Year 12 Physics                                                    NAME_____
# Projectile Motion Test

1. Explain why it is possible to use the equation $s = vt$ for horizontal motion instead of $s = v_0 t + \frac{1}{2}at^2$.  /2

2. Show that the maximum height $h$ of a projectile thrown directly upwards from ground height with initial
   speed $v$ is given by $h = \dfrac{v^2}{2g}$.  /3

3. BASE jumping is a sport involving jumping from large heights and using a parachute to survive the fall.
   In this question, a BASE jumper launches himself (or herself) horizontally off the top of a bridge 152m above
   the ground at a speed of 5.56ms$^{-1}$.
   *Assume the effect of air resistance is negligible prior to the parachute being opened.*
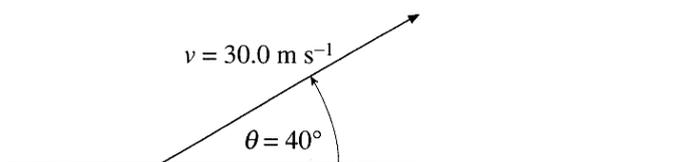
   (a) Calculate the vertical component of the BASE jumper's velocity 1.93s after launch.  /2
   (b) Calculate how far the jumper has moved horizontally by this time.  /2
   (c) Using a vector diagram, calculate the velocity of the jumper at this point.  /4
   (d) Explain why the parachute slows the jumper's fall once it opens.  /2

4. A golfer strikes a golf ball on level ground, such that it launches at a speed of 30.0ms$^{-1}$ and at an angle of
   40º, as shown in the diagram below.



   (a) Calculate the magnitude of the horizontal and vertical components of the ball's initial velocity.  /2
   (b) Calculate the time of flight of the golf ball.  /4
   (c) State and explain the effect on the range of the golf ball if it is launched from a height.  /2

5. The multi-image diagram below represents the motion of a projectile launched horizontally from a cliff on
   the planet Zorbatron. The time interval between images is 1.0 s. There is no air on Zorbatron.
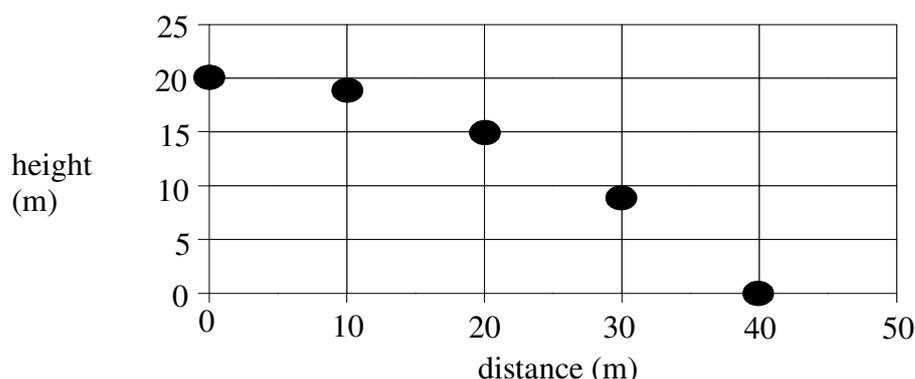


   (a) Calculate the horizontal speed of the projectile.  /2
   (b) Calculate the magnitude of the vertical acceleration of the projectile.  /3
   (c) On the multi-image diagram, draw an arrow on each image of the projectile representing the direction of
       the acceleration of the projectile at that point.  /1
   (d) On the multi-image diagram, draw a possible path for the projectile if Zorbatron had air.  /1

                                                                    TOTAL      /30

BASE is an acronym and stands for the locations from which a participant may jump:
   • **B**uilding
   • **A**ntenna (an uninhabited tower such as an aerial mast)
   • **S**pan (a bridge or arch)
   • **E**arth (a cliff or other natural formation)