# Chapter 4 (Motion in two and three dimension)

1- A ball leaves the ground with a speed of 50 m/s at an angle of 60 degrees with the horizontal. Find its speed at its highest point. (A: 25 m/s)

2- A stone is thrown from the ground into the air with an initial velocity V = (5.0i + 9.0j) m/s. To what maximum height will the stone rise? (A: 4.1 m)

3- A particle starts from the origin at t = 0 with a velocity of 8.0j m/s and moves in the XY plane with a constant acceleration of (4.0i +2.0j) m/s². At the instant the X coordinate of the particle is 32 m, find its y coordinate. (A: 48 m)

4- A stone is thrown horizontally from the top of a 40m high hill. It strikes the ground at an angle of 30 degrees. With what speed was it thrown? (A: 49 m/s)

5- The airplane shown is in level flight at an altitude of 0.50 km and a speed of 150 km/h. At what distance d should it release a heavy bomb to hit the target X? Take g = 10 m/s². (A: 417 m)
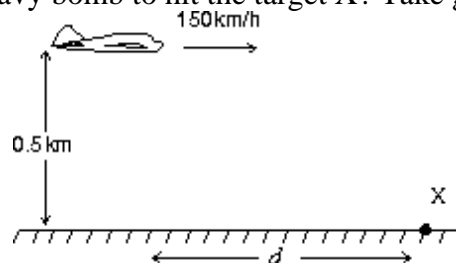
6- A river has a steady flow of 0.30 m/s. A student swims downstream a distance of 1.2 km and returns to the starting point. If the student can swim at a constant speed of v in still water and the downstream portion of the swim takes him 20 minutes, the time required for the entire swim is: (A: 70 minutes)

7- A particle moves with a constant speed along the circumference of a circle of radius 5 m. It completes one revolution every 20 s. What is the magnitude of its average velocity during the first 5 s? Assume that at t = 0, the particle is on +x-axis see figure. (A: sqrt(2) m/s)
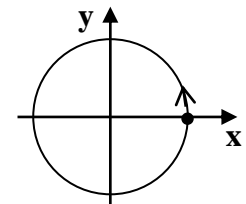
2- Car A is moving with a speed of 30 km/h along the positive x-axis and car B is moving with a speed of 40 km/h along the positive y-axis. What is the velocity of car B with respect to car A? (A: -30i + 40j km/h)

8- Find the magnitude of the centripetal acceleration of a particle on the tip of a fan blade, 0.150 m in radius, rotating at 1200 revolutions every minute. (A: 2370 m/s²)

9- A boat can travel with a velocity of 1.70 m/s in still water (that is Vbw = 1.70 m/s). The boat heads (points) across a river where the current is 0.75 m/s (that is Vwg = 0.75 m/s). What is the speed of the boat relative to the ground? (A: 1.86 m/s)

11- An object is moving on a circular path of radius π meters at a constant speed of 4.0 m/s. The time required for one revolution is: (A: $\pi^2/2$ s)

Summary of Chapter 4 topics

1- Understanding the equations of the projectile's motion
2- Understanding uniform Circular Motion
3- Understanding relative motion in 1D and 2D