Read 4.1 - 4.2

Exam Wednesday

chp 1-3

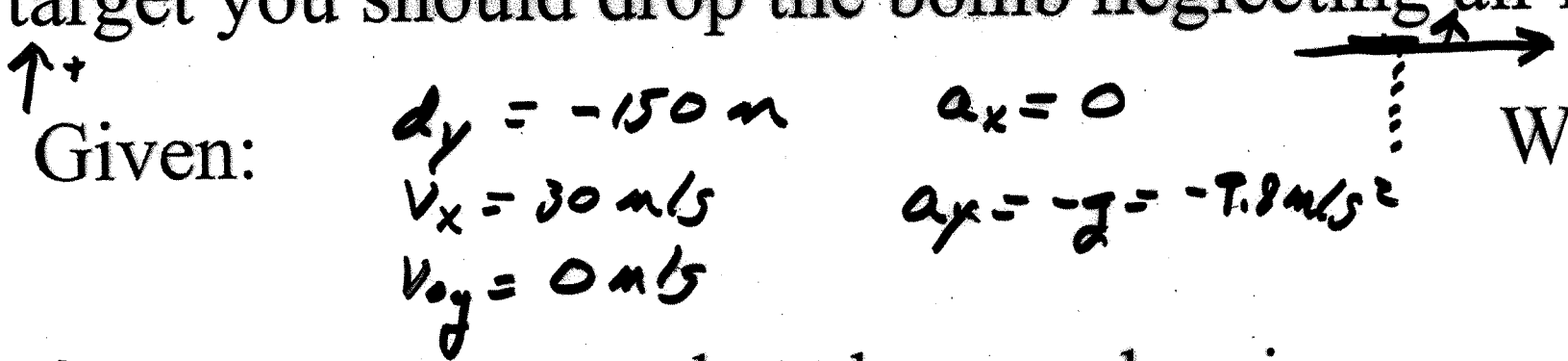
17 multiple choice questions

old exam class web page

H.w #3 Due tonight

office hours 11:30 - 12:30

Problem: You are working as a consultant on a video game designing a bomb site for a World War I airplane. In this game, the plane you are flying is traveling horizontally at 30.0 m/s at an altitude of 150 m when it drops a bomb. You need to determine how far from the target you should drop the bomb neglecting air resistance.



If you are not sure what else may be given, you can think about all the possibilities that are used in the equations describing projectile motion:

$$d_x,\ v_x,\ t,\ v_{0y},\ v_y,\ d_y,\ a_y$$

Always known for a falling object: $a_y = -g = -9.8\ m/s^2$

Vertical info to find t

$$d_y = v_{0y}^{0} t - \frac{1}{2} g t^2 \qquad d_y = -\frac{1}{2} g t^2 \qquad t^2 = \frac{-2 d_y}{g}$$

$$t = \sqrt{\frac{-2 d_y}{g}} = \sqrt{\frac{-2(-150\ m)}{9.8\ m/s^2}} = \boxed{5.53\ s}$$

Horizontal direction $a_x = 0$

$$d_x = v_x t = (30\ m/s)(5.53\ s) = \boxed{166\ m}$$

Interactive Question

B

A pilot drops a bomb from a plane flying horizontally. When the bomb hits the ground, the horizontal location of the plane will

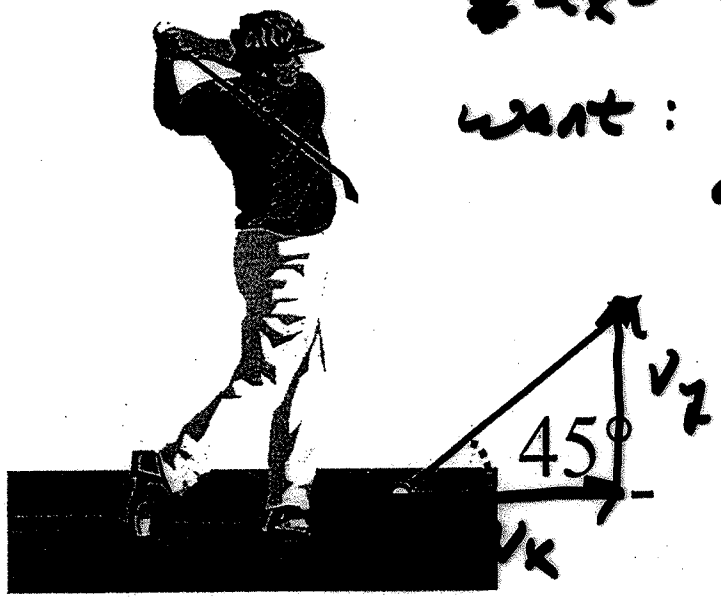
A) be behind the bomb.
B) be over the bomb.
C) be in front of the bomb.
D) depend on the speed of the plane when the bomb was released.

