Worksheet – Launching Projectiles at Any Angle

1. So as not to be seen by the road runner, Wiley Coyote sets up an enormous Acme slingshot in a ditch and shoots himself from the elastic band at ground level at the "appropriate time". He sails into the air with a velocity of 24.0 m/s at angle of 36^{o} with the ground.

   a) Even though it hardly ever happens, you must assume that there are no cliffs in the way, no trucks to crash into head-on, etc., and Wiley returns to earth some time later. When that happens, how long has he been in the air?

   b) How far from the take-off location does he land?

   c) What was Wiley's maximum altitude?

   d) As you might suspect, Wiley woefully miscalculated and spies the Road Runner directly below him when his altimeter says he is still 5.0 m above the ground. When did this event occur?

   e) Why are there two answers in part d? How fast did the Road Runner have to run in order for Wiley to be directly overhead in two different spots?

2. So as not to disappoint you, we must confess that we fibbed in problem 1. Wiley almost made it, but a cliff was, in fact, only 39.0 m from the take-off spot. So poor Wiley crashed into the cliff and fell straight down (gravity, you know!) leaving a skid mark on the cliff face all the way to the ground. How long was the skid mark? (Some hints: use the constant horizontal velocity to find the time to travel to the cliff; use this time to find Wiley's height at the awful moment).

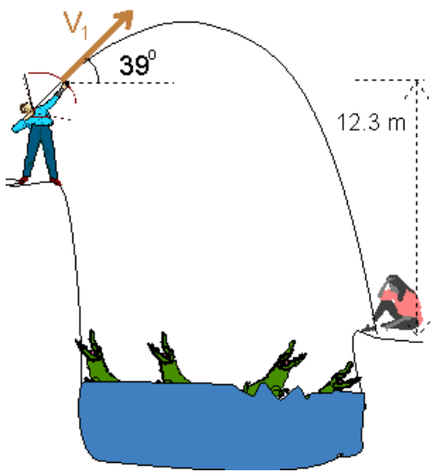
3. S. Handler (known affectionately as "Stick" to his friends) is famous for his slap shot which usually sails over the ice in a low trajectory. On an off-night he lets go a shot and the puck leaves his stick at 33.0 m/s at an angle of 35^{o} with the ice surface. If he is 6.3 m from the "boards" and the boards are 3.0 m high, will the spectators be protected?

4. A modern day Robin Hood sends a love note to his lady love who is sadly seated on the opposite side of a very dangerous river. The note is shot with a speed of 15 m/s and at an angle of 39^{o} with the horizontal. The message lands at a point 12.3 m below the level at which it was first propelled.

   a) How long was the note in the air?

   b) How wide is the river?

   c) What is the speed and direction of motion of the note when it lands on the opposite side?



5. A boulder falls of a sloped ledge that is 67 m above the canyon floor. A remote control camera captures the motion and measures the impact speed to be 71 m/s making an angle of 41^{o} with the ground. With what velocity did the boulder leave the ledge?