

<u>SPH4U – Projectile Practice Problems</u>

For all the problems, make sure to list all of the known and unknown variables. Show all of your work.

- 1. A rock kicked horizontally off a cliff moves 8.3m horizontally while falling 1.5m vertically. Calculate the rock's initial speed.
- A projectile launcher sends an object with an initial velocity of 1.1 x 10³ m/s [45° above the horizontal] into the air. The launch level is at the same level as the landing level.
 - (a) Calculate how long the object is airborne
 - (b) Determine its maximum range
 - (c) Determine the maximum height of the object
- 3. In a physics demonstration, a volleyball is tossed from a window at 6.0 m/s [32° below the horizontal], and it lands 3.4s later. Calculate
 - (a) The height of the window
 - (b) The velocity of the volleyball at ground level
- 4. A person kicks a soccer ball with an initial velocity directed 53° above the horizontal. The ball lands on a roof 7.2m high. The wall of the building is 25 m away, and it takes the ball 2.1 s to pass directly over the wall.
 - (a) Calculate the initial velocity of the ball.
 - (b) Determine the horizontal range of the ball.
 - (c) By what vertical distance does the ball clear the wall of the building>
- 5. A small asteroid strikes the surface of Mars and causes a rock to fly upward with a velocity of 26 m/s [52° above the horizontal]. The rock rises to a maximum height and then lands on the side of a hill 12 m above its initial position. The acceleration due to gravity on the surface of Mars is 3.7 m/s².
 - (a) Calculate the maximum height of the rock.
 - (b) Determine the time that the rock is in flight.
 - (c) What is the range of the rock?



- 6. A rock is thrown at an angle of 65° above the horizontal at 16 m/s up a hill that makes an angle of 30° with the horizontal. How far up the hill will the rock go before hitting the ground?
- 7. A football is thrown from the edge of a cliff from a height of 22 m at a velocity of 18 m/s [39° above the horizontal]. A player at the bottom of the cliff is 12 m away from the base of the cliff and runs at a maximum speed of 6.0 m/s to catch the ball. Is it possible for the player to catch the ball? Support your answer with calculations.