

Final Exam Review - Mult Ch.

1. Which is a vector quantity?

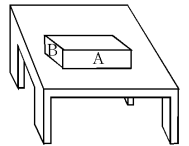
- a) distance                      b) time                      c) mass                      d) velocity

2. A 3.0-newton force and a 4.0-newton force act concurrently on a point. In which diagram shown would the orientation of these forces produce the greatest net force on the point?



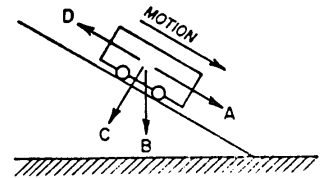
3. In the diagram shown, surface *A* of the wooden block has twice the area of surface *B*. If it takes *F* newtons to keep the block moving at constant speed across the table when it slides on surface *A*, what force is needed to keep the block moving at constant speed when it slides on surface *B*?

- a) *F*                      b)  $2F$                       c)  $\frac{1}{2}F$                       d)  $4F$



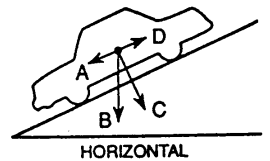
4. A cart rolls down an inclined plane with constant speed as shown in the diagram. Which arrow represents the direction of the frictional force?

- a) *A*                      b) *B*                      c) *C*                      d) *D*



5. The diagram represents a car resting on a hill. Which vector best represents the weight of the car?

- a) *A*                      b) *B*                      c) *C*                      d) *D*



6. A cannon fires a projectile at an angle with the horizontal. The horizontal component of the projectile's initial velocity is 866 meters per second and its initial vertical component is 500 meters per second. [Neglect air resistance.]

What is the shape of the path that the projectile will follow?

- a) circular                      b) straight                      c) hyperbolic                      d) parabolic

7.

After 5.00 seconds, what is the vertical component of the projectile's velocity?

- a) 549 m/s                      b) 500 m/s                      c) 451 m/s                      d) 49.0 m/s

8.

The maximum height to which the projectile in the previous problem rises is approximately

- a)  $2.50 \times 10^3$  m      b)  $1.28 \times 10^4$  m      c)  $1.54 \times 10^4$  m      d)  $4.42 \times 10^4$  m

9. A ball is fired vertically upward at 5.0 meters per second from a cart moving horizontally to the right at 2.0 meters per second. Which vector best represents the resultant velocity of the ball when fired?

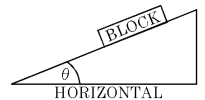
- a)       b)       c)       d) 

10. A projectile is fired with a velocity of 150 meters per second at an angle of  $30^\circ$  with the horizontal. What is the magnitude of the vertical component of the velocity at the time the projectile is fired?

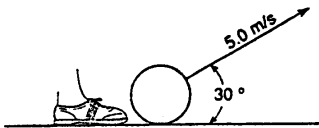
- a) 75.0 m/s      b) 130 m/s      c) 150 m/s      d) 225 m/s

11. A block is at rest on an inclined plane as shown in the diagram. As angle  $\theta$  is increased, the component of the block's weight parallel to the plane

- a) decreases      b) increases      c) remains the same



12. The diagram here represents a ball being kicked by a foot and rising at an angle of  $30^\circ$  from the horizontal. The ball has an initial velocity of 5.0 meters per second. [Neglect friction.]

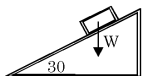


As the ball rises, the vertical component of its velocity

- a) decreases      b) increases      c) remains the same

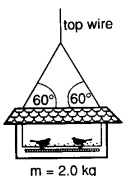
13. In the diagram, the weight of a box on a plane inclined at  $30^\circ$  is represented by the vector  $W$ . What is the magnitude of the component of the weight ( $W$ ) that acts parallel to the incline?

