QUIZ 4 Blue, PHY 191 B, Friday, Sep 23, 2016 (15 pts)
[see both sides of sheet!]

Question 1: The *y*-component of the velocity vector shown in the figure is

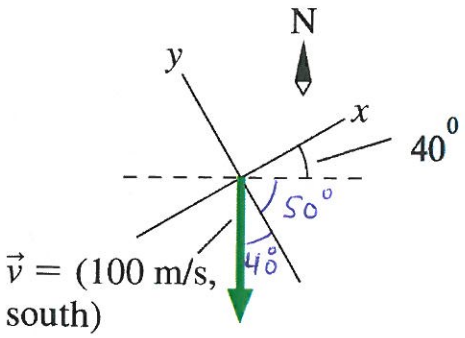
a) -87 m/s b) -77 m/s
c) + 77 m/s d) +87 m/s
e) -67 m/s

Answer: b (1 pt)
Show work: (4pts)

BLUE

$v_y = -100 \cos 40^\circ$

$= -77$ m/s



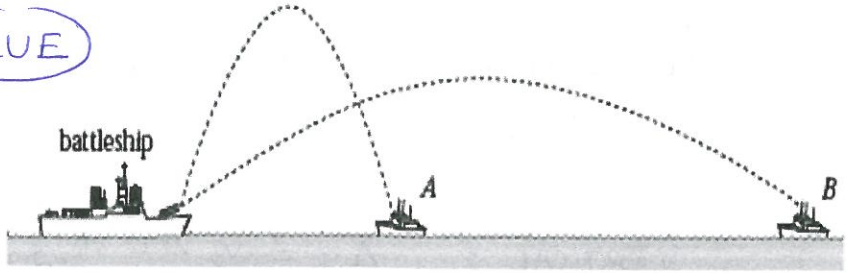
GREEN (a) −94 m/s
PINK (e) −64 m/s

Question 2: A battleship simultaneously fires two shells at enemy ships *with different launch velocities*. If the shells follow the parabolic trajectories shown, which ship gets hit first?

a) A
b) both at the same time
c) B
d) can't say, need more info

Answer: (c) B (1 pt)
Show reasoning: (4pts)

BLUE



GREEN a) A
PINK a) A

No matter what the initial launch velocity the shell that rises to the greater height has the larger vertical distance to fall (starting from zero initial vertical velocity at the highest point), and therefore takes the longer time.

TURN SHEET OVER

Question 3: In a contest at the county fair, a spring-loaded plunger launches a ball at 3.0 m/s from one corner of a smooth, flat board at an angle 60^0 as shown.

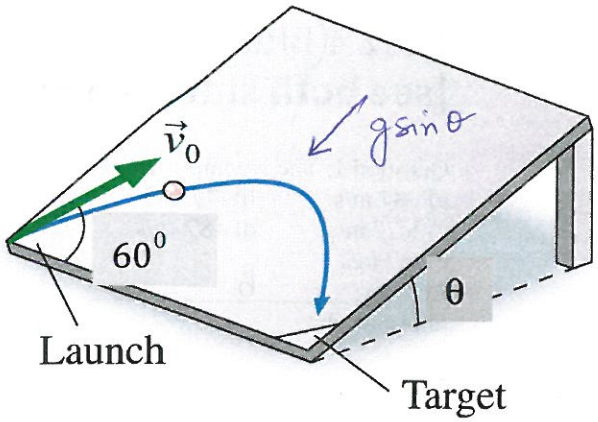
The board is tilted at an angle θ. To win, you must make the ball hit a small target at the adjacent corner, 4 m away. At what angle θ should you tilt the board?

[Note! Diagram not to scale!]

a) 6.5^0 b) 11.5^0
c) 16.5^0 d) 21.5^0
e) 26.5^0

Answer: 11.5^0 (b) (1 pt)

Show work: (4pts)



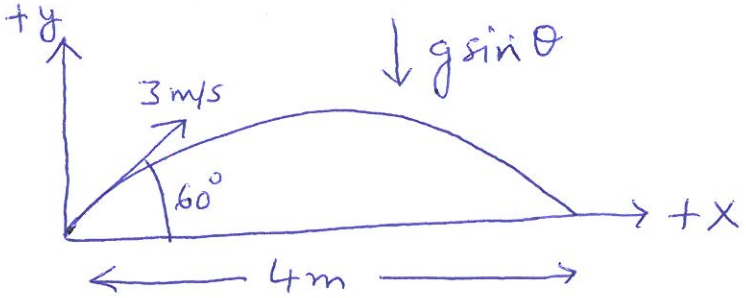
BLUE

GREEN e) 23.5^0

PINK a) 9^0

(See Sep 19 email to you)

USE LAST SLIDE OF "WHITEBOARD PROBLEM SOLUTIONS" POSTED ON 09/16



HORIZONTAL: $\Delta x = v_{0x}\Delta t \Rightarrow 4 = (3\cos 60)\Delta t$

$\Rightarrow \Delta t = 2.67\ s$ ——— (i)

VERTICAL: $\Delta y = v_{0y}\Delta t + \frac{1}{2}a_y(\Delta t)^2$

$\Rightarrow 0 = (3\sin 60)\Delta t + \frac{1}{2}(-9.8\sin\theta)(\Delta t)^2$

$\Rightarrow (3\sin 60)\Delta t = (4.9\sin\theta)(\Delta t)^2$, DIVIDING BOTH SIDES BY Δt

$\Rightarrow \sin\theta = \frac{3\sin 60}{(4.9)(2.67)} = 0.1986$ (2.67 s from (i))

$\Rightarrow \theta = 11.5^\circ$