Chapter 5   Projectile Motion

Exercises

5.1 Vector and Scalar Quantities (page 69)

1. Sketches in physics often include arrows, in which each arrow represents the _____ and the _____ of a quantity.

2. What two things are required of a vector quantity?

   a. force and time
   b. direction and magnitude
   c. time and temperature
   d. direction and mass

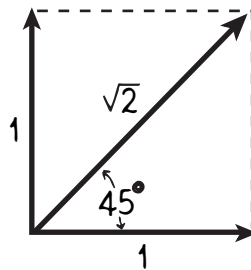3. Is the following sentence true or false? Velocity is a scalar quantity. _____

4. Circle the letter of each quantity that is a vector quantity.

   a. velocity
   b. time
   c. acceleration
   d. momentum

5. A scalar quantity includes only _____.

6. Circle the letter that best describes how two scalar quantities are multiplied.

   a. using scientific notation

   b. like ordinary numbers

   c. by taking the square root of the sum of their squares

   d. multiplying their magnitudes and subtracting their directions

7. In the spaces below, write an example of a vector quantity and a scalar quantity.

   vector: _____

   scalar: _____

8. Circle the letter of each quantity that is a scalar quantity.

   a. 5 liters
   b. 10 m/s north
   c. 32 minutes
   d. 2 cm south

9. Can a scalar quantity be made into a vector quantity by adding a direction to its magnitude? Explain why or why not and give an example.

   _____

   _____

5.2 Velocity Vectors (pages 70–71)

10. A diagram includes a 3-cm long arrow pointing to the right. The arrow is a vector scaled so that 1 cm = 10 m/s. Circle the letter of the statement that best describes the vector.

    a. 3 cm to the right
    b. 30 m/s to the right
    c. to the right
    d. 60 km/h to the right

11. An airplane flies in the same direction as the wind. Is the following sentence true or false? The velocity of the airplane is the sum of the airplane's velocity relative to the air and the wind's velocity relative to the ground. _____

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12. Is the following sentence true or false? A tailwind increases the velocity of an airplane. _____

13. Is the following sentence true or false? Vectors can only be used to add velocities that are parallel to each other. _____

14. The result of adding two vectors is called the _____.

15. Circle the letter of the resultant of a 3-unit vector and a 4-unit vector that are perpendicular.

   a. 1-unit vector   b. 3-unit vector
   c. 5-unit vector   d. 7-unit vector

16. The figure below shows the addition of vectors with equal magnitudes at right angles to each other. Circle the letter that best describes the resultant.

   a. 1 unit upward   b. 1 unit to the right
   c. $\sqrt{2}$ units at 45°   d. 2 units upward

17. Is the following sentence true or false? The length of the diagonal of a square is always 1.414 times the length of either side.
   _____

5.3 Components of Vectors (page 72)

18. Any vector can be resolved, or broken, into an equivalent set of two _____ vectors at right angles to each other.

19. Is the following sentence true or false? Component vectors are always at right angles to each other. _____

20. Is the following sentence true or false? The two components of a vector are independent of each other. _____

21. A ball is thrown into the air at an angle. The velocity of the ball can be resolved into _____ and _____ components.

5.4 Projectile Motion (page 73)

22. Circle the letter of each statement about a projectile that is true.

   a. A projectile moves through air or space.
   b. A projectile is always subject to at least two forces.
   c. A projectile is subject to the force of gravity.
   d. A projectile in air is subject to air resistance.

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23. Is this sentence true or false? For a projectile, the horizontal component of its motion is like the horizontal motion of a ball freely rolling on a level surface without friction. _____

24. The _____ component of velocity for a projectile always changes with time.

25. Circle the letter that best describes the relationship between the vertical and horizontal components of velocity for a projectile.

    a. equal   b. opposite
    c. independent   d. constant

5.5 Projectiles Launched Horizontally (page 74)

26. Is the following statement true or false? Ignoring air resistance, the horizontal component of velocity of a horizontally launched projectile remains constant. _____.

27. A ball is dropped off the edge of a desk. Another ball rolls off the desk at exactly the same time. Circle the letter that best describes the vertical component of velocity of the balls.

    a. equal   b. opposite
    c. zero   d. constant

28. Circle the letter of each statement about a horizontally launched projectile that is true.

    a. Gravity acts on the projectile.
    b. Ignoring air resistance, horizontal motion is constant.
    c. The projectile accelerates downward.
    d. The vertical motion is the same as a freely falling object.

29. Circle the letter that best describes the path followed by a ball that rolls off the edge of a desk.

    a. straight   b. circular
    c. curved   d. horizontal

30. The path of a projectile with constant horizontal motion and a downward acceleration due to gravity is a(n) _____.

31. A boy drops a rock off a cliff at the same time that his sister throws another rock horizontally from the cliff. Circle the letter of each statement about the two rocks that is true.

    a. Gravity acts on both rocks.
    b. Both rocks hit the ground at the same time.
    c. Both rocks accelerate horizontally and vertically.
    d. Both rocks follow parabolic paths.

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5.6 Projectiles Launched at an Angle (pages 75–79)

32. The path of a projectile is also called its _____.

33. Circle the letter that describes the motion of a ball thrown horizontally in the absence of gravity.

a. diagonally downward

b. vertically downward

c. parabolic

d. perfectly horizontal

34. The curving path followed by a projectile in air is due to

_____.

35. Is the following sentence true or false? The distance a projectile falls below its imaginary straight-line path (in the absence of gravity) is equal to the distance a freely falling object would travel in the same amount of time. _____

36. The equation for the distance a projectile falls below its imaginary straight-line path is _____.

Use the Figure below to answers questions 37–39.
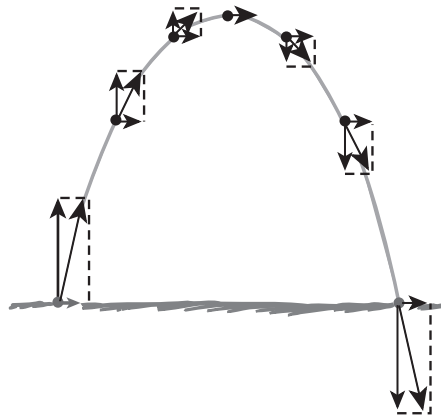
37. Circle the letter that best describes the horizontal component of velocity for the projectile.

a. zero

b. constant

c. varying

d. increasing

38. Circle the letter of the vertical component of velocity for the projectile at the peak of its trajectory.

a. zero

b. positive

c. negative

d. increasing

39. Is the following sentence true or false? At the beginning of the projectile's trajectory, the magnitude of the vertical component of the velocity is greater than the magnitude of the horizontal component of the velocity.

_____