# Fractional funds

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| Year levelStrand(s)Lesson lengthCD Code: | * Year 6
* Number
* 85 mins
* [AC9M6N07](https://v9.australiancurriculum.edu.au/f-10-curriculum.html/learning-areas/mathematics/year-6/content-description?subject-identifier=MATMATY6&content-description-code=AC9M6N07&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&side-by-side=1&strands-start-index=0&subjects-start-index=0&view=quick)
* [AC9M6N05](https://v9.australiancurriculum.edu.au/f-10-curriculum.html/learning-areas/mathematics/year-6/content-description?subject-identifier=MATMATY6&content-description-code=AC9M6N05&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&side-by-side=1&strands-start-index=0&subjects-start-index=0&view=quick)
* [AC9M6N09](https://v9.australiancurriculum.edu.au/f-10-curriculum.html/learning-areas/mathematics/year-6/content-description?subject-identifier=MATMATY6&content-description-code=AC9M6N09&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 fourth lesson of a series, we encourage financial literacy and reinforce understanding of fractions in a practical context, by learning how to find a fraction or percentage of an amount, through budgeting for a fictitious class party!This lesson was developed in collaboration with the Australian Association of Mathematics Teachers (AAMT). |
| Learning intention | * We are applying understanding of equivalent fractions and fraction addition and subtraction in a problem-solving context.
* We are learning to calculate a fraction of an amount, use technology to create a simple data display, and to connect fractional and percentage representations.
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| Success criteria | By the end of this lesson, students can:* find sets of fractions that sum to 1, with the same or different denominators
* apply different fractions to a whole number to calculate a fraction of an amount, in a budgeting context
* use technology to represent a budget as a pie chart
* compare percentage and fraction representations.
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| Why are we learning about this? | In the world of mathematics, fractions are fundamental for grasping financial concepts and budgeting effectively. In this lesson, we aim to enhance our understanding of fractions through practical budgeting, preparing students for real-world financial decision-making. This lesson equips students with essential life skills that involve managing budgets, making informed choices, and understanding the role of fractions in financial literacy. |
| Prerequisite student knowledge and language | Understanding of how to find equivalent fractions and to add/subtract fractions with related denominators. |
| **Resources** | Teacher’s slides (PowerPoint)Fractional funds class party budget (Excel)Fractional funds budget planning sheet (Word)Unifix cubes or countersTechnologies, such as tablets/computers with access to Microsoft Excel, Google Sheets or similarCalculators (optional)Protractors and pairs of compasses (optional) |

Curriculum information

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| Achievement standard | Students add and subtract fractions with related denominators and solve problems involving finding a fraction or percentage of a quantity. They use mathematical modelling to solve financial and other practical problems involving percentages and rational numbers, formulating and solving the problem, and justifying choices. |
| Content description(s) | Students solve problems that require finding a familiar fraction, decimal or percentage of a quantity, including percentage discounts, choosing efficient calculation strategies and using digital tools where appropriate. [AC9M6N07](https://v9.australiancurriculum.edu.au/f-10-curriculum.html/learning-areas/mathematics/year-6/content-description?subject-identifier=MATMATY6&content-description-code=AC9M6N07&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&side-by-side=1&strands-start-index=0&subjects-start-index=0&view=quick)Students solve problems involving addition and subtraction of fractions using knowledge of equivalent fractions. [AC9M6N05](https://v9.australiancurriculum.edu.au/f-10-curriculum/learning-areas/mathematics/year-6_year-5?view=quick&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&side-by-side=0&strands-start-index=0&subjects-start-index=1&load-extra-subject=MATMATY5_MATMATY6&achievement-standard=fd946fb0-8c14-44f8-919a-b7f401d94188)Students use mathematical modelling to solve practical problems, involving rational numbers and percentages, including in financial contexts; formulate the problems, choosing operations and efficient calculation strategies, and using digital tools where appropriate; interpret and communicate solutions in terms of the situation, justifying the choices made. [AC9M6N09](https://v9.australiancurriculum.edu.au/f-10-curriculum/learning-areas/mathematics/year-6_year-5?view=quick&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&side-by-side=0&strand) |
| General capabilitiesCross-curriculum priority | General capabilitiesNumeracy * Interpreting fractions ([Level 8](https://v9.australiancurriculum.edu.au/f-10-curriculum/general-capabilities/numeracy/slideout?code=NNInF8&element=0&sub-element=4))
* Understanding money ([Level 7](https://v9.australiancurriculum.edu.au/f-10-curriculum/general-capabilities/numeracy/slideout?code=NNUnM7&element=0&sub-element=7))
* Proportional thinking ([Level 2](https://v9.australiancurriculum.edu.au/f-10-curriculum/general-capabilities/numeracy/slideout?code=NNPrT2&element=0&sub-element=5))
* Interpreting and representing data ([Level 4](https://v9.australiancurriculum.edu.au/f-10-curriculum/general-capabilities/numeracy/slideout?code=NSIRD4&element=2&sub-element=1))

