Work Program for B2FMaths@Home Week 7 Year 7

Contents – click on the link below

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How to use this work program

Accessing the online resources

To access the online resources, please go to: https://www.backtofrontmaths.com.au/b2fmathshome

Running the program each week

Each week is designed with five maths lessons so that you can do it each day. Different days have different types of lessons to make sure that students experience the kind of thinking that they need to continue growing in maths. The types of lessons include:

- **At-home investigation:** This is a hands-on task where students explore a new idea before they are taught that skill. They need to come up with an idea to try to solve the problem, try out their idea, decide if it worked or not, try again if needed, and explain what they did. If your child has time with your teacher with a webcam, the teacher will generally be doing this lesson with your child. This is the lesson that will require the heaviest input from you to help your child think through an idea and generally requires the use of some hands-on materials that are listed in the information page.
- **Connecting lesson:** This type of lesson has questions that lead students to develop their ideas and learn a new skill. It should be fairly easy for a student to do, but you will need to be available to read the question to your child as needed, encourage them to think further, and make sure that they complete the work. Most of these lessons will include 10 minutes of practising number operations or concepts through activities or games.
- **Interleaved practise lesson:** This type of lesson provides 8-10 questions from different areas of maths so that students practise remembering what they have previously been taught. Some of the questions may not be easy for your child, so feel free to help whenever you see them struggling.
- **Number practice:** This lesson contains games and number tasks to do regularly with your child. Number is the most important concept to establish in Foundation, so we will be using similar activities each week to help your child develop a very firm understanding of "how many", to be able to picture that amount in their head, and to be able to add and subtract small amounts very flexibly. **These sessions will not focus heavily on counting, as counting is far less important than making amounts, drawing those amounts and recognising that the amount is still the same when the objects move.**

Getting help

The website above will have answers to frequently asked questions as well as videos to help you successfully teach your child at home. If you have further questions or need support, please contact your child's teacher directly using the contact details that they have provided to you. If they can't answer your questions, they will contact the B2FMaths@Home team directly to get an answer within 3 days.

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What you need to know this week

Week overview

This week we are teaching the concept of fractions (especially: $^1/_2$, $^1/_3$, $^1/_4$, $^1/_5$, $^1/_8$ and multiples of any of these such as $^2/_3$, $^4/_5$, $^3/_8$…). We will look at fractions of shapes (2D), fractions of lengths, fractions of capacity (e.g. $^1/_3$ of a glass), and fractions of a collection or group.

Students at this age need to work out:

- Fractions need to be "fair". If the pieces are to be given the same name, then the **size** of each piece needs to be the same. That includes fractions of a group of objects (e.g. half of 6 shells is 3 shells).
- We can have fractions of different types of wholes. We can have "half full" glasses, halves of string or ribbon, halves of amounts (e.g. half of $4 is $2) and also halves of shapes (e.g. rectangles, circles).
- Fraction names are related to the **size** of the pieces compared to the whole, not about how many pieces there are. If we cut a cake into 4 different sized pieces, they would not be quarters. Likewise, we could cut the cake into 1 half and 2 quarters, making 3 pieces altogether. They would not be called thirds.
- We can have different sized pieces in the same whole as long as we name them according to their size (e.g. one half, one quarter and two eighths cut into the same circle).
- Fractions can be compared to each other to work out which is bigger and to order them.
- The "whole" needs to be the same when comparing fractions. You can't compare fractions if one is from a small pizza and one is from a family-sized pizza!
- Fraction names are related to ordinal numbers (e.g. position in a race: third, fourth, fifth…)
- When using a fraction symbol, e.g. ½, the bottom number refers to how many parts there are in the whole (2 parts), and the top tells us how many we are talking about right now (1 out of the 2 parts is ½). When they return to school, children will refer to the bottom number as the denominator and the top number as the numerator. You don't need to use or remember those terms right now though.
- Fractions and division are different expressions of the same concept: 3 ÷ 4 = ¾
- Fractions, decimals and percentages are all different ways of expressing the same amount. We can use the context "of a dollar" to help with conversions. For example, what is half of a dollar? 50c. The number of cents is the same as that fraction converted to a percent, ½ = 50%. If we write the amount in dollars, we are converting it to a decimal, ½ = 0.50 or 0.5
- In real life, we use fractions as numbers far more often than fractions of pizzas and cakes. For example, we express probability as a fraction, decimal or percentage (e.g. a 5% chance of rain), we use fractions in equations for measurement, we use fractions in budgeting. We will be using probability next week as a natural extension of what we learn about fractions this week.

