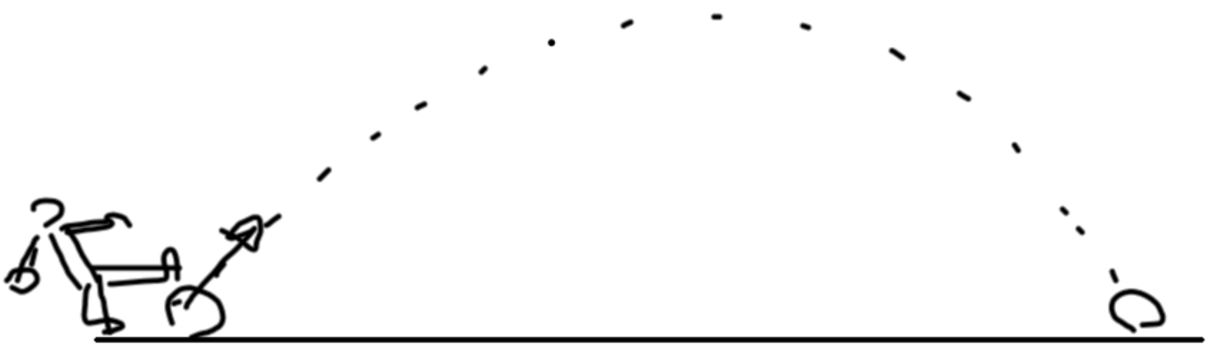
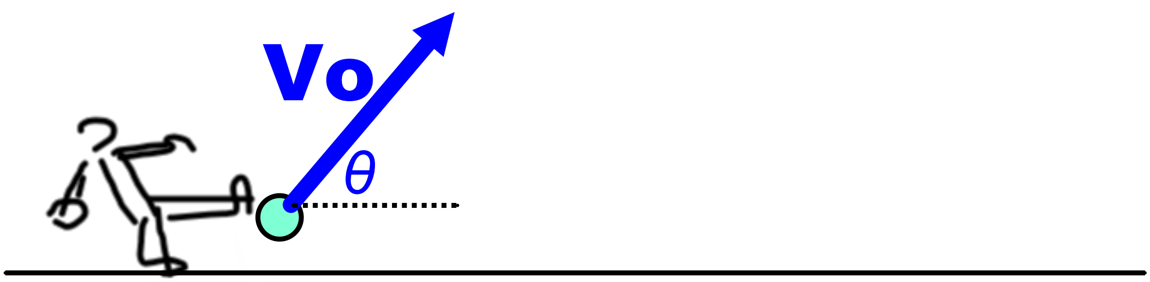
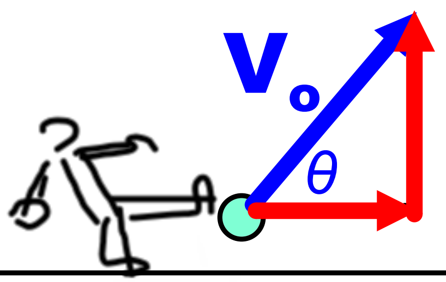
Before starting these problems, there is an initial step.



The initial velocity has to be broken into components.



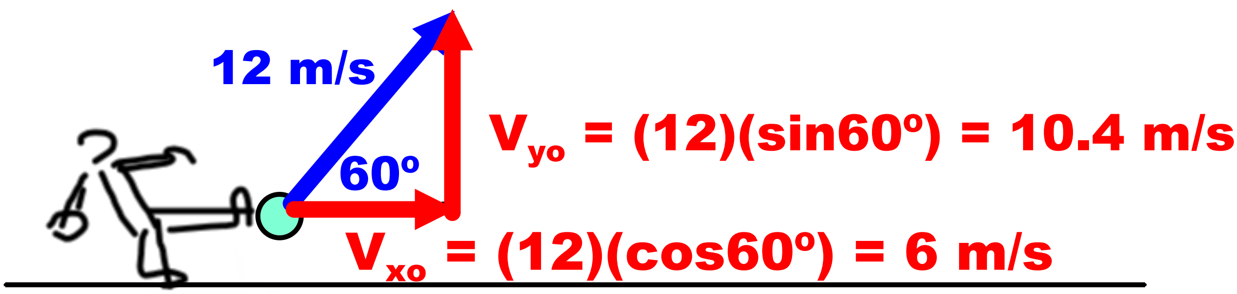
The initial velocity has to be broken into components.



