## High School Physics - Core Concept Cheat Sheet

<ul> <li>Key Physics Terms</li> <li>Vector: A quantity that represents magnitude (size) and direction. It is usually represented with an arrow to indicate the vertical direction.</li> <li>Productines move with a constant acceleration due to gravity only in the two scale.</li> <li>Quantity that can be completely described by its size.</li> <li>Resultant: the result of adding two or more vectors; exector sum.</li> <li>Productines move with a constant concepts of the vector.</li> <li>Velocity of a projectile gravity that describes the position of an object. Distance is a scalar.</li> <li>Velocity is a vector.</li> <li>Speed: The distance is a vector.</li> <li>Velocity is a vector quantity.</li> <li>Constant velocity: a velocity on the separated and that act in different directions.</li> <li>There addition: The process of combining vectors; added the task of velocity. Speed of an object. Distance the charge in the direction of motion.</li> <li>Displacement is a vector.</li> <li>Constant velocity: a velocity due to the complexity of the component is a vector.</li> <li>Constant velocity: a velocity that does not change with the estimation of an object. Distance wells as calar.</li> <li>Constant velocity: a velocity that does not change with the reproduct appropriate formation.</li> <li>Constant velocity: a velocity that does not change with the reproduct appropriate formation.</li> <li>Constant velocity: a velocity that does not change with the reproduct appropriate formation.</li> <li>Constant velocity: a velocity that does not change with a constant cell diversion of the problem.</li> <li>Constant velocity is a vector.</li> <li>Convert units if needed. Use units throughout your calculations.</li> <li>Convert units if needed. Use units throughout your calculations.</li> <li>Convert units if needed. Use units throughout your calculations.</li> <li>Convert units if needed of use and the same to a strong of the problem.<th colspan="2">05: Vectors and Kinematics in Two Dimensions</th></li></ul>	05: Vectors and Kinematics in Two Dimensions	
<ul> <li>Vector: A quantity that represents magnitude (size) and direction. It is usually represented with an arrow to indicate the appropriate direction. Vectors and incretion associated with its size.</li> <li>Scalar: A quantity that can be completely described by its magnitude. (size). It is an office direction associated with its size.</li> <li>Vector Component: The perpendicular parts into which a vector: The separated and that act in different direction.</li> <li>Vector Addition: The process of combining vectors; addit tho tail.</li> <li>Vector Addition: The process of combining vectors; addit tho tail.</li> <li>Vector Addition: The process of combining vectors; addit tho tail.</li> <li>Vector Addition: The process of combining vectors; addit to tail.</li> <li>Vector Addition: The process of combining vectors; addit tho tail.</li> <li>Vector Addition: The process of combining vectors; addit the sacience the vector.</li> <li>Vector Addition: The process of combining vectors; addit the sacience the vector.</li> <li>Vector Addition: The process of combining vectors; addition: Velocity is a vector quantity.</li> <li>Vector Addition: The problem conject of velocity is a vector quantity.</li> <li>Constant velocity: A vector duality.</li> <li>Vector Addition: The problem conject of velocity is a vector quantity.</li> <li>Vector Addition: The problem conject of velocity is a vector.</li> <li>Velocity is a vector quantity.</li> <li>Vector Addition: Nelocity is vector and specific velocity is constant.</li> <li>Vector Addition: The problem conject of velocity is a vector and vector.</li> <li>Vector Addition: We prove the vector.</li> <li>Vector Addition: Nelocity is vector quantity.</li> <li>Vector Addition: Nelocity is vector quantity.</li> <li>Constant velocity is vector quantity.</li> <li>Constant velocity is vector quantity.</li> <li>Vector Addition: The problem.</li> <li>Vector Addition: The problem.</li> <l< th=""><th>Key Physics Terms</th><th>Constant Velocity vs. Constant Acceleration</th></l<></ul>	Key Physics Terms	Constant Velocity vs. Constant Acceleration
