Weight

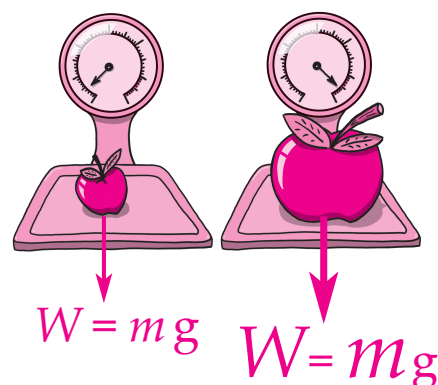**Weight** is the non-contact force of gravity.

As weight is a force, it is measured in units called newtons. The symbol for the unit is N.
A medium apple has a weight of about 1 N.

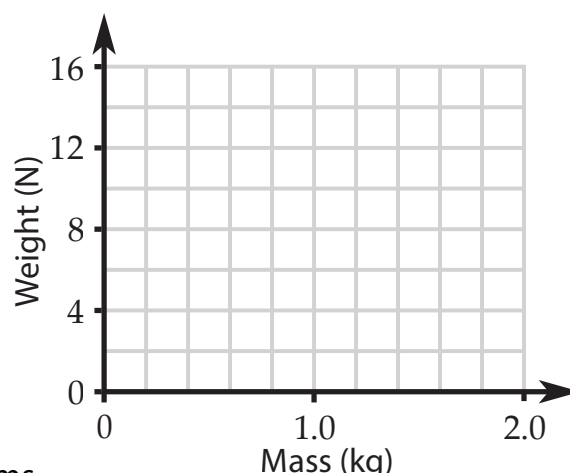An object's weight depends on its mass (measured in kilograms or grams).

The weight also depends on the strength of the local gravity.

$$W = mg$$

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1   The weights of some objects (on Earth) are given in the table.

Object	Mass (g)	Mass (kg)	Weight (N)
Apple	100		1.0
Full bottle	1200		12
Rat	400		4.0
Kitten	1600		16

(a) Fill in the column with masses in kilograms.

(b) Plot a graph of weight against mass. Add a straight line of best fit.

(c) What is the weight of a 0.6 kg bag of flour? Use the graph.

(d) What is the mass of a 15 N weight? Use the graph.

On Earth, the relationship between mass and weight is
- Weight $(N) =$ Mass $(kg) \times 10$
- Mass $(kg) =$ Weight $(N) \div 10$

2   Calculate the weight of each mass on Earth.
   (a) 2.0 kg   (c) 0.8 kg   (e) 540 g

   (b) 3.0 kg   (d) 5.4 kg   (f) 30 g

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3   Calculate the mass (in kg) of each weight on Earth.
   (a) 20 N   (c) 250 N   (e) 4 N

   (b) 50 N   (d) 12 N   (f) 0.7 N

4   Calculate the mass (in g) of each weight on Earth.
     (a) 8.0 N   (b) 0.5 N   (c) 0.02 N

The weight of a kilogram depends on the strength of gravity.

On Earth, one kilogram weighs 10 N.   On Mars, each kilogram weighs 3 N.
On the Moon, one kilogram weighs 1.7 N.   On Venus, one kilogram weighs 7 N.

5   What is the weight of...
     (a) 5 kg on Mars?   (c) 50 kg on the Moon?

     (b) 2 kg on Venus?   (d) 60 kg on Mars?

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6   How many kilograms of mass would you need to weigh...
     (a) 15 N on Mars?   (c) 34 N on the Moon?

     (b) 28 N on Venus?   (d) 300 N on Mars?

The weight of each kilogram is called the gravitational field strength.
Its symbol is g and it is measured in N/kg.

The gravitational field strength on Earth $g_{\text{Earth}} = 10$ N/kg.

7   Write down the gravitational field strength (giving the units) on
     (a) the Moon   (b) Mars   (c) Venus

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8   Complete the word equations using **Weight**, **Mass** and g.
     (a) Weight $=$ (b) Mass $=$ (c) $g =$

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9   Rewrite your word equations using symbols. W is weight and m is mass.
     (a) $W =$ (b) $m =$ (c) $g =$

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10   Calculate the gravitational field strength (g) on

     (a) Neptune if a 300 kg rocket weighs 3300 N.

     (b) Jupiter if a 3 kg rabbit weighs 69 N.