

A hunter aims directly at a target on the same level, 150 m away. If the bullet leaves the gun at a speed of 50 m/s, by how much will it miss the target?

44.1 m below target

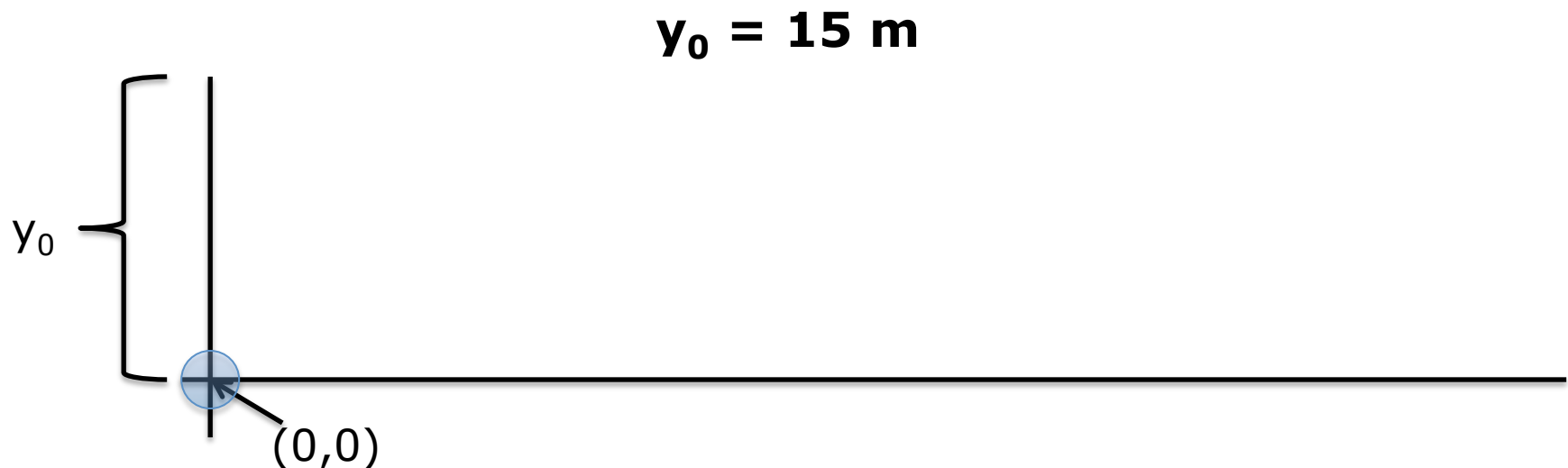
A tiger leaps horizontally from a 17 m high rock with a speed of 4.0 m/s. How far away will it land?

7.44 m

A tiger leaps horizontally from a 15 m high rock with a speed of 7.0 m/s. How far away will it land?

12.25 m

**Step 1: Set up the problem.** A diagram really really helps. The tiger is jumping off of a rock placed above ground and is landing on the ground, so let's make our  $(0,0)$  point be at the ground level. This means:

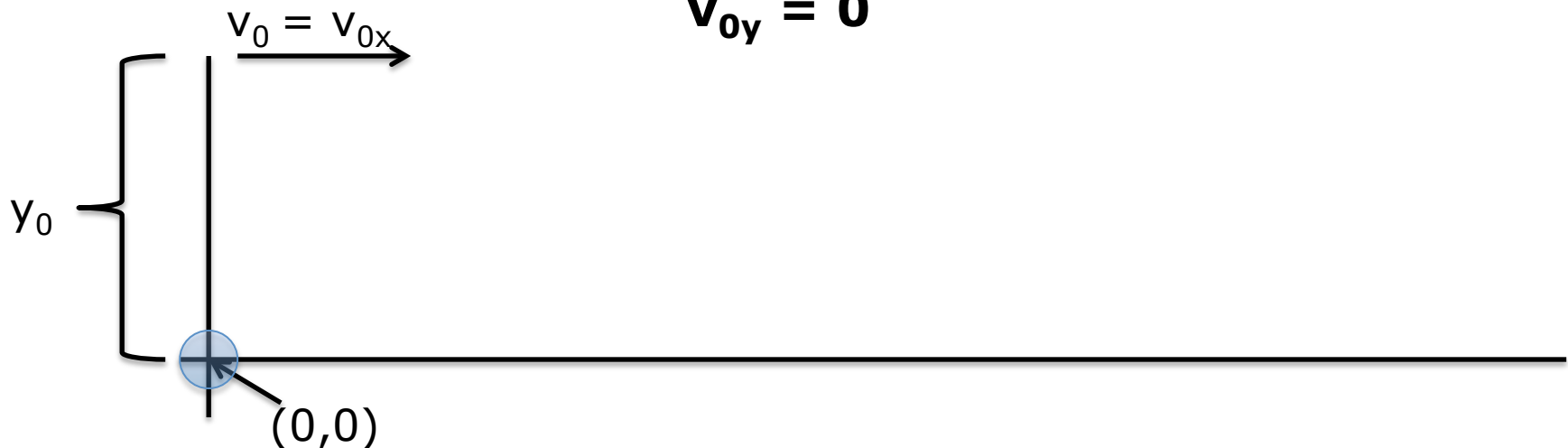


A tiger leaps horizontally from a 15 m high rock with a speed of 7.0 m/s. How far away will it land?

12.25 m

**Step 1: Set up the problem.** What else are we given in the problem or do we know? We're told the tiger leaps **horizontally**. That means all of the initial velocity is ONLY in the x direction!

$$\mathbf{v}_0 = \mathbf{v}_{0x} = 7.0 \text{ m/s}$$
$$\mathbf{v}_{0y} = 0$$

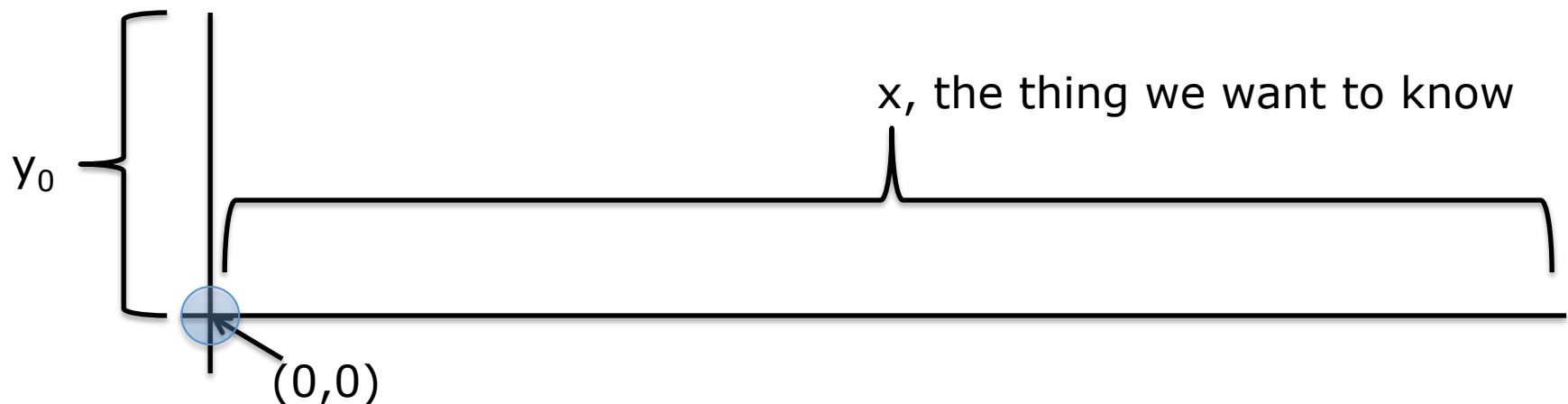


A tiger leaps horizontally from a 15 m high rock with a speed of 7.0 m/s. How far away will it land?

12.25 m

**Step 2: What variable are we trying to solve for?** It helps to write this down, to allow you to better understand what equations might be useful in solving the problem.