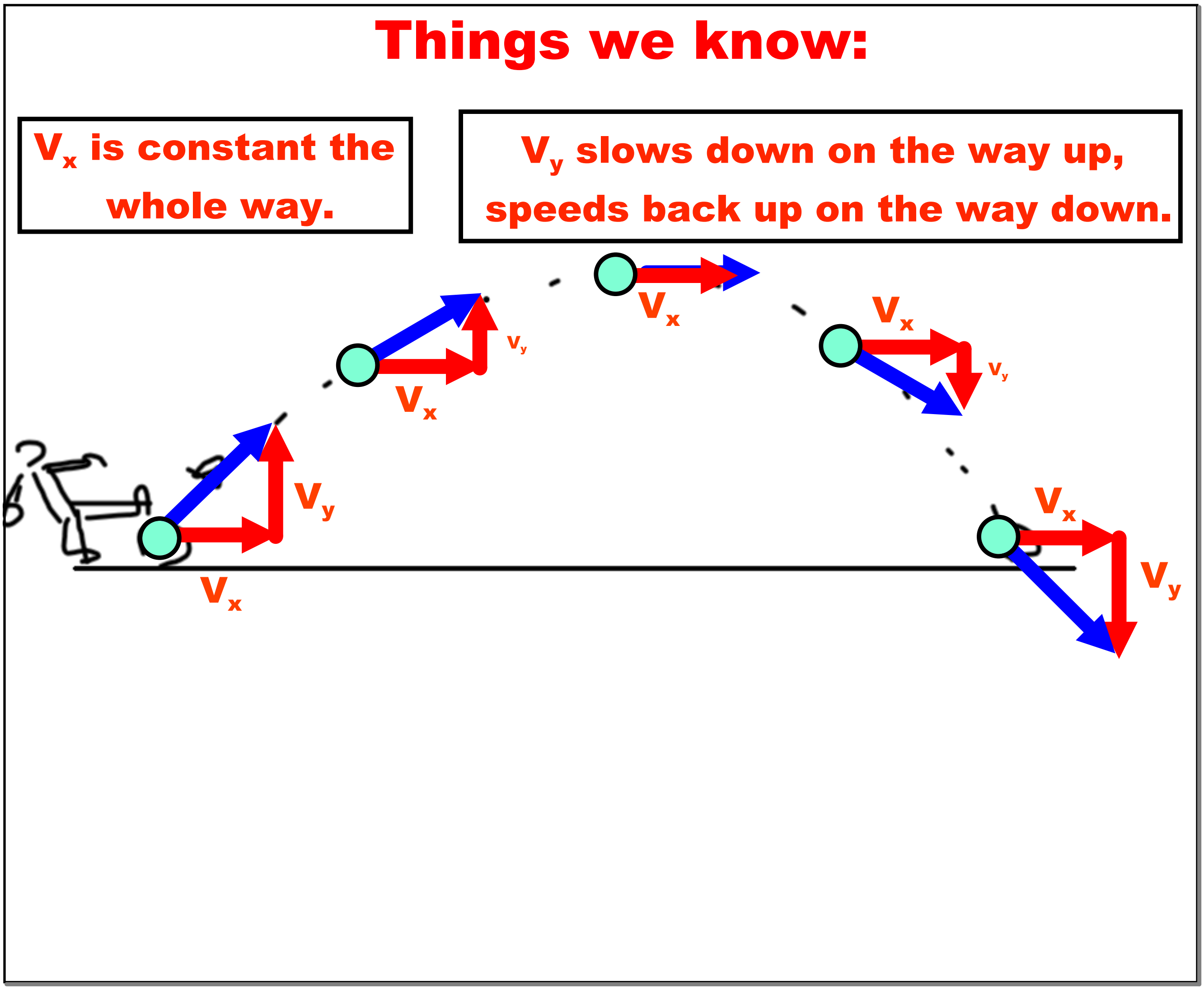
$$V_{yo} = V_o \sin\theta$$

$$V_{xo} = V_o \cos\theta$$

The initial velocity has to be broken into components.



