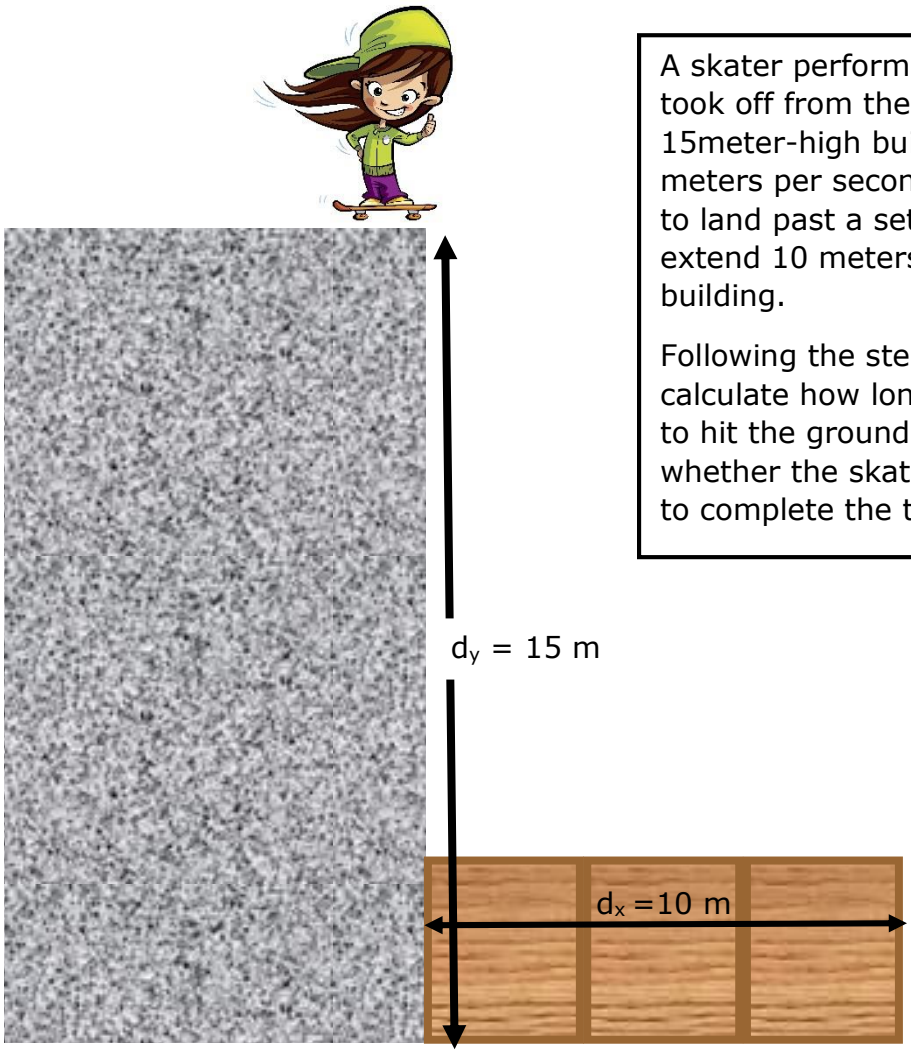
Sample Projectile Calculation - KEY



A skater performing a skateboard trick took off from the edge of a 15meter-high building with a speed 6 meters per second. The goal of the trick is to land past a set of wooden boxes that extend 10 meters from the edge of the building.

Following the steps from the video, (a) calculate how long it will take the skater to hit the ground, and (b) determine whether the skater will travel far enough to complete the trick successfully.

Remember to show all your calculations, including SI units.

Formulas	
$d_y = v_{iy}\, t + \frac{1}{2}\, at^2$	$d_x = v_x\, t$

Givens:	Vertical Motion	Horizontal Motion
	a = **-9.8 m/s²** (- because it is falling)	d_x = ?
	d_v = **-15 m** (- because it is falling)	v_x = **6 m/s**
	v_{iy} (initial vertical velocity) = **0 m/s**	t = ?
	v_{fy} (final vertical velocity) = ? (not calculated)	
	t = ?	

Remember, ***in physics + and – are used to indicate direction.***

Up and right *are usually considered* ***+ directions****, so an object moving to the right us usually described as moving in the positive (+) x-direction.*

Down and left *are usually considered* ***– directions****, so a falling object is usually described as moving in the negative (-) y-direction.*

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

$$d_y = 0 \cdot t + \frac{1}{2} a t^2$$

$$d_y = \frac{1}{2} a t^2$$

$$d_y / a = \frac{1}{2} t^2$$

$$2(d_y / a) = t^2$$

$$2(d_y / a) = t^2$$

$$t = \sqrt{2 d_y / a}$$

$$t = \sqrt{2(-15\ m) / -9.8\ m/s^2}$$

$$\underline{\boldsymbol{t = 1.75\ s}}$$

(b) Determine whether the skater will travel far enough to complete the trick successfully.

$$d_x = v_x\ t$$

$$d_x = (6 m/s) \cdot (1.75 s)$$

$$\underline{\boldsymbol{d_x = 10.5\ m}}$$

Yes, the skater will clear the boxes by 0.5 meters.