{F}}_F$, but they have opposite directions.
   e. $\vec{\mathbf{F}}_R$ is less than $\vec{\mathbf{F}}_F$, but they have the same direction.
10. The horizontal surface on which the objects slide is frictionless. If F = 12 N, what is the tension in string 1?



   a. 35 N
   b. 30 N
   c. 40 N
   d. 45 N
   e. 25 N
11. The system shown is released from rest and moves 50 cm in 1.0 s. What is the value of M? All surfaces are frictionless.

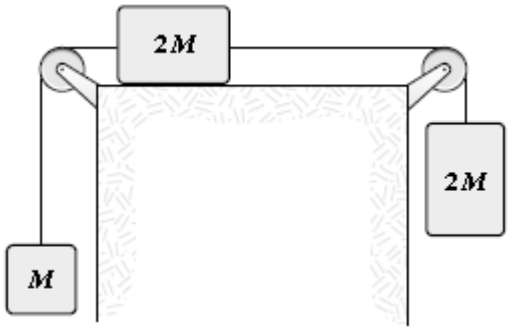


   a. 0.42 kg
   b. 0.34 kg
   c. 0.50 kg
   d. 0.59 kg
   e. 0.68 kg
12. A 2.0-kg block slides on a rough horizontal surface. A force (magnitude P = 4.0 N) acting parallel to the surface is applied to the block. The magnitude of the block's acceleration is 1.2 m/s^2. If P is increased to 5.0 N, determine the magnitude of the block's acceleration.
   a. 2.1 m/s^2
   b. 2.3 m/s^2
   c. 1.9 m/s^2
   d. 1.7 m/s^2
   e. 3.2 m/s^2

13. A 1.8-kg block is projected up a rough 10° inclined plane. As the block slides up the incline, its acceleration is 3.8 m/s² down the incline. What is the magnitude of the force of friction acting on the block?
    a. 5.0 N
    b. 3.8 N
    c. 4.2 N
    d. 4.6 N
    e. 6.5 N

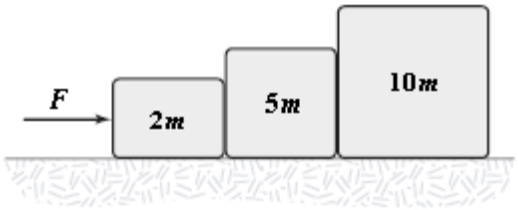
14. A 1.0-kg block is pushed up a rough 22° inclined plane by a force of 7.0 N acting parallel to the incline. The acceleration of the block is 1.4 m/s² up the incline. Determine the magnitude of the force of friction acting on the block.
    a. 1.9 N
    b. 2.2 N
    c. 1.3 N
    d. 1.6 N
    e. 3.3 N

15. The three blocks shown are released from rest and are observed to move with accelerations that have a magnitude of 1.5 m/s². What is the magnitude of the friction force on the block that slides horizontally? Disregard any pulley mass or friction in the pulley and let $M = 2.0$ kg.



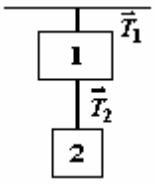
    a. 6.0 N
    b. 5.1 N
    c. 5.5 N
    d. 4.6 N
    e. 3.7 N

16. Three boxes are pushed across a frictionless horizontal surface as shown. When we compare the normal force $N_{2,5}$ that mass $2m$ exerts on mass $5m$ with the normal force $N_{5,10}$ that mass $5m$ exerts on mass $10m$, we find that



    a. $N_{2,5} = N_{5,10} = F$.
    b. $N_{2,5} = F > N_{5,10}$.
    c. $F > N_{2,5} = N_{5,10}$.
    d. $F > N_{2,5} > N_{5,10}$.
    e. $F > N_{5,10} > N_{2,5}$.

Exhibit 5-1
A 2.30 kg mass is suspended from the ceiling and a 1.70 kg mass is suspended from the 2.30 kg mass, as shown. The tensions in the strings are labeled $\vec{T}_1$ and $\vec{T}_2$.



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

17. Refer to Exhibit 5-1. A hand exerts an upward force of 6.70 N on the 1.70 kg mass. The magnitudes of the tensions are
    a. $T_1 = 15.8$ N; $T_2 = 10.0$ N.
    b. $T_1 = 15.8$ N; $T_2 = 16.7$ N.
    c. $T_1 = 22.5$ N; $T_2 = 10.0$ N.
    d. $T_1 = 22.5$ N; $T_2 = 16.7$ N.
    e. $T_1 = 32.5$ N; $T_2 = 10.0$ N.

18. Refer to Exhibit 5-1. The string supporting the 1.70 kg mass is cut. The magnitudes of the tension in string 1 before and after string 2 is cut are
    a. $T_{1,i} = 22.5$ N; $T_{1,f} = 5.80$ N.
    b. $T_{1,i} = 39.2$ N; $T_{1,f} = 5.80$ N.
    c. $T_{1,i} = 22.5$ N; $T_{1,f} = 22.5$ N.
    d. $T_{1,i} = 39.2$ N; $T_{1,f} = 22.5$ N.
    e. $T_{1,i} = 39.2$ N; $T_{1,f} = 39.2$ N.
19. An object on the flat bed of a truck that is accelerating along a straight horizontal road. The coefficient of static friction is 0.300 in this case. Of the following choices, which is the lowest value of acceleration that would result in the object sliding on the bed of the truck?
    a. 0.280 m/s^2
    b. 0.310 m/s^2
    c. 2.93 m/s^2
    d. 2.99 m/s^2
    e. 3.02 m/s^2

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Answer Section

MULTIPLE CHOICE

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