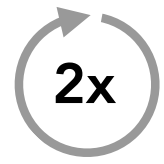
PHYSICS PROBLEM-SOLVING METHOD

1 Read the problem carefully, twice

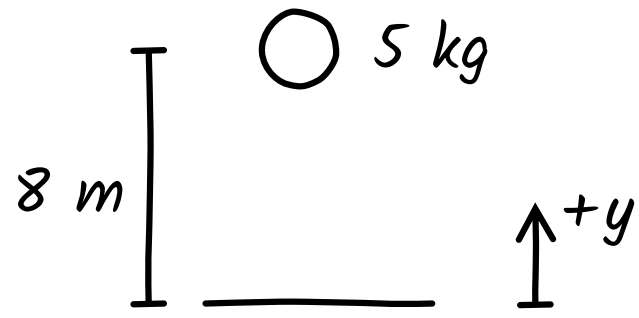
- It's easy to miss something or read it the wrong way



> A 5 kg ball is dropped from rest at a height of 8 m. Ignoring air resistance, how fast will it be travelling when it hits the ground?

2 Draw a picture

- Include the objects, geometry, forces and other information that are relevant to solving the problem
- Choose the origin and the positive direction



3 Write what you are given, your assumptions, and what the problem is asking you to find

- Keep in mind that the problem may give you more information than you need to solve it

$m = 5\ kg$ $\quad v_i = 0\ m/s$

$y_i = 8\ m$ $\quad g = 9.8\ m/s^2$

$y_f = 0\ m$ $\quad v_f = ?$

4 Figure out which physics concept(s) you can use, and think through how you could solve the problem conceptually before starting

- There may be more than one concept you can use
- Have at least some idea of how you will solve the problem before you start using equations and plugging in numbers

kinematics

→ conservation of energy

~~conservation of momentum~~

"All of the ball's initial potential energy will be converted into kinetic energy, which includes velocity, so if I..."

5 Check the equations from that concept(s) and decide which ones you can use

- Look for equations that have the variables you know and the variables you want to find

Energy

$\Sigma E_i = \Sigma E_f$

$K = \frac{1}{2}mv^2$ $\quad K_r = \frac{1}{2}I\omega^2$

$U = mgh$ $\quad U_s = \frac{1}{2}kx^2$

6 Solve the equation(s) and do the math

- Recommended but optional: rearrange and combine equations to solve for the variable you're looking for first, then plug in numbers at the end
- Keep your work organized and easy to follow
- Make sure you use the correct units

$$E_i = E_f$$

$$K_i + U_i = K_f + U_f$$

$$mgh_i = \frac{1}{2}mv_f^2$$

$$\sqrt{2gh_i} = v_f$$

$$\sqrt{2(9.8)(8)} = v_f$$

$$12.5\ m/s = v_f$$

7 Check your answer

- Did you actually find what the problem asked for?
- Do your units make sense?
- Do the magnitude and sign (+/-) make sense?

> A 5 kg ball is dropped from rest at a height of 8 m. Ignoring air resistance, how fast will it be travelling when it hits the ground?

✓ $v_f = 12.5\ m/s$