# Flag fractionisation

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| Year levelStrand(s)Lesson lengthCD Code: | * Year 5
* Number
* 85 mins
* [AC9M5N03](https://v9.australiancurriculum.edu.au/f-10-curriculum.html/learning-areas/mathematics/year-5/content-description?subject-identifier=MATMATY5&content-description-code=AC9M5N03&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&side-by-side=1&strands-start-index=0&subjects-start-index=0&view=quick)
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| Lesson summary | In this second lesson of the series, students investigate fractions by exploring the colourful world of flags, including Aboriginal and Torres Strait Islander ones. They use a grid to understand fractions, and guide a partner to draw an Asian flag using precise mathematical language and locating fractions on a number line.This lesson was developed in collaboration with the Australian Association of Mathematics Teachers (AAMT). |
| Learning intention | * We are learning to comprehend the essential concepts of numerator and denominator, recognise and represent fractions and in the context of exploring fractions in flags.
* We can apply knowledge of fractions to analyse and compare fractional representations, to deepen understanding of how fractions like halves, quarters and eighths vary both visually and conceptually in a flag context.
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| Success criteria | By the end of this lesson, students can:* identify fractions of a whole in different and split orientations, using mathematical terminology to describe orientation, in flag designs
* demonstrate their understanding by creating visual representations of fractions within flag designs, using grids and number lines with precision and accuracy.
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| Why are we learning about this? | In the realm of mathematics, fractions are vital tools that underpin various numerical concepts. In a real-world application (such as baking), it is important to be able to compare measurements such as $\frac{1}{2}$ teaspoon and $\frac{1}{4}$ cup and a deep understanding of fractions leads ultimately to the development of percentages and their various applications in financial contexts and other growth/decay scenarios. |
| Prerequisite student knowledge and language | Basic arithmetic skills (addition, subtraction and multiplication)Some awareness of flags is useful |
| **Resources** | Teacher’s slides (PowerPoint) Fractions of a flag worksheet (Word)Flags of Asia worksheet (Word)Art supplies (coloured pencils, rulers, etc) |

Curriculum information

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| Achievement standard | Students order and represent, add and subtract fractions with the same or related denominators. They represent common percentages and connect them to their fraction and decimal equivalents. |
| Content description(s) | Compare and order fractions with the same and related denominators including mixed numerals, applying knowledge of factors and multiples; represent these fractions on a number line. [AC9M5N03](https://v9.australiancurriculum.edu.au/f-10-curriculum.html/learning-areas/mathematics/year-5/content-description?subject-identifier=MATMATY5&content-description-code=AC9M5N03&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&side-by-side=1&strands-start-index=0&subjects-start-index=0&view=quick) |
| General capabilitiesCross-curriculum priority | General capabilitiesLiteracy: Speaking and listening ([Level 4](https://v9.australiancurriculum.edu.au/teacher-resources/understand-this-general-capability/literacy))Numeracy: Interpreting fractions ([Level 5](https://v9.australiancurriculum.edu.au/f-10-curriculum/general-capabilities/numeracy/slideout?code=NNInF5&element=0&sub-element=4))Cross-curriculum prioritiesAboriginal and Torres Strait Islander Histories and Cultures ([A\_TSICP1](https://v9.australiancurriculum.edu.au/f-10-curriculum/cross-curriculum-priorities/aboriginal-and-torres-strait-islander-histories-and-cultures/slideout?code=A_TSICP1&organising-idea=0)**)**Asia and Australia’s Link with Asia**:** Growing Asia–Australia engagement ([AAG1](https://v9.australiancurriculum.edu.au/f-10-curriculum/cross-curriculum-priorities/asia-and-australias-engagement-with-asia?organising-idea=0)) |
| Areas of challenge | Some students may:* find the introduction of terms such as ‘numerator’ and ‘denominator’ a bit abstract and may confuse them. Continue to model correct metalanguage to build students’ language confidence and skill.
* initially find it challenging to understand that different visual representations can still represent the same fraction (equivalency of fractions). For example, two different flag designs could both represent $\frac{1}{2}$, even though they look different. Emphasise that fractions represent a proportion of an amount, so that it is the quantity (or area in this case) that matters, not the shape. Paper folding may help with this (to illustrate different ways a square may be folded in half for example).
* find that flags are an emotive issue (for instance, based on current world events or specifically for students from war-torn refugee backgrounds) so sensitivity may be needed.
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| Strategies | * Mathematics investigation
* Classroom talks
* Concrete, Representational, Abstract model (CRA)
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Lesson structure

