

Instructions

Each person in your group has a different problem. You are to solve the problem showing and following EVERY step demonstrated in class. You may get help from members of DIFFERENT GROUP than your own. When you are done, pass your paper to another group member who has not seen your problem yet.

After receiving another person's question;

(1) solve on a separate sheet of paper and pass this along with the paper;

(2) grade it. Look for

- a list of givens in a "T-table" format; which are to include
 - variables
 - numbers
 - units
 - directions -when appropriate.
- Look for a formula with variables only.
- Look for a formula with numbers and the unknown.
- Look for some math
- Numerical answer
- Answer has units

Do not make any marks on the original students work. Instead make comments *on the back of the paper* as to what need to be correctly. Do not write anything demeaning.

A ball is thrown at the edge of a tall building . The ball is thrown with a velocity of 25 m/s at an angle of 15° above the horizontal. If the building's roof is 12 m above the ground, then how fast will the ball be traveling when is lands on the ground?

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An outfielder is throwing a ball from center field to second base. The ball is thrown at 35 m/s with an angle of 65° *with the vertical*. How far away was the ball when it landed assuming it landed from the same height it was thrown from?

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A ball is thrown of the edge of a cliff. It is thrown at 33 m/s with an angle of 48° above the horizontal. How high did the ball travel?

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A plane is diving downwards at an angle of 15° below the horizontal when its engines quit working and its wings fall off. When this happens the plane is traveling 200 m/s. The plane is in the air for 25 seconds when this happens. How high was the plane when this event happened?

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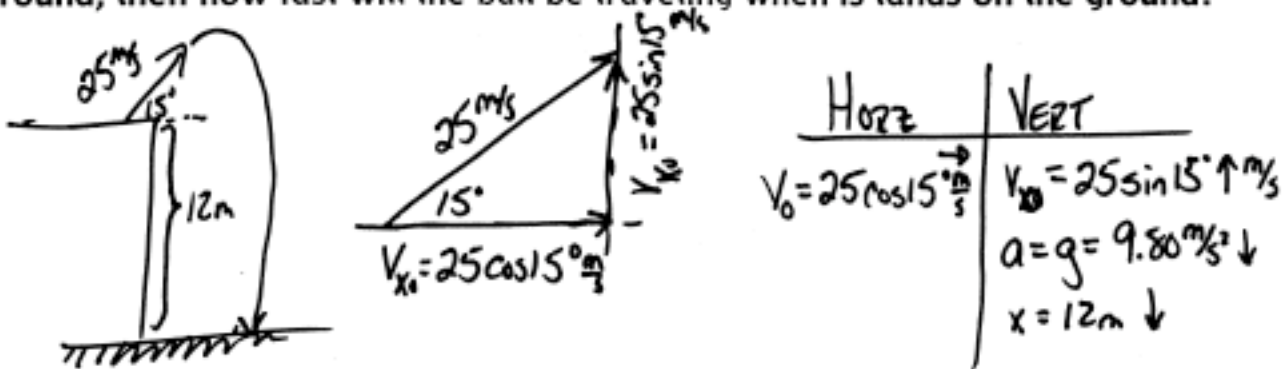
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A ball is tossed at an angle of 33° above the horizontal with a velocity of 22 m/s. the ball lands at a height of 4.0 meters above the thrown height. The ball passes apogee before landing. for how much time was the ball in the air?

ANSWER to Question 1

A ball is thrown at the edge of a tall building. The ball is thrown with a velocity of 25 m/s at an angle of 15° above the horizontal. If the building's roof is 12 m above the ground, then how fast will the ball be traveling when it lands on the ground?



