Quiz: Motion in One and Two Dimensions

Read each question. Circle the letter of the correct answer.

1. Which of these quantities has both magnitude and direction?

A. energy

B. scalar

C. unit

D. vector

2. Scarlett is analyzing a position-time graph of a moving train. Which quantity can be found by measuring the slope of a line that is tangent to a point on the graph?

A. acceleration

B. displacement

C. average velocity

D. instantaneous velocity

3. The average velocity and time of motion for three objects are recorded.

I. $v_{avg} = +2.0$ m/s, $\Delta t = 2.0$ s

II. $v_{avg} = +3.0$ m/s, $\Delta t = 2.0$ s

III. $v_{avgy} = -3.0$ m/s, $\Delta t = 3.0$ s

Which option ranks the displacement of these objects in decreasing order?
Note: Assume each item has zero initial displacement.

A. I, II, III

B. II, III, I

C. II, I, III

D. III, II, I

4. A car's velocity is positive and its acceleration is negative. Which of these statements describes the car's motion?

A. The car is speeding up.

B. The car is slowing down.

C. The car is remaining at rest.

D. The car is traveling at constant speed.

5. Which of these is an example of projectile motion?

A. a jet lifting off a runway

B. a piece of fruit falling off a tree

C. a baseball that has just been thrown

D. a roller coaster going down a steep track

6. Which of these describes the motion of a ball as it drops onto a vertical spring?

A. The acceleration of the ball decreases as the spring shrinks.

B. The acceleration of the ball decreases as the spring extends.

C. The velocity of the ball changes from positive to negative as the spring shrinks.

D. The velocity of the ball changes from negative to positive as the spring extends.

7. Which answer is true about an object undergoing projectile motion?

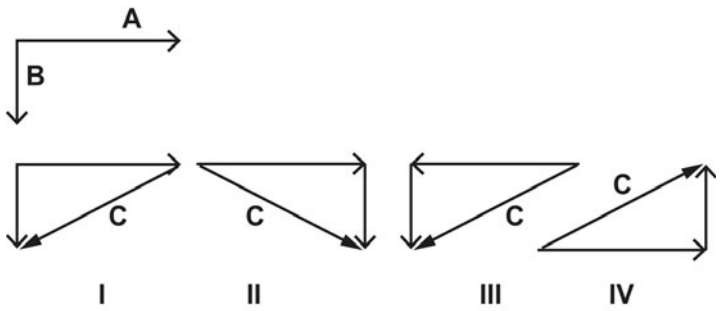
A. $a_x = a_y = -g$

B. v_x = constant, and $a_y = -g$

C. v_x = constant, and v_y = constant

D. a_x = constant, and v_y = constant

8. The diagrams show vectors.



Which diagram represents the vector addition **C** = **A** + **B**?

A. I

B. II

C. III

D. IV

9. Which of these describes the motion of a raindrop as observed by a cyclist moving eastward?

A. The raindrop appears to be falling down and moving eastward.

B. The raindrop appears to be falling down and moving westward.

C. The raindrop appears to be falling down more slowly than it really is.

D. The raindrop appears to be falling down more quickly than it really is.

10. Which of these scenarios describes a change in the velocity of a ball?

A. a ball staying still on a table

B. a ball rolling on a table at a constant speed

C. a ball attached to a string and dragged on a table at a constant speed

D. a ball attached to a string and spun around at a constant speed

Read each statement. Write your answer on the lines.

11. A runner drops her phone as she is running at a constant speed of 3 miles per hour from point A to point B in a park. Describe the motion of the phone as it is observed by someone sitting on a bench at the park.

12. Traveler A takes the train from New York to Boston. Traveler B flies from Boston to New York. Describe how the size and direction of displacement of Traveler A is different from the size and direction of displacement of Traveler B.

13. A motorized scooter starts from rest and accelerates for 4 seconds at 2 m/s^2. Calculate the average velocity of the scooter for the interval 0–4 seconds.

14. A cyclist starts from rest and accelerates for 5 seconds at 3 m/s^2. After the first 5 seconds, the cyclist continues at a constant speed for 5 more seconds. Explain during which interval the cyclist's average acceleration is greater, 4.0–5.0 s or 5.0–6.0 s.

15. A marble is rolled down a ramp. The ramp has a slope of 0.2 for the first meter and then 0.1 for the second meter. Describe how the acceleration and velocity of the marble will be different when it has traveled 1.5 meters as compared with when it has traveled 0.5 meters.