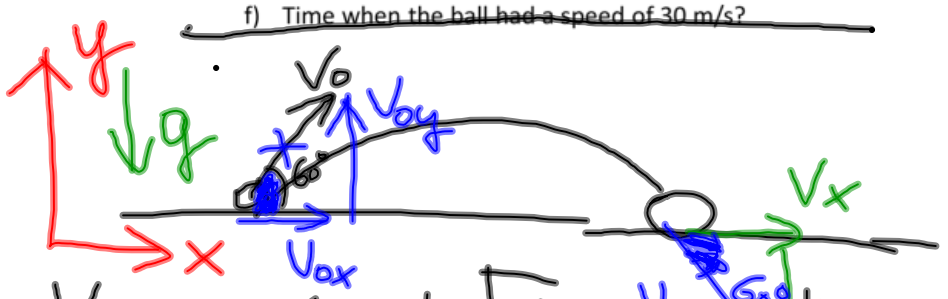
Ex.1

A ball is kicked with a speed of 40 m/s at an angle of 60° above the horizontal on a flat horizontal field. Find the following.

a) Range of the ball?
b) Hang time of the ball?
c) It's final velocity just before it hit the ground?
d) Max. height above the field?
e) Time to reach the max. height?
f) Time when the ball had a speed of 30 m/s?



$V_{ox} = 40(\cos 60°)$

$V_{oy} = 40(\sin 60°)$

$V_{ox} = 20.0 \frac{m}{s}$

$V_{oy} = 34.6 \frac{m}{s}$

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(x)

$a_x = 0$

$V_{ox} = 20.0 \frac{m}{s}$

$V_x = 20.0 \frac{m}{s}$

$\Delta x = ?$

$t = ?$

(y)

$g = -9.8 \frac{m}{s^2}$

$V_{oy} = 34.6 \frac{m}{s}$

$V_y = -34.6 \frac{m}{s}$

$\Delta y = 0$

$t = ?$

Oct 30-9:53 AM

a) (x) $\Delta x = v_{ox} t$

b) (y) $v_y = v_{oy} + gt$

$-34.6 = 34.6 - 9.8t$

$t = 7.06\ s$

a) (x) $\Delta x = 20(7.06)$

$\Delta x = 141.2\ m$

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c) $v_x = v_{ox} = 20 \frac{m}{s}$

$v_y = -34.6 \frac{m}{s}$

$v = \sqrt{v_x^2 + v_y^2}$

$v = \sqrt{(20)^2 + (-34.6)^2}$

$v = 40 \frac{m}{s}$

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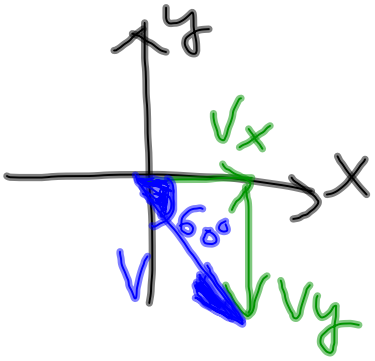
$\theta_v = \tan^{-1}\left|\frac{v_y}{v_x}\right|$

$\theta_v = \tan^{-1}\left|\frac{-34.6}{20.0}\right|$

$\theta_v = 60°$ BELOW THE HORIZONTAL



E 60° S

Nov 3-12:35 PM

c) New problem ⇒ new sketch, new lists.

(x)

$v_{0x} = 20 \frac{m}{s}$

$v_x = 20 \frac{m}{s}$

$\Delta x = 141.2$ m

$t = \frac{7.06}{2}$ s

$a_x = 0$

(y)

$v_{0y} = 34.6 \frac{m}{s}$

$v_y = 0$!!

$\Delta y = ?$

$g = -9.8 \frac{m}{s^2}$

$t = \frac{7.06}{2}$ s

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(y) $\Delta y_{MAX.} = \frac{1}{2}(v_{oy} + v_y)t$

$\Delta y_{MAX.} = \frac{1}{2}(34.6 + 0)\left(\frac{7.06}{2}\right)$

$\boxed{\Delta y_{MAX.} = 61.1\ m}$

c) $t = \frac{t_{TOTAL}}{2}$ $t = \frac{7.06}{2}$ $\boxed{t = 3.53\ s}$

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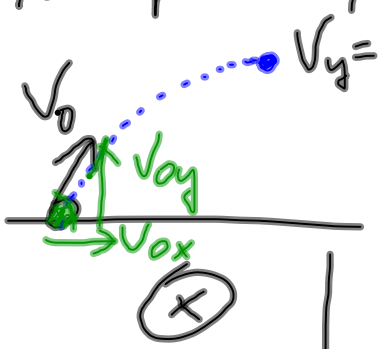
d) New problem; new sketch, new list.