**We want to know  $x$ , the total distance traveled (or  $R$ , range, they're the same thing)**

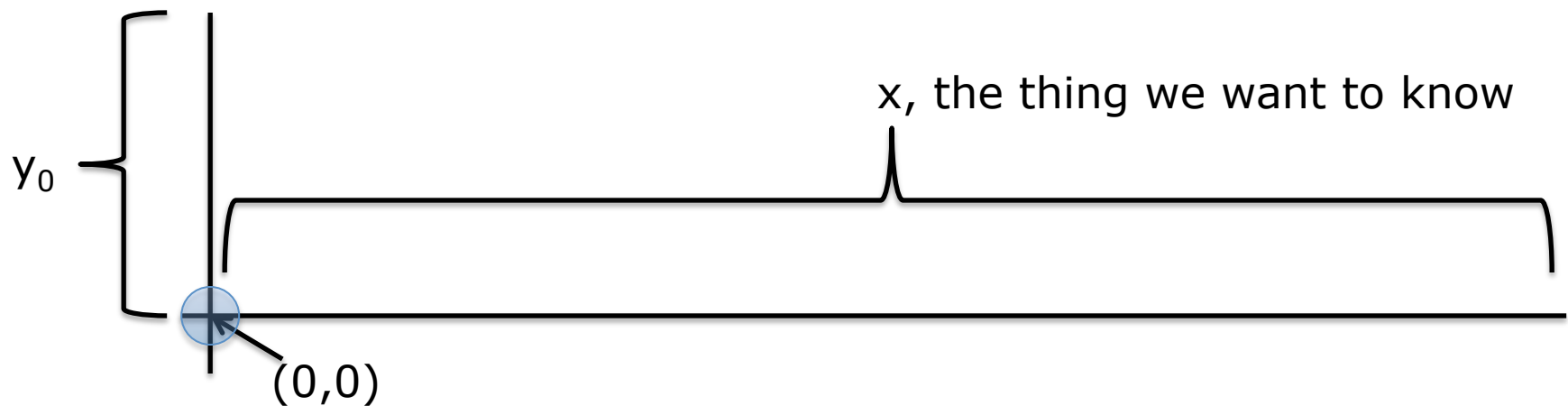


A tiger leaps horizontally from a 15 m high rock with a speed of 7.0 m/s. How far away will it land?

12.25 m

**Step 3: Write down any equations you think might be useful.**

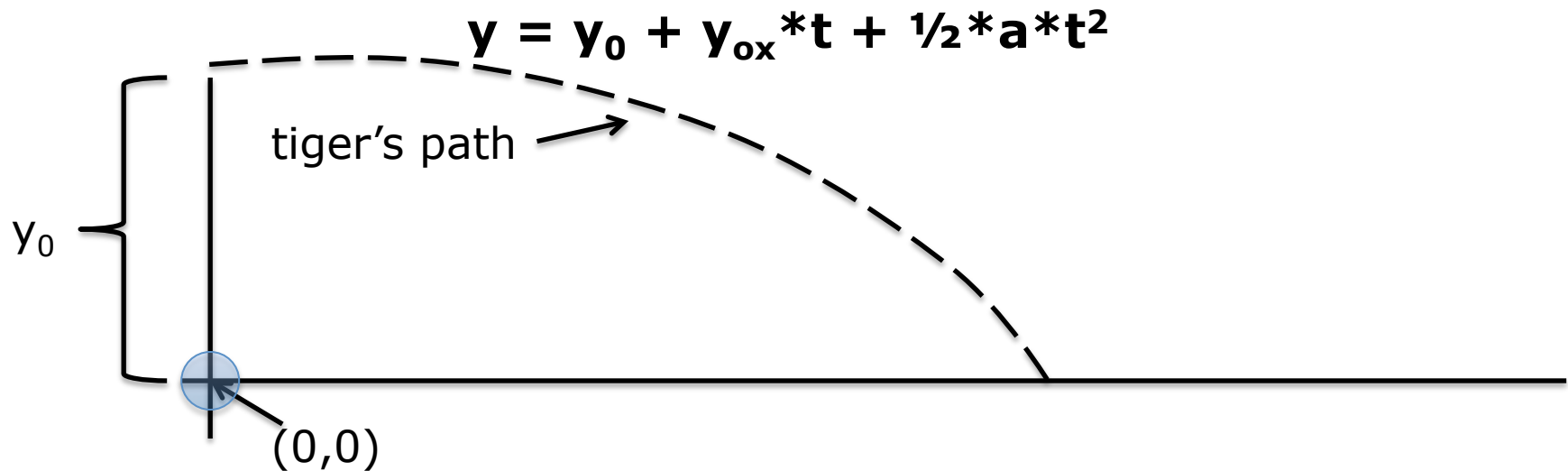
$$x = x_0 + v_{ox} * t$$



A tiger leaps horizontally from a 15 m high rock with a speed of 7.0 m/s. How far away will it land?

