Motion Equation Questions 1: Time

1. Jörg Ngunderssøn rolls a large steel ball along a flat wooden floor. When he releases the ball it is travelling at 1.5 ms⁻¹.

   (a) Calculate the time it takes the ball to travel 11 m.   /2

   Further along the floor is Jörg's fiercest foe, Nirk Tergbrüm. The ball rolls slowly towards him and he jumps over it. His initial vertical speed is 9 ms⁻¹.

   (b) Calculate Nirk's time of flight.   /2

2. As part of a very important global science experiment, a five cent coin is dropped from a skyscraper at a height of 215 m.

   (a) Calculate the time it takes for the coin to reach the ground, ignoring air resistance.   /2

   (b) Explain the effect on the time of flight if there is significant air resistance.   /2

3. Consider a cannon fired horizontally out of another cannon at a speed of 47 ms⁻¹ from a height of 36 m.

   (a) State why the initial vertical component of velocity is zero.   /1

   (b) Calculate the time of flight of the cannon.   /2

4. A stunt car drives off a ramp at a speed of 20.8 ms⁻¹ at an angle of 17.5° above the horizontal, and lands on another ramp at the same height.

   (a) Calculate the initial horizontal component of velocity.   /1

   (b) State why the horizontal acceleration of the car is zero, ignoring resistance.   /1

   (c) Hence calculate the time it takes the stunt car to reach the other ramp, given that they are 25.3 m apart.   /2

   (d) Calculate the initial vertical component of velocity.   /1

   (e) Hence calculate the time of flight of the stunt car using the vertical component.   /2

TOTAL   /17