# Density

We can compare the weights of things made of different materials.

For a fair test, we weigh objects made of different materials which have the _____ _____.

1 $cm^3$ of iron is heavier than 1 $cm^3$ of plastic.

This is because the _____ has more _____ even though the _____ is the same.

Iron is more _____ than plastic.

Glass marbles _____ in water. This means that glass is _____ dense than water.

A cork _____ in water. This means that cork is _____ than water.

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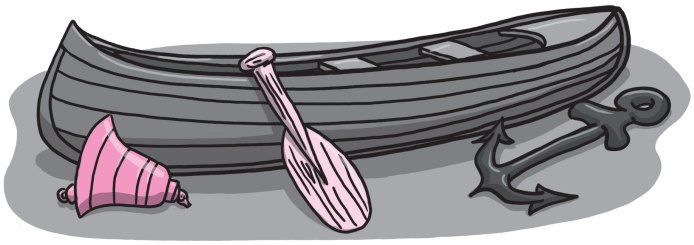
1 "Iron is heavier than wood." This is not true. Give an example of something made of wood, and something made of iron where the wooden object is heavier.

(a) Object made of wood:

(b) Object made of iron:



2 Rewrite "Iron is heavier than wood" to make it scientifically correct.

(a) Rewrite it using the word **dense**.

(b) Rewrite it without using the words **dense** or **density**. Explain what you meant in (a).

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3 Here is a list of materials. Number them in order of density. Put 1 against the least dense material, and 5 against the most dense.

air wood water helium steel

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**Density** tells us the mass of _____ of material. It enables materials to be compared.

4 A 100 $cm^3$ block of iron has a mass of 790 g.

(a) Mass of 1 $cm^3$ of iron = ☐ ÷ ☐ = ☐ grams

(b) Complete the sentence: The density of iron (in $g/cm^3$) is ☐.

(c) 1000 g of salt has a volume of 500 $cm^3$. Work out its density using an equation.

| mass (g) | = | density ($g/cm^3$) | × | volume ($cm^3$) |
|---|---|---|---|---|
| _____ | = | | × | 500 |

(d) Work out the density of aluminium if $540$ g has a volume of $200$ cm$^3$.

(e) $8$ kg of rice has a volume of $10\,000$ cm$^3$. Work out the density in g/cm$^3$. $1$ kg $= 1000$ g

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5 Calculate the density of these materials in g/cm$^3$.

(a) Uranium: $20$ cm$^3$ has a mass of $380$ g.

(b) Lead: $60$ cm$^3$ has a mass of $660$ g.

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6 The volumes of liquids are measured in m$\ell$ (millilitres). $1$ m$\ell$ $=$ _ cm$^3$.
Calculate the density in g/cm$^3$ of

(a) Olive oil, if $750$ m$\ell$ has a mass of $675$ g,

(b) Water, if $350$ m$\ell$ has a mass of $350$ g.

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7 Silver has a density of $10$ g/cm$^3$.

(a) Complete the sentence: The mass of $1$ cm$^3$ of silver is [ ] grams.

(b) Work out the mass of $15$ cm$^3$ of silver using an equation.

| mass (g) | $=$ | density (g/cm$^3$) | $\times$ | volume (cm$^3$) |
|---|---|---|---|---|
| [ ] | $=$ | 10 | $\times$ | [ ] |

(c) Work out the mass of $45$ cm$^3$ of silver using an equation.

| mass (g) | $=$ | density (g/cm$^3$) | $\times$ | volume (cm$^3$) |
|---|---|---|---|---|
| [ ] | $=$ | 10 | $\times$ | [ ] |

(d) Work out the mass of $100$ cm$^3$ of silver.

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8 Calculate the mass in grams of

(a) $200$ cm$^3$ of flour with a density of $0.8$ g/cm$^3$,

(b) $60$ cm$^3$ of cheese with a density of $1.1$ g/cm$^3$.

9 Jelly has a density of $1.5$ g/cm$^3$.

(a) What is the mass of $1$ cm$^3$ of jelly?

(b) If you divide $180$ g of jelly into $1.5$ g pieces, how many pieces would you have?

(c) What is the volume of $180$ g of jelly? Count the $1$ cm$^3$ ($1.5$ g) pieces.

(d) Work out the volume of $800$ g of salt using an equation.

| mass (g) | = | density (g/cm$^3$) | × | volume (cm$^3$) |
|---|---|---|---|---|
| ___ | = | 2 | × | |

(e) Work out the volume of $1600$ g of rice using an equation.

| mass (g) | = | density (g/cm$^3$) | × | volume (cm$^3$) |
|---|---|---|---|---|
| ___ | = | 0.8 | × | |

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10 Calculate the volume in cm$^3$ of

(a) $39$ g of chocolate with a density of $1.3$ g/cm$^3$,

(b) $112$ g of treacle with a density of $1.4$ g/cm$^3$.

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11 Complete the word equations using **density**, **mass** and **volume**.

(a) density $=$ (b) mass $=$ (c) volume $=$

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12 Rewrite your word equations using symbols.
$\rho$ (rho) is the density, $m$ is the mass and $V$ is the volume.

(a) $\rho =$ (b) $m =$ (c) $V =$

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13 A gold bar is a $15$ cm $\times$ $8$ cm $\times$ $6$ cm rectangular block. The density of gold is $19$ g/cm$^3$.

(a) Calculate the volume in cm$^3$.

(b) Calculate the mass in grams.

(c) If each gram of gold is worth £$50$, calculate the cost of the bar.