12.25 m

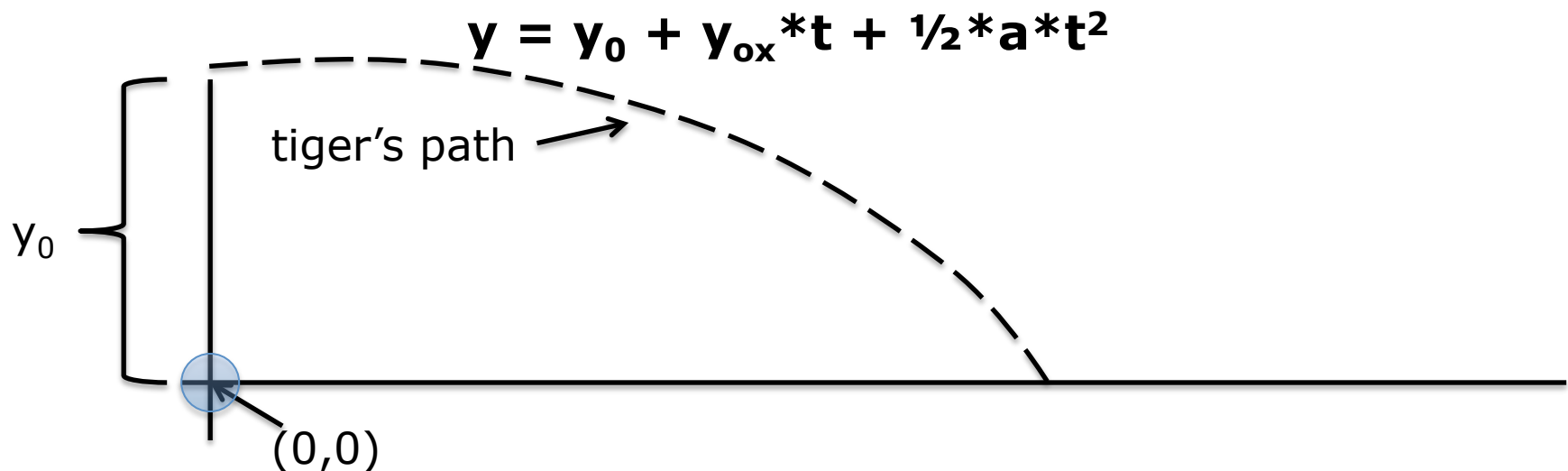
**Step 3: Write down any equations you think might be useful.** We know  $x_0$  and  $v_{0x}$  but we don't know  $t$ . What other equation might help us find  $t$ ? This is projectile motion so let's think about what might be going on in the  $y$  direction, too.



A tiger leaps horizontally from a 15 m high rock with a speed of 7.0 m/s. How far away will it land?

12.25 m

**Step 3: Write down any equations you think might be useful.** We know  $y_0$  is 15 m and  $v_{oy}$  is going to be 0 because all of the initial velocity is in the x direction. We might be able to use an equation for distance traveled in y to help us find t.





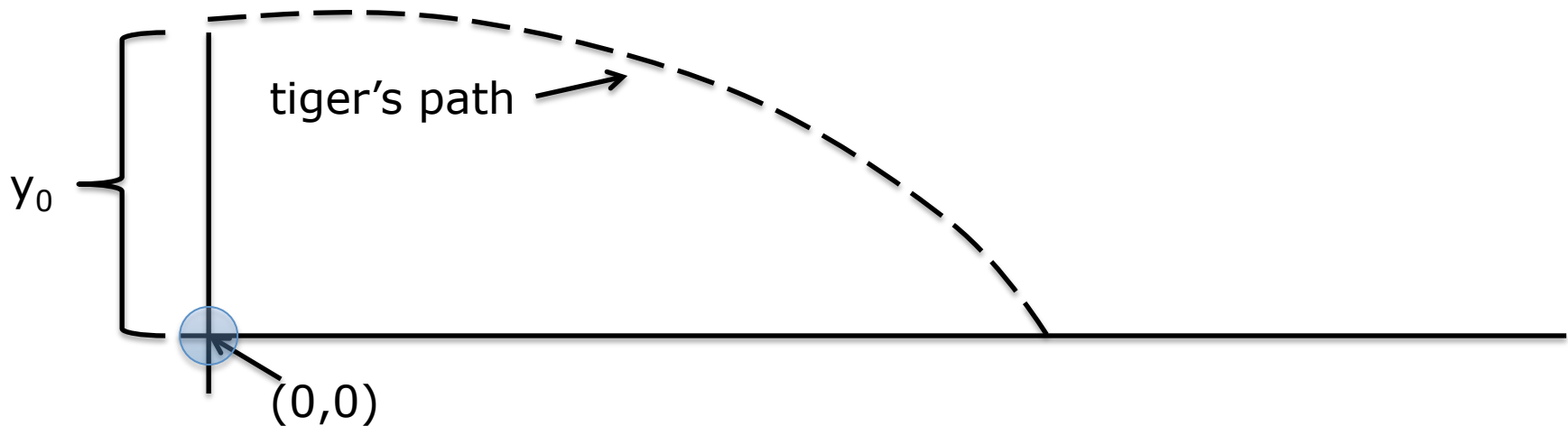
A tiger leaps horizontally from a 15 m high rock with a speed of 7.0 m/s. How far away will it land?

