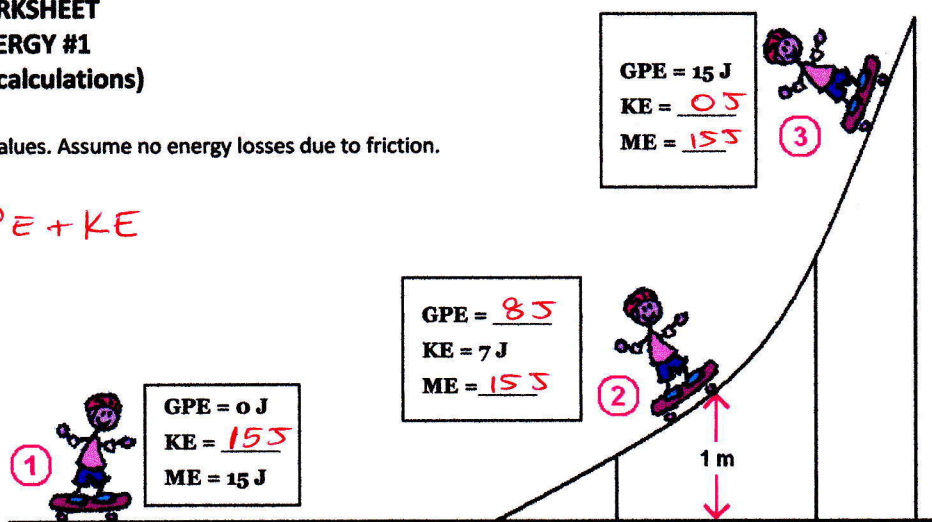


**PHYSICAL SCIENCE WORKSHEET**  
**CONSERVATION OF ENERGY #1**  
 (use  $g = 10 \text{ m/s}^2$  for all calculations)

1. Fill in the missing values. Assume no energy losses due to friction.

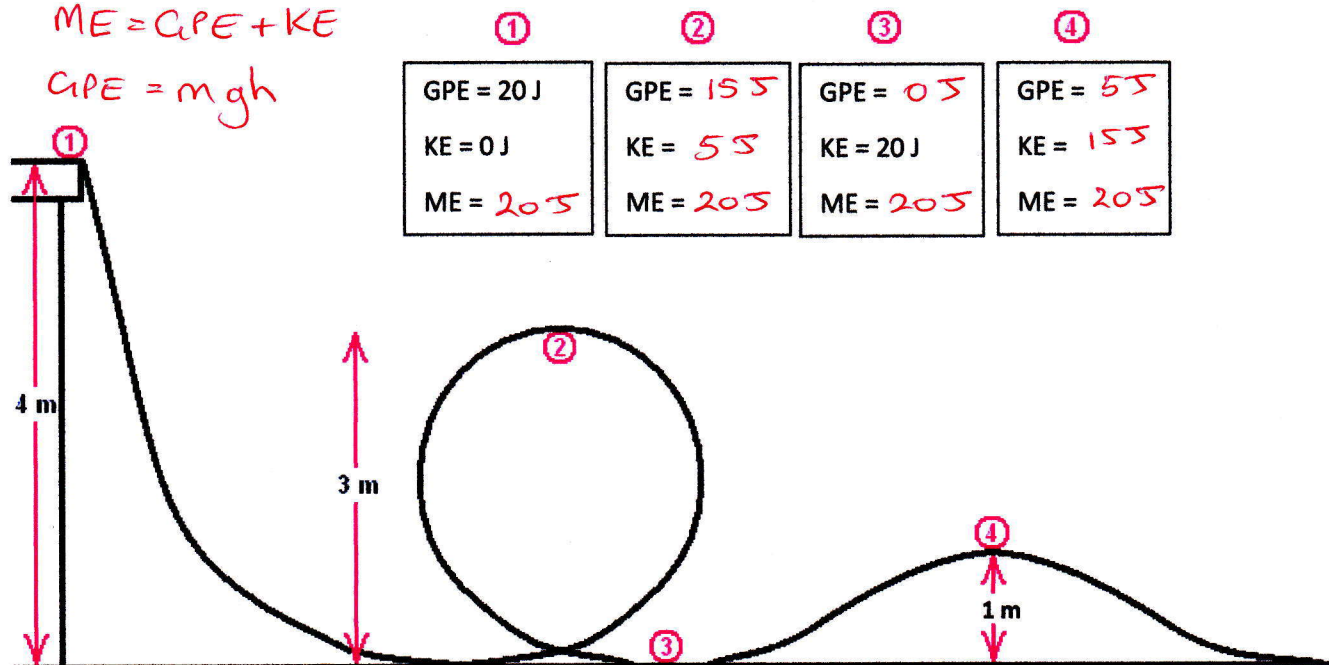
$$ME = GPE + KE$$



2. Fill in the missing values. Assume no energy losses due to friction. The data relates to a  $0.5 \text{ kg}$  object at each position.

$$ME = GPE + KE$$

$$GPE = mgh$$



3. A 1.8 kg book has been dropped from the top of the football stadium. Its speed is 4.8 m/s when it is 2.9 metres above the ground. What is its mechanical energy?

