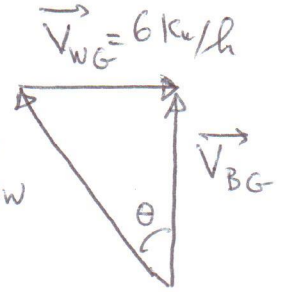
QUIZ#4- CHAPTER 4
DATE: 07/10/19

Name: Key Id#: Sect.#:

A ball is thrown with a speed of 10 m/s at an angle of 30^0 with the horizontal from the top of a 100 m tall building.

(a) Calculate the time the ball takes to reach the ground.

$$\vec{V}_{BG} = \vec{V}_{BW} + \vec{V}_{WG}$$

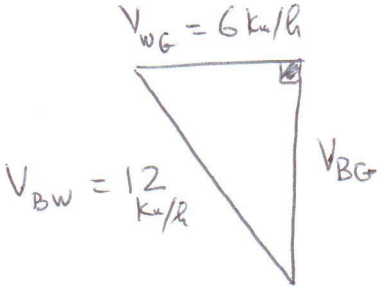


$$\sin\theta = \frac{V_{WG}}{V_{BW}} = \frac{6}{12} = \frac{1}{2}$$

$$\theta = \sin^{-1}\left(\frac{1}{2}\right) = 30^\circ$$

Direction is 30° West of north.

(b) What is the magnitude and direction of the velocity of the ball just before it hits the ground?



$$V_{BW}^2 = V_{WG}^2 + V_{BG}^2$$

$$\Rightarrow V_{BG} = \sqrt{V_{BW}^2 - V_{WG}^2} = \sqrt{12^2 - 6^2}$$

$$= \boxed{10.4 \text{ Km/h}}$$

$$V_{BG} = 10.4 \times \frac{10}{36} \text{ m/s} = 2.89 \text{ m/s}$$

(c) What is the horizontal distance travelled by the ball when it hits the ground?

$$t = \frac{d}{V_{BW}} = \frac{200 \text{ m}}{2.89 \text{ m/s}} = \boxed{69.2 \text{ s}}$$

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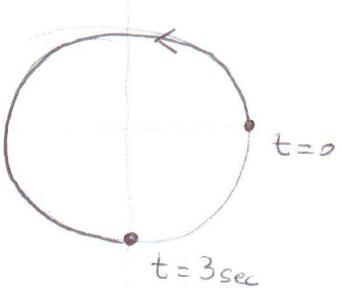
A particle is moving counterclockwise with constant speed around a circle that is centered at the origin. At time t = 0, the particle is at (3.0, 0) m. At t = 3.0 s, the particle reaches the point (0, −3. 0) m for the first time.

(a) What is the period of the motion?

$$\frac{3T}{4} = 3 \Rightarrow T = \frac{12}{3} = \boxed{4 \text{ sec}}$$



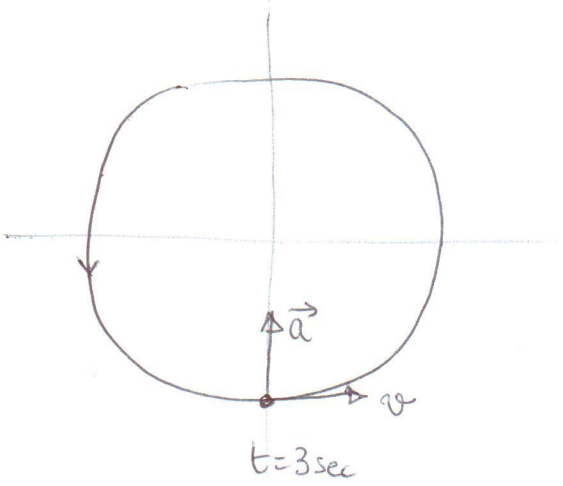
(b) What is the speed of the particle?

$$v = \frac{2\pi r}{T} = \frac{2\pi(3)}{4} = \boxed{4.7 \text{ m/s}}$$

(c) What is the magnitude of the acceleration of the particle?

$$a = \frac{v^2}{r} = \frac{(4.7)^2}{3} = \boxed{7.4 \text{ m/s}^2}$$

(d) Draw a diagram showing the directions of the velocity and acceleration at t = 3.0 s.



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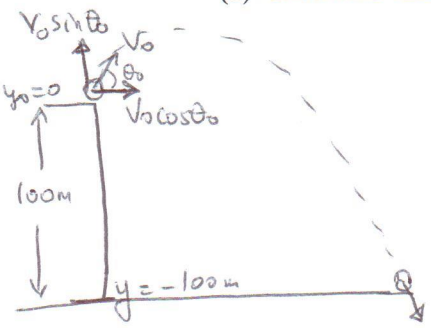
A ball is thrown with a speed of 10 m/s at an angle of 30° with the horizontal from the top of a 100 m tall building.

(a) Calculate the time the ball takes to reach the ground.



$$y - y_0 = V_{0y} t - \frac{1}{2} g t^2$$

$$-100 = 10 \sin\theta_0 t - 4.9 t^2 = 5t - 4.9t^2$$

$$4.9t^2 - 5t - 100 = 0$$

$$t = \frac{5 \pm \sqrt{(5.0)^2 + 4 \times 4.9 \times 100}}{2 \times 4.9} = \frac{5 \pm 44.6}{9.8}$$

$$t = \begin{cases} t = -4 \text{ sec} \times \\ \boxed{t = 5 \text{ sec}} \checkmark \end{cases}$$

(b) What is the magnitude and direction of the velocity of the ball just before it hits the ground?

$$V_y = V_{0y} - g t = 10 \sin 30° - 9.8 \times 5 = -44 \text{ m/s}$$

$$V_x = V_{0x} = 10 \cos 30° = 8.66 \text{ m/s}$$

$$\vec{V} = 8.66 \hat{i} - 44 \hat{j} \text{ m/s}$$

$$\boxed{|\vec{v}| = 44.8 \text{ m/s}}$$

$$\theta = \tan^{-1}\left(\frac{-44}{8.66}\right) = 78.9°$$

$$\boxed{\theta = -78.9°}$$

(c) What is the horizontal distance travelled by the ball when it hits the ground?

$$x - \cancel{x_0}^{0} = V_{0x} t = 10 \cos 30° \times 5 = \boxed{43.3 \text{ m}}$$