Critical and Creative Thinking* Create, communicate and collaborate

Personal and Social capability* Social management: Collaboration
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| Areas of challenge | Some students may:* find it challenging to create equivalent fractions. Encourage hands-on activities or representations such as an area model with discussions to reinforce the concept of equivalence.
* get confused finding fractions that sum to 1; restating all the fractions with the same denominator will allow students to test and adjust their fraction sums.
* find it challenging to make trade-offs when allocating funds in the budget. They might need guidance to understand that increasing the budget for one category means reducing it for another by the same amount or fraction.
* struggle with finding fractions of an amount if they use more challenging fractions such as $\frac{2}{7},\frac{2}{15}$ or $\frac{1}{23}$. Encourage students to use more familiar divisors such as 2, 3, 4, 5, 8 or 10, or allow the use of calculators to help (or check) division.
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| Strategies | Worked examplesConcrete, abstract, representational (CRA) |

Lesson structure

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| Learning hook20 mins | Warm-up challenge: Maths battleShow image from the Teacher’s slides (slide 2). Students use mini-whiteboards or their maths book to choose which student (Jordan or Taylor) is correct for the statement ‘Percentages are always out of 100’.Expect responses that students agree with Jordan but have difficulty explaining why percentages are always out of 100. Rate the responses: gather or annotate some students’ answers. Have a class discussion as to why percentages are always out of 100, relating to the language of ‘per cent’ and the two zeroes in the % symbol.Set the content for investigation for a class party celebration. Ask students if they've ever been involved in planning a party and how they decided what to include and how much to spend.* Show students slide 3, and facilitate a ‘Which one doesn’t belong’ discussion about the various class party budgets. (Note: There is no correct answer; this is an opportunity for students to share and develop their mathematical knowledge, language and justification.)
* Show slide 4, Looking at class party budget 1, and ask questions such as:
	+ Which section has the largest budget?
	+ Are there any sections that appear to have the same budget percentage?
	+ What percentage or what fraction do you think each section represents?
	+ Where and how do you think might use a pie chart in this way?
* Explain that today, they'll be taking on the role of party planners and budget managers. They have a fixed budget to organise a class party, and they need to make choices wisely.
* Have a class mind-map brainstorm about what things would need to be bought for a class party. List party expenses, such as decorations, food, drinks, games and prizes, and discuss the importance of budgeting for each of these categories.

Clarify that their goal is to create a successful party while staying within the budget. Discuss the real-world significance of budgeting and why it's an essential skill. |
| Explore55 mins | **Introduction** (5 mins)* Learning intentions and success criteria: Display the learning intentions and success criteria (slides 5 and 6) for the lesson.