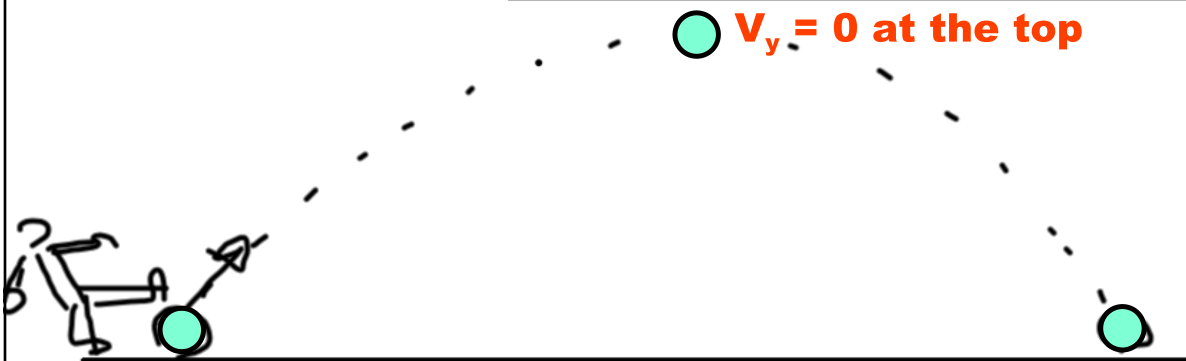
Once you do that, you never use the 12 m/s again!


Things we know:
Vx is constant the whole way.
Vy slows down on the way up, speeds back up on the way down.
Vx
Vy
Vx
Vy
Vx
Vx
Vy
Vx
Vy

Things we know:

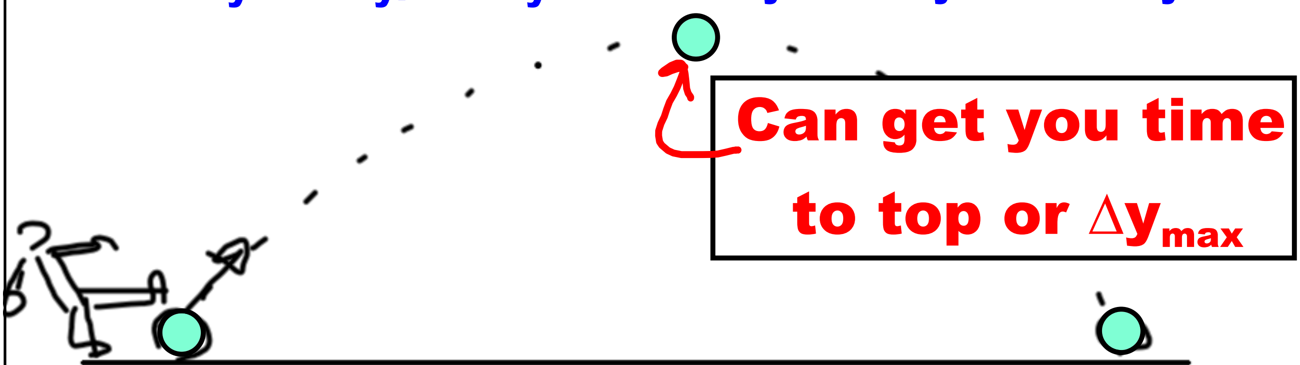
V_x is constant the whole way.

V_y slows down on the way up, speeds back up on the way down.



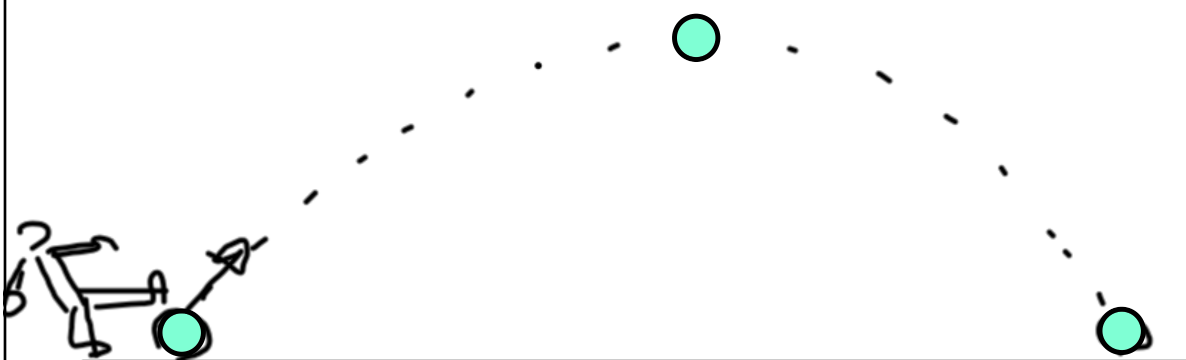
plugging in $V_y = 0$

$$V_y = V_{yi} + a_y t \qquad V_y^2 = V_{yo}^2 + 2a_y\Delta y$$



(a_y is always $-10 m/s^2$)

