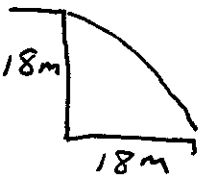
Key

200802071421 Name_____

A flat surfaced cliff, abutting a lake, is located 18.00 meters above a lake. Bubba wants to, because he thinks that he can, run off the cliff and land exactly 18.00 meters from the base of the vertical cliff, which just happens to be located on the 3rd planet from the Sun where g = 9.800 m/s/s. Neglect the curvature of the planet and neglect air friction. Show equations used, work done, and circle final answer. Make a good diagram on the back of the paper and label it correctly.



A) How long, in seconds, will it take for Bubba to hit the water's surface?

$\Delta y = v_{iy}t + \frac{1}{2}at^2 = 0 + \frac{1}{2}(-9.8)t^2 = -4.9t^2$

$-18 = -4.9t^2 \quad t^2 = \frac{18}{4.9} = 3.6734$ $\quad t = 1.9166 \text{ sec}$

B) What will Bubba's final vertical velocity be, in m/s, as he hits the surface?

$v_f^2 = v_i^2 + 2ay$

$v_f^2 = 2(-9.8)(18) = 352.8$

$v_f = \sqrt{352.8} = -18.783 \text{ m/s}$

or $v_f = v_i + at$

$= (-9.8)(1.9166)$

$v_f = -18.78 \text{ m/s}$

$v_f = -18.78 \frac{m}{s}$

C) After he leaves the cliff, how long, in seconds, will Bubba travel in a horizontal direction before hitting the water?

Same as the time to fall on $t = 1.9166$ sec

D) At what initial horizontal velocity, in m/s, must Bubba be running at to land exactly 18 m meters from the base of the cliff?

$D = RT$

$R = \frac{D}{T} = \frac{18 \text{ m}}{1.9166 \text{ sec}} = 9.3916 \text{ m/s}$ to the right

E) What is the total resultant velocity of Bubba, in m/s, just as he hits the water?

$v_f^2 = v_{fx}^2 + v_{fy}^2$

$= 9.3916^2 + (-18.78)^2$

$= 88.203 + 352.8$

$v_f^2 = 441$

$v_f = \sqrt{441}$

$v_f = 21 \text{ m/s} \ @ 63.43^\circ \text{ Below}$

$\text{Tan}\phi = \frac{18.78}{9.3916} = 2.00$

$\phi = 63.43^\circ \text{ Below}$

F) What will be Bubba's horizontal distance, in meters. from the cliff after he has fallen half the height of the cliff toward the lake?

$\Delta y = v_i t + \frac{1}{2}at^2$

$-9 = \frac{1}{2}at^2$

$-18 = 4.8t^2$

$t^2 = \frac{-18}{-9.8}$

$D = RT$

$D = (9.3916 \frac{m}{s})(\frac{18}{9.8})^{\frac{1}{2}}$

$D = (9.3916)(1.355)$

$D = 12.71 \text{ m}$

12.71 m