

# Practice Exam

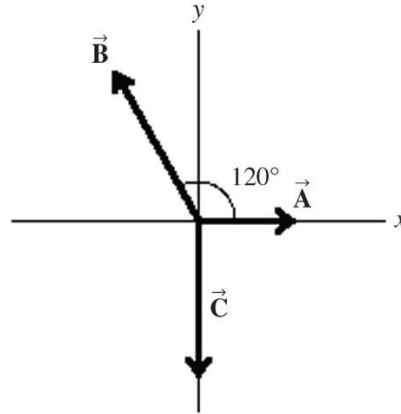
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1. True or False: *“In a collision between a huge Tesla Cybertruck and a small two-seat car Smart, the Cybertruck exerts a larger force on the Smart than the Smart exerts on the Cybertruck.”*
  - A) Always true
  - B) Always false
  - C) It depends on whether the collision is a head-on collision or a rear-end collision.
  - D) It depends on which vehicle moves faster. The faster vehicle exerts a larger force on the slower vehicle.
  - E) It depends on which vehicle moves faster. The slower vehicle exerts a larger force on the faster vehicle.
  
2. A person stands on a bathroom scale in a motionless elevator. When the elevator begins to move, the scale briefly reads only 0.87 of the person’s regular weight. What is the direction and magnitude of the acceleration of the elevator? (Hint: The bathroom scale measures the normal force on the person.)
  - A) up,  $1.3 \text{ m/s}^2$
  - B) up,  $0.7 \text{ m/s}^2$
  - C) 0
  - D) down,  $0.7 \text{ m/s}^2$
  - E) down,  $1.3 \text{ m/s}^2$

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3. Find the magnitude of the net force vector, when the force  $\vec{A}$ ,  $\vec{B}$ , and  $\vec{C}$  are applied to an object as shown in the figure. These forces have the following magnitudes:  $A = 5.0 \text{ N}$ ,  $B = 7.9 \text{ N}$ , and  $C = 8.0 \text{ N}$ .

- A) 20.9 N
- B) 4.5 N
- C) 1.6 N
- D) 0.9 N
- E) 0 N



4. A crate is sliding down an inclined ramp at a constant velocity of  $0.55 \text{ m/s}$ . The vector sum of all the forces acting on this crate must point

- A) down the ramp.
- B) up the ramp.
- C) perpendicular to the ramp.
- D) vertically downward.
- E) None of the above choices is correct, as the vector sum is zero.

5. A  $50.0\text{-kg}$  crate is being pulled along a horizontal frictionless surface. The pulling force is  $10.0 \text{ N}$  and is directed  $20.0^\circ$  above the horizontal. What is the magnitude of the acceleration of the crate?

- A)  $0.0684 \text{ m/s}^2$
- B)  $0.188 \text{ m/s}^2$
- C)  $0.200 \text{ m/s}^2$
- D)  $0.376 \text{ m/s}^2$
- E)  $0.0728 \text{ m/s}^2$

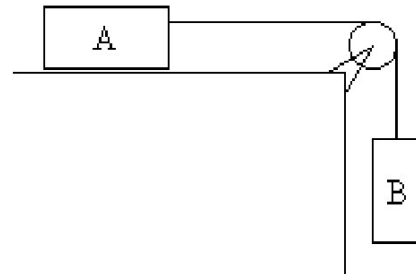
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6. If the coefficient of kinetic friction between a 21 kg crate and the floor is 0.32, what horizontal force is required to move the crate at a constant acceleration of  $0.50 \text{ m/s}^2$  across the floor?

- A) 66 N
- B) 76 N
- C) 89 N
- D) 164 N
- E) 216 N

7. A block *A* with mass  $m_A = 14.0 \text{ kg}$  on a smooth horizontal surface is connected by a thin cord that passes over a pulley with a negligible mass to a second block *B* with mass  $m_B = 5.0 \text{ kg}$  which hangs vertically, as shown in the figure. Determine the magnitude of the acceleration of the system.

- A)  $1.1 \text{ m/s}^2$
- B)  $2.6 \text{ m/s}^2$
- C)  $3.5 \text{ m/s}^2$
- D)  $7.2 \text{ m/s}^2$
- E)  $9.8 \text{ m/s}^2$



8. A 6.0-kg box slides down a frictionless inclined plane that makes an angle of  $39^\circ$  with the horizontal. At what rate does the box accelerate down the slope?

- A)  $1.6 \text{ m/s}^2$
- B)  $3.3 \text{ m/s}^2$
- C)  $4.1 \text{ m/s}^2$
- D)  $6.2 \text{ m/s}^2$
- E)  $7.6 \text{ m/s}^2$

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9. When an object moves in uniform circular motion, the direction of its acceleration is

- A) in the same direction as its velocity vector.
- B) in the opposite direction of its velocity vector.
- C) directed toward the center of its circular path.
- D) directed away from the center of its circular path.
- E) dependent on the speed of the object.

10. A 0.25-kg toy is attached to the end of a 0.5-m very light string. The toy is whirled in a horizontal circular path on a frictionless tabletop. If the maximum tension that the string can withstand without breaking is 350 N, what is the maximum speed the toy can have without breaking the string?

- A) 700 m/s
- B) 26 m/s
- C) 19 m/s
- D) 13 m/s
- E) 8.0 m/s

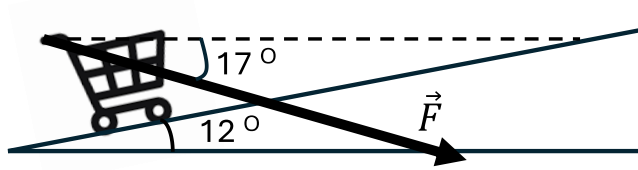
11. A bucket of mass 2.30 kg is whirled in a vertical circle of radius 1.5 m. At the lowest point of its motion the speed of the bucket is 1.8 m/s. Find the tension in the rope supporting the bucket at the lowest point.

- A) 13 N
- B) 18 N
- C) 23 N
- D) 28 N
- E) 34 N

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12. As shown in the figure, a grocery cart with mass of 16 kg is being pushed up a 12 degree ramp by a force  $\vec{F}$ , which has a magnitude of 72 N and acts at an angle of 17 degree below the horizontal. Find the work done by the force  $\vec{F}$  on the cart if the ramp is 7.5 m long.

- A) 470 J
- B) 490 J
- C) 520 J
- D) 530 J
- E) 540 J



13. A truck has four times the mass of a car and is moving with twice the speed of the car. If  $K_t$  and  $K_c$  refer to the kinetic energies of truck and car respectively, it is correct to say that

- A)  $K_t = 16K_c$ .
- B)  $K_t = 4K_c$ .
- C)  $K_t = 2K_c$ .
- D)  $K_t = K_c$ .
- E)  $K_t = \frac{1}{2}K_c$ .

14. A baseball ( $m = 145$  g) traveling 38 m/s moves a fielder's glove backward 22 cm when the ball is caught. What was the net work done on the ball?

- A) 110 J
- B) 64 J
- C) 0 J
- D) -64 J
- E) -110 J

15. Person X pushes twice as hard against a stationary brick wall as person Y. Which one of the following statements is correct?

- A) Both do positive work, but person X does four times the work of person Y.
- B) Both do positive work, but person X does twice the work of person Y.
- C) Both do the same amount of positive work.
- D) Both do zero work.
- E) Both do positive work, but person X does one-half the work of person Y.

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