

## Break Out Session Solutions

### Breakout Session 1 – Units and Measurement

- 1) 29 m/s
- 2) 35.5 m (including being pushed backwards at the end)
- 3) 25 s (including being pushed backwards at the end)
- 4) a) 2.0 m/s    b) 1.33 m/s    c) 1.62 m/s

### Breakout Session 2 – Projectile Motion

- 1) Velocity is the derivative of position with respect to time, acceleration is the derivative of velocity with respect to time
- 2) 15.6 m
- 3) 2.57 s
- 4) 14.0 m/s

### Breakout Session 3 – Forces

- 1) Newton's Second Law refers to the sum of forces on a single object, Newton's Third Law refers to forces acting between two different objects.
- 2) a) 2700 N    b)  $1.125 \text{ m/s}^2$
- 3) 0.339 m
- 4) 4.4 m/s

### Breakout Session 4 – Energy

- 1) The kinetic energy gained by the ball comes from the gravitational potential energy lost by the ball
- 2) 37 m/s
- 3) 37 m/s (this method is simpler)
- 4)  $k = 800 \text{ N/m}$ ,  $\text{PE} = 9 \text{ J}$