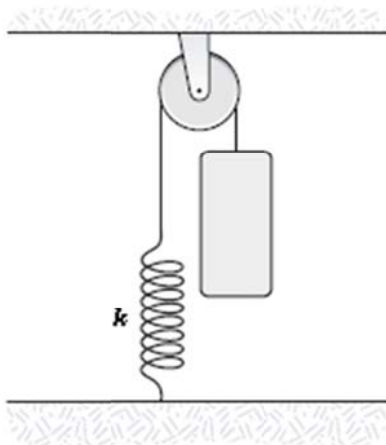


Physics 111, sample problems for Quiz 2

1. At $t = 0$, a particle leaves the origin with a velocity of 12 m/s in the positive x direction and moves in the xy plane with a constant acceleration of $(-2.0\hat{i} + 4.0\hat{j}) \text{ m/s}^2$. At the instant the y coordinate of the particle is 18 m, what is the x coordinate of the particle?
- a. 30 m
 - b. 21 m
 - c. **27 m**
 - d. 24 m
 - e. 45 m
2. A 20-kg mass is fastened to a light spring ($k = 380 \text{ N/m}$) that passes over a pulley as shown. The pulley is frictionless, and the mass is released from rest when the spring is unstretched. After the mass has dropped 0.40 m, what is its speed?

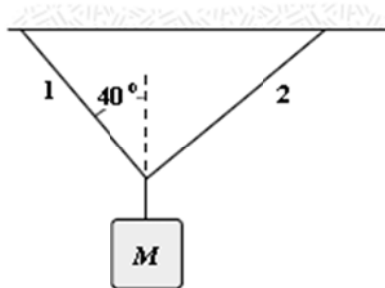


- a. **2.2 m/s**
- b. 2.5 m/s
- c. 1.9 m/s
- d. 1.5 m/s
- e. 3.6 m/s

3. A particle moves at a constant speed in a circular path with a radius of 2.06 cm. If the particle makes four revolutions each second, what is the magnitude of its acceleration?

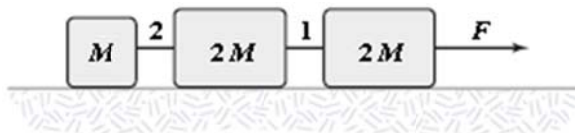
- a. 20 m/s^2
- b. 18 m/s^2
- c. **13 m/s^2**
- d. 15 m/s^2
- e. 24 m/s^2

4. 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?



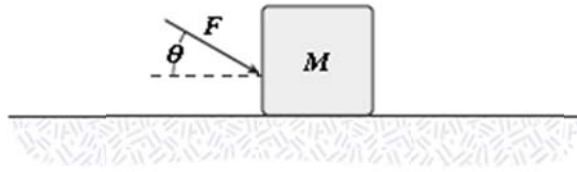
- a. 7.3 kg
- b. 5.5 kg
- c. 1.8 kg
- d. **3.7 kg**
- e. 4.5 kg

5. The horizontal surface on which the objects slide is frictionless. If $M = 2.0 \text{ kg}$, the tension in string 1 is 12 N. Determine F .



- a. 25 N
- b. **20 N**
- c. 30 N
- d. 35 N
- e. 40 N

6. A block is pushed across a horizontal surface by the force shown. If the coefficient of kinetic friction between the block and the surface is 0.30, $F = 20 \text{ N}$, $\theta = 30^\circ$, and $M = 3.0 \text{ kg}$, what is the magnitude of the acceleration of the block?



- a. 2.8 m/s^2
- b. 2.3 m/s^2
- c. **1.8 m/s^2**
- d. 3.3 m/s^2
- e. 5.4 m/s^2

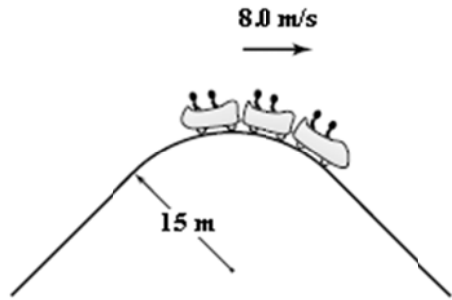
7. A 30-kg child rides on a circus Ferris wheel that takes her around a vertical circular path with a radius of 20 m every 22 s. What is the magnitude of the resultant force on the child at the highest point on this trajectory?