$v_{0x} = ?0$

$v_x = ?0$

$\Delta x = \frac{14?}{2}$

$t = \frac{1}{2}t_{TOTAL}$

$a_x = 0$

$v_{oy} = 34.6$

$\boxed{v_y = 0}$ ||

$g = -9.8\ \frac{m}{s^2}$

$\Delta y = ?$

$t = \frac{1}{2}t_{TOTAL}$

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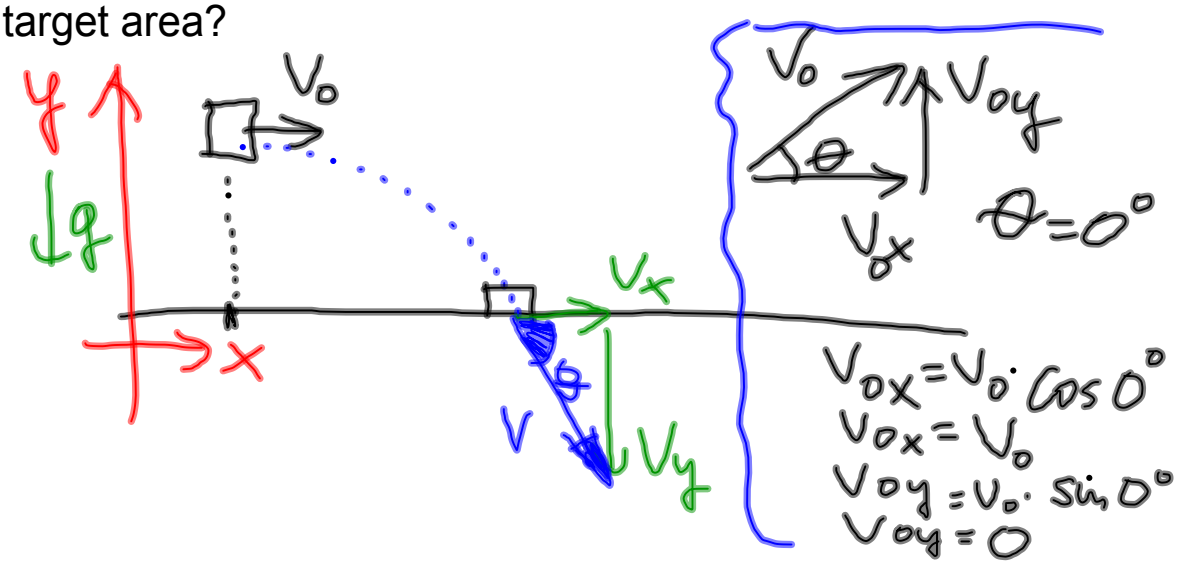
(y) $\Delta y_{MAX.} = \frac{1}{2}(V_{oy} + V_y)t$

$\Delta y_{MAX.} = \frac{1}{2}(34.6 + 0)\left(\frac{7.06}{2}\right)$

$\boxed{\Delta y_{MAX.} = 61.1\ m}$

Nov 3-9:39 AM

How soon (distance-wise) before the intended target does the pilot need to release his cargo to hit the target? The plane is in a level flight at 800 m with a speed of 200 m/s. After the drop the pilot continues at the original altitude and speed. b) Where is the plane in reference to the target when the cargo hits the target area?



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(x)

$a_x = 0$

$V_{0x} = 200 \frac{m}{s}$

$V_x = 200 \frac{m}{s}$

$\Delta x = ?$

$t = ?$

(y)

$g = -9.8 \frac{m}{s^2}$

$V_{0y} = 0$

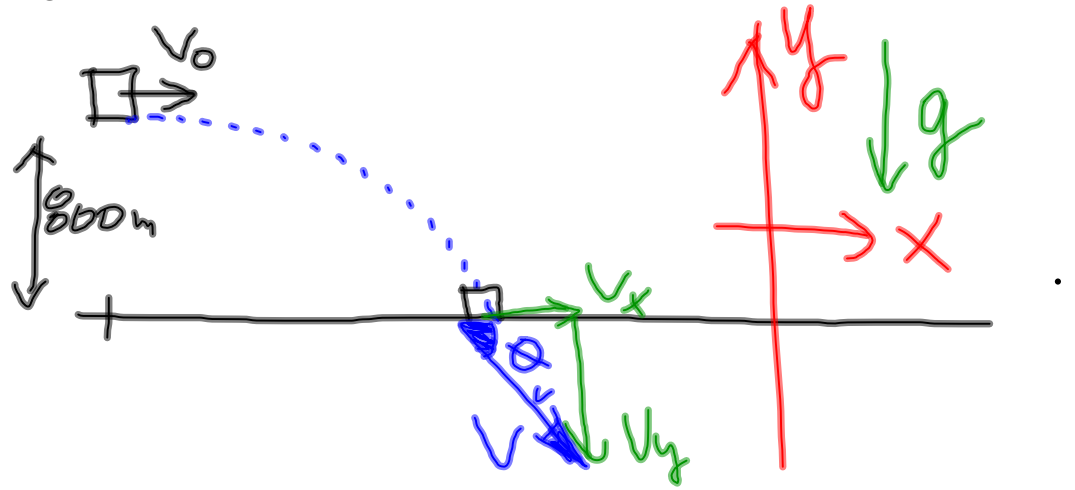
$V_y = ?$

$\Delta y = -800\ m$

$t = ?$

Nov 3-12:57 PM

How soon (distance-wise) before the intended target does the pilot need to release his cargo to hit the target? The plane is in a level flight at 800 m with a speed of 200 m/s. After the drop the pilot continues at the original altitude and speed. b) Where is the plane in reference to the target when the cargo hits the target area?



