

## Chapter 8 The drop zone

### Short investigation 8.2: Horizontally launched projectiles

Name: .....

#### Aim

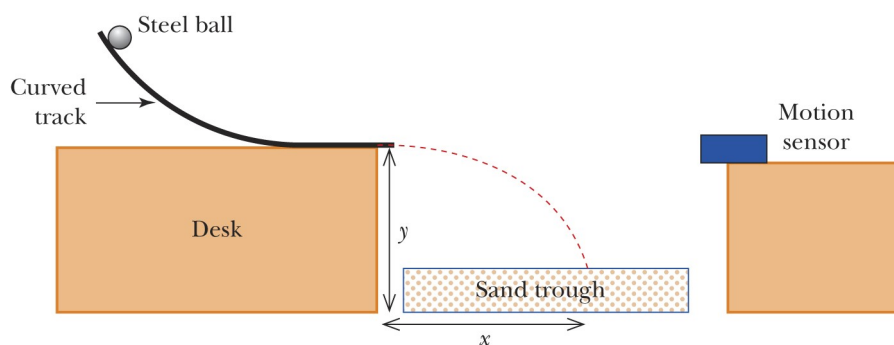
To explore the relationship between the initial speed of a horizontally launched object and its range

#### Materials

Steel ball, curved track (or flexible plastic racing car track), metre ruler, long plastic trough or tray filled with sand, data logger with motion sensor

#### Method

1. Set up the apparatus as shown in the figure below. Ensure that the motion sensor is mounted directly opposite the launch end of the track.



2. Measure the height  $y$  between the launch end of the track and the floor.
3. Roll the ball down the track and note its landing position in the sand tray. Measure the distance  $x$  between the launch end of the track and the landing position. Enter this value into table 8.2A.
4. Read the launch speed ( $u_x$ ) from the data logger and enter this value into table 8.2.1.
5. Adjust the height of the top end of the track to vary the value of  $u_x$  and repeat steps 3–5 for 3 more launch speeds.

#### Results

Table 8.2A

$u_x$ ( $\text{m s}^{-1}$ )	$x$ (m)
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**Analysing the results**

1. Given your measurement of the vertical distance  $y$ , and assuming that  $a = -9.8 \text{ m s}^{-2}$  and  $u_y = 0$ , determine the flight time  $t$  of the ball using the equation  $y = u_y t + \frac{1}{2} a t^2$ .
2. Using the flight time and the values of  $u_x$ , determine the theoretical range  $x$  that the ball should have reached in each of the 4 trials, given that  $x = u_x t$ .
  - (a) Trial 1 ( $u_x = \quad \text{m s}^{-1}$ )
  - (b) Trial 2 ( $u_x = \quad \text{m s}^{-1}$ )
  - (c) Trial 3 ( $u_x = \quad \text{m s}^{-1}$ )
  - (d) Trial 4 ( $u_x = \quad \text{m s}^{-1}$ )
3. Compare these theoretical values to the investigational values that you obtained in each case.
4. What explanations can you give for any discrepancies between the values?

**Conclusion**

State the relationship between the initial speed of a horizontally launched projectile and its range.

**Notes:**