**Worked examples: Sharing the whole** (20 mins)* Start by asking for two volunteers to come to the front of the class (or choose two students).
* Problem 1: Give the students 24 Unifix cubes or counters. Ask them to share them so that each student gets $\frac{1}{2}$. Ask the students what they divided them how they did, and how they knew that they each had half? Expect answers such as:
	+ ‘I know that $\frac{1}{2}$ of 24 is 12’: a response to this might be to ask the students ‘What would you do if there were 286 cubes/counters?’ to encourage them to articulate their strategy more generally.
	+ ‘We made two equal piles’: this is important to understand that two halves have to be the same size.
	+ ‘We divided the total by 2’: this is the key concept that you need the students to note, as when finding a fraction of an amount the first step is to divide the amount by the denominator. Use questions such as, ‘How did you divide the 24 cubes/counters up?’ and ‘How many groups did you need?’ to elicit this response.
	+ Write $\frac{1}{2} ,\frac{1}{2}$ on the board and circle it.
* Problem 2: Choose two different students and explain that this time we are not sharing the cubes/counters equally. Ask them to share them out so one student gets $\frac{1}{4}$ and the other gets $\frac{3}{4}$. Ask the students what they did and how they knew that they had the right answer? Expect answers such as:
	+ ‘We divided 24 by 4 which equals 6 and gave that to one person, the other person got the rest’: this is an important observation as it shows that the students understand that all the cubes/counters are being shared out and that $\frac{1}{4}+\frac{3}{4}=1$.
	+ ‘We divided the 24 cubes/counters into 4 equal piles, one person got one pile, the other got 3’: this thinking underpins the way of finding a fraction of an amount for non-unit fractions, for instance, first finding $\frac{1}{4}$ and then multiplying by 3 to obtain $\frac{3}{4}$.
	+ Write $\frac{1}{4} ,\frac{3}{4}$ on the board and circle it.
* Problem 3: Choose three different students and ask them to share out the cubes/counters so that the different students each get $\frac{1}{8}$, $\frac{1}{4} $and $\frac{5}{8}$ of the total. (Because these fractions have different denominators, this is much more challenging and the students may need more support. Using a representation such as an area model may be needed.) Ask the students what they did and how they knew that they had the right answer? Expect answers such as:
	+ *‘*We found $\frac{1}{8}$ by dividing 24 by 8 to get 3, then doubled it to get 6, because we know that $\frac{2}{8}$ make up a $\frac{1}{4}$ and $\frac{5}{8} $was the rest.’
	+ ‘We found $\frac{1}{8}$ by dividing 24 by 8 to get 3, then multiplied by 5 so we knew that $\frac{5}{8}$ of $24=15$ and $\frac{1}{8} $was the rest’: respond by asking the students how they were sure that the rest of the cubes/counters comprised $\frac{5}{8} $or $\frac{1}{4}$ of the total.
	+ ‘We knew that $\frac{1}{4}=\frac{2}{8}$ from our equivalent fraction knowledge so we first found $\frac{1}{8}$ by finding $24÷8=3$, so we knew $\frac{1}{8}$ of $24=3. $We then doubled it to find $ \frac{2}{8}$ of $24=6$ and multiplied by 5 to find $\frac{5}{8}$ of $24=15. $
	+ Write $\frac{1}{8}$, $\frac{1}{4} $and $\frac{5}{8}$ on the board and circle it.
* Problem 4: Split the children into groups of 4 and allocate a set of 24 cubes/counters to each group. Ask the students to share out the cubes/counters so that they receive $\frac{1}{12},\frac{1}{6},\frac{1}{4}$ and $ \frac{1}{2}$ (slide 7). Observe the different groups’ progress and try to identify the two approaches shown below in use and select those two groups to explain how they approached the problem and have students comment of the pros and cons of the different methods. If students do not use the different methods outlined, the teacher may need to highlight these. Two different (but valid) approaches:
	+ Using equivalent fractions $\frac{1}{12},\frac{1}{6}=\frac{2}{12},\frac{1}{4}=\frac{3}{12}$ and $ \frac{1}{2}=\frac{6}{12}$. This is an efficient strategy as the only division then required is to find $\frac{1}{12}$ of 24, for instance that $24÷12=2,$ and then use multiplication to find the other fractions giving piles of $2, 4, 6$ and $12$. This method also makes it easy to check that the given fractions comprise the whole and no cubes/counters are left over.
	+ Separately finding each fraction by dividing the original 24 cubes/counters, $24÷12=2, 24÷6=4, 24÷4=6, 24÷2=12$. This is a more time-consuming method and involves harder steps, that is, more division, which would be more challenging if the number of cubes/counters was a larger and/or less friendly number.
	+ Write $\frac{1}{12}, \frac{1}{6}, \frac{1}{4}$ and $ \frac{1}{2}$ on the board and circle it.
* Ask the students to look at the four circled sets of fractions from Problems 1 to 4 and ask them what they notice about the fractions, what’s the same and different about their numerators and denominators and the whole set. Answers may include:
	+ ‘Problems 1 and 2 have the same denominator but the last two sets of fractions have different denominators’: ask students what the impact of this was when sharing out the cubes/counters (made the problem harder and needed an approach of using equivalent fractions with the same denominator).
	+ ‘There’s a mix of numerators; in Problems 1 and 4 the fractions all have numerator of 1 (‘unit fractions’), while in 2 and 3 there are other numerators’: ask students what the impact of the non-unit numerators is (first they need to find the unit fraction , for example, $\frac{1}{8}$, then multiply by say 5 to find $\frac{5}{8}$ ).
	+ ‘The problems got harder as we worked down the board’: ask students why this may be the case (mixed denominators, non-unit fractions, less familiar fractions).
	+ ‘In each case, the fractions in each set add up to 1’: this is reasonably obvious for Problems 1 and 2 but less so for 3 and 4. It is worthwhile using equivalent fractions to show that in each problem the whole of the cubes/counters are shared out because the fractions all add to 1 whole. This is an important skill needed for the next activity.

