One and two dimensional motion

by anjuscha via cheatography.com/125991/cs/24592/

Speed and Velocity

speed	the distance traveled per unit of time. Speed is a scalar, a quantity that is described by magnitude alone. Constant speed refers to a fixed distance per unit of time. Average speed includes the total distance and total time.
velocity	the displacement of an object per unit of time. Since displacement includes a direction, so does velocity. Speed with direction. Velocity is a vector a quantity that has both magnitude and direction.
vector	a quantity that has both magnitude and direction
reference frame	the position from which an event is observed
motion map	an image that represents the position, velocity, and acceleration of an object at one-second intervals
scalar	a quantity that is described by magnitude alone

Speed and Velocity (cont)

Motion and reference frame	All motion is relative. It depends on a reference frame. An object may appear to move faster or slower depending on the reference frame.
average velocity	The slope of a line changes when the velocity of an object changes -> The steeper the slope, the greater the velocity. The average velocity will be different than any of the other. Any point on the line will give only an instantaneous velocity.
change in direction	A change in direction is represented when the line on a position-time graph changes from a positive slope to a negative. slope or from a negative slope to a positive slope. A negative slope indicates an object moving towards the origin. A positive slope indicates an object moving away from the origin.

Speed and Velocity (cont)

No motion	horizontal line - means object is not moving -> The object’s position does not change
Motion	Displayed in a vector !

Formula

speed	s = d/t -> 50 + 30 = 80 miles, 1+1 = 2h -> 80 miles/2h = 40 mph
velocity	v = Δx/t
average velocity	v avg = Δx/Δt = xf − xi/tf − ti -> 100 m in 10.61 s -> xf = 100 m, xi = 0 m, tf = 10.61 s, ti = 0 s -> v avg = 100 m - 0 m / 10.61 s - 0 s = 100/10.61 = 9.43 m/s

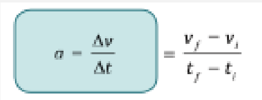
Acceleration

positive acceleration	an increase in velocity over time
negative acceleration	a decrease in velocity over time
acceleration	the rate at which velocity changes over time
constant	staying the same; unchanging
Positive acceleration	speeds up in the positive direction. slows down in the negative direction

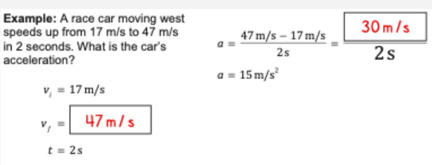
Acceleration (cont)

Negative acceleration	slow down down in the positive direction. speeds up in the negative direction.
Slope	of the line on a velocity vs. time graph represents acceleration. Positive slope = acceleration, negative slope = negative acceleration

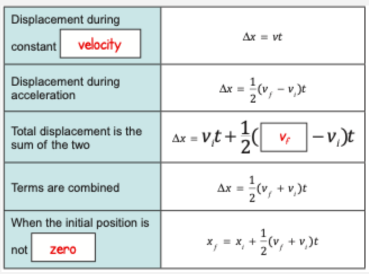
acceleration



Acceleration example

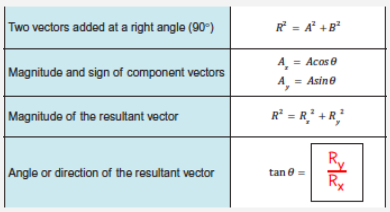


Displacement during constant acceleration



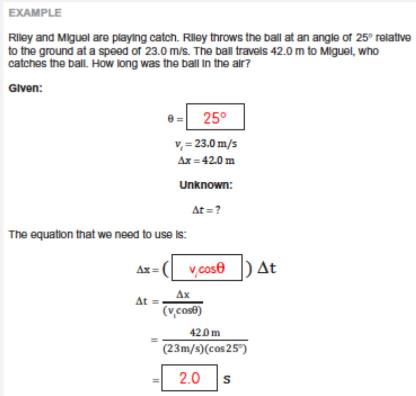
Displacement during constant velocity	$\Delta x = vt$
Displacement during acceleration	$\Delta x = \frac{1}{2}(v_f - v_i)t$
Total displacement is the sum of the two	$\Delta x = v_i t + \frac{1}{2}(v_f - v_i)t$
Terms are combined	$\Delta x = \frac{1}{2}(v_f + v_i)t$
When the initial position is not zero	$x_f = x_i + \frac{1}{2}(v_f + v_i)t$

Formula

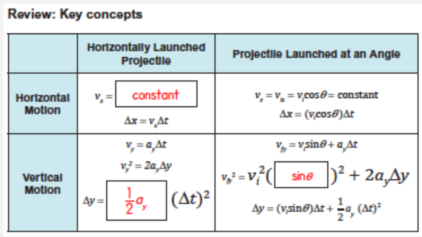


Two vectors added at a right angle (90°)	$R^2 = A^2 + B^2$
Magnitude and sign of component vectors	$A_x = A\cos\theta$, $A_y = A\sin\theta$
Magnitude of the resultant vector	$R^2 = R_x^2 + R_y^2$
Angle or direction of the resultant vector	$\tan\theta = \frac{R_y}{R_x}$

