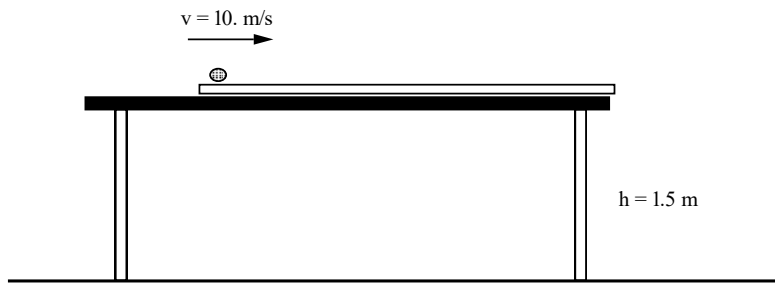


Unit 4.5: Worksheet 2

1. Given the following situation of a marble in motion on a rail (ignore air resistance):



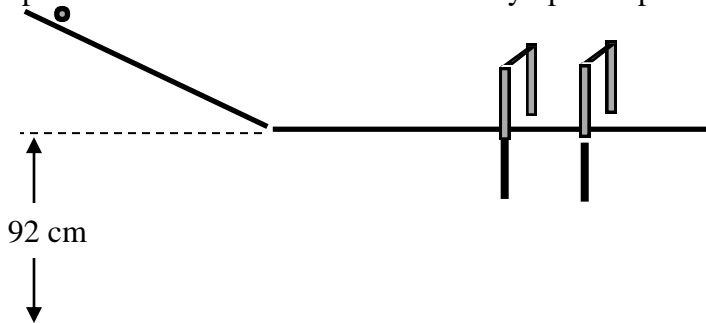
- a. Sketch motion maps showing the motion of the marble after it leaves the rail. Sketch motion maps for x , y , v_x , v_y , a_x , and a_y .
- b. Sketch and label force diagrams for the marble both when it is on the rail and off the rail.
- c. Calculate the horizontal range of the marble as it falls to the floor.
2. Determine the horizontal range for the marble if the table in part one were 3.0 m high (so we have doubled the height).

Explain the effect doubling the height has on range of the marble.

3. While standing on a quarry wall, a boy tosses a piece of granite into the water below. He throws the ball horizontally with a velocity of 3.0 m/s, and it strikes the water 4.5 m away. Calculate how high the wall is above the water.

4. Tad drops his bowling ball out the car window 1.0 m above the ground while traveling down the road at 18 m/s. Calculate how far, horizontally, from the initial dropping point the ball will hit the ground. If the car continues to travel at the same speed, determine where will the car be in relation to the ball when it lands.

5. A student finds that it takes 0.20s for a ball to pass through photogates placed 30 cm apart on a level ramp. The end of the ramp is 92 cm above the floor. Calculate where should a coin be placed so that the ball strikes it directly upon impact with the ground.



6. Suppose now that the same ball, released from the same ramp in problem #5 (92 cm high) struck a coin placed 25 cm from the end of the ramp.
- Calculate the ball's horizontal velocity before leaving the ramp.
 - Calculate how long it took for the ball to pass through the photogates.
7. When using the sight on a rifle, you should aim right for the bulls-eye.
- Explain how to design a sight so that it will cause the user to hit the target. Explain with words and a diagram.
 - Will the same sight when used work if you are shooting downhill? Explain with words and a diagram.