Problem: A golfer hits a ball from level ground at an angle of 45° above the ground, so that ~~the initi~~al velocity in the vertical direction is equal to the initial velocity in the horizontal direction. Both are equal to 60 mi/hr.

Neglect air resistance

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

(b) How far does the ball go (in yards)?



Given $v_x = 60 \text{ mi/hr} = 27.3 \text{ m/s}$

$v_y = 60 \text{ mi/hr} = 27.3 \text{ m/s}$

$a_x = 0 \quad a_y = -g = -9.8 \text{ m/s}^2$

$\uparrow +$

$d_y = 0$

want: t

d_x

y: $d_y = v_{oy}t - \frac{1}{2}gt^2$

$0 = v_{oy}t - \frac{1}{2}gt^2$

$0 = v_{oy} - \frac{1}{2}gt$

& $V_{oy} = \frac{1}{2} g t$

$t = \frac{2 V_{oy}}{g} = \frac{2 \cdot 29.3 \text{ yd/s}}{10.7 \text{ yd/s}^2}$

$t = 5.48 \text{ s}$

$9.8 \text{ m/s}^2 = 32 \text{ ft/s}^2$

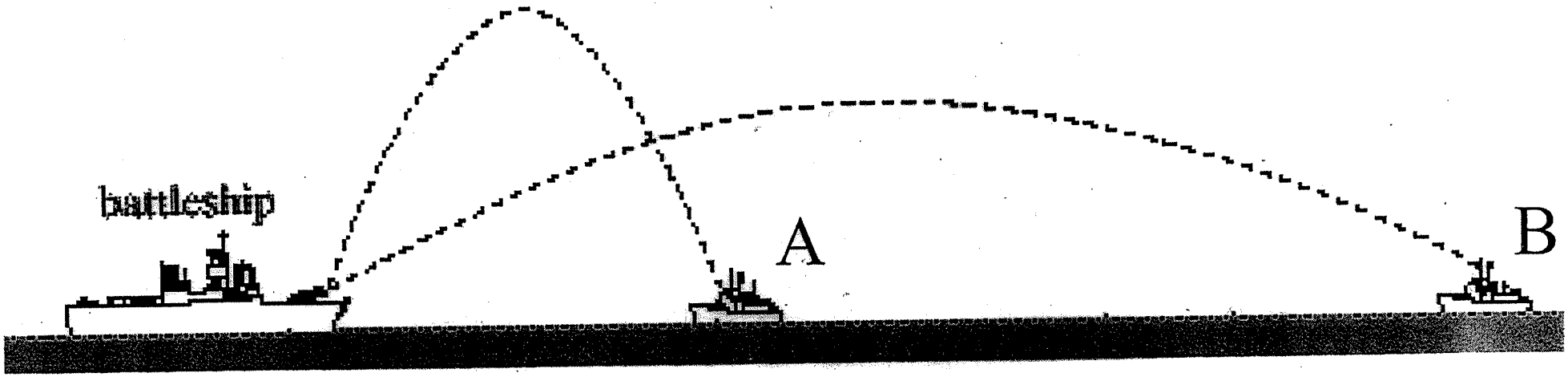
$\frac{32 \text{ ft}}{\text{s}^2} \left| \frac{1 \text{ yd}}{3 \text{ ft}} \right| = 10.7 \text{ yd/s}^2$

b) $d_x = V_x t = (29.3 \text{ yd/s} \times 5.48 \text{ s}) = 161 \text{ yd}$

Interactive Question

B

A battleship simultaneously fires two shells toward two enemy ships, one close by (A), and one far away (B). The shells leave the battleship at different angles and travel along the parabolic trajectories indicated. Which of the two enemy ships gets hit first?



A) A

B) B

C) They both get hit at the same time.

D) It is impossible to tell from the information given

Exam Wednesday

BRING 1 sheet of paper

Equations etc.

Calculator

Pencil / PEN

STAY outside Room Before exam. Exam will Have seat number

4 Exam versions A, B, C, D