Horizontal motion example



Key concepts



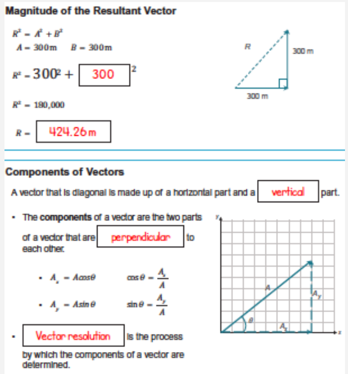
Review: Key concepts

	Horizontally Launched Projectile	Projectile Launched at an Angle
Horizontal Motion	$v_x = $ constant; $\Delta x = v_x \Delta t$	$v_x = v_{ix} = v_i\cos\theta =$ constant; $\Delta x = (v_i \cos\theta)\Delta t$
Vertical Motion	$v_y = a_y \Delta t$; $v_y^2 = 2a_y\Delta y$; $\Delta y = \frac{1}{2}a_y(\Delta t)^2$	$v_y = v_i\sin\theta + a_y\Delta t$; $v_y^2 = v_i^2(\sin\theta)^2 + 2a_y\Delta y$; $\Delta y = (v_i \sin\theta)\Delta t + \frac{1}{2}a_y(\Delta t)^2$

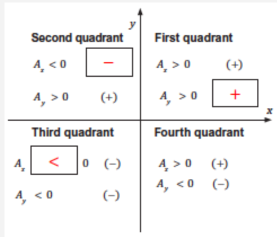
vectors

quadrant	a quarter of the coordinate plane
components	the two parts of a vector that are perpendicular to each other
resultant vector	the sum of two or more vectors
vector resolution	the process by which the components of a vector are determined
Properties of a vector	A vector is a quantity that has both magnitude and direction. Examples of vectors: Displacement, velocity, acceleration. Vectors are drawn using an arrow

More



Sign of a component



The sign of a component depends on the quadrant of the coordinate system it is in.

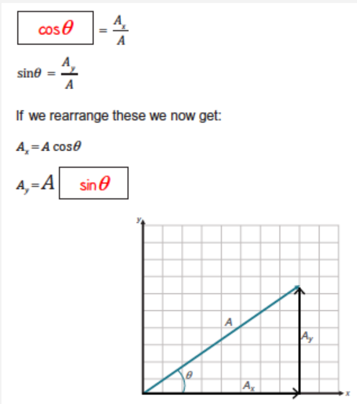
Projectile Motion

projectile	an object that is set in motion following a path in which the only force acting on it is gravity.
inertia	the natural tendency of objects to resist a change in motion

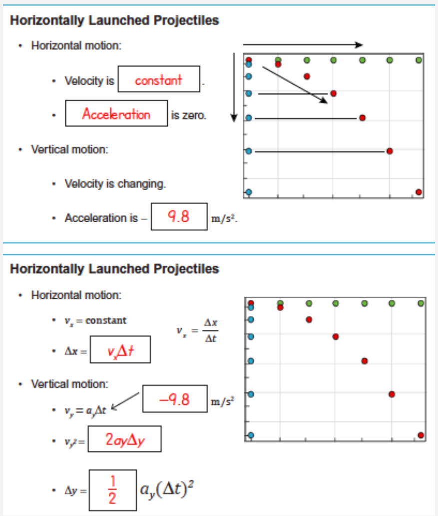
Projectile Motion (cont)

projectile motion	the curved motion that results from the combination of an object’s horizontal inertia and the force due to gravity pulling the object downward. I.e. A ball rolling of the table, A player shooting a jump shot -> Projectiles follow a parabolic path
parabolic	having the shape of a parabola
vectors	Vectors are used to describe motion in two dimensions. Vectors can be broken down into x and y components. The components of a vector are the two parts of a vector that are perpendicular to each other

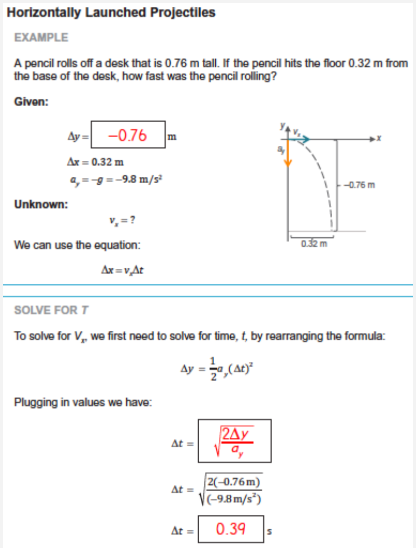
Add



Horizontal



Horizontal example



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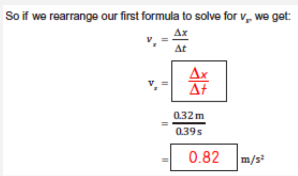

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