2d motion lab essay

1) Once the simulation opens, click on ‘ Show Both’ for Velocity and Acceleration at the top of the page. Now click and drag the red ball around the screen. Make 3 observations about the blue and green arrows (also called vectors) as you drag the ball around. The vectors appear to have both direct and inverse relationships with each other. When I move the ball one direction, both of the vectors move the same direction i. e. move right, the arrows move right. Then when I exert stopping force onto the ball, the green continues to move with the same direction while the blue moves the opposite direction. The slower I move the ball, the smaller the vectors are and conversely, the faster I move the ball, the larger the vectors are.

2) Which color vector (arrow) represents velocity and which one represents acceleration? How can you tell? I think the green vector represents velocity while the blue vector represents acceleration. When I slow down the ball movement, the blue vector moves the opposite direction while the green vector continues toward the same direction as the ball. This indicates acceleration increased initially then decreased and velocity continued to increase.

3) Try dragging the ball around and around in a circular path. What do you notice about the lengths and directions of the blue and green vectors? Describe their behavior in detail below. The directions of the vectors are perpendicular to each other. The green vector is longer than the length of the blue vector. The blue vector is accelerating toward the center. The green vector is perpendicular due to being tangent along the path of the circle.

4) Now move the ball at a slow constant speed across the screen. What do you notice now about the vectors? Explain why this happens. The vectors are not noticeable. The speed remains constant therefore there would not be acceleration. Velocity still occurs but since the speed is slow, it is not visible. If I moved the ball at higher speeds, the green vector would be more noticeable but the blue vector would not due to not accelerating and remaining constant.

5) What happens to the vectors when you jerk the ball rapidly back and forth across the screen? Explain why this happens. The vectors move at high speeds and the lengths are longer than normal. The blue vector increases directly proportionate to the green vector until the ball moves the opposite direction or stops. The blue vector decelerates at a certain point on the path while the green vector continues to move with the direction of the ball. Velocity and acceleration increase as the ball moves rapidly in one direction. When the ball changes direction, the acceleration decreases the opposite direction while velocity follows the movement of the ball.

6) Now click on ‘ Circular’ on the bottom. Describe the motion of the ball and the behavior of the two vectors. Is there a force on the ball? How can you tell? Be detailed in your explanations. The ball is moving in a circulation motion. The vectors remain constant even though there is still force exerted on the ball. Since the ball is accelerating towards the center, the ball is experiencing net force. If there was not force pushing the ball, the ball would not be moving in a circle.

7) Click on ‘ Simple Harmonic’ on the bottom. Based on the behavior of the ball and the vectors, write a definition of Simple Harmonic Motion. The green vector is demonstrating the direction of the ball. The blue vector is demonstrating the acceleration of the ball. The ball is moving on a linear path around an equilibrium point. The acceleration is always moving toward the equilibrium point and directly proportional to the displacement of the ball from the equilibrium point.