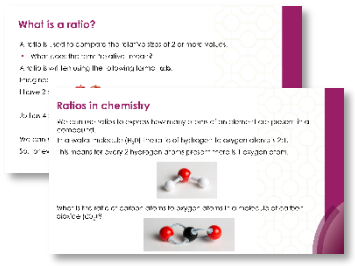
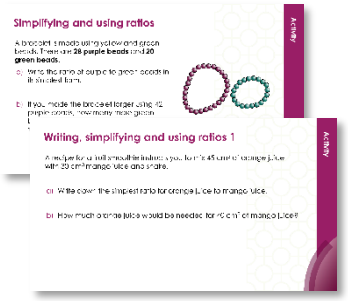
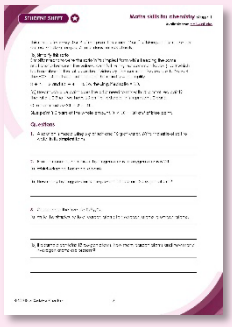
Ratio and proportion

This learner worksheet forms part of the Maths skills for chemistry resources series which can be viewed at: rsc.li/4A41ezG. The series offers flexible, targeted support for maths skills which are fundamental to chemistry teaching:

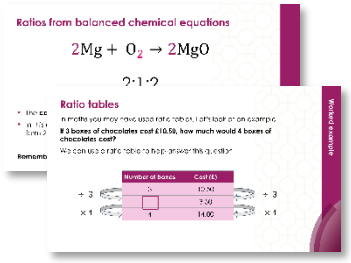
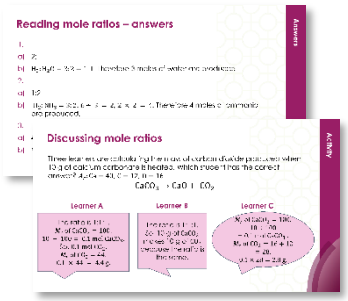
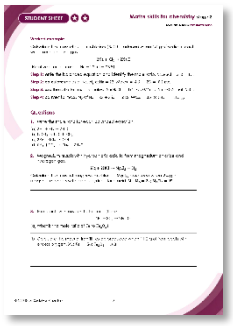
- Graphs and data, divided into:
    - Creating graphs
    - Interpreting graphs
- **Ratio and proportion**
- Understanding number, divided into:
    - Unit conversion
    - Significant figures and rounding
- Algebra and equations

Resource series components

The resource series is divided into two stages. Stage 1 (✪) is most suitable for ages 11–14 and stage 2 (✪✪) for ages 14–16. However, older learners with gaps in their fundamental knowledge can use stage 1 as a stepping stone.

Stage 1 ✪		
		
Teacher-led presentation (✪): a full lesson including learning objectives, learner-facing instructions and activities.	**Short activities (✪):** learner-facing activities, designed as lesson starters or quick activities to engage prior knowledge.	**Learner worksheet (✪):** activities for learners to independently practice their maths skills. Suitable as classroom activity following the teacher presentation or as a home-learning task.

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Stage 2 ✪✪		
		
Teacher-led presentation (✪✪)	**Short activities (✪✪)**	**Learner worksheet (✪✪)**

Key terms support

Key vocabulary for each skill area is defined in the key terms support: rsc.li/4wypuqq. You will find the key terms listed by topic area and an accessible glossary slide for each term.

Using the learner worksheet

The focus of this learner worksheet is mastering maths skills in a chemistry context. The aim is for learners to develop and apply maths skills independently.

Learning objectives

1. Understand how to write ratios correctly and simplify them.
2. Know how and when to simplify ratios.
3. Work out the ratios of atoms in a chemical formula.
4. Use ratios to calculate required quantities.

The learner worksheets complement the teacher-led presentations but can function independently, for example as a classroom activity or homework assignment.

Answers are provided at the end of this document. When relevant, common mathematical misconceptions are highlighted.

When to use

Use the learner worksheet for:

- **Reviewing learning** – if learners are confident with the mathematical skill, use the worksheet as a tool to review learning and assess learners' skill level.
- **Independent practice** – provide learners with the worksheet to use as independent practice.
- **Scaffolded practice** – break the worksheet into sections and complete over a longer period, such as multiple lessons.
- **Mathematical modelling** – for those requiring additional support, talk through the initial questions pulling out the mathematical skills used to answer the question,

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highlighting and defining any key terms. If learners are still finding the task difficult, consider fading the initial questions and asking learners to complete the later questions independently.

Scaffolding

The worksheet presents a clear progression in skill development. It starts with a recap of key knowledge and a worked example. The first question engages prior knowledge of the chosen maths skill. Following this, learners will do some maths–chemistry translation tasks, then complete activities in a chemistry context.

Have the key terms list or accessible glossary available for learners who require additional support with mathematical vocabulary.

Metacognition

The learner worksheet supports learners to develop their metacognitive skills in three key areas.

- **Planning** – prompt learners to draw on their existing mathematical knowledge by asking themselves: 'Have I seen a similar question before? Have I come across this mathematical skill before? Have I learned a different method for solving a similar problem?'
- **Monitoring** – prompt learners to ask themselves: 'How confident am I feeling with these mathematical skills? Which questions am I finding difficult? Which type of questions do I feel I have mastered?'
- **Evaluation** – prompt learners to ask themselves: 'What have I learned about myself when doing these questions? Which of the mathematical skills did I use to answer these questions?'

Common misconceptions

Some of the common misconceptions related to ratio are:

- thinking that the order of the ratio does not matter
- thinking that bigger numbers mean a substance is more reactive
- thinking that to simplify a ratio, we can subtract numbers
- assuming only even numbers can be simplified
- assuming ratios must always be simplified.

In this resource we have not highlighted the difference between a ratio by mass and a ratio by atoms.

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Answers

1. salt:water = 6:18
The highest common factor (HCF) of 6 and 18 is 6.
Divide both numbers by the HCF:
$6 \div 6 = 1$
$18 \div 6 = 3$
Answer: 1:3

2.

(a) The ratio is 2:1. So, there are more hydrogen atoms.
(b) If there were 3 oxygen atoms and the ratio was 2:1, then there must be 6 hydrogen atoms.
There are 3 parts in total (2:1). If 1 part is equal to 3 atoms, then 2 parts must be 6 atoms.

3.

(a) 1:2:1
(b) Using the ratio 1:2:1($C:H:O$) we know from the question that 18 oxygen atoms represent 1 part in the ratio. There must be 18 carbon atoms as this is also 1 part. Then there are 2 parts of hydrogen atoms so $2 \times 18 = 36$ atoms.

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