12.25 m

**Step 4: Simplify any helpful equations**

$$y = y_0 + y_{0x} * t + \frac{1}{2} * a * t^2$$

↑            ↑            ↑  
15 m    0            -9.8 m/s<sup>2</sup>

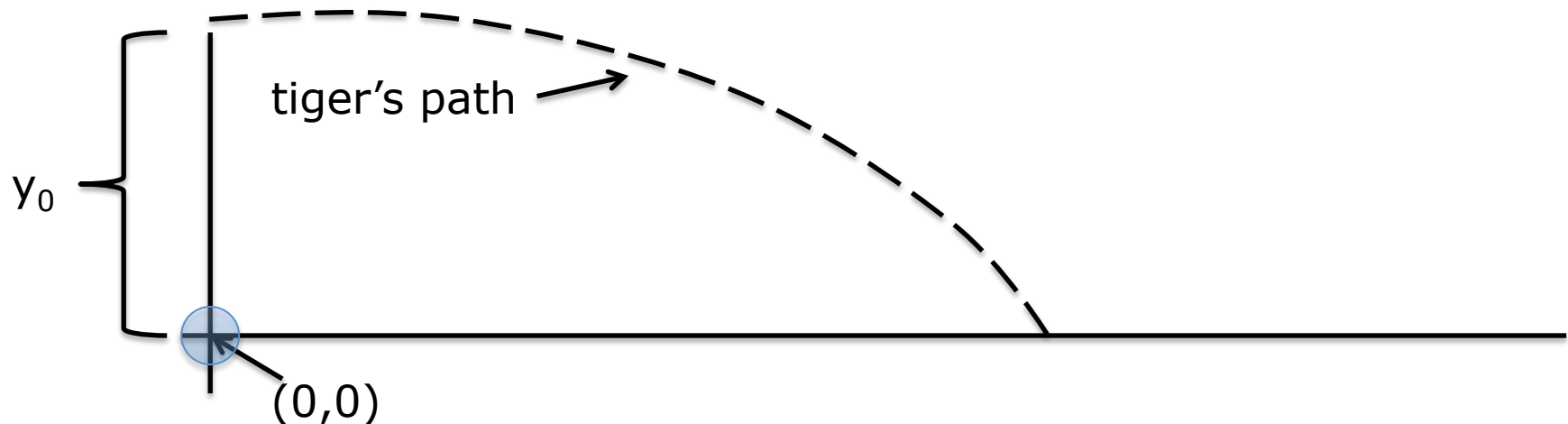


A tiger leaps horizontally from a 15 m high rock with a speed of 7.0 m/s. How far away will it land?

12.25 m

**Step 4: Simplify any helpful equations.** What about  $y$ ? We know at the end of the leap the tiger is on the ground. That means the tiger has ended up at 0 m in  $y$ .

$$0 = 15 \text{ m} + 0 - (9.8 \text{ m/s}^2 / 2) * t^2$$



A tiger leaps horizontally from a 15 m high rock with a speed of 7.0 m/s. How far away will it land?

12.25 m

**Step 5: Solve for your unknowns in the helpful equations**

$$(9.8 \text{ m/s}^2 / 2) * t^2 = 15 \text{ m}$$

$$t^2 = (30 \text{ m} / 9.8 \text{ m/s}^2)$$

$$t^2 = 3.06 \text{ s}^2$$

$$t = 1.75 \text{ s}$$



A tiger leaps horizontally from a 15 m high rock with a speed of 7.0 m/s. How far away will it land?

12.25 m

**Step 6: Substitute into your original equation.**

$$\begin{aligned}x &= x_0 + v_{ox} * t \\x &= 0 + (7.0 \text{ m/s}) * (1.75 \text{ s}) \\x &= 12.25 \text{ m}\end{aligned}$$