$$KE = \frac{1}{2}mv^2$$

$$= \frac{1}{2} \times 1.8 \times 4.8^2$$

$$= 20.7 \text{ J}$$

$$GPE = mgh$$

$$= 1.8 \times 10 \times 2.9$$

$$= 52.2 \text{ J}$$

$$ME = GPE + KE$$

$$= 52.2 + 20.7$$

$$= 72.9 \text{ J}$$

4. A 28 kg child on a swing is travelling at 4.2 m/s. What is his gravitational potential energy if he has 315 J of mechanical energy?

$$KE = \frac{1}{2}mv^2$$

$$= \frac{1}{2} \times 28 \times 4.2^2$$

$$= 247 \text{ J}$$

$$GPE = ME - KE$$

$$= 315 - 247$$

$$= 68 \text{ J}$$

5. Identical twins Rick and Chris are painting a house. Rick is standing on the scaffolding 5 metres above the ground. Chris is standing on the scaffolding 5 metres above Rick. Who has more gravitational potential energy? Explain your answer.

Chris.

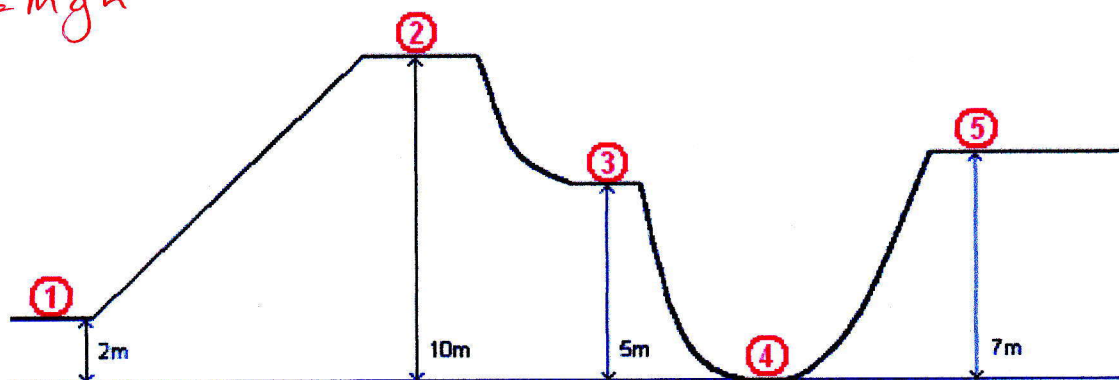
Assume their masses are the same if they are identical twins so Chris has greater GPE since he is at a greater height than Rick

6. Fill in the missing values. Assume no energy losses due to friction. The data relates to a 2 kg object at each position.

①	②	③	④	⑤
GPE = 40 J	GPE = 200 J	GPE = 100 J	GPE = 0 J	GPE = 140 J
KE = 170 J	KE = 10 J	KE = 110 J	KE = 210 J	KE = 70 J
ME = 210 J	ME = 210 J	ME = 210 J	ME = 210 J	ME = 210 J

$$ME = GPE + KE$$

$$GPE = mgh$$



7. John has 200 Joules of gravitational potential energy when he is standing still on a diving board.

a. Find his mechanical energy.

$$\begin{aligned}ME &= GPE + KE \\&= 200 + 0 \\&= 200 \text{ J}\end{aligned}$$

b. John jumps off the diving board. What is his gravitational potential energy when he is halfway to the water?

$$\begin{aligned}\text{If } h \text{ is halved, GPE is halved} \\ \therefore GPE &= 100 \text{ J}\end{aligned}$$

c. What is his mechanical energy when he lands in the water?

$$\begin{aligned}ME \text{ is conserved during the motion} \\ \therefore ME &= 200 \text{ J}.\end{aligned}$$

8. A ball has a 17 J of kinetic energy and its mechanical energy is 25 J.

a. Find the gravitational potential energy of the ball.

$$GPE = ME - KE = 25 - 17 = 8 \text{ J}$$

b. If the ball has a mass of 3.2 kg, what is its height above the ground?

$$\begin{aligned}GPE &= mgh \\ 8 &= 3.2 \times 10 \times h \\ h &= 0.25 \text{ m}\end{aligned}$$

c. What is the speed of the ball?

$$\begin{aligned}KE &= \frac{1}{2}mv^2 \\ 17 &= \frac{1}{2} \times 3.2 \times v^2 \\ v &= \sqrt{17 \div 1.6} = 3.26 \text{ m/s}\end{aligned}$$

9. What is the mass of a child that has a KE of 400 J who is riding her bike at 3.9 m/s?

$$\begin{aligned}KE &= \frac{1}{2}mv^2 \\ 400 &= \frac{1}{2} \times m \times 3.9^2 \\ m &= 800 \div 3.9^2 = 52.6 \text{ kg}\end{aligned}$$

10. Jared and Clay are climbing the stairs. Jared gets tired and stops halfway to the fourth floor. Clay makes it to the fourth floor without a problem. If Jared is twice as heavy as Clay, who has more gravitational potential energy? Explain your answer.

GPE is the same!

Clay has twice the height of Jared.  
but Jared has twice the mass of Clay.

$$\begin{aligned}GPE_{\text{clay}} &= mg(2h) = 2mgh \\ GPE_{\text{jared}} &= (2m)gh = 2mgh\end{aligned} \quad \left. \vphantom{\begin{aligned}GPE_{\text{clay}} \\ GPE_{\text{jared}}\end{aligned}} \right\} \text{ same.}$$