You will need the following objects:

- Lots of scrap paper for Monday (at least 12 pieces)

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Teacher Overview

Students will be considering simple fractions, equivalence and operations with fractions. We will not be converting to decimals and percent this week. Ideally, we would use the following sequence of thinking to develop fractions. For all year levels, we need to make sure that we include all of the following models or representations: **shapes (2D), objects (3D), collections or groups and lines**. For older children we also consider fractions of numbers, and fractions as numbers themselves.

1. Understand and describe a "whole" and a "part". Make halves and consider what is a half and what is not a half. Understand that halves must be fair. This includes understanding sharing a collection fairly (e.g. half of 8 lollies).
2. Understand that we could cut a shape into more than two pieces, but still divide the pieces fairly between 2 people so that each person gets half E.g. cut in 4 pieces, each person gets 2.
3. Understand that the concept of the size of parts being fair applies to other fractions as well, not just halves. Fractions are named for the size of the part, not the number of parts.
4. Fraction names are related to ordinal numbers: third, fourth, fifth etc.
5. One fourth has a special name: one quarter. Quarters are fourths, not other fractions.
6. Understand that fractions and division are related to each other.
7. Use the symbol (vinculum) for fractions. Understand that the denominator represents the number of parts altogether in the whole and the numerator represents how many of the parts we are specifically talking about.
8. We can compare the size of fractions. The larger the number of pieces that a whole is divided into, the smaller the size of each piece. That means that eighths are smaller than thirds.
9. Sometimes fractions can be the same size as each other even if they have different denominators (number of parts altogether). E.g. $^{3}/_{6}$ is equivalent to $^{2}/_{4}$.
10. Unit fractions mean one of. Simple fractions are between 0 and 1. Mixed numbers or improper fractions are more than one.
11. There are just as many fractions between 1 and 2 as there are between 0 and 1. Fractions are used more often as numbers than as pizzas. This means that we can write fractions larger than one as improper fractions (larger numerator than denominator) or mixed numbers (whole number and a simple fraction).
12. Fractions, division, decimals and percentages are all different ways to express the same concept. Arrays help us to link all of these concepts together. Money is another great connecting concept to help children understand.
13. Fractions between 0 and 1 are used to express probability or chance.
14. We can have negative fractions just like we can have negative whole numbers.

Tracking student achievement

This week we are focusing investigating comparing fractions using equivalence, adding and subtracting fractions and expressing one quantity as a fraction of another. Next week we will link this to chance and order fractions on a number line, and also connect to decimals and percentages.

To achieve the C standard, students need to:

- Solve problems with fractions (**N3C**), and use fractions, decimals, percentages and their equivalences (**N8C** – we will do the decimals and percentage parts next week)
- Express one quantity as a fraction of another (**N9C**)

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Monday: At-Home Investigation

Today we are revising what we know about halves, quarters, eighths, thirds and fifths then using our representation to order and compare fractions. You may wish to consider providing your child with paper to make and colour each fraction, then comparing the size of each. They can also use equivalent fractions if they understand how to use these for comparisons.

Steps:

1. Make sure you have read "What you need to know this week" so that you know what to emphasise with your child.
2. Read the sheet to your child. Ask for their ideas on how to fold/draw each fraction. Focus on using the terms "fair", "the same amount", or "the same size". One example of answers for the first two lines is shown below.
3. When making thirds and fifths, make sure that you try out their ideas first before you try to help them come up with a better plan. This is important because then they will know *why* their idea didn't work.
4. Help your child think about what worked and what didn't, then come up with a new plan if needed. Focus on the idea of "fair". For example, thirds should all be the same as each other. One half and two quarters is not thirds.
5. Encourage your child to draw or write answers to the questions on the page. It is important to make a record of this page, whether as a photograph showing their folded fractions or by keeping the page with the drawings.
6. Discuss what your child found out with them. Keep in mind the ideas from the "What you need to know this week" section so that you can ask questions that are appropriate to the issues identified.
7. At the end: consider writing a comment on the page to say what went well or what you are concerned about. Fractions can be hard to understand for children, so please contact your teacher for help as needed.