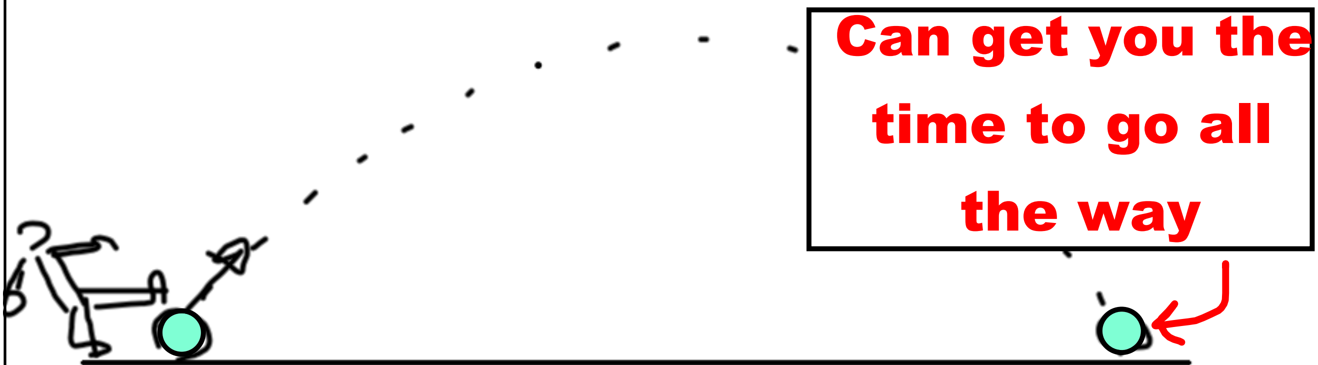
Things we know:



$\Delta y = 0$ **when it gets back down.**

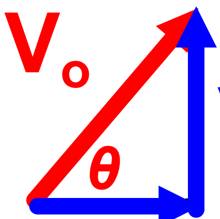
plugging in $\Delta y = 0$

$$\Delta y = V_{yo}t + 1/2a_yt^2$$



(a_y is always $-10 m/s^2$)

angled launches



$V_{yo} = V_o \sin\theta$

$V_{xo} = V_o \cos\theta$

$\Delta x = V_{xo}t$	$\Delta y = V_{yo}t + 1/2 a_y t^2$
	$V_y = V_{yo} + a_y t$ $V_y^2 = V_{yo}^2 + 2a_y \Delta y$

Use to get how far in the x (range).

Set $V_y = 0$ to get the time to the top and double it.

Set $V_y = 0$ to get Δy_{max} (max ht at the top)

(a_y is $-10 m/s^2$)

2. The baseball is hit from and caught at the same height.
  a) Resolve the initial velocity into components.
  b) How long was the ball in flight?
  c) What horizontal distance did the ball travel?
  d) How high above the start height did the ball get?

2. The baseball is hit from and caught at the same height.
   a) Resolve the initial velocity into components.
   b) How long was the ball in flight?
   c) What horizontal distance did the ball travel?
   d) How high above the start height did the ball get?

(a) V_{xo} = (50 m/s)cos25° = 45.3 m/s

V_{yo} = (50 m/s)sin25° = 21.1 m/s

(b) Vy = Vyo + at

(Vy = 0 at the top)

0 = (21.1) + (-10)t

0 = 21.1 - 10t

10t = 21.1

t = 2.11 s

double it!

t = 4.22 s

(c) $\Delta x = V_{xo}t$

(find Δx at the total time)

$\Delta x = (45.3)(4.2)$

Δx = 190.3 m

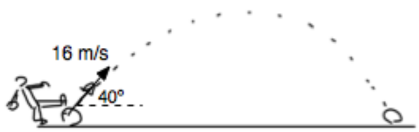
(d) $V_y^2 = V_{yo}^2 + 2a_y\Delta y$

(V_y = 0 at the top when it hits Δy_{max})