- a)  $W$       b)  $0.50 W$       c)  $0.87 W$       d)  $1.5 W$



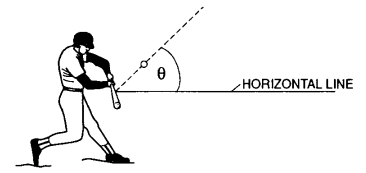
14. A bird feeder with two birds has a total mass of 2.0 kilograms and is supported by wire as shown in the diagram. The force in the top wire is approximately

- a) 10 N      b) 14 N      c) 20 N      d) 39 N



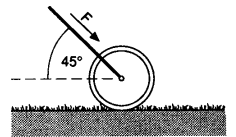
15. The diagram shows a baseball being hit with a bat. Angle  $\theta$  represents the angle between the horizontal and the ball's initial direction of motion. Which value of  $\theta$  would result in the ball traveling the longest horizontal distance? [Neglect air resistance.]

- a)  $25^\circ$                       b)  $45^\circ$                       c)  $60^\circ$                       d)  $90^\circ$



16. The handle of a lawn roller is held at  $45^\circ$  from the horizontal. A force,  $F$ , of 28.0 newtons is applied to the handle as the roller is pushed across a level lawn, as shown in the diagram. What is the magnitude of the force moving the roller forward?

- a) 7.00 N                      b) 14.0 N                      c) 19.8 N                      d) 39.0 N

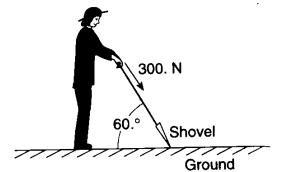


17. As the angle between a force and level ground decreases from  $60^\circ$  to  $30^\circ$ , the vertical component of the force

- a) decreases                      b) increases                      c) remains the same

18. The diagram shows a person exerting a 300-newton force on the handle of a shovel that makes an angle of  $60^\circ$  with the horizontal ground. The component of the 300-newton force that acts perpendicular to the ground is approximately

- a) 150 N                      b) 260 N                      c) 300 N                      d) 350 N



19. Four different balls are thrown horizontally off the top of four cliffs. In which diagram does the ball have the shortest time of flight?

a)  $m = 1.0 \text{ kg}$ ,  $v = 50 \text{ m/s}$ ,  $s = 125 \text{ m}$

b)  $m = 0.25 \text{ kg}$ ,  $v = 35 \text{ m/s}$ ,  $s = 375 \text{ m}$

c)  $m = 0.50 \text{ kg}$ ,  $v = 40 \text{ m/s}$ ,  $s = 250 \text{ m}$

d)  $m = 0.10 \text{ kg}$ ,  $v = 20 \text{ m/s}$ ,  $s = 450 \text{ m}$

20. A 1.0-kilogram block is placed on each of four frictionless planes inclined at different angles. On which inclined plane will the acceleration of the block be greatest?

a)  $1.0 \text{ kg}$  block on a right triangle with vertical side 1m and horizontal side 3m.

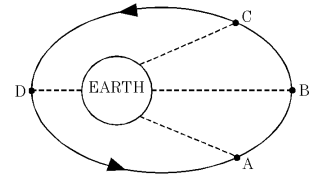
b)  $1.0 \text{ kg}$  block on a right triangle with vertical side 1m and horizontal side 2m.

c)  $1.0 \text{ kg}$  block on a right triangle with vertical side 2m and horizontal side 3m.

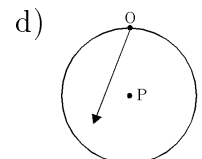
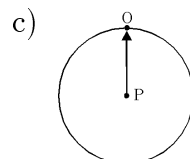
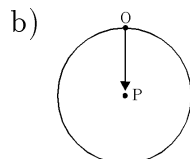
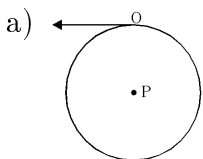
d)  $1.0 \text{ kg}$  block on a right triangle with vertical side 1m and horizontal side 1m.

21. What is the magnitude of the centripetal acceleration of a 4-kilogram mass orbiting at 10 meters per second with a radius of 2 meters?
- a)  $5 \text{ m/sec}^2$                       b)  $50 \text{ m/sec}^2$                       c)  $80 \text{ m/sec}^2$                       d)  $200 \text{ m/sec}^2$
22. The gravitational force between two objects is inversely proportional to
- a) mass squared                      b) distance squared                      c) mass                      d) distance
23. Astronauts experience a condition called weightlessness when both they and their environment have the same
- a) momentum                      b) speed                      c) acceleration                      d) mass
24. The diagram shows positions of a satellite as it orbits the Earth. At which position will the satellite achieve its highest velocity?