What we are looking for:

One way to answer the question would be to convert each fraction to 60ths as 60 is a multiple of all of the denominators. So ½ would become $^{30}/_{60}$. Another way is simply to make each, then compare the size. Some fractions are easy to compare as their denominators are related (e.g. halves and quarters or fifths and tenths). The inclusion of thirds makes it trickier, however working through this will make the other learning that we need to do this week on adding and subtracting fractions.

For the final question, the order for all the fractions is as follows.

$\frac{1}{10}\ \frac{1}{5}\ \frac{1}{4}\ \frac{1}{3}\ \frac{2}{5}\ \frac{1}{2}\ \left(same\ as \frac{2}{4}\right)\ \frac{3}{5}\ \left(same\ as\ \frac{6}{10}\right)\ \frac{2}{3}\ \frac{3}{4}\ \frac{4}{5}$

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At-Home Investigation

Comparing the size of fractions:

Today we are going to draw each of the fractions listed below, then compare them and place them in order. If you know about equivalent fractions (e.g. $\frac{1}{4} = \frac{3}{12}$) then you can use that to help you.

Draw the lines to show each fraction. Take a photo of what you have made to send to your teacher.

$\frac{1}{2}$	$\frac{1}{4}$	$\frac{2}{4}$	$\frac{3}{4}$
$\frac{1}{3}$	$\frac{2}{3}$	$\frac{1}{5}$	$\frac{2}{5}$
$\frac{3}{5}$	$\frac{4}{5}$	$\frac{1}{10}$	$\frac{6}{10}$

Ordering fractions:

Now that you have made each fraction, order the each of the fractions from smallest to largest. Show any that are the same. Explain how you did it. If you know how to use equivalent fractions, then make sure to include that in your working.

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Teacher Overview

This is a ***Problem Solving and Reasoning*** task.

The emphasis is on *designing* an investigation, *developing* a plan, *testing* it out, *verifying* that the plan worked, changing it as needed and *communicating* the procedure. There is also an emphasis on *generalising* an appropriate process that can be replicated for sharing any amount fairly.

If you are at school: Focus on making fractions using rectangles of paper as well as the other models (lines, volumes…). Focus on comparing the size of fractions and especially on equivalent fractions as this leads into ordering, comparing and adding unrelated fractions.

Please note: Watch out for using the word "even" to mean "equally sized" when describing fractions. This tends to lead to students thinking that only fractions with even numbers for denominators can be evenly sized. Instead, try using any of the following terms or phrases: equal, fair, same-size, equivalent, same amount.

Watch out for:

- Any three pieces are thirds – no need to be equally sized or shared fairly
- Only understanding fractions of shapes
- Any number of pieces are "quarters" (e.g. thirds are three quarters…)
- All fractions start when we fold in half (this won't work for thirds, fifths…)

Good questions to prompt thinking:

- Is it fair? What would fair look like? Fractions have to be fair to have the same name.
- How can we compare the size of the fractions? Which is biggest/smallest? Which are the same size even though they have different names?

Students requiring support:

- Use physical manipulatives
- Make sure that you do not limit the thinking to squares and circles – shapes AND collections are required to meet the C standard
- Watch for misconceptions listed

Extension:

- Provide "one third" and ask "what would the whole look like?" Repeat for simple fractions that are not unit-fractions.
- Find thirds and fifths of collections (e.g. 30)
- Link with time: "half an hour", being 5 and a half years old
- Link with measurement: "quarter of a metre", "half a litre"
- Link with chance: one quarter of the time the card drawn will be a heart, half the time it will be black
- Link with money: half a dollar is 50c
- Link with a number line: half way between 0 and 100 is 50, one quarter of the way is 25

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Tuesday: Connecting lesson

In this lesson we will revise the concept of equivalent fractions that students were introduced to in Years 4 and 5, then use equivalent fractions to make addition easier. Equivalent fractions are the same size as each other. For example, 2 quarters of a cake is the same as half a cake. $\frac{2}{4} = \frac{1}{2}$

If the children worked through yesterday's task properly, they should have been introduced to several fractions that were the same size as each other (equivalent). This worksheet should not be too difficult as the concept is a revision of addition of fractions from Year 6. If you have trouble, use the pictures or folding that your child did on Monday to compare sizes. Find ones that are the same and consider introducing others (e.g. $\frac{6}{8}$)

Terms you need to know:
Denominator (bottom number in a fraction) represents the number of parts altogether in the whole and the
Numerator (top number in a fraction) represents how many of the parts we are specifically talking about.