Component DiagramComponent DiagramVector Component: The perpendicular parts into which a vector can be separated and that at in different directions from the vector.Vector Addition: The process of combining vectors; added a distance is a scalar.Vector Addition: The quantity that describes the change in location of an object and includes its direction of motion. Velocity is a vector quantity.Vector Addition: The quantity that describes the change in location of an object and includes its direction of motion. Velocity is a vector quantity.Vector Addition: The rate at which an object's velocity changes with time; this change may in speed, direction, or both. Acceleration: The rate at which an object's velocity changes with time; this change may in speed, direction, or both. Acceleration weetor.Valocity (usually average velocity or constant velocity: * v = offit vectual calculations.Velocity (usually average velocity or constant velocity: * a = accelerationKey FormulasVelocity (usually average velocity or constant velocity: * a = accelerationKey FormulasVelocity (usually average velocity or constant velocity: * a = acting in 6 = anyleKey Metric UnitsNow for the vertical component of motion.Velocity (usually average velocity or constant velocity: * a = acting in motion welcocity is constant. Garay is a cocleration of up is positive: A = change in 6 = anyle / hypSome diftic the vertical componentVelocity (usu	<ul> <li>Vector: A quantity that represents magnitude (size) and direction. It is usually represented with an arrow to indicate the appropriate direction. Vectors may or may not be drawn to scale.</li> <li>Scalar: A quantity that can be completely described by its</li> </ul>	<ul> <li>Projectiles move with a constant acceleration due to gravity only in the vertical direction.</li> <li>Projectiles move with a constant velocity only in the horizontal direction.</li> </ul>
Solution: the result of adding two or more vectors; exector <i>Component</i> : The perpendicular parts into which a vector <i>Component</i> : The parts that act in different directions from the vector. Solution: The process of combining vectors; addet the totall. Solution: The quantity that describes the position of an object. Distance is a scalar. Solution of an object ravels per unit of time; the magnitude of velocity. Speed is a scalar. Velocity: Spe	magnitude, (size). It has no direction associated with its	Component Diagram
Kinematics in 2-D Problem Solving TipsNaplacement is a vector.• Speed : The distance an object travels per unit of time; the magnitude of velocity: Speed of an object including its direction of motion. Velocity is a vector quantity.• Constant velocity: A velocity that does not change with time.• Constant velocity: The rate at which an object's velocity changes with time; this change may in speed, direction, of both. Acceleration: The rate at which an object's velocity changes with time; this change may in speed, direction, of both. Acceleration is a vector.• d = distance• d = distance• t = time• v = velocity (usually average velocity or constant velocity)• a = change in θ = angle• v = d/t • a = charge in θ = angle• v = d/t • a = charge in • trans = opp / hyp • Cose θ = ad / hyp • Tan θ = opp / adj• V = d/t • Stain a ence in disconnetic of the relical sign convention of up is positive: Acceleration: m/s <sup>1</sup> , m/s/s• Neederation is a positive: Acceleration is m/s <sup>2</sup> , m/s/s• V = find is convention of up is positive: Acceleration: m/s <sup>2</sup> , m/s/s• V = opp / adj • Time is convention throughout, the problem.