P6. A projectile is launched from the roof of a 28.4-m-tall building at a speed of 33.5 m/s and at an angle of 52.4° above the horizontal. How long does it take the projectile to reach the ground?

A) 5.89 s
B) 6.11 s
C) 6.33 s
D) 6.55 s
E) 6.77 s

$$t = \frac{v_{y_0} + \sqrt{v_{y_0}^2 + 2gh}}{g} = \frac{33.5\sin(52.4) + \sqrt{(33.5\sin(52.4))^2 + 2(9.8)(28.4)}}{9.8}$$

P06. A projectile is launched from the ground at an angle of 42.1° above the horizontal. It reaches a maximum height of 22.3 m. Find the initial velocity of the projectile. Ignore air resistance.

A) 26.8 m/s
B) 29.0 m/s
C) 31.2 m/s
D) 33.4 m/s
E) 35.6 m/s

$$h = \frac{(v_0\sin(\theta))^2}{2g}$$

$$22.3 = \frac{(v_0\sin(42.1))^2}{2(9.8)}$$

P6. A football was kicked from the 40-yard line and landed at the goal line, 60 yards away. If the football left the ground at an angle of 38° above the horizontal, what was the initial velocity of the football?

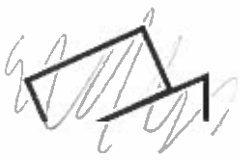
A) 74.1 ft/s
B) 77.3 ft/s
C) 80.5 ft/s
D) 83.7 ft/s
E) 86.9 ft/s

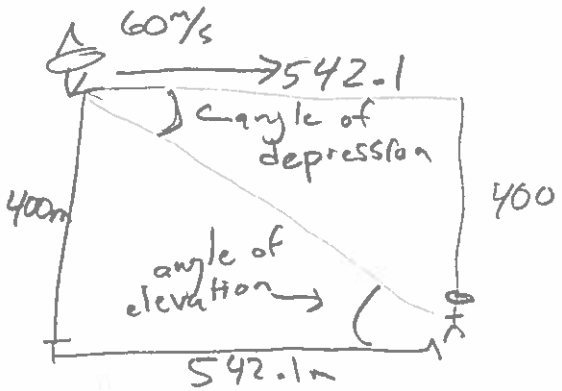
$$3(60) = \frac{v_0^2\sin(2(38))}{32.17}$$ g in $\frac{ft}{sec^2}$

$$v_0 = 77.25\ \frac{ft}{sec}$$

P6. A rescue plane is flying horizontally at an elevation of 400 m and at a speed of 60.0 m/s toward a point directly over some stranded hikers. At what angle of depression should the plane release the rescue package?

A) 32.0°
B) 34.2°
C) 36.4°
D) 38.6°
E) 40.8°





$$t = \sqrt{\frac{2(400)}{9.8}} = 9.035\ sec$$

$$v = \frac{x}{t} \qquad x = vt = 60(9.035) = 542.1\ m$$

$$\tan(\theta) = \frac{o}{h}$$

$$\theta = \tan^{-1}\left(\frac{400}{542.1}\right) = 36.4^\circ$$

P19. Evel Knievel drove his motorcycle off a ramp inclined at 16.4° that was on the roof of the Kermit Sate Bank at a speed of 40.6 m/s. If the top edge of the ramp was 38.2 m above the ground, how far from the base of the building did he land?

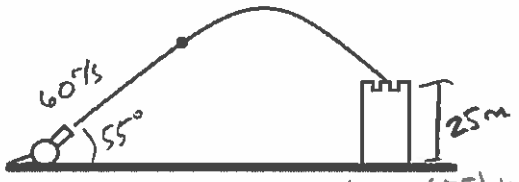
A) 137 m
B) 150 m
C) 163 m
D) 176 m
E) 189 m

time in air $t = \dfrac{40.6\sin(16.4) + \sqrt{(40.6\sin(16.4))^2 + 2(9.8)(38.2)}}{9.8}$

$t = 4.196$

$v = \dfrac{x}{t}$ $\quad x = vt = 40.6\cos(16.4)\,4.196 = 163.46\text{ m}$

P15. A cannonball is launched at 60.0m/s at an angle of 55.0° above the horizontal. On the way back down, the cannonball lands on the top of a tower that is 25.0m tall. How far horizontally from the launch point is the tower located? You may assume the ground is level and ignore air resistance.



negative because we are shooting onto the tower, meaning h_f is above the ground.

$t = \dfrac{60\sin(55) + \sqrt{(60\sin(55))^2 + 2(9.8)(-25)}}{9.8} = 9.493\text{ m}$

A) 153 m
B) 306 m
C) 327 m
D) 345 m
E) 467 m

$v = \dfrac{x}{t}$ $\quad x = vt = 60\cos(55)(9.493) = 326.69\text{ m}$

P11. A basketball is thrown from across the court just as the buzzer sounds. The ball is thrown from a horizontal distance of 12.0m away from the net and it successfully goes down through the net located 3.0m above the throw height. How long was the basketball in the air before it scored?

A) 0.94 sec.
B) 1.13 sec.
C) 1.83 sec.
D) 2.70 sec.
E) 2.85 sec.