

Quest Chapter 03

#	Problem	Hint
1	<p>Which of acceleration, age, speed, temperature, and velocity are vector quantities?</p> <ol style="list-style-type: none"> 1. Speed and temperature 2. Acceleration, speed, temperature 3. Acceleration, age, speed 4. Age and temperature 5. Acceleration, speed, velocity 6. Acceleration and velocity 7. All are vectors. 8. Age, speed, temperature 9. All are scalars. 10. Acceleration, age, speed, temperature 	<p>What are the two properties of any vector?</p> <p>Which of the five things have both of those properties?</p>
2	<p>When two vectors sum to zero, how must they be related?</p> <ol style="list-style-type: none"> 1. All are wrong. 2. The magnitudes are different; the directions are the same. 3. The magnitudes are different; the directions are opposite. 4. The magnitudes are the same; the directions are opposite. 5. Both magnitude and direction are the same. 	<p>What does “sum to zero” mean?</p> <p>So, what must be the same, and what must be different?</p>
3	<p>Part 1 of 2 A cat climbs 20 m directly up a tree.</p> <p>a) What is the horizontal component of the cat’s displacement?</p>	<p>What does “directly” mean?</p> <p>How much of that is vertical?</p> <p>How much is horizontal?</p>
4	<p>Part 2 of 2 b) What is the vertical component of the cat’s displacement?</p>	<p>Use the previous hint.</p>
5	<p>Vectors A and B are shown in the figure below. For convenience, the tails of each vector are arbitrarily located at (0,0). Select the figure showing the resultant vector R, where $\mathbf{R} = \mathbf{A} + \mathbf{B}$.</p>	<p>How do you add vectors?</p> <p>Make sure to draw the parallelogram carefully.</p>

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6	<p>A heavy crate accidentally falls from a highflying airplane just as it flies directly above a shiny red Camaro parked in a parking lot. Relative to the Camaro, where will the crate crash?</p> <ol style="list-style-type: none"> 1. The crate will hit the Camaro. 2. The crate will hit the front part of the car. 3. The crate will continue to fly and will not crash. 4. The crate will not hit the Camaro, but will crash a distance beyond it determined by the height and speed of the plane. 	<p>Compare the motion of the plane and the car.</p> <p>Draw a diagram of the problem.</p> <p>Based on your diagram, where will the crate crash?</p>
7	<p>If you are standing in a bus that moves at constant velocity and drop a ball from your outstretched hand, you will see its path as a vertical straight line. How will the path appear to a friend standing at the side of the road?</p> <ol style="list-style-type: none"> 1. The path curves downward. 2. The path curves upward. 3. The path is a straight line orientated vertically. 4. The path is a straight line slanted down. 	<p>This is an F_{frame} O_f R_{eference} problem.</p> <p>Draw a diagram of the problem from the perspective of the friend.</p>
8	<p>A bowling ball accidentally falls out of the cargo bay of an airliner as it flies along in a horizontal direction. As observed by a person standing on the ground and viewing the plane as in the figure, which path would the bowling ball most closely follow after leaving the airplane?</p> <ol style="list-style-type: none"> 1. Z 2. U 3. X 4. W 5. V 6. Y 	<p>First, what will be the general shape of the path? Eliminate obviously wrong answers.</p> <p>Which of the ones left just curve too much? Eliminate them.</p> <p>What's left?</p>
9	<p>How does the vertical component of a projectile's motion compare with the motion of vertical free fall when air resistance is negligible?</p> <ol style="list-style-type: none"> 1. Identical to that of free fall 2. Less than that of free fall 3. It cannot be determined. 4. Greater than that of free fall 	<p>What does free fall have to do with the vertical component of a projectile?</p> <p>What affects them?</p>

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10	<p>The velocity of a projectile at launch has a horizontal component v_h and a vertical component v_v. Note: Air resistance is negligible. When the projectile is at the highest point of its trajectory, which of the following show the vertical and the horizontal components of its velocity and the vertical component of its acceleration in 3 columns?</p> <table border="0"> <tr> <td></td> <td>Vertical</td> <td>Horizontal</td> <td>Vertical</td> </tr> <tr> <td></td> <td>Velocity</td> <td>Velocity</td> <td>Acceleration</td> </tr> </table> <ol style="list-style-type: none"> 0 0 g v_v 0 0 v_v v_h 0 0 v_h 0 0 v_h g 		Vertical	Horizontal	Vertical		Velocity	Velocity	Acceleration	<p>Draw a diagram of the problem.</p> <p>Label the components for velocity and acceleration.</p> <p>Which answer choice agrees with your analysis?</p>
	Vertical	Horizontal	Vertical							
	Velocity	Velocity	Acceleration							
11	<p>Given: The battleship and enemy ships A and B lie along a straight line. Neglect air friction. A battleship simultaneously fires two shells (with the same muzzle velocity) at these two enemy ships. If the shells follow the parabolic trajectories shown in the figure, which ship gets hit first?</p> <ol style="list-style-type: none"> need more information B both at the same time A 	<p>Muzzle velocity = v_0.</p> <p>Which component of v_0 affects the time the projectile is in the air?</p> <p>Which will hit first?</p>								
12	<p>A person tosses a ball from the ground up into the air at an initial speed of 10 m/sec and an initial angle of 43° off the ground. After the ball is released, what is the total acceleration vector acting on the ball when the ball is at the top of its arc?</p> <ol style="list-style-type: none"> 9.8 m/s^2, in the horizontal direction 9.8 m/s^2, down None of these zero 9.8 m/s^2, up 	<p>What acts on the ball that will change its velocity?</p> <p>What is its size?</p> <p>Is it a vector? If so, what else do you need to specify?</p>								
13	<p>At what point in its trajectory does a batted baseball have its minimum speed?</p> <ol style="list-style-type: none"> at the beginning point at the end point somewhere at the middle height at the top 	<p>In two-dimensional motion, how do we determine speed?</p> <p>Is there anyplace where one of those components goes to zero?</p>								

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14	<p>When a rifle fires at a distant target, where should the barrel be pointing?</p> <ol style="list-style-type: none"> 1. above the target 2. directly at the target 3. below the target 4. diagonally from the target 5. to the right of the target 6. to the left of the target 	<p>What happens to a projectile the moment it leaves the barrel of the gun?</p> <p>How would the marksmen adjust for that?</p>
15	<p>Someone in a car going past you at the speed of 47 m/s drops a small rock from a height of 2.1 m. How far from the point of the drop will the rock hit the ground? The acceleration due to gravity is 9.8 m/s².</p>	<p>Draw a diagram and separate the components.</p> <p>What are you asked to find: vertical or horizontal distance?</p> <p>You will need to use the distance equation twice. The first time to find the time to hit the ground, and the second time to find the distance travelled.</p>
16	<p>Part 1 of 2</p> <p>A long jumper leaves the ground at an angle of 24^o to the horizontal and at a speed of 10.7 m/s. How far does he jump? The acceleration due to gravity is 9.8 m/s². Answer in units of m</p>	<p>Once he jumps, this becomes a projectile motion problem.</p> <p>Follow the sample problems we did in class.</p>
17	<p>Part 2 of 2</p> <p>What maximum height does he reach? Answer in units of m.</p>	<p>Hang time problem.</p> <p>What do we do with the time from the previous problem?</p>