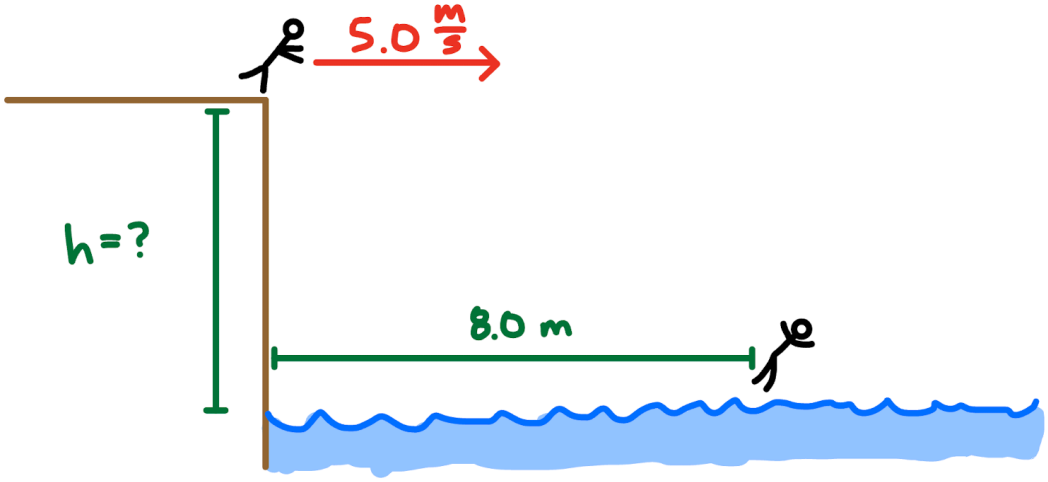
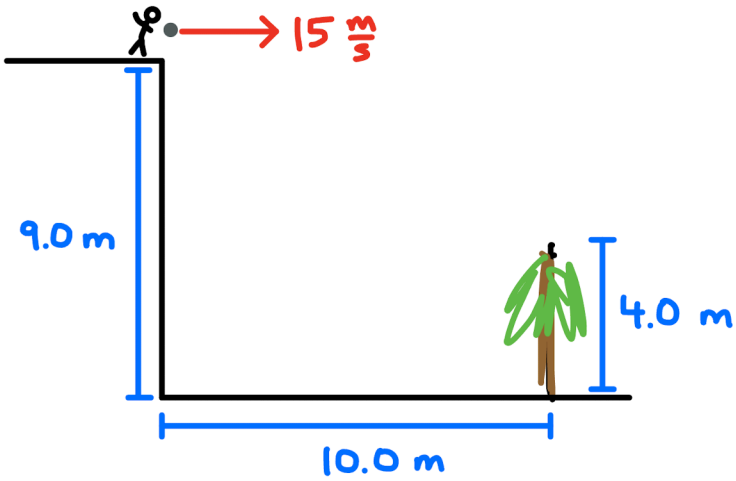
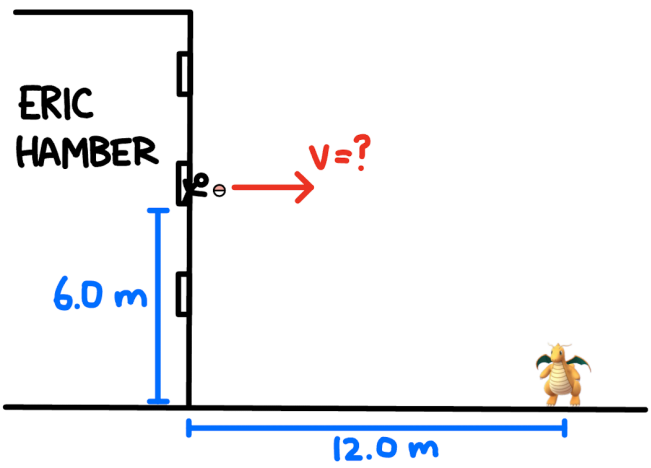
A swimmer runs at 5.0 m/s off the top of a cliff into a lake. He lands 8.0 m from the cliff. How high is the cliff?



