# Mechanics 1.1 AS 90940 Mechanics

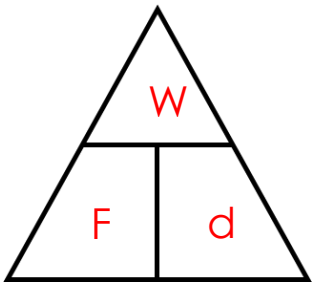
## ANSWERS Formula revision Part 2

**Success Criteria:** We know we have achieved this when we can:

- Construct a Formula equation for Work, Power and Energy
- Be able to give the names and units used in each Formula
- Be able to solve a simple question using each Formula

**Remember to answer questions:**
1. Write down formula
2. Rearrange formula if needed
3. Show working
4. Give answer with units

**1.** Calculating **work** - Fill in triangle and give names and units for each Letter




| Letter | Name | Units |
|---|---|---|
| W | Work | J |
| F | Force | N |
| d | distance | m |

W = Fd

Sample Question: A motorbike of mass **150 kg** is lifted **2 m** onto a display stand.

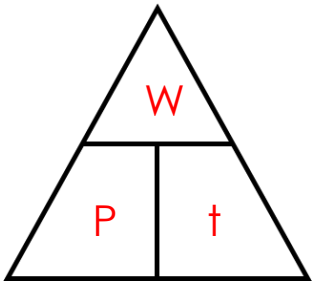
What is the work done to lift the motorbike onto the display stand?

$F_w$ = 150 kg x 10 = 1500 N

W = Fd

W = 1500 N x 2 m W = 3000 J

**2.** Calculating **power** - Fill in triangle and give names and units for each Letter




| Letter | Name | Units |
|---|---|---|
| P | Power | W |
| W | Work | J |
| t | time | s |

P = W/t

1. Sample Question: A crane lifts **800 kg** of concrete a height of **25 m** in **20 s**.

Calculate the power needed by the crane to lift the concrete.

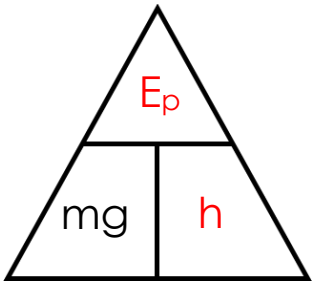
Fw = 800kg x 10 = 8000N

W = Fd

W = 8000 N x 25 m = 200,000 J

P = W/t = 200,000 / 20 P = 10,000

**3.** Calculating (gravitational) **potential Energy** - Fill in triangle and give names and units for each Letter




| Letter | Name | Units |
|---|---|---|
| $E_p$ | Potential energy | J |
| m | mass | kg |
| g | Acceleration due to Gravity (10) | $ms^{-2}$ |
| h | height | m |

$E_p = mgh$

Sample Question: A dog, mass **45 kg**, jumps off a bridge into the water below. The bridge is **1.5 m** above the water. Calculate the **gravitational potential energy** the girl loses when she hits the water.

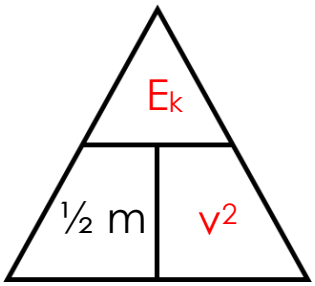
$E_p = mgh$

$E_p = 45\ kg \times 10 \times 1.5\ m$

$E_p = 675\ J$

**Remember to convert mass to weight:**
F (weight) = Mass x Gravity
Acceleration due to gravity = $10ms^{-2}$

**4.** Calculating **kinetic energy** - Fill in triangle and give names and units for each Letter




| Letter | Name | Units |
|---|---|---|
| $E_k$ | Kinetic energy | J |
| m | mass | kg |
| $V^2$ | Velocity squared | $ms^{-1}$ |

$E_k = ½ mv^2$

Sample Question: The world record for a men's team sprint of 1000 m sprint is an average speed of **23.9 $ms^{-1}$.** If the mass of a rider was **70 kg + 7 kg** for his bike, calculate the riders **kinetic energy** output when he crossed the line.

$m = 70\ kg + 7\ kg = 77kg$

$Ek = ½\ m\ v^2$

$Ek = ½\ 77\ kg \times (23.9)^2$

$Ek = 38.5 \times 571.2$

$Ek = 21{,}991.6\ J$

Remember to add mass together

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