

2. (30 pts.) In basketball, it is important to not only have the correct range so that the ball reaches the basket, but also to have a good trajectory such that the ball goes down through the basket instead of bouncing off the rim.

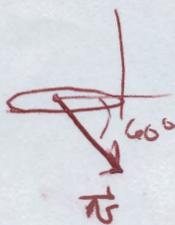
Consider a basketball player a horizontal distance of 4.21 m from the basket. The basket is 3.05 m above the ground, and the player releases the ball from a height of 2.68 m. The ball takes 1.25 s to travel to the basket and passes through it at an angle of 60° below the horizontal.

- a. (5 pts.) What was the initial x -component of the ball's velocity?

$$v_{0x} = \frac{4.21 \text{ m}}{1.25 \text{ s}} = \boxed{3.37 \text{ m/s}}$$

Note since $a_x = 0$, $v_x = v_{0x}$ never changes.

- b. (5 pts.) What was the y -component of the ball's velocity as it went through the basket?



$$\tan(-60^\circ) = \frac{v_y}{v_x}$$

$$v_y = v_x \tan(-60^\circ)$$

$$\boxed{v_y = -5.83 \text{ m/s}}$$

- c. (20 pts.) What was the initial y -component of the ball's velocity?

$$v_y = v_{0y} - gt$$

$$-5.83 = v_{0y} - 9.8(1.25)$$

$$\boxed{v_{0y} = 6.42 \text{ m/s}}$$