The formula for finding impact speed is

$$v^2 = v_0^2 + 2gh$$

Use the sign conventions from the table

$$v^2 = 25^2 + 2(-9.80)(-12)$$

$$v^2 = 625 + 235.2$$

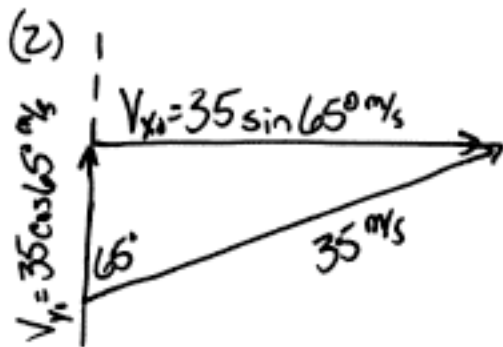
$$v^2 = 860.2$$

$$v = 29.32 \text{ m/s}$$

The impact speed is 29.32 m/s

This answer makes sense b/c whenever a body lands lower than where it starts, it will be traveling faster than v_0 .

ANSWER to Question 2



HOZZ	VERT
$V_0 = 35 \sin 65 \frac{m}{s}$	$V_0 = 35 \cos 65 \frac{m}{s} \uparrow$
	$a = g = 9.80 \frac{m}{s^2} \downarrow$
	$x = 0$ b/c it lands at the same height it is thrown from.

To find the range, you must find time in the air and then use that time in the range equation w/ horizontal givens.

$$x = v_{0x}t + \frac{1}{2}at^2$$

$$0 = 35 \cos 65 t + \frac{1}{2}(-9.80)t^2$$

$$t = 3.01870187 \text{ sec.}$$

$$\text{RANGE} = (v_{x0})t$$

$$\text{RANGE} = 35 \sin 65 (3.01870187)$$

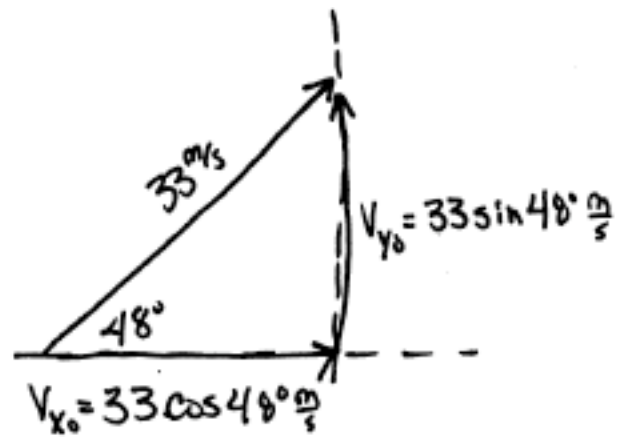
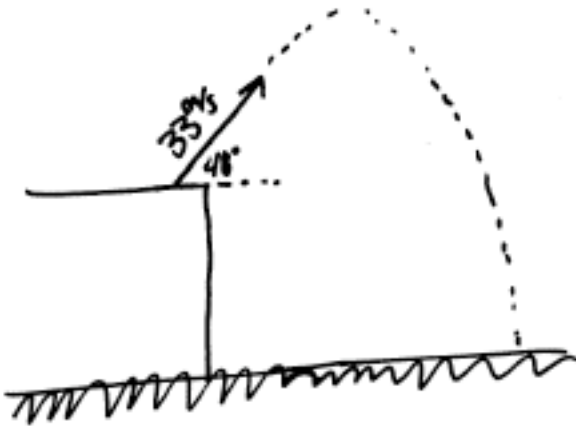
$$\text{RANGE} = 95.75556$$

$$\text{RANGE} = 95.76 \text{ m}$$

Note: "t" is a scalar and can be used in both horizontal and vertical equations.

