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| **Fun with fractions** |
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| Teaching fractions and measurement through filling beakers. |
| **Subject(s):** Maths**Approx time:** 40 - 60 minutes |  | **Key words / Topics:** * Full
* Empty
* More than
* Less than
* Half
* Quarter
* Volume
* Capacity
* Water
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| **Suggested Learning Outcomes**  |  |  |
| * To be able to describe capacity and volume and give examples of: full/empty, more than, less than, half, half full and quarter.
* To be able to measure, through practical activity, capacity and volume using a variety of different sized beakers.
* To understand that a half and quarter are ‘fractions of’ a whole object.
* To recognise, find and name a half as one of two equal parts of a unit.
* To recognise, find and name a quarter as one of four equal parts of a unit.
* To understand that fractions, halves and quarters, can be combined as part of a whole unit.
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| **Introduction** |  |  |
| This is one of a set of resources developed to support the teaching of the primary national curriculum. They are designed to support the delivery of key topics within maths and science. This resource focusses on using water and different sized beakers/containers, that are proportional to each other in size, to explore capacity and volume.Fractions are important as they help us to be able to divide objects into equal and measurable parts.They tell you what portion of a whole you need, have, or want. |
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| **Activity** |  | **Teacher notes** |
| **Introduction (5-10 minutes)**Teacher to explain that learners are going to perform an experiment to see ‘fractions at work’ and explain that the capacity of a glass/container is the amount of water that it can hold. If necessary, support understanding by quick discussion of ‘more or less’, and ‘capacity’.Teacher to hand out equipment needed for the task to learners.**Performing the experiment (30-40 minutes)**Teacher to demonstrate the steps shown in the teacher presentation and listed below.* Step 1 - fill two half-sized glasses all the way to the top with water and then pour them into a proportionally larger glass. Teacher to explain that the volume of the larger glass is made up of two half glasses, of which one glass is equal to half the volume.
* Step 2 - fill four quarter-sized glasses all the way to the top with water and then pour them into a proportionally larger glass. Teacher to explain that the volume of the larger glass is made up of four quarter glasses, of which one glass is equal to a quarter of the volume.

Learners can then complete each step themselves. The teacher presentation can be left on the whiteboard as a supporting guide as they do this.**Discussing the results of the experiment (5-10 minutes)**Teacher to discuss with learners how they would describe a glass of water as half-full (optimist) or half-empty (pessimist) – however, an engineer would state that the container is twice as big as it needs to be! |  | This activity could be carried out as individuals or in small groups.**Filling the glasses with water**If there is not easy access to a sink then this step could be done in advance with glasses pre-filled with water. If there are only one or two sinks within easy access the learners may need to perform this experiment a few at a time whilst another activity is taking place. Alternatively, an open water bottle could also be used.The drinking glasses used must be proportionally larger to each in size. This is to allow accurate filling of a large glass/container by half and quarter sized glass/containers.**Results of the experiment.**Learners could write down their findings or teacher could lead a class discussion.  |
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| **Differentiation** |  |  |
| **Basic** |  | **Extension** |
| Provide pre-measured quantities of water.  |  | Use the Combinations slide to experiment with a variety of half and quarter sized glasses to fill a larger glass. Use additional fractions, such as 1/8 and 1/3.Use containers with graduated measurements (such as science beakers), so that pupils can measure the quantities of water and relate these to fractions. |
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| **Resources** |  | **Required files** icon-docicon-pdficon-ppt |
| * Various drinking glasses/containers of proportional sizes.
* Access to a sink and/or source of water.
 |  |  Fun with fractions presentation  |
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| **Additional websites** |  |  |
| * **Bitesize – What is Capacity:** Video about capacity using terms half and full. <https://www.bbc.co.uk/bitesize/topics/zt9k7ty/articles/zp8crdm>
* **Bitesize – What are Fractions:** A fun cartoon that explains a half and quarters.

 <https://www.bbc.co.uk/bitesize/topics/z3rbg82/articles/zq2yfrd>* **NRich Fractions KS1**: Collection of jars and bottles of different sizes and shapes. <https://nrich.maths.org/10337>
* **NRich Fractions KS1**: Alternative ways of dividing items into fractions <https://nrich.maths.org/8939>
* **Snappymaths:** a selection of fractions worksheets and resources <http://www.snappymaths.com/counting/fractions/fractions.htm>
* **Interactive resources:** three flash-based resources that could be used on an interactive white board <https://www.topmarks.co.uk/Interactive.aspx?cat=14>
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| **Related activities (to build a full lesson)** |  |  |
| **Starters** (Options) * Show the photo from **NRich Fractions KS1**: Collection of jars and bottles of different sizes and shapes, <https://nrich.maths.org/10337>
* Discuss what capacity is in relation to bottle size.
 | **Extension** (Options)* Investigate how different combinations of halves and quarters. Look at eights and thirds etc.
* As an alternative use beakers with measurements (Scientific) to allow the introduction of simple addition
* Using the internet, investigate other sizes of bottle and container
* Show bitesize video about capacity
* ACTIVITY – Pizza fractions

**Plenary*** Discuss the outcome of the combination experiment and how to interpret the proportion of the container that is filled.
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| **The Engineering Context** film |
| * An understanding of capacity and volume are vital to the way engineers develop containers for a variety of liquids and materials. From aircraft fuel tanks to a tube of toothpaste, we need to know when they are half full or half empty.
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| **Curriculum links**  |
| **England: National Curriculum**MathsKS1 Year 1 Measurement* Compare, describe and solve practical problems for: capacity and volume, for example, full/empty, more than, less than, half, half full, quarter
* measure and begin to record the following capacity and volume

KS1 Year 1 Number - fractions* recognise, find and name a half as one of two equal parts of an object, shape or quantity
* recognise, find and name a quarter as one of four equal parts of an object, shape or quantity
 | **Northern Ireland Curriculum**Mathematics and Numeracy KS1 Number* recognise and use simple everyday fractions

KS1 Measures* understand and use the language associated with length, weight, capacity, area and time
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| **Scotland: Curriculum for Excellence**Numeracy and mathematicsFractions, decimal fractions and percentages* MNU1-07a, MNU1-07b, MNU1-07c
* MNU2-07a, MNU2-07b, MNU2-07c
 | **Wales: National Curriculum** MathematicsKS2 Using number skills - fractions, decimals, percentages and ratio* Y3 use halves and quarters
* Y3 recognise a quarter as a half of a half
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| **Assessment opportunities** |
| * Informal teacher assessment of experiment results through Q&A.
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