A rock is thrown horizontally at 15 m/s from the top of a 9.0 m high building. There is a 4.0 m tall tree 10.0 m away from the building. Does the rock make it over the tree?



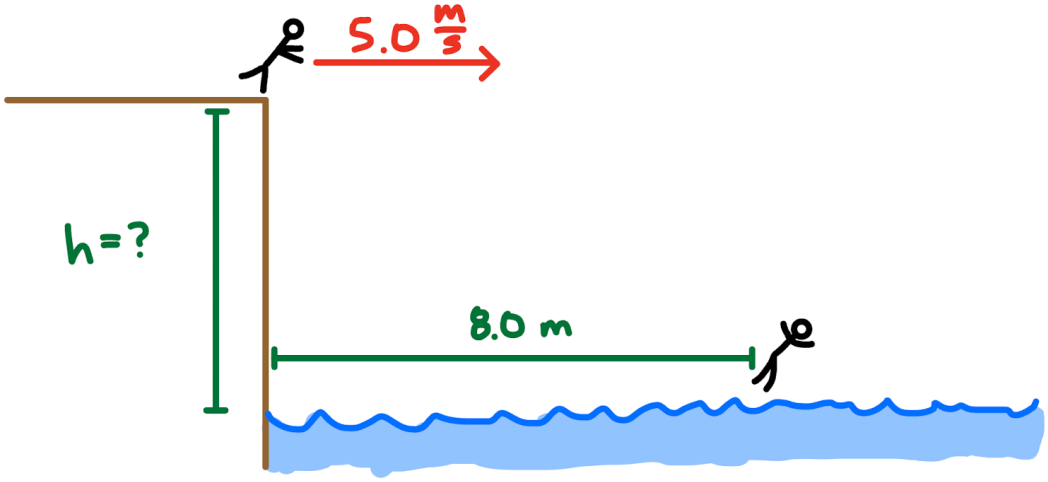
You are on the second floor of Hamber, 6.0 m above the ground. You see a Dragonite 12.0 m away, outside the building.



a) If you release the ball horizontally, what speed must you throw the Pokéball in order for it to hit the Dragonite?

b) If your friend is on the third floor, how will the speed at which he must throw the Pokéball compare to yours? Use principles of physics to explain your answer.

A swimmer runs at 5.0 m/s off the top of a cliff into a lake. He lands 8.0 m from the cliff. How high is the cliff?



x

$v_x = 5.0\ \frac{m}{s}$

$d_x = 8.0\ m$

$t = ?$

$d_x = v_x t$

$t = \frac{d_x}{v_x}$

$= \frac{8.0}{5.0}$

$= 1.6\ s$

y

$v_{iy} = 0$

$a_y = 9.8\ m/s^2$

$t = ?$

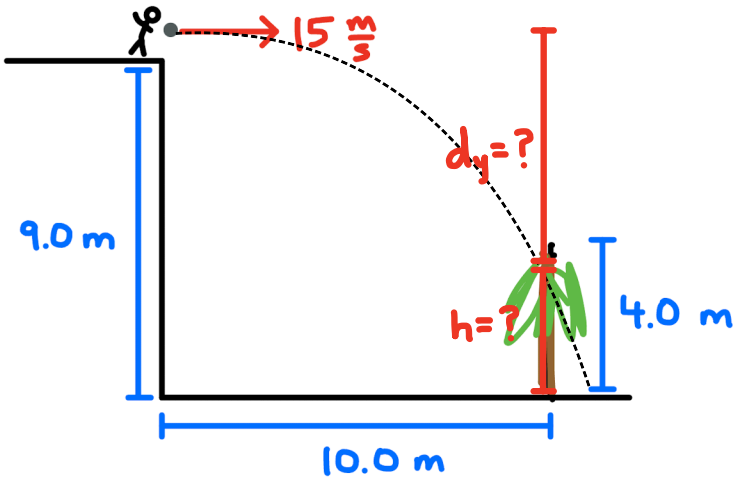
$d_y = ?$

$d_y = v_{iy} t + \frac{1}{2} a_y t^2$

$= \frac{1}{2}(9.8)(1.6)^2$

$= \boxed{12.5\ m}$

A rock is thrown horizontally at 15 m/s from the top of a 9.0 m high building. There is a 4.0 m tall tree 10.0 m away from the building. Does the rock make it over the tree?



