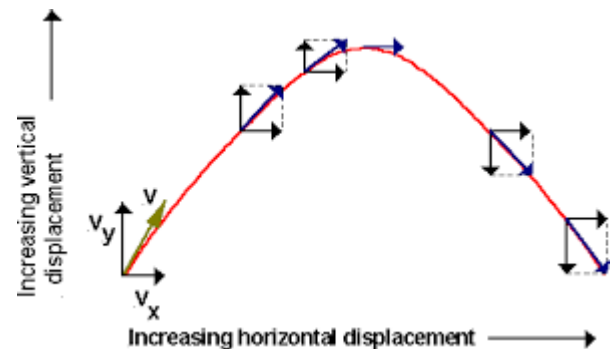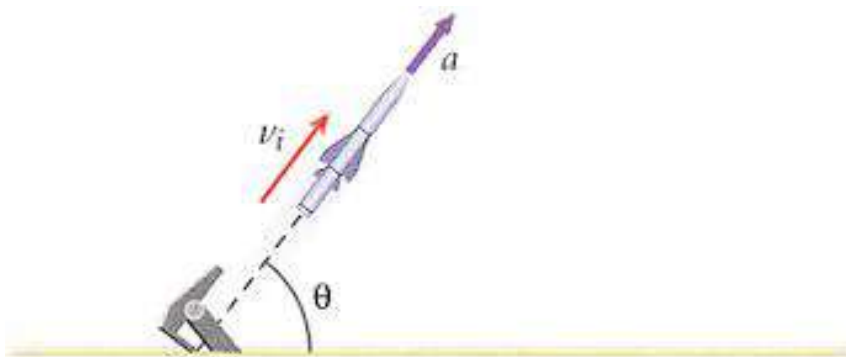# Projectile Motion Part 2
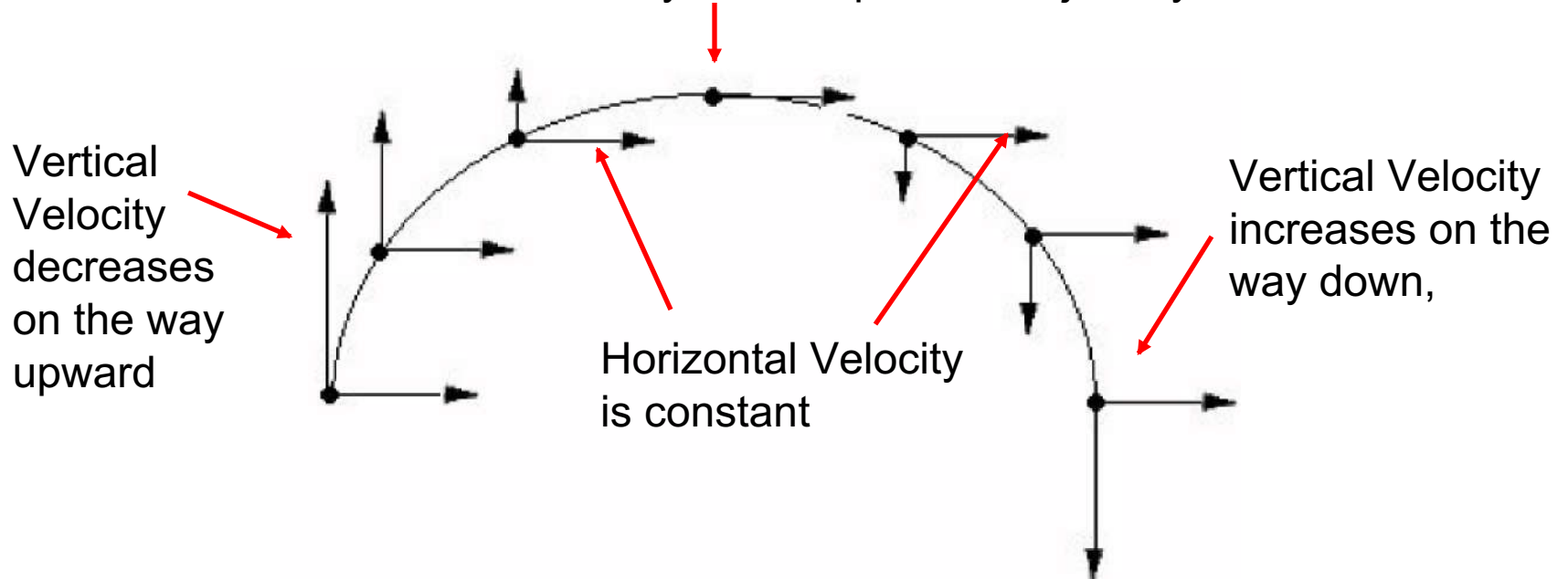# Full Projectiles

A Flipped Lesson by Ms. Logan

Vertically Launched Projectiles

NO Vertical Velocity at the top of the trajectory.

