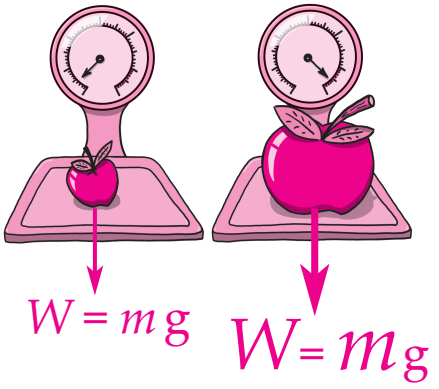
# Weight

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

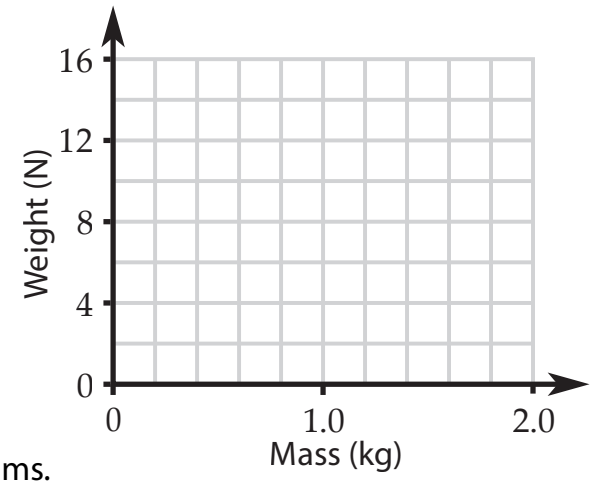
As weight is a force, it is measured in units called newtons. The symbol for the unit is N.
A medium apple has a weight of about 1 N.

An object's weight depends on how much stuff it contains. This is called its mass (measured in kilograms or grams). The weight also depends on the strength of the local gravity.




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.

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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

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

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

5 What is the weight of...
(a) $5$ kg on Mars?
(b) $2$ kg on Venus?
(c) $50$ kg on the Moon?
(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?
(b) $28$ N on Venus?
(c) $34$ N on the Moon?
(d) $300$ N on Mars?

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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.