ANSWER to Question 3

(3)



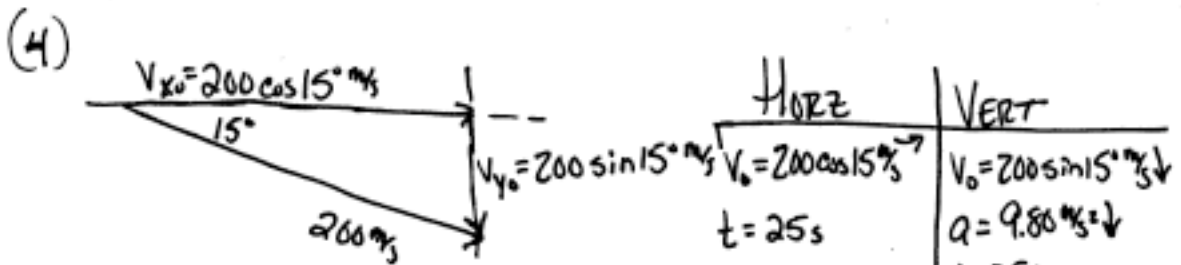
HORZ	VERT
$V_{x0} = 33 \cos 48^\circ \frac{m}{s} \rightarrow$	$V_{y0} = 33 \sin 48^\circ \frac{m}{s} \uparrow$
	$a = g = 9.80 \frac{m}{s^2} \downarrow$
	$v = 0$ @ apogee
	$x = ?$

This question asks to find the maximum height, apogee. At apogee the velocity is zero vertically.

$$\begin{aligned}
 & \cancel{v^2 = v_0^2 + 2ax} \\
 & v^2 = v_0^2 + 2ax \\
 & 0 = (33 \sin 48^\circ)^2 + 2(-9.8)x \\
 & -601.4157482 = -19.6x \\
 & x = 30.68447695
 \end{aligned}$$

30.68m above the edge of the cliff.

ANSWER to Question 4



Recall "t" is a scalar and appears in both columns.

$$x = v_0 t + \frac{1}{2} a t^2$$

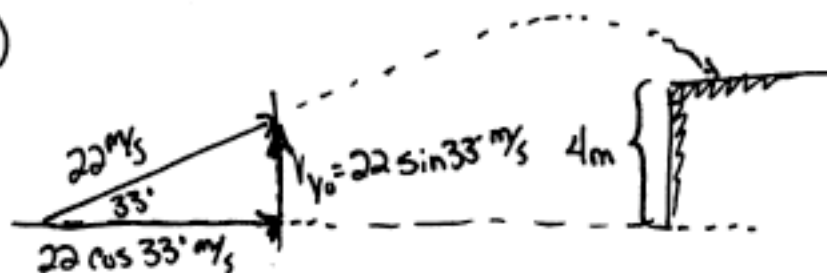
$$x = (200 \sin 15^\circ)(25) + \frac{1}{2}(9.8)(25)^2$$

$$x = 4356.595226$$

The plane is 4356.60 m above the ground

ANSWER to Question 5

(5)



HORZ	VERT
$v_0 = 22 \cos 33^\circ \frac{m}{s} \rightarrow$	$v_0 = 22 \sin 33^\circ \frac{m}{s} \uparrow$
	$a = g = 9.80 \frac{m}{s^2} \downarrow$
	$x = 4m \uparrow$
	$t = ?$

Find time from the vertical givens b/c there is not enough information horizontally.

$$x = v_0 t + \frac{1}{2} a t^2$$

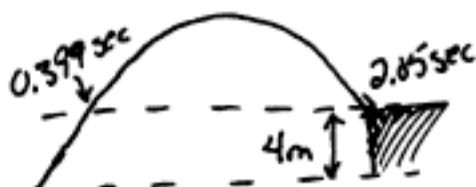
$$4 = (22 \sin 33^\circ) t + \frac{1}{2} (-9.80) (t)^2$$

$$0 = -4.9 t^2 + 22 \sin 33^\circ t - 4$$

QUADRATIC EQUATION

$$t = 2.046411838 \text{ or } t = 0.3989062785$$

The ball passes the 4m height twice. First on the way up, then on the way down. The problem states that the ball has passed apogee. Therefore the longer time is the answer



2.05 seconds