

Motion

Projectile Motion

Practise Book 1

Name: _____

General Consolidation

Some Advanced Questions

Give all answers to 3sf

Ask me if you are stuck on any of these and there are
answers provided, too.

1) A Punter on an NFL team kicks a football with velocity 35 m/s at an angle of 40° to the horizontal. The ball is caught 0.3m above from where it was kicked.

a) Determine the initial horizontal and vertical components of the velocity?

Ans: $u_v = 22.5 \text{ m/s}$ $u_h = 26.8 \text{ m/s}$

b) Determine the total flight time of the ball?

Ans: 4.58s

c) What is the horizontal distance the ball has travelled?

Ans: 123m

2) A helicopter is ordered to drop a care package to soldiers on the front line. The helicopter is travelling at a horizontal velocity of 45m/s and the care package is dropped when the helicopter is 150 m above the ground.

a) How long does it take for the package to hit the ground?

Ans: 5.53 s

b) If air resistance is accounted for, what happens to the time travelled, Vertical acceleration and horizontal acceleration?

Ans: Time increased, Vertical acceleration unchanged, Horizontal increase

3) A sport scientist wants to figure out how high on average a baseball player can hit. A particular subject hits the ball at an initial velocity of 60m/s at an angle of 1.3° to the horizontal. There is a wall of height 1m, 15.0 m away from the subject. Will the ball clear the wall?

$$15 = (60 \cos 1.3) t$$

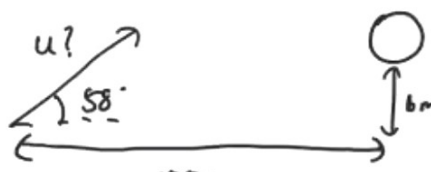
$$t = 0.250 \text{ s}$$

$$s_v = (60 \sin 1.3)(0.250) - \frac{1}{2}(9.8)(0.250)^2 = 0.0340 \text{ m}$$

Ans: No the ball will not clear the net since $s_v = 0.43$ at that point $< 1\text{m}$

4) A cricketer hits a target with a ball that is 100m away from him and is 6m high. He hits the ball at 58° to the horizontal.

a) What velocity must the ball be at when coming off the bat?



$$100 = u \cos 58^\circ t \quad \text{--- (1)}$$

$$s_v = ut + \frac{1}{2}at^2$$

$$6 = u \sin 58^\circ \times \frac{100}{u \cos 58^\circ} - 4.9t^2$$

$$6 = 100 \tan 58^\circ - 4.9t^2$$

$$t = 5.61$$

$$5.61 = \frac{100}{u \cos 58^\circ}$$

$$u = \frac{100}{5.61 \cos 58^\circ} = 33.7 \text{ m/s}$$

Ans: 33.7m/s

b) If he hits the same ball at 65° instead, with the same velocity will the ball hit the target?

$$\begin{aligned} S_v &= 33.7 \sin 65^\circ \times 7.03 - 4.9 \times 7.03^2 \\ &= \underline{-27} \end{aligned}$$