This lesson is important as it leads into the operations with fractions that have unrelated denominators that we will be doing on Friday.

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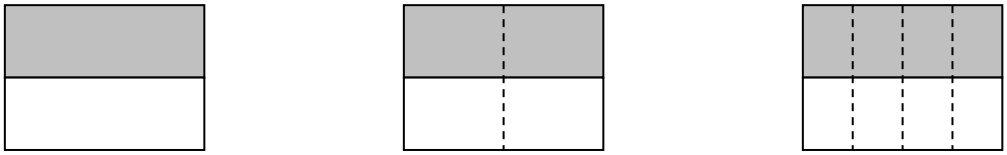
Revising equivalent fractions

Different common fractions can be used to represent the same amount. These are called ***equivalent fractions****. Use the diagrams below to help you to identify the common fractions.*

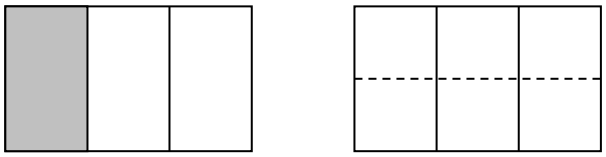
Example:



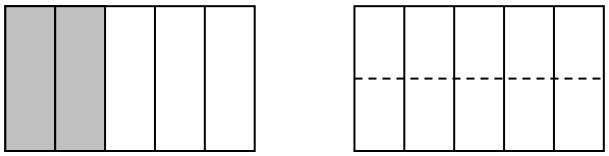
$^{1}/_{2}$ = $^{2}/_{4}$ = $^{4}/_{8}$

Colour the diagrams below and use them to help you answer the questions.

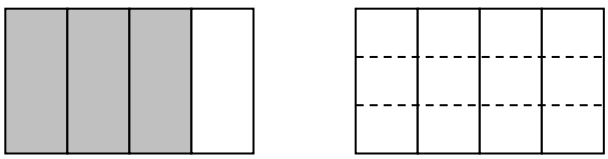
1. $^{1}/_{3}$ = how many sixths? What is the pattern?



2. $^{2}/_{5}$ = how many tenths? What is the pattern?



3. $^{3}/_{4}$ = how many twelfths? What is the pattern?



Look at the numbers in each numerator and denominator in the set of equivalent fractions.
What patterns do you see between the numbers?

Think it through:
Is there a way that you could use your understanding of equivalent fractions to add different fractions together? Try drawing what it would look like to add $\frac{1}{2}$ to $\frac{1}{4}$
If you can, also try adding on $\frac{1}{8}$

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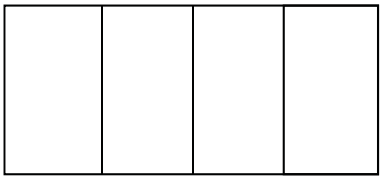
C6. Adding fractions with related denominators

TR p78

Using pictures is a good way to understand a concept. Today we will learn how to add and subtract fractions with related denominators.

Example:

$^1/_4 + {}^1/_2$



Colour ¼ of the rectangle in blue: how many pieces do you shade? _____

Colour ½ of the rectangle in red: how many pieces do you shade? _____

How many pieces would this make altogether? _____ What fraction is this? _____

What would you have done if it was ½ - ¼? Can you think of how to do it using an eraser?

Try these: some are addition and some are subtraction. For some you will need to cut the shape into more parts before you can add or subtract. Make sure that you think about how many pieces you need altogether before getting started.

1. $^3/_4 + {}^1/_8 =$

2. $^2/_5 - {}^1/_{10} =$

3. $^2/_6 + {}^1/_3 =$

4. $^1/_2 - {}^3/_{10} =$

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Teacher Overview

This is an ***Understanding*** lesson. The first page gives students an opportunity to reflect on what they know about comparing the size of fractions and use deductive reasoning to work out equivalent fractions. The second page uses equivalence to encourage addition and subtraction of fractions with related denominators.

You may also want to review concepts of arrays, shapes, length, area and capacity that students were working on in previous weeks to build retention.

