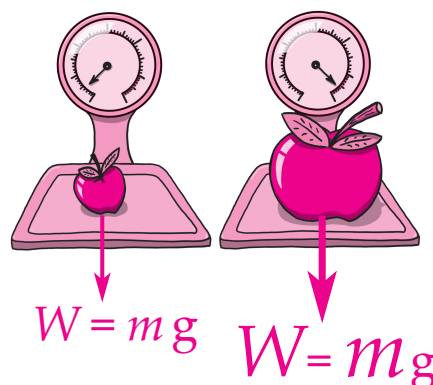## Weight

Weight is the ____ -contact force of _____ .

As weight is a ____ , it is measured in units called _____ (usually shortened to _).
A medium apple has a weight of about ___ .

An object's weight depends on how much stuff it contains. This is called its ____ (measured in _____ or _____).

The weight also depends on the _____ of the local _____ .

$$W = mg$$

$$W = mg$$

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1   Are these describing weight or mass? Decide each one separately.

(a) It is measured in kilograms.

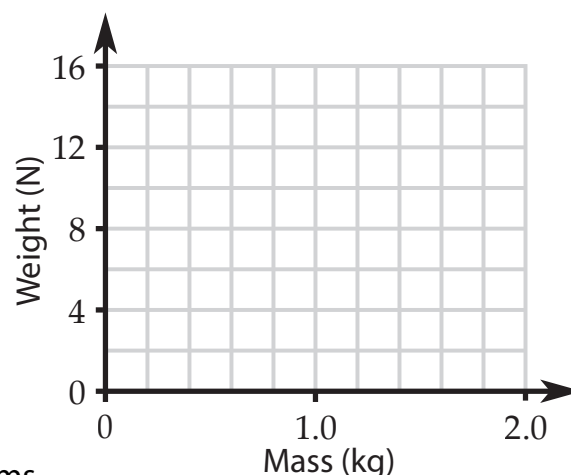(d) It is measured in newtons.

(b) It makes things hard to support.

(e) It makes moving things hard to stop.

(c) It measures the amount of stuff.

(f) It would be larger in stronger gravity.

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2   The weights of some objects (on Earth) are given in the table. 1 kg = 1000 g

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 weight of a 3 kg melon? (Look for a pattern in the numbers.)

(e) Complete the equation: weight (in newtons) = mass (in kilograms) × ☐

3 At a port in Brazil, 15 000 kg of sugar is loaded onto a ship. The sugar weighs 146 820 N. The ship travels to the UK. The Earth's gravity field is stronger in the UK than in Brazil.

(a) Is the sugar's mass in the UK smaller than, equal to, or larger than 15 000 kg? Why?

(b) Is the sugar's weight in the UK smaller than, equal to, or larger than 146 820 N? Why?

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4 Work out the numbers which need to go in the boxes to make the equations true.

(a) ⬜ $= 60 \times 10$ (b) ⬜ $= 24 \times 10$ (c) ⬜ $= 20 \times 3$

5 Work out the numbers which need to go in the boxes to make the equations true.

(a) $120 =$ ⬜ $\times 10$ (b) $75 =$ ⬜ $\times 10$ (c) $12 =$ ⬜ $\times 3$

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weight (N) _____ = mass (kg) ____   weight (N) _____ = mass (kg) ___

6 Will a 1 kg bag of flour weigh more on Earth or Mars?

7 Is the gravity stronger on Earth or Mars? How do the equations tell you this?

8 Work out these weights using the equations:
(a) 5 kg cat on Earth   (b) 4000 kg elephant on Mars

weight (N) $=$ mass (kg) $\times$ 10   weight (N) $=$ mass (kg) $\times$ 3

⬜ $=$ ⬜ $\times$ 10   ⬜ $=$ ⬜ $\times$ 3

9 Work out these masses using the equations:
(a) 650 N teacher on Earth   (b) 9 N hen on Mars

weight (N) $=$ mass (kg) $\times$ 10   weight (N) $=$ mass (kg) $\times$ 3

⬜ $=$ ⬜ $\times$ 10   ⬜ $=$ ⬜ $\times$ 3

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10 Calculate the weight of each mass. Remember that 1 kg = 1000 g.
(a) 2.0 kg on Earth   (b) 3.0 kg on Mars   (c) 540 g on Earth

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11 Calculate the mass (in kg) of each weight.
(a) 20 N on Earth   (b) 60 N on Mars   (c) 0.7 N on Earth

12 Calculate the mass (in g) of each weight on Earth.

(a) 8.0 N   (b) 0.5 N   (c) 0.02 N

The _____ of a kilogram depends on the strength of _____ .

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.

13 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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14 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 _____ of each _____ is called the _____ .
Its symbol is __ and it is measured in ____ .

The gravitational field strength on Earth is 10 N/kg.

15 Write down the gravitational field strength (giving the units) on

(a) the Moon   (b) Mars   (c) Venus

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16 Complete the word equations using **weight**, **mass** and g.

(a) weight $=$ (b) mass $=$ (c) $g =$

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17 Rewrite your word equations using symbols. W is weight and m is mass.

(a) $W =$ (b) $m =$ (c) $g =$

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18 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.