

- Q1. Xavier and Benjamin are standing 49 m apart on a flat field, tossing a ball backwards and forwards between them. Look! – there goes the ball now! Let's time it. It takes 4.00 s to cross from Xavier to Benjamin, landing at precisely the same height as that from which it was thrown. From this information find:-
- the initial horizontal velocity of the ball [3];
  - the final horizontal velocity of the ball [2];
  - its initial vertical velocity [4];
  - its final vertical velocity [3];
  - the maximum height it reaches [4];
  - its initial speed [2];
  - the angle above the horizontal at which it is thrown [2].
- Q2. Elliot is one of Robin's "merrie men", and a hell of a shot with an arrow! In order to save the inn-keeper's daughter from the evil Sheriff's thugs, Elliot has to fire an arrow to hit a rope that supports a sign. This is 84.0 m due east of his bow, and 3.60 m above it. These thugs! - always causing visual and noise pollution, and considerable annoyance! **TWANG!** This is only a story, so the arrow hits the rope first time, precisely 2.40 s later. No problems. Determine:-
- the initial horizontal velocity of the arrow [3];
  - its initial vertical velocity [3];
  - hence, what was its initial velocity [VECTOR!] [4].
- [P.S. The joyful daughter returned to the harvest festival of singing and dancing. Life goes on!]
- Q3. Luke is on the eighteenth hole, one shot down. Let's be quiet as he lines up his 3-iron towards the flag. The hole is known to be 8.1 m below the height of the tee, and 180.0 m away. Shhh! **CRACK!** Ah! – he has used his favourite swing in the still air with no resistance. The ball is launched at  $47.667 \text{ m s}^{-1}$ , at an angle of  $65.0^\circ$  above the horizontal. [He often uses this shot.] Find:-
- the initial vertical velocity of the golfball [2];
  - the maximum height it reaches [3];
  - the time it takes before landing – on the green, naturally! [5]
  - the distance from the tee that the ball lands [4]. [P.S. the ball "bit", and spun backwards, but rimmed out.]
- Q4. Alex launches a javelin with a velocity of  $24 \text{ m s}^{-1}$  at an angle  $49^\circ$  above the horizontal, and from a height of 2.0 m above the ground. Determine:-
- the initial horizontal velocity of the javelin [2];
  - the initial vertical velocity of the javelin [2];
  - its maximum height above the ground [4];
  - how long it takes to strike the ground [5];
  - how far in front of the launching position it lands [3].