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Wednesday: Connecting lesson

You will need:

- A **calculator** or your phone: *while students could work out each question by hand, we need them to be focused on finding the underlying patterns*. This means that we want to take the difficulty out of performing the calculations so that they focus on finding the connection to division instead.

In this lesson children will be working out how to find a ***unit fraction*** (one) of an amount, for example finding ***one*** third of thirty, or finding ***one*** fifth of 25. Once children have found the unit fraction (one), they can easily multiply that amount to find other fractions as well. For example, having found that ¼ of 12 is 3, they could find ¾ by tripling their 3.

The answers to the questions on the second page are:

7. $^1/_3$ of 30 = 1 ÷ 3 x 30 = 10 (you could also do 30 ÷ 3 x 1)
8. $^2/_3$ of 30 = 2 ÷ 3 x 30 = 20 (you could also do 30 ÷ 3 x 2)
9. $^1/_5$ of 25 = 1 ÷ 5 x 25 = 5 (you could also do 25 ÷ 5 x 1)
10. $^3/_5$ of 25 = 3 ÷ 5 x 25 = 15 (you could also do 25 ÷ 5 x 3)
11. 5
12. 25
13. 4
14. 16
15. 12
16. 27
17. 12
18. 21

Extension question:
$^9/_7$ of 14 = 9 ÷ 7 x 14 = 18 (you could also do 14 ÷ 7 x 9)

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Finding any fraction of a whole number

Fractions are related to multiplication and division facts. Examine the examples below to find the pattern, then use the pattern to complete the following questions.

Words	Fractions	Expanded form
½ of 10 =	10 x ½ =	10 ÷ 2 x 1 = 5 *or* 10 x 1 ÷ 2 = 5
¼ of 12 =	12 x ¼ =	12 ÷ 4 x 1 = 3 *or* 12 x 1 ÷ 4 = 3
$^2/_5$ of 20 =	20 x $^2/_5$ =	20 ÷ 5 x 2 = 8 *or* 20 x 2 ÷ 5 = 8

Thinking about the examples:

1. Which operation do you think the word "of" refers to? Explain why:

2. How does the "fractions" column relate to the "words" column? How are they similar?

3. Describe what you think is happening in order to turn the "fractions" column into the "expanded form" column:

4. Guess: Do you think that you would get the same answer if the fraction was written first in the equations? (e.g. ½ x 10 instead of 10 x ½) Why?

5. Try it with a calculator and see. For ½ x 10 you would need to type 1 ÷ 2 x 10 = _____
   Describe what happens:

6. Describe how you think fractions are related to multiplication and division facts:

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Questions: For each of these questions work out which operations to use to calculate the answers. List the operations after the first = sign, and then put the answer after the second = sign.

7. $^{1}/_{3}$ of 30 = =

8. $^{2}/_{3}$ of 30 = =

9. $^{1}/_{5}$ of 25 = =

10. $^{3}/_{5}$ of 25 = =

11. $^{1}/_{6}$ of 30 = =

12. $^{5}/_{6}$ of 30 = =

13. $^{1}/_{7}$ of 28 = =

14. $^{4}/_{7}$ of 28 = =

15. $^{2}/_{3}$ of 18 = =

16. $^{3}/_{5}$ of 45 = =

17. $^{2}/_{9}$ of 54 = =

18. $^{3}/_{6}$ of 42 = =

Extension Question:
$^{9}/_{7}$ of 14 =

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Teacher Overview

This is a deductive ***Problem Solving*** task – students are presented with a way of finding fractions of a number and asked what the system is and how this relates to what they already know about fractions and dividing. Focus on finding the patterns.

Focus on prompting students to find the patterns between the equations and symbolic format. Because fractions is one of the pivotal concepts underpinning later mathematical thinking it is very important that they understand fractions for themselves rather than just memorising a rule. Ask students, "How did we find half? What operation did we use to find half?". Make sure that students understand the link between fractions and division. Fractions are just another way of writing division instead of using the symbols ÷ or ⟌. For instance, if you were trying to divide 50 by 10 you could write: $^{50}/_{10}$ or 50 ÷ 10 or 10⟌50 and they all mean the same thing.

Support students: Provide students with a multiplication table so that they can focus on understanding that $^{1}/_{3}$ of 30 means 30 ÷ 3 rather than spending all of their time trying to divide.