• V = ofter convention for up ossitive: Acceleration: m/s <sup>2</sup> , m/s/s• Velocity/speed: m/s • Velocity/speed: m/s• Acceleration: m/s <sup>2</sup> , m/s/s• Velocity seed is convention throughout the problem.• velocity • velocity • en if some opsitive: Acceleration: m/s <sup>2</sup> , m/s/s• velocity • Velocity speed: in m/s • Nectory speed: • Nectory speed: • Velocity speed: m/s • Acceleration a positive: • Acceleration is c	<ul> <li>Resultant: the result of adding two or more vectors; vector sum.</li> <li>Vector Component: The perpendicular parts into which a vector can be separated and that act in different directions from the vector.</li> <li>Vector Addition: The process of combining vectors; added tip to tail.</li> <li>Distance: The quantity that describes the position of an object. Distance is a scalar.</li> <li>Displacement: The quantity that describes the change in</li> </ul>	Velocity of a projectile Vertical component Horizontal component
Unclusted• d = distance• t = time• v = velocity (usually average velocity or constant velocity)• a acceleration• v = velocity (usually average velocity or constant velocity)• a a acceleration• v = final velocity• v = nange <b>Typical 2-D Kinematics Problem</b> • v = d/t• a a $\Delta v/\Delta t= (v, - v) / t$ • d = vt + at <sup>2</sup> / 2• v = d/t• a = $\Delta v/\Delta t= (v, - v) / t$ • d = vt + at <sup>2</sup> / 2• v = d/t• a = $\Delta v/\Delta t= (v, - v) / t$ • d = vt + at <sup>2</sup> / 2• V = $2 + 2 ad$ • Pythagorean Theorem: $c^2 = a^2 + b^2$ • For the vertical sign convention of up is positive:• Acceleration due to gravity, $g_{-} = -9.8 m/s^2$ • Displacement/distance: meters, m• Time: s• Velocity/speed: m/s• Acceleration m/s <sup>2</sup> , m/s/s• Acceleration m/regative.• Neg tube is into exposite direction must be negative.• Otten, up and right are positive while down and left are negative.• Even if someone else choses the opposite direction as positive.• Even if someone else choses the opposite	<ul> <li>location of an object and includes its direction of motion.</li> <li>Displacement is a vector.</li> <li>Speed: The distance an object travels per unit of time; the magnitude of velocity. Speed is a scalar.</li> <li>Velocity: Speed of an object including its direction of motion. Velocity is a vector quantity.</li> <li>Constant velocity: A velocity that does not change with time.</li> <li>Acceleration: The rate at which an object's velocity changes with time; this change may in speed, direction, or both. Acceleration is a vector.</li> </ul>	<ul> <li>Kinematics in 2-D Problem Solving Tips</li> <li>These tips will make it easier to solve any kinematics physics problems.</li> <li>Thoroughly read the entire problem.</li> <li>Draw a diagram if needed.</li> <li>Identify all given information.</li> <li>Identify the quantity to be found.</li> <li>Select appropriate formula(s) that incorporate what you know and what you want to find.</li> <li>Convert units if needed. Use units throughout your calculations</li> </ul>
• v = velocity (usually average velocity or constant velocity) • a = acceleration • v = final velocity • a = change in $\theta$ = angle <b>Key Formulas</b> • v = d/t • a = $\Delta v/\Delta t = (v_r - v_i) / t$ • d = v_t + at <sup>2</sup> /2 • v <sub>r</sub> <sup>2</sup> = v <sub>r</sub> <sup>2</sup> + 2ad • v <sub>r</sub> <sup>2</sup> = v <sub>r</sub> <sup>2</sup> + 2ad • v <sub>r</sub> <sup>2</sup> = v <sub>r</sub> <sup>2</sup> + 2ad • v <sub>r</sub> <sup>2</sup> = v <sub>r</sub> <sup>2</sup> + 2ad • v <sub>r</sub> <sup>2</sup> = v <sub>r</sub> <sup>2</sup> + 2ad • v <sub>r</sub> <sup>2</sup> = v <sub>r</sub> <sup>2</sup> + 2ad • v <sub>r</sub> <sup>2</sup> = v <sub>r</sub> <sup>2</sup> + 2ad • v <sub>r</sub> <sup>2</sup> = v <sub>r</sub> <sup>2</sup> + 2ad • v <sub>r</sub> <sup>2</sup> = v <sub>r</sub> <sup>2</sup> + 2ad • v <sub>r</sub> <sup>2</sup> = v <sub>r</sub> <sup>2</sup> + 2ad • v <sub>r</sub> <sup>2</sup> = v <sub>r</sub> <sup>2</sup> + 2ad • v <sub>r</sub> <sup>2</sup> = v <sub>r</sub> <sup>2</sup> + 2ad • v <sub>r</sub> <sup>2</sup> = v <sub>r</sub> <sup>2</sup> + 2ad • v <sub>r</sub> <sup>2</sup> = v <sub>r</sub> <sup>2</sup> + 2ad • v <sub>r</sub> <sup>2</sup> = v <sub>r</sub> <sup>2</sup> + 2ad • v <sub>r</sub> <sup>2</sup> = v <sub>r</sub> <sup>2</sup> + 2ad • v <sub>r</sub> <sup>2</sup> = v <sub>r</sub> <sup>2</sup> + 2ad • v <sub>r</sub> <sup>2</sup> = v <sub>r</sub> <sup>2</sup> + 2ad • v <sub>r</sub> <sup>2</sup> = v <sub>r</sub> <sup>2</sup> + 2ad • v <sub>r</sub> <sup>2</sup> = v <sub>r</sub> <sup>2</sup> + 2ad • v <sub>r</sub> <sup>2</sup> = v <sub>r</sub> <sup>2</sup> + 2ad • v <sub>r</sub> <sup>2</sup> = v <sub>r</sub> <sup>2</sup> + 2ad • v <sub>r</sub> <sup>2</sup> = v <sub>r</sub> <sup>2</sup> + 2ad • v <sub>r</sub> <sup>2</sup> = v <sub>r</sub> <sup>2</sup> + 2ad • v <sub>r</sub> <sup>2</sup> = v <sub>r</sub> <sup>2</sup> + 2ad • v <sub>r</sub> <sup>2</sup> = v <sub>r</sub> <sup>2</sup> + 2ad • v <sub>r</sub> <sup>2</sup> = v <sub>r</sub> <sup>2</sup> + 2ad • v <sub>r</sub> <sup>2</sup> = v <sub>r</sub> <sup>2</sup> + 2ad • v <sub>r</sub> <sup>2</sup> = v <sub>r</sub> <sup>2</sup> + 2ad • v <sub>r</sub> <sup>2</sup> = v <sub>r</sub> <sup>2</sup> + 2ad • v <sub>r</sub> <sup>2</sup> = v <sub>r</sub> <sup>2</sup> + 2ad • v <sub>r</sub> <sup>2</sup> = v <sub>r</sub> <sup>2</sup> + 2ad • v <sub>r</sub> <sup>2</sup> = v <sub>r</sub> <sup>2</sup> + 2ad • v <sub>r</sub> <sup>2</sup> = v <sub>r</sub> <sup>2</sup> + 2ad • v <sub>r</sub> <sup>2</sup> = v <sub>r</sub> <sup>2</sup> + 2ad • v <sub>r</sub> <sup>2</sup> = v <sub>r</sub> <sup>2</sup> + 2ad • v <sub>r</sub> <sup>2</sup> = v <sub>r</sub> <sup>2</sup> + 2ad • v <sub>r</sub> <sup>2</sup> = v <sub>r</sub> <sup>2</sup> = a <sup>2</sup> + b <sup>2</sup> • Sin $\theta$ = opp / hyp • Tan $\theta$	Variables Used • d = distance • t = time	<ul> <li>Do any mathematical calculations carefully. Check the number of significant figures in the problem.</li> <li>For all projectiles, the horizontal velocity is constant. Gravity only affects the vertical component of motion.</li> </ul>
• a = acceleration • v = final velocity • v = initial velocity • a = change in $\theta$ = angle <b>Key Formulas</b> • v = d/t • a = $\Delta v/\Delta t = (v_r - v_i) / t$ • d = $v_t + at^2 / 2$ • v <sub>r</sub> <sup>2</sup> = v <sub>r</sub> <sup>2</sup> + 2ad • Pythagorean Theorem: c <sup>2</sup> = a <sup>2</sup> + b <sup>2</sup> · Sin $\theta$ = opp / hyp • Cos $\theta$ = adj / hyp • Tan $\theta$ = opp / hyp	• v = velocity (usually average velocity or constant velocity)	
• v <sub>1</sub> = initial velocity • $\Delta$ = change in $\theta$ = angle <b>Key Formulas</b> • v = d/t • $a = \Delta v/\Delta t = (v_r - v_i) / t$ • $d = v_i t + at^2 / 2$ • $v_i^2 + v_i^2 + 2ad$ • Pythagorean Theorem: $c^2 = a^2 + b^2$ • Sin $\theta = opp / hyp$ • Cos $\theta = adj / hyp$ • Tan $\theta = opp / adj$ • Por the vertical sign convention of up is positive: Acceleration due to gravity, $g_i = -9.8 \text{ m/s}^2$ • Displacement/distance: meters, m • Time: s • Velocity/speed: m/s • Acceleration: m/s <sup>2</sup> , m/s/s • Assign a direction as positive. • Key Conventions • Assign a direction as positive. • Key Conventions • Assign a direction as positive. • Cotten, up and right are positive, while down and left are negative. • Even if someone else choses the opposte direction as positive, while down and left are negative. • Even if someone else choses the opposite direction as positive, while down and left are negative. • Even if someone else choses the opposite direction as positive for their someone that is are correct, sig fig correct, magnitude looks proceeding the for their sign convention throughout the problem. • Any quantities in the opposite direction as the opposite direction as positive, while down and left are negative. • Even if someone else choses the opposite direction as positive for their someone that the sign convention throughout the problem. • Any quantities