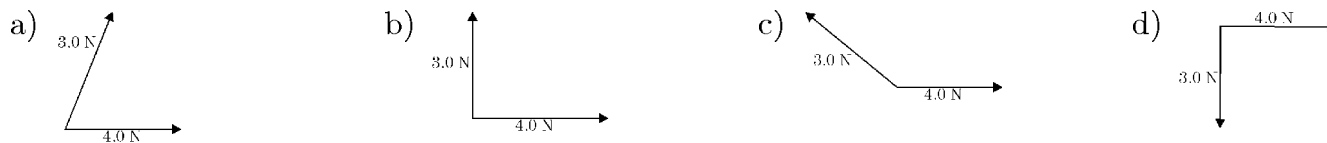1.  Which is a vector quantity?

    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?

    a)    b)    c)    d) 

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) $4F$
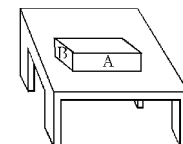
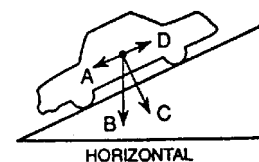    

4.  A cart rolls down an inclined plane with constant speed as shown in the diagram. Which arrow represents the direction of the frictional force?

    a) $A$          b) $B$          c) $C$          d) $D$
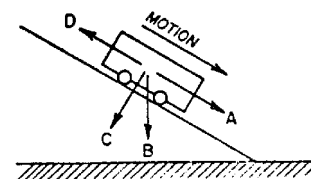
    

5.  The diagram represents a car resting on a hill. Which vector best represents the weight of the car?

    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) $549\,\text{m/s}$          b) $500\,\text{m/s}$          c) $451\,\text{m/s}$          d) $49.0\,\text{m/s}$

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° 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
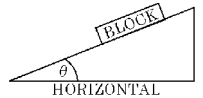


12. The diagram here represents a ball being kicked by a foot and rising at an angle of 30° from the horizontal. The ball has an initial velocity of 5.0 meters per second. [Neglect friction.]
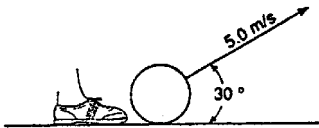


As the ball rises, the vertical component of its velocity

a) decreases    b) increases    c) remains the same

13. In the diagram, the weight of a box on a plane inclined at 30° 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
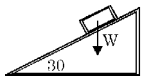


14. A bird feeder with two birds has a total mass of 2.0 kilograms and is supported by wire as shown in the diagram. The force in the top wire is approximately

a) 10 N    b) 14 N    c) 20 N    d) 39 N
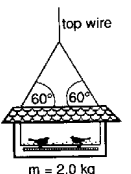
15. The diagram shows a baseball being hit with a bat. Angle $\theta$ represents the angle between the horizontal and the ball's initial direction of motion. Which value of $\theta$ would result in the ball traveling the longest horizontal distance? [Neglect air resistance.]

   a) 25°                b) 45°                c) 60°                d) 90°

16. The handle of a lawn roller is held at 45° 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

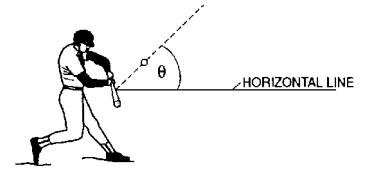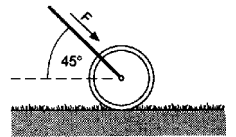17. As the angle between a force and level ground decreases from 60° to 30°, the vertical component of the force

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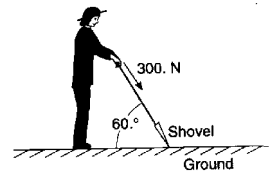
19. Four different balls are thrown horizontally off the top of four cliffs. In which diagram does the ball have the shortest time of flight?

   a) $v = 50$ m/s, $m = 1.0$ kg, $S = 125$ m
   
   b) $v = 35$ m/s, $m = 0.25$ kg, $s = 375$ m
   
   c) $v = 40$ m/s, $m = 0.50$ kg, $s = 250$ m
   
   d) $m = 0.10$ kg, $v = 20$ m/s, $s = 450$ 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 kg, 1m, 3m
   
   b) 1.0 kg, 1m, 2m
   
   c) 1.0 kg, 2m, 3m
   
   d) 1.0 kg, 1m, 1m
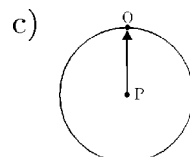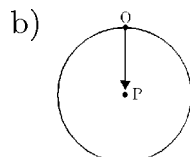
21. What is the magnitude of the centripetal acceleration of a 4-kilogram mass orbiting at 10 meters per second with a radius of 2 meters?