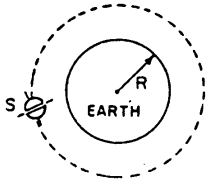
- a) *A*                      b) *B*                      c) *C*                      d) *D*



25. As the radius of an orbiting satellite is decreased, the speed required to keep it in orbit will have to
- a) decrease                      b) increase                      c) remain the same
26. An object traveling with uniform circular motion has a centripetal acceleration due to the change in
- a) speed                      b) direction                      c) kinetic energy                      d) mass
27. Satellite *A* has a circular orbit of radius  $R$  and satellite *B* has a circular orbit of radius  $2R$ . Compared to the period of satellite *A*, the period of satellite *B* is
- a) less                      b) greater                      c) the same
28. As one object moves away from another object, the gravitational force of attraction between them
- a) decreases                      b) increases                      c) remains the same
29. If the 10-kilogram mass is replaced with a greater mass, the centripetal acceleration will
- a) decrease                      b) increase                      c) remain the same
30. If object *O* is moving in a uniform circular motion around point *P* at constant speed, which vector shown represents a centripetal force?



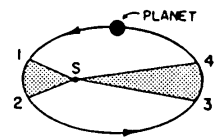
31. What is the centripetal acceleration of a ball traveling at 6.0 meters per second in a circle whose radius is 9.0 meters?
- a)  $0.66 \text{ m/sec}^2$                       b)  $1.5 \text{ m/sec}^2$                       c)  $15 \text{ m/sec}^2$                       d)  $4.0 \text{ m/sec}^2$
32. If the distance between a spaceship and the center of the Earth is increased from one Earth radius to 4 Earth radii, the gravitational force acting on the spaceship becomes approximately
- a)  $\frac{1}{16}$  as great                      b)  $\frac{1}{4}$  as great                      c) 16 times greater                      d) 4 times greater
33. The diagram shown represents a  $4.0 \times 10^2$ -kilogram satellite,  $S$ , in a circular orbit at an altitude of  $5.6 \times 10^6$  meters. The orbital speed of the satellite is  $5.7 \times 10^3$  meters per second and the radius of the Earth,  $R$  is  $6.4 \times 10^6$  meters.



The centripetal acceleration of the satellite is approximately

- a)  $9.8 \text{ m/s}^2$                       b)  $4.9 \text{ m/s}^2$                       c)  $2.7 \text{ m/s}^2$                       d)  $1.4 \text{ m/s}^2$
- 34.
- If the altitude of the satellite in the previous problem decreased, its centripetal acceleration would

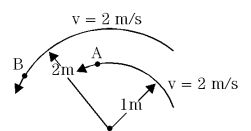
- a) decrease                                      b) increase                                      c) remain the same
35. The diagram shown represents the motion of a planet around the Sun,  $S$ . The time it takes the planet to go from point 1 to point 2 is identical to the time it takes the planet to go from point 3 to point 4. Which statement must be true?



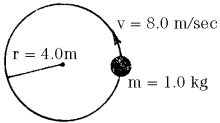
- a) The two shaded regions of the diagram have equal areas.
- b) The centripetal acceleration of the planet is constant.
- c) The planet moves at a constant speed.
- d) The planet moves faster when it is farthest from the Sun.

36. Two masses,  $A$  and  $B$ , move in circular paths as shown in the diagram. The centripetal acceleration of mass  $A$ , compared to that of mass  $B$ , is

- a) the same                                      b) twice as great
- c) one-half as great                                      d) four times as great



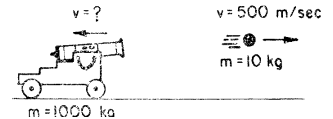
37. A motorcycle of mass 100 kilograms travels around a flat, circular track of radius 10 meters with a constant speed of 20 meters per second. What force is required to keep the motorcycle moving in a circular path at this speed?
- a) 200 N                      b) 400 N                      c) 2000 N                      d) 4000 N
38. The momentum of a 5-kilogram object moving at 6 meters per second is
- a)  $1 \text{ kg} \cdot \text{m}/\text{sec}$                       b)  $5 \text{ kg} \cdot \text{m}/\text{sec}$                       c)  $11 \text{ kg} \cdot \text{m}/\text{sec}$                       d)  $30 \text{ kg} \cdot \text{m}/\text{sec}$
39. The diagram here represents a mass of 1.0 kilogram traveling at 8.0 meters per second in a circular path of radius 4.0 meters.