$0^2 = 21.1^2 + 2(-10)\Delta y_{max}$

$0 = 446.5 - 20\Delta y_{max}$

22.3 m = Δy_{max}



The soccer ball is kicked from and lands at the same height.

a) Resolve the initial velocity into components.
b) How long was the ball in flight?
c) What horizontal distance did the ball travel?
d) How high above the start height did the ball get?

a) $v_{xo} = v_o \cos\theta = (18)\cos 40° = 12.3 \frac{m}{s}$

$v_{yo} = v_o \sin\theta = (18)\sin 40° = 10.3 \frac{m}{s}$

b) $v_y = v_{yo} + a_y t$

$0 = 10.3 + (-10)t$

$10t = 10.3$

$t = 1.03$ double it! → $2.06 s$

c) $\Delta x = v_{xo} t$

$= (12.3)(2.06)$

$= 25.3 m$

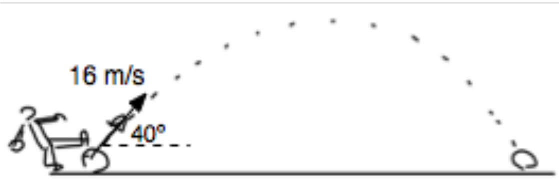
d) $v_y^2 = v_{yo}^2 + 2a_y \Delta y$

$0 = 10.3^2 + 2(-10)\Delta y$

$0 = 106.1 - 20\Delta y$

$20\Delta y = 106.1$

$\Delta y = 5.3 m$



The soccer ball is kicked from and lands at the same height.

a) Resolve the initial velocity into components.
b) How long was the ball in flight?
c) What horizontal distance did the ball travel?
d) How high above the start height did the ball get?

Try it!

See if you can get these answers:

(a) $V_{x0} = 12.3$ m/s
$V_{y0} = 10.3$ m/s

(b) $t = 2.06$ s

(c) $\Delta x = 25.3$ m

(d) $\Delta y_{max} = 5.3$ m

The baseball is hit from and caught at the same height. **additional**

a) Resolve the initial velocity into components.
b) How long was the ball in flight?
c) What horizontal distance did the ball travel?
d) How high above the start height did the ball get?

The baseball is hit from and caught at the same height. **additional**

a) Resolve the initial velocity into components.
b) How long was the ball in flight?
c) What horizontal distance did the ball travel?
d) How high above the start height did the ball get?

(a) $V_{xo} = (40\ m/s)\cos 30^\circ = 34.6\ m/s$

$V_{yo} = (40\ m/s)\sin 30^\circ = 20\ m/s$

(b) $\Delta y = V_{yo}t + 1/2a_yt^2$

(total time is when $\Delta y = 0$)

$0 = (20)t + 1/2(-10)t^2$

$0 = 20t - 5t^2$

$0 = t(20 - 5t)$

either $t = 0$ or $(20 - 5t) = 0$

so $t = 0$ or $t = 20/5 = $ **4 sec.**

at the start — at the end

(c) $\Delta x = V_{xo}t$

(find Δx at the total time)

$\Delta x = (34.6)(4)$

$\Delta x = 139\ m$

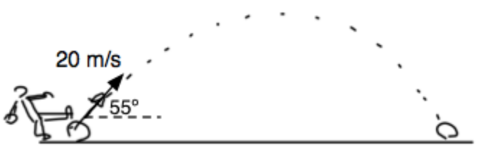
(d) $V_y^2 = V_{yo}^2 + 2a_y\Delta y$

(set $V_y = 0$ to get Δy_{max})

$0^2 = 20^2 + 2(-10)\Delta y_{max}$

$0 = 400 - 20\Delta y_{max}$

$20\ m = \Delta y_{max}$



The soccer ball is kicked from and lands at the same height.

additional

a) Resolve the initial velocity into components.
b) How long was the ball in flight?
c) What horizontal distance did the ball travel?
d) How high above the start height did the ball get?

Try it!

See if you can get these answers:

a) v_{xo} = 11.5 m/s
v_{yo}=16.4 m/s

b) 3.27 s

c) 37.7 m

d) 13.4 m