Gravity Mass and Weight

KS3 Physics · Follows the national curriculum

Name _____ Class _____ Date _____

1. Worked example

What is the weight of a 50 kg pupil on Earth (g = 10 N/kg)?

Step 1 · Formula

Weight (N) = mass (kg) × gravitational field strength (N/kg).

Step 2 · Calculate

50 × 10 = 500 N.

Answer: 500 N

Check: Weight is a force, so it is in newtons.

2. Now try one with the steps

The same pupil goes to the Moon (g = 1.6 N/kg). Find their mass and weight.

Step 1 · Mass

Step 2 · Weight

Answer:

3. Practice

Show your working. The marks tell you how much is expected.

1. What are the units of mass and of weight? [1]

2. Write the equation linking weight, mass and gravitational field strength. [1]

3. What value of g do we use for the Earth, in N/kg? [1]

4. What is the weight of a 50 kg person on Earth, in newtons? [1]

5. On the Moon g = 1.6 N/kg. What is the weight of the same 50 kg person there, in newtons? [1]

6. What is the mass of the 50 kg person on the Moon, in kg? [1]

7. A rock weighs 300 N on Earth. What is its mass, in kg? [1]

8. On Mars g = 3.7 N/kg. What does a 60 kg astronaut weigh there, in newtons? [2]

9. At Jupiter's cloud tops g is about 25 N/kg. What would a 40 kg object weigh there, in newtons? [1]

10. An astronaut weighs 1000 N on Earth. What does she weigh on the Moon (g = 1.6 N/kg), in newtons? [3]

11. Why is the gravitational field strength different on the Moon and on Jupiter? [2]

12. Why do we measure weight with a newton meter, not a balance? [1]

13. At the Sun's surface g is about 274 N/kg. What would a 2 kg bag of sugar weigh there, in newtons? [1]

14. Astronauts on the International Space Station float, even though g there is still about 9 N/kg. Explain why. [2]

4. Before you hand it in

"My weight is 50 kg."

Your mass is 50 kg; your weight on Earth is 500 N.

"On the Moon your mass is smaller."
Mass stays the same; weight changes with g.

"There is no gravity in space."
Gravity gets weaker with distance but never disappears. Astronauts float because they are in free fall.