HOW HIGH IS THE ROCK WHEN IT IS 10.0m FROM THE BUILDING?

x	y
$V_x = 15\ \frac{m}{s}$	$V_{iy} = 0$
$d_x = 10.0$ m	$a_y = 9.8\ m/s^2$
t = ?	t = ?
$d_x = v_x t$	+ ↓
$t = \frac{d_x}{v_x}$	d_y = ?
$= \frac{10.0}{15}$	
$= 0.\overline{66}$ s	

$d_y = v_{iy}t + \frac{1}{2}a_y t^2$ ($v_{iy} = 0$)

$= \frac{1}{2}(9.8)(0.\overline{66})^2$

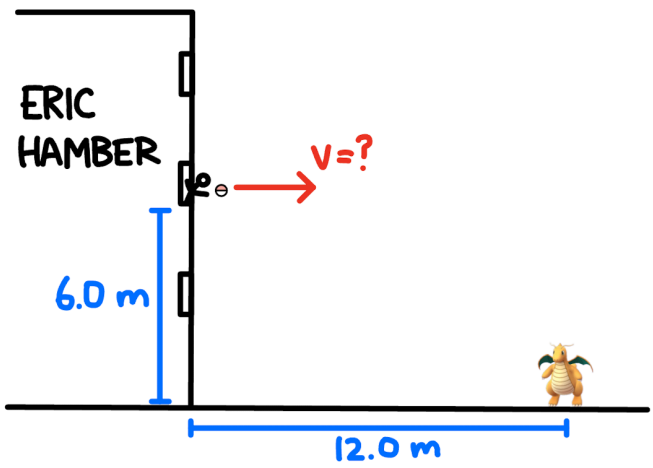
$= \boxed{2.18\ m}$

$h = 9.0 - 2.18$

$= 6.8\ m > 4.0\ m$

YES, THE ROCK MAKES IT OVER THE TREE.

You are on the second floor of Hamber, 6.0 m above the ground. You see a Dragonite 12.0 m away, outside the building.



a) If you release the ball horizontally, what speed must you throw the Pokéball in order for it to hit the Dragonite?

x	y
$d_x = 12.0$ m	$v_{iy} = 0$
$t = ?$	$a_y = 9.8\ m/s^2$
$v_x = ?$	$d_y = 6.0$ m
	$t = ?$

+ ↓

$d_y = v_{iy}t + \frac{1}{2}a_y t^2$ ($v_{iy} = 0$)

$t = \sqrt{\frac{2d_y}{a_y}}$

$= \sqrt{\frac{2(6.0)}{9.8}}$

$= 1.11$ s

$v_x = \frac{d_x}{t}$

$= \frac{12.0}{1.11}$

$= \boxed{10.8\ \frac{m}{s}}$

b) If your friend is on the third floor, how will the speed at which he must throw the Pokéball compare to yours? Use principles of physics to explain your answer.

- THE TIME IT TAKES THE POKEBALL TO REACH THE GROUND DEPENDS ON THE <u>VERTICAL</u> DISPLACEMENT (I.E. THE HEIGHT)

$$t = \sqrt{\frac{2d_y}{a_y}} \longrightarrow t \propto \sqrt{d_y}$$

TIME IS DIRECTLY PROPORTIONAL TO THE SQUAREROOT OF VERTICAL DISPLACEMENT.

BECAUSE YOUR FRIEND IS ON THE THIRD FLOOR, THE VERTICAL DISPLACEMENT IS GREATER AND THE BALL WILL SPEND MORE TIME IN THE AIR.

- AS THE AIR TIME IS GREATER, TO REACH THE SAME <u>HORIZONTAL</u> DISPLACEMENT, THE BALL MUST BE THROWN WITH A LOWER HORIZONTAL VELOCITY.