

# Work Done

Q1. Define the term work done.

Word done is energy transferred.

All answers to calculations should be to 2 significant figures.

Q2. State the SI unit for work done

Joules, J. This is because work done is energy transferred.

Q3. Write down the formula which links distance, work done and force.

Work done = force x distance

Q4. Calculate the work done in lifting a box of 500N upwards to a height of 200cm.

200cm = 2m

500N x 2m = 1000J

Q5. Calculate the force needed to supply 10kJ of energy to move an object over a distance of 4.5 m

10kJ = 10,000J

Force = Work done/distance

Force = 10,000J/4.5m = 2222.2 N. To 2 SF this is 2200N.

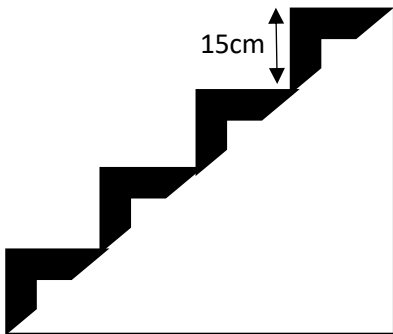
Q6. Calculate the distance an object would travel if a force of 10kN is applied and the energy transferred to the object is 9500J

Distance = work done/force

10kN = 10,000N

Distance = 9500J/10,000 = 0.95m

Q7.



a. Sally has a mass of 45kg, calculate the work done in walking up the 4 steps on the staircase to the left. Assume that  $g = 10\text{N/kg}$ .

Weight = mass x  $g$

Weight = 45kg x 10N/kg = 450N

Each step = 0.15m, 4 steps = 0.6m total distance

Work done = 450N x 0.6m = 270J

b. Sally now needs to carry a box when she walks up the staircase which has a mass of 7.5kg. Calculate the work done when Sally carries this box up the staircase.

Total mass = 7.5kg + 45 kg = 52.5kg

Weight = 52.5kg x 10N/kg = 525N

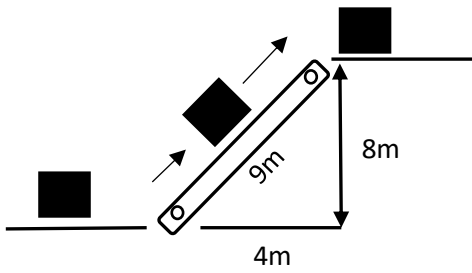
Total distance = 0.6m

Work done = 525N x 0.6m = 315J

c. Sally wonders if more work is done running or walking up the stairs. Help Sally to answer this question and explain your answer.

Work done depends on force and distance. Regardless of whether Sally runs or walks both of these quantities are the same. This is because her weight is equal to the force. So, work done will not be affected by speed at which she travels up the steps.

Q8. A conveyor belt is lifting boxes from the ground floor to a higher platform.



Each box has a mass of 25kg. Assume  $g = 10\text{N/kg}$ . Calculate the work done in lifting the box from the ground floor to the higher platform.

$$\text{Weight} = 25\text{kg} \times 10\text{N/kg} = 250\text{N}$$

$$\text{Work done} = \text{force} \times \text{distance}$$

$$\text{Work done} = 250\text{N} \times 8\text{m} = 2000\text{J}$$

8m is used because work done uses the distance in the direction of the force. In this case the object is being lifted, so the direction used is directly up.