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| Learning hook10 mins | **Warm-up**: 2 truths, 1 lieShow the warm-up exercise image from the teacher’s slides (slide 2). Students use mini-whiteboards or their maths book to choose ‘True’ or ‘False’ and justify their answer using mathematical language. Expect responses such as - True because it is cut into four pieces; False because the parts don’t look the same. Rate the responses - gather or annotate some students’ answers. Have a class discussion as to what constitutes a quarter (four equal parts) and why this is quarters. Further questioning includes – What is the relationship between a quarter and a half?Differentiation (extension): Can you prove it with concrete materials such as a piece of paper? Differentiation (support): Similar diagram/discussion utilising halves instead of quarters. **Classroom talk**Conduct classroom talk with a ‘Notice/Wonder’: show students the flags of Thailand (left) and France (right) side by side (see teacher’s slides, slide 3).Ask students what they notice, and what they wonder about the flags. Direct the conversation towards mathematical language, including ‘vertical’, ‘horizontal’, ’fractions’, ’equal’, ’equivalent’ and ’thirds’.Share with students that today we will be investigating various flags from around the world.(Optional*:* take a few minutes to research and discover the flags of the countries associated with students’ own heritage.) |
| Explore55 mins | **Fractions of a flag student worksheet activity** (15 mins)* Distribute the Fractions of a flag student worksheet, which features flags of different countries. Ask students to find the fractions of different colours within each flag.
* Students work on the worksheet independently, investigating the fractional representations of these flags, including Italy, Germany, Austria, Jamaica, Panama, Australian Aboriginal, and Torres Strait Islander. (Note: Torres Strait Islander flag may look like it is thirds but is in fact halves/quarters.) See the Further information section for more background detail on some of these flags.
* Students can use estimation strategies for some of the more challenging flags.
* When students have done their investigation, ask the following.
	+ *‘Which flags were easiest to find the fractions for each colour and why’?*
	+ *‘Which flags were hardest and why?’*
	+ *‘How did you figure out the fractions for the harder flags?’*
	+ *‘Why do you think the Australian flag isn’t included on the worksheet?’*

*You may want to incorporate Aboriginal and Tores Strait Islander Histories and Cultures when discussing origins of Australian flags. Refer to Australian flags and maths https://eprints.qut.edu.au/244009/.***Exploration of fractions through Asian flag design** (15 mins)* Distribute art supplies.
* Show students the Flags of Asia map (see teacher’s slides, slide 4). Explain that the flags have been distributed across two worksheets, and that students will receive a sheet showing half the flags.
* Distribute the Flags of Asia Worksheet and instruct students to select an Asian flag to redraw from their sheet using the 6 x 4 grid or blank rectangle (teachers can adjust the borders on the grid to suit their students).
* Students should represent fractions by colouring specific parts of the flag with different colours, so geometric designs are better suited, for instance, flags such as those from Cyprus or Saudi Arabia would not be a good choice for this activity.
* Emphasise the concept of numerator and denominator as students redraw their flags. For example, if they colour two out of four sections, explain that 2 is the numerator and 4 is the denominator.

Differentiation (support): for students experiencing difficulty, easier options include the flags of Indonesia, Japan, Armenia and Yemen.Differentiation (mid): options include the flags of Laos, United Arab Emirates, Tajikistan and the State of Palestine.Differentiation (extension): for students requiring a further challenge, options include the flags of Kuwait, Malaysia and Uzbekistan.**Paired ‘barrier’ activity** (15 mins)* When students have completed redrawing their chosen flag teacher removes the Flags of Asia map (slide 4).
* In pairs, students play a ‘barrier’ game using mathematical language to get their partner to redraw their chosen flag without looking at it. Students instruct their partner to complete this task again using a 6 x 4 grid or rectangle. See below for example for drawing the national flag of India:
	+ Begin with a rectangular shape that is 6 x 4 (provided on reverse of worksheet).
	+ Divide the rectangle into three equal horizontal stripes.
	+ Colour the top stripe saffron, the middle one should be white, and the bottom stripe should be green.
	+ Ensure that each stripe is one-third of the total height.
	+ In the centre of the middle white stripe, draw a navy blue circle to represent the Ashoka Chakra.
	+ The Ashoka Chakra should have 24 equally spaced spokes or lines radiating from the centre.
	+ The flag from Nepal would not be a good choice for this activity.
* **Gallery Walk**: When students have redrawn their partner’s chosen flag, have students leave their flag on their desk and allow student to move about the room, looking at the various flags. Encourage discussions about the similarities and differences in their fractional representations.

**Utilising number lines** (10 mins)* Provide students with number lines.
* Explain how they can use number lines to locate and represent unit fractions within their flag designs. For instance, if they coloured half of the flag, mark the number line accordingly.

**Optional activity**: Students design their own flag.**Differentiation** (extension): ask open questions, for example, *‘What could your flag look like if* $\frac{2}{6}$ *of it were blue?’***Differentiation** (support): ask closed questions, for example, *‘I would like you to draw me a flag that is half blue, half red.’* |
| Summary and reflection5 mins | Summarise the lesson's key points.Invite students to reflect on what they've learned.* + *‘What did you find most interesting about the various fractions in flags?’*
	+ *‘What do we know about numerators and denominators?’*
	+ *‘Do thirds always look the same? What makes fractions equal’?*
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| Assessment5 mins | * Reserve some time at the end of the lesson for students to reflect and demonstrate their learning.
* Use the Flag fractionisation exit ticket (slide 5) in the teacher’s slides to ask: *‘What fraction of this shape is black? How do you know?’*
* Expect responses such as*:* Half because there are two different colours; $\frac{13}{64}$ because they see the middle as $\frac{1}{64}$ not $\frac{4}{64}$.
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