What is the magnitude of the object's momentum?

- a)  $8.0 \text{ kg} \cdot \text{m}/\text{sec}$                       b)  $16 \text{ kg} \cdot \text{m}/\text{sec}$                       c) 8.0 newtons                      d) 16 newtons
40. Which of the following objects has the greatest momentum?
- a) a 1-kg object moving at 200 m/sec                      b) a 10-kg object moving at 30 m/sec
- c) a 20-kg object moving at 20 m/sec                      d) a 100-kg object moving at 2 m/sec
41. In the diagram shown, a 10-kilogram ball is fired with a velocity of 500 meters per second from a 1,000-kilogram cannon. What is the recoil velocity of the cannon?

- a) 5 m/sec                      b) 2 m/sec                      c) 10 m/sec                      d) 500 m/sec



42. The diagram shown represents two objects at rest on a frictionless horizontal surface with a spring compressed between them. When the compressed spring is released, the two objects are pushed apart.



What is the velocity of the 2.0-kilogram object that is shown after being acted on by 10 newton-seconds of impulse?

- a) 1.0 m/s                      b) 2.0 m/s                      c) 5.0 m/s                      d) 10 m/s
43. If a net force of 10 newtons acts on a 6.0-kilogram mass for 8.0 seconds, the total change of momentum of the mass is
- a)  $48 \text{ kg} \cdot \text{m}/\text{s}$                       b)  $60 \text{ kg} \cdot \text{m}/\text{s}$                       c)  $80 \text{ kg} \cdot \text{m}/\text{s}$                       d)  $480 \text{ kg} \cdot \text{m}/\text{s}$

44. A string requires a 175 N force in order to break it. A 3.5 kg mass is tied to this string and whirled in a vertical circle with a radius of 0.90 m. What is the maximum speed that this mass can be whirled without breaking the string?
- a)  $v_{max} = 7.5 \text{ m/s}$       b)  $v_{max} = 7.3 \text{ m/s}$       c)  $v_{max} = 6.0 \text{ m/s}$       d)  $v_{max} = 12 \text{ m/s}$
45. What is the minimum velocity required for a rollercoaster cart to stay on a track when going through a loop of radius 13 m? The mass of the cart is 125 kg.
- a) 11.3 m/s      b) 1400 m/s      c) 1200 m/s      d) 15.9 m/s
46. What is the acceleration due to gravity on a planet that is 4 times as massive as Earth and has a radius 2.5 times that of Earth?
- a)  $15.7 \text{ m/s}^2$       b)  $6.28 \text{ m/s}^2$       c)  $25.1 \text{ m/s}^2$       d)  $7.84 \text{ m/s}^2$
47. What orbital radius about the Earth will result in an acceleration of  $1.96 \text{ m/s}^2$ ?
- a)  $6.38 \times 10^6 \text{ m}$       b)  $3.9 \times 10^9 \text{ m}$       c)  $2.0 \times 10^{14} \text{ m}$       d)  $1.4 \times 10^7 \text{ m}$
48. A planet is  $7.8M_{Earth}$ . If its surface gravity is the same as Earth's, what is the planet's radius?
- a)  $2.8R_{Earth}$       b)  $7.8R_{Earth}$       c)  $0.13R_{Earth}$       d)  $0.35R_{Earth}$
49. An object is placed on a flat board. The board is slowly increased until the object just starts to move. If the angle between the board and the horizontal is  $29^\circ$  what is the coefficient of static friction?
- a) 0.55      b) 0.48      c) 0.87      d) 0.29
50. Refer to the diagram below which shows a sign hanging from a support. What is the tension in each wire? The mass is 51 kg and the angle  $\theta$  is  $62^\circ$ .
- a) 500 N      b) 280 N      c) 250 N      d) 1000 N