*Notation note: It is important to be very precise when using notation when finding fractions of an amount. Writing* $\frac{1}{2}=12$ *should be discouraged as this is mathematically false. Ask the students if they would rather that the school holiday lasts for* $\frac{1}{2} $*week or* $12$ *weeks to illustrate that these are different numbers. The correct statement is* $\frac{1}{2}$ *of 24* $=12$ *or* $\frac{1}{2}×24=12.$**Creating a class party budget** (15 mins)* Have students work in pairs. Distribute a copy of the Fractional funds budget planning sheet to each pair. These sheets include different expense categories such as decorations, food, drinks, games and prizes. There is an additional line for students to choose another expense category of their own (for example, paper plates/cups, party entertainer, fireworks!).
* Instruct students in their pairs to allocate a fraction of the whole budget to the different expense categories. They need to make sure that their fractions all add to 1 and need to prove it in the space for Question 2. Otherwise, they will spend too much money, or not spend all the budget! Emphasise that their goal is to stay within (that is, spend the whole) budget while ensuring a successful class party.

Differentiation (extension): suggest students pick a range of denominators with harder numbers (for example, twentieths, eighths, ninths, fifteenths) or use percentages. Differentiation (support): suggest that students pick a range of fractions with the same denominators, for example, all tenths or twelfths. Discourage divisors that are more challenging such as 7 or 13.* Once students have completed their fractional allocation and proven that the fractions total 1 whole, the teacher can provide them with the total budget, choosing either to set the same budget for the whole class, or differentiating by choosing different amounts for different groups. A good total budget to set is one with many factors such $120, $180 or $240. If students are working in percentages, a multiple of 50 would be recommended, for example, $150, $200 or $250. *(Note: if the total budget amount is communicated to students too soon, they may just allocate the dollar-value amount and miss out on the rich fraction exploration in this lesson.)*
* Students should then calculate how much they will spend on each category by finding the relevant fraction of the total budget, using the methods explored in the ‘Sharing the whole’ worked examples. They can check their work by adding their dollar amounts and checking that this sum equals the total budget.

**Budget pie chart** (10 mins)* Have students create a pie chart to visually represent their budget allocations, by sharing the Fractional funds class party budget Excel file and asking students to type their dollar amounts into the green cells. Students can see how the pie chart automatically calculates the percentage for each category and they should note these on their Budget planning sheet (in the Fraction of total budget column) and compare the percentages with the fractions. Note some of the percentages may be slightly different to expected, which will make for an interesting discussion point (for example, $\frac{1}{8}$ will show up as $13\%$ not $12.5\%$ as the percentages will have been rounded to the nearest whole).
* Alternatively, students can create a pie chart using pen, paper, a pair of compasses and protractors. They will need to multiply the fraction for each expense category by $360°$ to calculate the correct angle for each sector of the pie chart. This is best done using a calculator or other technologies.

**Discussion and sharing** (5 mins)* Encourage a class discussion about the different approaches students took and the trade-offs they made while budgeting.

Discuss the importance of budgeting, making informed choices, and understanding fractions in practical financial situations. |
| Summary and reflection10 mins | Summarise the lesson's key points.* Invite students to reflect on what they've learned.
* *‘What did you find was the biggest challenge in today’s lesson and how did you overcome it?’*
* *‘Could you explain how to find a set of fractions that add to 1?’*
* *‘How could you find a fraction of an amount, using the example of say* $\frac{2}{5}$ *of $80?’*
* *‘Do you think the budget you were given was enough and if not, explain why not?’*
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| Assessment | * Reserve time at the end of the lesson for students to reflect and demonstrate their learning.
* Use the Fractional fund exit ticket (slide 8) to ask: ‘What percentage do you think these sections represent? Prove your answer using mathematical language.’
* Expect responses such as: ‘They are $\frac{1}{5}$ or $20\%$ each because there are 5 pieces’; inappropriate ratios/explanations.
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