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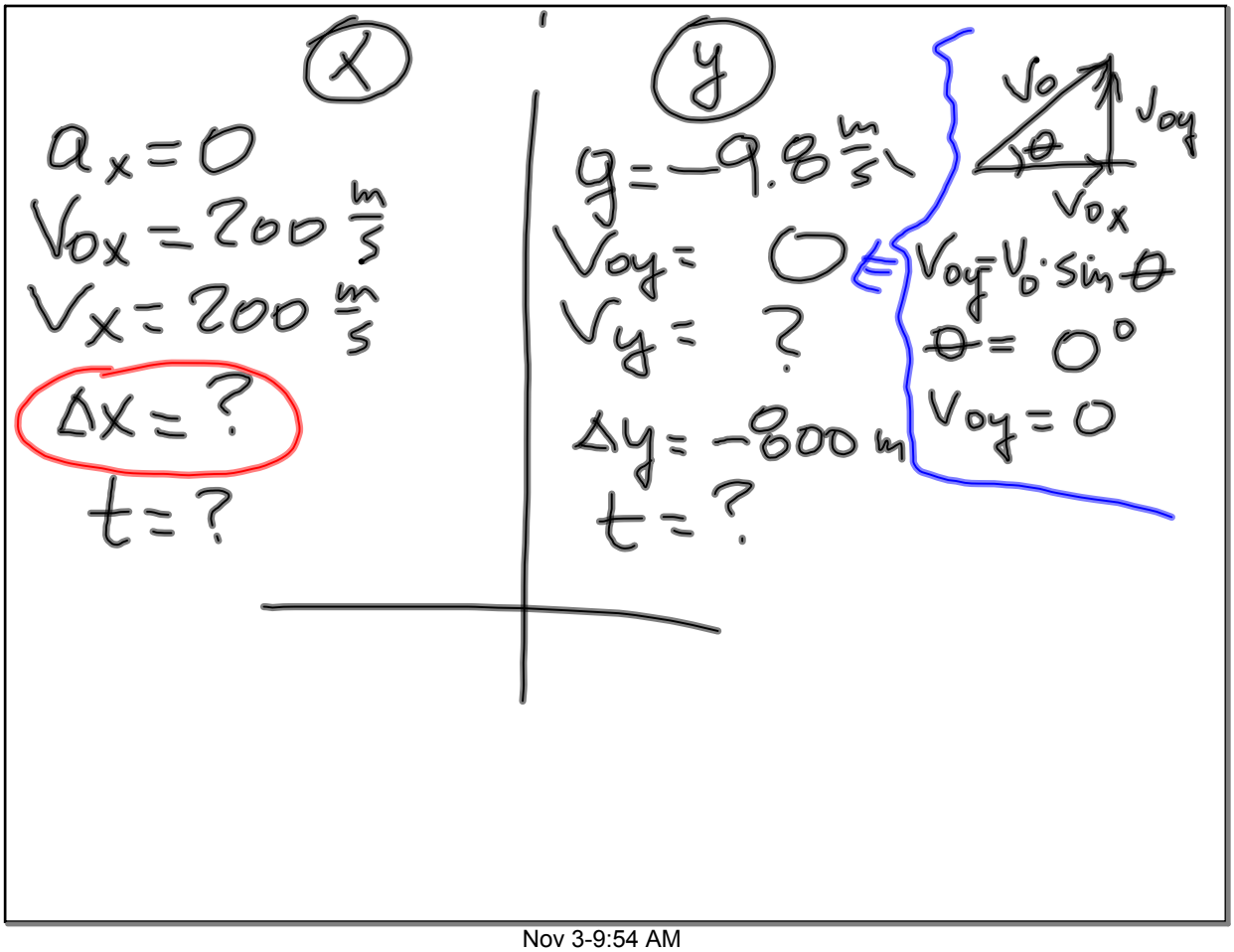

Nov 3-9:54 AM

(x) $\Delta x = v_{ox} \cdot t$

(y) $\Delta y = v_{oy} t + \frac{1}{2} g t^2$

$-800 = -4.9 t^2$

$t = 12.8\ s$

(x) $\Delta x = v_{ox} \cdot t$

$\Delta x = 200(12.8)$

$\Delta x = 2{,}560\ m$

Nov 3-9:58 AM