Vertical Velocity decreases on the way upward

Horizontal Velocity is constant

Vertical Velocity increases on the way down,

Component	Magnitude	Direction
Horizontal	Constant	Constant
Vertical	Decreases up, 0 @ top, Increases down	Changes

Vertically Launched Projectiles

Since the projectile was launched at a angle, the velocity MUST be broken into components!!!
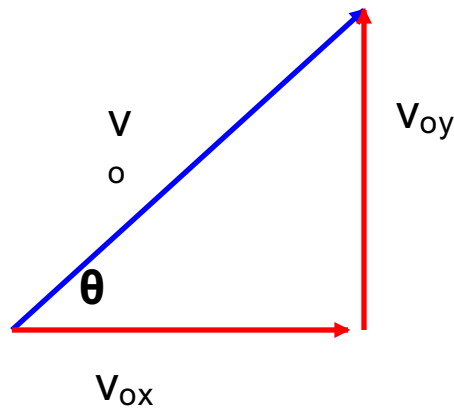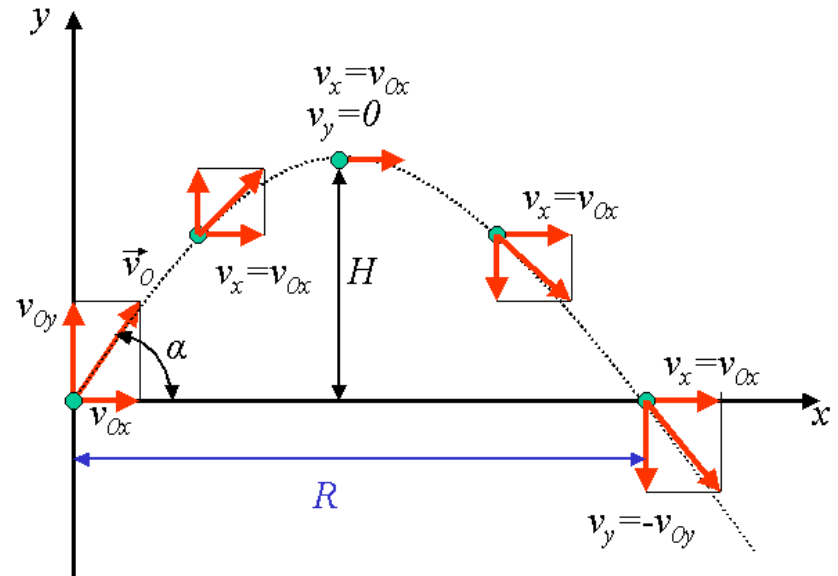
$$v_{ox} = v_o \cos \theta$$

$$v_{oy} = v_o \sin \theta$$

Vertically Launched Projectiles

There are several things you must consider when doing these types of projectiles besides using components. If it begins and ends at ground level, the "y" displacement is ZERO: y = 0

Steps to Solve a Full Projectile

1) Draw a diagram. You should have a triangle.

2) Solve for your x and y velocities

2) Write down your known and unknowns in the and x AND y directions

3) Determine which equations you will use to solve

4) SOLVE!

X (horiz)	Y (vertical)
V_0=8.6 m/s	V_0=3.5 m/s
V_f= 8.6 m/s	A = 9.8m/s^2
T = ?	d = 0
D = ?	T = ?
Equ	Equ

Hints to Solve a Full Projectile

| X (horiz)	Y (vertical)
$V_0 = 8.6$ m/s	$V_0 = 3.5$ m/s
$V_f = 8.6$ m/s	$A = 9.8 m/s^2$
T = ?	d = 0
D = ?	T = ?

Example: Set Up Only!

A rocket is launched with an initial velocity of 184 m/s at an angle of 50 degrees. How long is the rocket in the air? How far away does it land?

Example

A place kicker kicks a football with a velocity of 20.0 m/s and at an angle of 53 degrees.

(a) How long is the ball in the air?

(b) How far away does it land?

(c) How high does it travel?
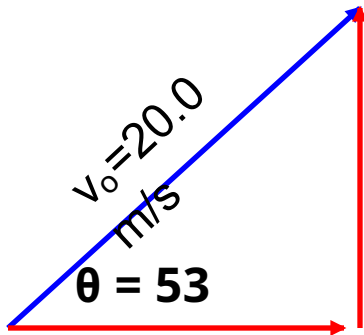
$$v_{ox} = v_o \cos\theta$$

$$v_{ox} = 20\cos 53 = 12.04 \, m/s$$

$$v_{oy} = v_o \sin\theta$$

$$v_{oy} = 20\sin 53 = 15.97 \, m/s$$

$v_o = 20.0$ m/s

θ = 53

Example

A place kicker kicks a football with a velocity of 20.0 m/s and at an angle of 53 degrees.

(a) How long is the ball in the air?

x	y

Example

A place kicker kicks a football with a velocity of 20.0 m/s and at an angle of 53 degrees.

(b) How far away does it land?

x	y

Example

A place kicker kicks a football with a velocity of 20.0 m/s and at an angle of 53 degrees.

(c) How high does it travel?

x	y

Follow Up Questions!

1) In the x direction, _____ and _____ velocity are always equal.

2) In the y direction, _____ is always 0.

3) My sketch should always be a _____.

4) After I make my sketch, I need to solve for my _____ and _____ velocities using SOHCAHTOA.

5) SET UP ONLY- Sketch, Solve for x/y velocities & x/y components.

A punter kicks a ball at an angle of 60 degrees at 20 m/s. How far does the fall travel in the horizontal direction? How long does it take to land?

6) SET UP ONLY- Sketch, Solve for x/y velocities & x/y components.

A football is thrown at an angle of 30 degrees at 12 m/s. How far does the football go? How long does it take for the ball to land?