in the opposite direction as the opposite direction as positive, while down and left are negative. • Even if someone else choses the opposite direction as positive for their sign convention throughout the problem. • Displacement is someone of the opposite direction as the opposite direction as positive. • Even if someone else choses the opposite direction as positive for their sign convention theory will active at the problem. • Displacement is the opposite direction as positive. • Even if someone that is a convention throughout the problem. • Displacement is the opposite direction as	• $a = acceleration$ • $v_f = final velocity$	Typical 2-D Kinematics Problem
Key FormulasKnown: $d_v = -1m$ $a = -9.8$ m/s² $v_h = 15$ m/s $v_{1v} = 0$ m/s• $v = d/t$ $a = \Delta v/At = (v_r - v_i) / t$ $d_v = -1m$ $a = -9.8$ m/s² $v_h = 15$ m/s $v_{1v} = 0$ m/s• $d_v = v_t + at^2/2$ $v_r^2 = v_r^2 + 2ad$ • Pythagorean Theorem: $c^2 = a^2 + b^2$ $h_h = ?$ t = ?• Pythagorean Theorem: $c^2 = a^2 + b^2$ $h_h = ?$ t = ?• Pythagorean Theorem: $c^2 = a^2 + b^2$ $h_h = ?$ t = ?• Displacement/distance: $c^2 = a^2 + b^2$ $h_h = ?$ • For the vertical sign convention of up is positive: Acceleration due to gravity, $g_r = -9.8$ m/s²Define: First, find the time in the air: $d = v_t + at^2/2$ This formula can be used since the air time for horizontally launched projectile equals the time for one that is simply dropped. Since $v_{1v} = 0$ m/s then $d = at^2/2$ Rearranging: $t = \sqrt{(2d/a)}$ • Displacement/distance: meters, m • Time: s • Velocity/speed: m/s • Acceleration: m/s², m/s/sSecond, find the horizontal distance: $d_h = vt$ This formula can be used since the horizontal velocity is constant.• Assign a direction as positive. • Keep this convention throughout the problem. • Any quantities in the opposite direction must be negative. • Often, up and right are positive, while down and left are negative. • Even if someone else choses the opposite direction as positive for their sign convention throughout the will arrive at the positive for their sign convention throughout will arrive at the positive for their sign convention the will arrive at the positive for their sign convention throughout the problem. • Any quantities in the opposite direction as positive for their sign convention throughout the will arrive at the positive for their sign convention the wil	• $v_i$ = initial velocity • $\Delta$ = change in $\theta$ = angle	Example: A toy projectile is fired horizontally from a launcher at height of 1.0 m and a velocity of 15 m/s. How far away from the starting point will the projectile land?
• $v = d/t$ • $a = \Delta v/\Delta t = (v_r - v_i) / t$ • $d = v_i t + at^2 / 2$ • $v_r^2 = v_i^2 + 2ad$ • Pythagorean Theorem: $c^2 = a^2 + b^2$ • Sin $\theta = opp / hyp$ • Cos $\theta = adj / hyp$ • Tan $\theta = opp / adj$ • For the vertical sign convention of up is positive: Acceleration due to gravity, $g_r = -9.8 \text{ m/s}^2$ <b>Define:</b> First, find the time in the air: $d = v_i t + at^2/2$ This formula can be used since the air time for horizontally launched projectile equals the time for horizontally launched projectile equals the time for one that is simply dropped. Since $v_{iv}=0 \text{ m/s}$ then $d = at^2/2$ Rearranging: $t = \sqrt{(2d/a)}$ • Displacement/distance: meters, m • Time: s • Velocity/speed: m/s • Acceleration: m/s <sup>2</sup> , m/s/s • Acceleration: m/s <sup>2</sup> , m/s/s • Acceleration throughout the problem. • Any quantities in the opposite direction must be negative. • Often, up and right are positive, while down and left are negative. • Even if someone else choses the opposite direction as positive, for their sign convention throughout the problem. • Any quantities in the opposite direction as negative. • Even if someone else choses the opposite direction as positive, for their sign convention throughout the problem. • Even if someone else choses the opposite direction as positive, for their sign convention throughout the problem. • Dits are correct, sig fig correct, magnitude looks • represented	Key Formulas	Known:
