Towards Mastery:

**Calculation Checklist**

1. Write the values you’re given.
2. Check the values are in SI units.
3. Write the equation you will use.
4. Substitute in the values you know.
5. If necessary, re-arrange the equation.
6. Calculate your answer.
7. Write your answer – don’t forget the units!

Gravitational Potential Energy (GPE) Calculations

[Learning]

*This is what you really need to be able to do – use the equation exactly as it is given to you, substitute in the values you are given in the question and calculate the kinetic energy. Show all your working out.*

1. Calculate the GPE a 2kg object that is 10m above the ground (assume gravity is 10N).
2. The men’s high jump world record is 2.45m, what would be the GPE of a 60kg man at this height? (Assume gravity is 10N).
3. A plane is at 10,000m, it has a mass of 1000kg, assume gravity is 10N what is the GPE of the plane?
4. How much GPE does a skydiver have who is 5000m above the ground and has a mass of 55kg? (Assume gravity is 10N).
5. A kangaroo jumps 1.8m high, it has a mass of 90kg, the force of gravity is 10N, what is the GPE of the kangaroo?

[Challenge]

*These are the more difficult questions – you will need to substitute and then rearrange these equations – if you can do these then you are really starting to grasp these calculations. Show all your working out.*

1. Calculate the mass of a bird that is 50m above the ground with a GPE of 250J. Assume gravity is 10N.
2. What is the gravity force on the moon if a 55kg woman 1m above the surface has a GPE of 88J?
3. How high is a ball with mass 0.5kg that has a GPE of 1000J? Assume gravity is 10N.
4. Calculate the mass of a spring that is 0.3m above the ground with 100J of GPE. Assume gravity is 10N.
5. What is the gravity force if a 60kg person has a GPE of 4000J and is 4m high?

[Extreme]

*These are the most difficult questions – you will need to convert the units, substitute your values and then rearrange the equations – if you can do this you are well on your way on the journey to mastery of these calculations. Show all your working out.*

1. A grasshopper has a mass of 10g, it jumps 30m high, assuming gravity is 10N what is the GPE of the grasshopper at the top of the jump?
2. How high is a kite of mass 200g with GPE of 0.3kJ? Assume gravity is 10N.
3. A window cleaner climbs 400cm up a ladder, she gains 1kJ of GPE, if the gravity force is 10N what is her mass?
4. A balloon rises 10km, it gains 20kJ of GPE, assume the gravity force is 10N, what is the mass of the balloon?
5. Valentina Tereshkova was the first female in space, she orbited Earth 7 times in a space ship. Valentina had a mass of 50kg, she was orbiting Earth 320km above the surface, her GPE was 16,000,000J, what was the gravity force of the Earth on the space ship?