    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) $D$
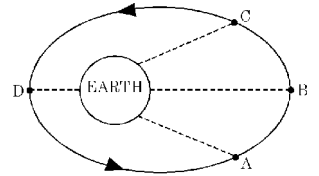
25. As the radius of an orbiting satellite is decreased, the speed required to keep it in orbit will have to

    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?

    a)       b)       c)       d)

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) $0.66\,\mathrm{m/sec^2}$      b) $1.5\,\mathrm{m/sec^2}$      c) $15\,\mathrm{m/sec^2}$      d) $4.0\,\mathrm{m/sec^2}$

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) $9.8\,\mathrm{m/s^2}$      b) $4.9\,\mathrm{m/s^2}$      c) $2.7\,\mathrm{m/s^2}$      d) $1.4\,\mathrm{m/s^2}$

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 kg · m/sec      b) 5 kg · m/sec      c) 11 kg · m/sec      d) 30 kg · m/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.
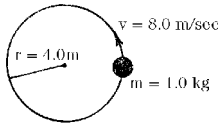


What is the magnitude of the object's momentum?

    a) 8.0 kg · m/sec      b) 16 kg · m/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
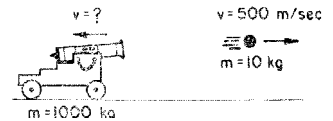


42. The diagram shown represents two objects at rest on a frictionless horizontal surface with a spring compressed between them. When the compressed spring is released, the two objects are pushed apart.



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 kg · m/s      b) 60 kg · m/s      c) 80 kg · m/s      d) 480 kg · m/s

44. A string requires a 175 N force in order to break it. A 3.5 kg mas is tied to this string and whirled in a vertical circle with a radius of 0.90 m. What is the maxiumum speed that this mass can be whirled without breaking the string?

    a) $v_{max} = 7.5$ m/s      b) $v_{max} = 7.3$ m/s      c) $v_{max} = 6.0$ m/s      d) $v_{max} = 12$ 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 of Earth and has a radius 2.5 times that of Earth?

    a) 15.7 m/s$^2$      b) 6.28 m/s$^2$      c) 25.1 m/s$^2$      d) 7.84 m/s$^2$

47. What orbital radius about the Earth will result in an acceleration of 1.96 m/s$^2$?

    a) $6.38 \times 10^6$ m      b) $3.9 \times 10^9$ m      c) $2.0 \times 10^{14}$ m      d) $1.4 \times 10^7$ 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° 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°.

    a) 500 N      b) 280 N      c) 250 N      d) 1000 N

Physics 122     Final Exam Review - Mult Ch.      Mr. P. MacDonald      1/12/2013
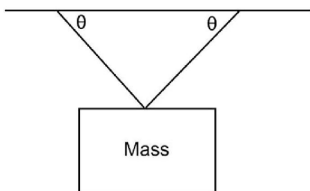
## Answer List

| | | | |
|---|---|---|---|
| 1.  d | 2.  a | 3.  a | 4.  d |
| 5.  b | 6.  d | 7.  c | 8.  b |
| 9.  d | 10.  a | 11.  b | 12.  a |
| 13.  b | 14.  c | 15.  b | 16.  c |
| 17.  a | 18.  b | 19.  a | 20.  d |
| 21.  b | 22.  b | 23.  c | 24.  d |
| 25.  b | 26.  b | 27.  b | 28.  a |
| 29.  c | 30.  b | 31.  d | 32.  a |
| 33.  c | 34.  b | 35.  a | 36.  b |
| 37.  d | 38.  d | 39.  a | 40.  c |
| 41.  a | 42.  c | 43.  c | 44.  c |
| 45.  a | 46.  b | 47.  d | 48.  a |
| 49.  a | 50.  b | | |