Key Metric UnitsRearranging: $t = \sqrt{(2d/a)}$ • Displacement/distance: meters, mSecond, find the horizontal distance: $d_h = vt$ • Time: sSecond, find the horizontal distance: $d_h = vt$ • Velocity/speed: m/sSecond, find the horizontal distance: $d_h = vt$ • Acceleration: m/s <sup>2</sup> , m/s/sThis formula can be used since the horizontal• Acceleration: m/s <sup>2</sup> , m/s/sOutput:• Assign a direction as positive. $u = \sqrt{(2d/a)} = \sqrt{(2(-1m)/(-9.8m/s^2))} = .45s$ • Any quantities in the opposite direction must be negative. $d_h = (.45 s)(15 m/s) = 6.8 m$ • Even if someone else choses the opposite direction as positive, for their sign convention three will arrive at the positive for their sign convention they will arrive at the positive for their sign convention they will arrive at the positive.	• $v = d/t$ • $a = \Delta v/\Delta t = (v_f - v_i) / t$ • $d = v_i t + at^2 / 2$ • $v_f^2 = v_i^2 + 2ad$ • Pythagorean Theorem: $c^2 = a^2 + b^2$ • Sin $\theta = opp / hyp$ • Cos $\theta = adj / hyp$ • Tan $\theta = opp / adj$ • For the vertical sign convention of up is positive: Acceleration due to gravity, g, = -9.8 m/s <sup>2</sup>	$eq:linear_line$
<ul> <li>Displacement/distance: meters, m</li> <li>Time: s</li> <li>Velocity/speed: m/s</li> <li>Acceleration: m/s<sup>2</sup>, m/s/s</li> <li>Acceleration: m/s<sup>2</sup>, m/s/s</li> <li>Assign a direction as positive.</li> <li>Assign a direction as positive.</li> <li>Assign a direction as positive.</li> <li>Any quantities in the opposite direction must be negative.</li> <li>Often, up and right are positive, while down and left are negative.</li> <li>Even if someone else choses the opposite direction as positive for their sign convention they will arrive at the positive for their sign convention they will arrive at the positive.</li> </ul>	Key Metric Units	Rearranging: $t = \sqrt{(2d/a)}$
Key ConventionsOutput:• Assign a direction as positive. $t = \sqrt{(2d/a)} = \sqrt{(2(-1m)/(-9.8m/s^2))} = .45s$ • Any quantities in the opposite direction must be negative. $d_h = (.45 s)(15 m/s) = 6.8 m$ • Often, up and right are positive, while down and left are negative. $u_h = (.45 s)(15 m/s) = 6.8 m$ • Even if someone else choses the opposite direction as positive for their sign convention they will arrive at theUnits are correct, sig fig correct, magnitude looks	<ul> <li>Displacement/distance: meters, m</li> <li>Time: s</li> <li>Velocity/speed: m/s</li> <li>Acceleration: m/s<sup>2</sup>, m/s/s</li> </ul>	Second, find the horizontal distance: $d_h = vt$ This formula can be used since the horizontal velocity is constant.
<ul> <li>Assign a direction as positive.</li> <li>Keep this convention throughout the problem.</li> <li>Any quantities in the opposite direction must be negative.</li> <li>Often, up and right are positive, while down and left are negative.</li> <li>Even if someone else choses the opposite direction as positive for their sign convention they will arrive at the</li> </ul>	Key Conventions	Output:
positive, for their sign convention they will drive at the provide redSONADIE.	<ul> <li>Assign a direction as positive.</li> <li>Keep this convention throughout the problem.</li> <li>Any quantities in the opposite direction must be negative.</li> <li>Often, up and right are positive, while down and left are negative.</li> <li>Even if someone else choses the opposite direction as positive, for their sign convention they will arrive at the</li> </ul>	t = $\sqrt{(2d/a)} = \sqrt{(2(-1m)/(-9.8m/s^2))} = .45s$ d <sub>h</sub> =(.45 s)(15 m/s) = 6.8 m Substantiate: Units are correct, sig fig correct, magnitude looks reasonable.

How to Use This Cheat Sheet: These are the keys related this topic. Try to read through it carefully twice then write it out on a blank sheet of paper. Review it again before the exams.