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Thursday: Interleaved Practice Questions

Why we are using mixed up questions:
In this lesson your child will be reviewing a range of skills that they have learned previously. Each question is unrelated to the previous question, because we want your child to have to *think hard* about what to do. Mixing up questions like this, rather than just practising related questions, has been shown in research to improve student retention of concepts by 60% over a 4 month period.

What to expect:
Your child will probably have forgotten how to complete quite a few of the questions. If needed, change the numbers in each question to make them easier because this will still require your child to think hard and remember a process. If they still can't work it out, feel free to show them, but try using different numbers rather than the exact same question. There are answers to each question on the website in case you get stuck.

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Interleaved practise

Year 7, week 7

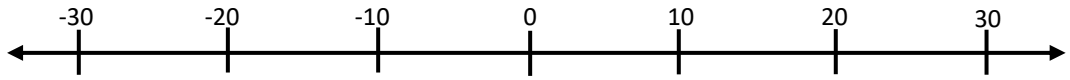
Number:

1. Write out the repeated multiplication for these and use a calculator (or phone app) to find out what numbers they represent e.g. $2^3 = 2 \times 2 \times 2 = 8$

   2^5 4^4 11^3

2. Write this product using index notation: 2 x 3 x 2 x 3 x 3

3. Use the number line to help you answer the questions below:



-12 + 15 = ☐ 2 + -7 = ☐ 5 + ☐ = -11 ☐ - 22 = -28

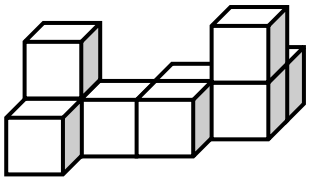
4. True or False? Explain your answer 3 (15 + 27) = (3 x 15) + 27

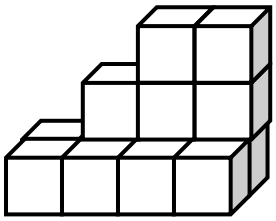
5. I pay $27.30 per week for milk. How much does it cost me for one day? Show how you worked it out.

Measurement/Geometry:

6. Write the volume of these objects in cm^3

 = 1cm^3





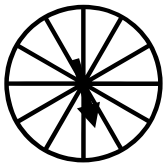
7. Fill in the missing numbers:

   41.35 kg = _____ g _____ L = 12 450 mL 3.57 m = _____ mm

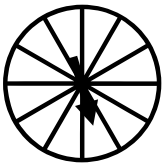
8. Draw a square based pyramid and describe its properties

Chance/Data:

9. Use as many colours as you like to make sure that this spinner gives you an equal chance of spinning each colour.



Use as many colours as you like to make sure that this spinner gives you a different chance of spinning each colour.



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Teacher Overview

The questions on this worksheet are drawn from the “C standard” of the Achievement Standard. See your tracking sheet for more detail. Each week the interleaved questions will get a little harder, and more concepts will be reviewed throughout the program as we teach that concept. We have included answers to these questions on B2FMaths@Home so that parents can find them if needed.

Support for struggling students:
You might like to reduce the numbers in the questions. You might also give the student the answer, then ask them to work out how the answer was obtained.

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Friday: Connecting and Generalising Lesson

Visually adding and subtracting fractions

Today we will learn how to make equivalent fractions using pictures so that we can add fractions easily.

What ways are there to draw one third on the following rectangles? Draw as many ways as possible:

What ways are there to draw one fifth on the following rectangles? Draw as many ways as possible:

Let's try adding one third and one fifth by drawing them onto the same rectangle.

Is there a way that you can overlay these representations so that you could determine what one third + one fifth would look like? Try drawing it below:

What problems have you found?

How might you be able to get around these problems? Try your ideas and come up with something that works. Working through the next page will help if you are stuck.

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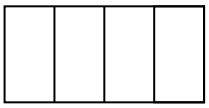
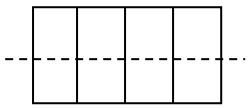
Adding fractions with pictures example:

$^1/_4 + {}^1/_2$

Think of a rectangle that is broken into **quarters** vertically:



What would it look like if you broke it into **halves** horizontally?