- a. **49 N**
- b. 0.29 kN
- c. 0.34 kN
- d. 0.25 kN
- e. 0.15 kN

8. The coefficient of static friction for the tires of a race car is 0.950 and the coefficient of kinetic friction is 0.800. The car is on a level circular track of 50.0 m radius on a planet where $g = 2.45 \frac{\text{m}}{\text{s}^2}$ compared to Earth's $g = 9.80 \frac{\text{m}}{\text{s}^2}$. The maximum safe speed on the track on the planet is ____ times as large as the maximum safe speed on Earth.

- a. 0.250
- b. **0.500**
- c. 1.00
- d. 2.00
- e. 4.00

9. A roller-coaster car has a mass of 500 kg when fully loaded with passengers. The car passes over a hill of radius 15 m, as shown. At the top of the hill, the car has a speed of 8.0 m/s. What is the force of the track on the car at the top of the hill?

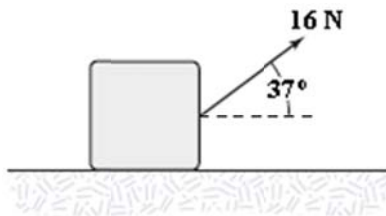


- a. 7.0 kN up
- b. 7.0 kN down
- c. 2.8 kN down
- d. 2.8 kN up**
- e. 5.6 kN down

10. A race car travels 40 m/s around a banked (45° with the horizontal) circular (radius = 0.20 km) track. What is the magnitude of the resultant force on the 80-kg driver of this car?

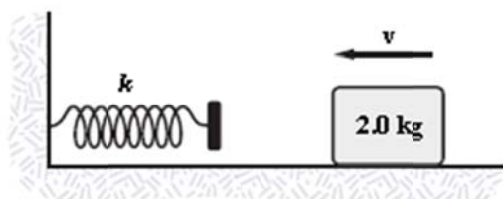
- a. 0.68 kN
- b. 0.64 kN**
- c. 0.72 kN
- d. 0.76 kN
- e. 0.52 kN

11. A 3.0-kg block is dragged over a rough horizontal surface by a constant force of 16 N acting at an angle of 37° above the horizontal as shown. The speed of the block increases from 4.0 m/s to 6.0 m/s in a displacement of 5.0 m . What work was done by the friction force during this displacement?

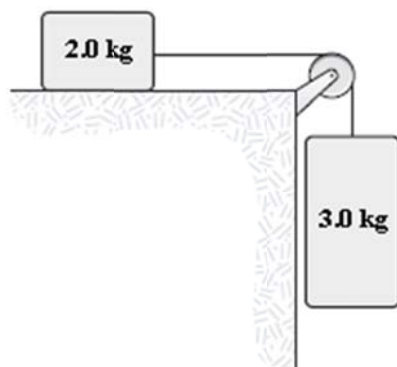


- a. -34 J**
- b. -64 J
- c. -30 J
- d. -94 J
- e. $+64 \text{ J}$

12. The horizontal surface on which the block slides is frictionless. The speed of the block before it touches the spring is 6.0 m/s. How fast is the block moving at the instant the spring has been compressed 15 cm? $k = 2.0 \text{ kN/m}$



- a. **3.7 m/s**
b. 4.4 m/s
c. 4.9 m/s
d. 5.4 m/s
e. 14 m/s
13. A constant force of 15 N in the negative y direction acts on a particle as it moves from the origin to the point $(3\hat{i} + 3\hat{j} - 1\hat{k})$ m. How much work is done by the given force during this displacement?
- a. +45 J
b. **-45 J**
c. +30 J
d. -30 J
e. +75 J
14. The two masses in the figure are released from rest. After the 3.0-kg mass has fallen 1.5 m, it is moving with a speed of 3.8 m/s. What is the change in mechanical energy done on the system during this time interval by the frictional force on the 2.0 kg mass?



- a. -12 J
b. -17 J
c. -20 J
d. **-8.0 J**
e. -28 J

15. Cubical blocks of mass m and side l are piled up in a vertical column. The total gravitational potential energy of a column of three blocks is

- a. $\frac{5}{2}mgl.$
- b. $3mgl.$
- c. $\frac{9}{2}mgl.$
- d. $6mgl.$
- e. $9mgl.$