How many pieces do you have now altogether? _____

If you shade ¼ of this shape, how many pieces do you shade? _____

If you shade ½ of this shape, how many pieces do you shade? _____

How many would this make altogether? _____ What fraction is this? _____

How could you apply this to adding one third and one fifth? Draw it below and explain what you are doing to find the answer:

Try these on your own:

1. $^2/_5 + {}^1/_2 =$

2. $^2/_7 + {}^1/_3 =$

Explain the pattern for adding fractions using pictures:

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Below are sets of fractions for you to add and subtract. You can use pictures if they help or you can do it in your head. Give an explanation for how you did each one.

Questions:	Working Space and Explanation:
$^2/_3 + {}^3/_4$	
$^4/_5 - {}^1/_2$	
$^3/_8 + {}^1/_4$ See if you can do this one in your head. Hint: what is $^1/_4$ the same as?	
$^1/_5 - {}^1/_7$	
$^1/_{10} + {}^3/_5$ See if you can do this one in your head. Hint: what is $^3/_5$ the same as?	

Extension Questions:

If the answer was $^7/_{12}$ and one of the fractions that was added was $^1/_2$, what was the other fraction?

How would your answer change if one of the fractions was $^1/_4$ instead of $^1/_2$?

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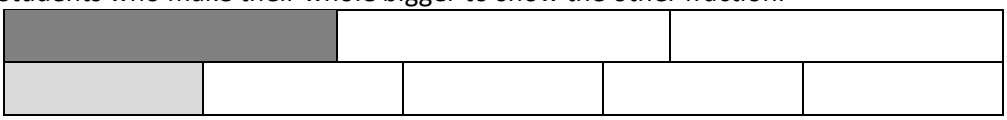
Teacher Overview

This is a ***Problem Solving and Reasoning*** lesson. It is designed to apply students' understanding of equivalent fractions to addition of fractions with unrelated denominators. **Please note:** this worksheet does not teach formal strategies for finding common denominators, but works by building a visual model first. Once we have returned to school you will need to introduce a more efficient model. If your students have had difficulty with fractions, you may wish to consider using *Fixing Misconceptions in Fractions* for some of the remaining time this year.

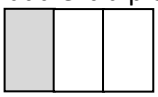
Watch out for the following misconceptions:

- Students who make their whole bigger to show the other fraction.



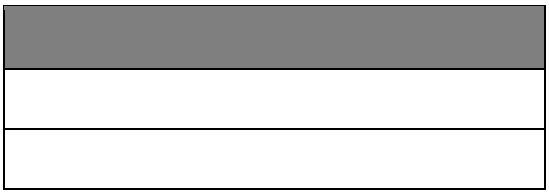
This is not $^1/_3 + {}^1/_5$! Also, it is not $^2/_8$.

- Students who draw unequal sized pieces:  This is not thirds.

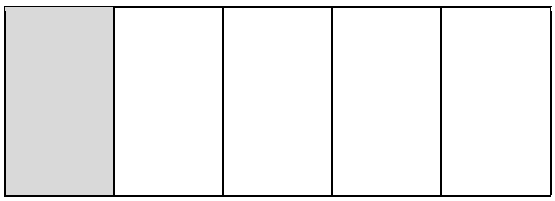
- Students who add extra pieces to their whole:
  Start with:  But then add two more: 

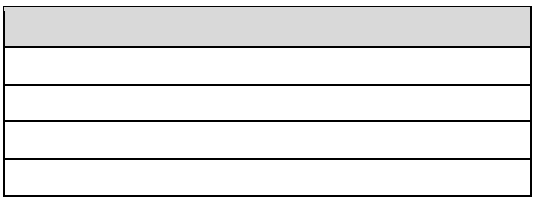
A visual model to use:

- Have the students draw different ways to make $^1/_3$, then put these on the board:

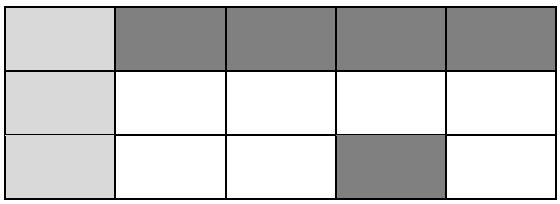


- Repeat with ways to draw $^1/_5$





- Ask students to put both together:



Watch out for the overlap. Remember to account for it somewhere else.

Next week we will use fractions of a line to link in with probability.

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