

White

**Rose
Maths**

Autumn - Block 3

Fractions

Overview

Small Steps

Notes for 2020/21

- ▶ Equivalent fractions R
- ▶ Simplify fractions
- ▶ Improper fractions to mixed numbers R
- ▶ Mixed numbers to improper fractions R
- ▶ Fractions on a number line
- ▶ Compare and order (denominator)
- ▶ Compare and order (numerator)
- ▶ Add and subtract fractions (1)
- ▶ Add and subtract fractions (2)
- ▶ Add mixed numbers R
- ▶ Add fractions
- ▶ Subtract mixed numbers R
- ▶ Subtract fractions

Many children may have missed the block of learning from Y5 on fractions therefore we are suggesting recapping this.

Spend time ensuring children can add and subtract proper fractions, before moving onto mixed numbers.

These skills require understanding of equivalent fractions.

Overview

Small Steps

- ▶ Mixed addition and subtraction
- ▶ Multiply fractions by integers
- ▶ Multiply fractions by fractions
- ▶ Divide fractions by integers (1)
- ▶ Divide fractions by integers (2)
- ▶ Four rules with fractions
- ▶ Fraction of an amount
- ▶ Fraction of an amount – find the whole

Notes for 2020/21

Many children may have missed the block of learning from Y5 on fractions therefore we are suggesting recapping this.

Spend time ensuring children can add and subtract proper fractions, before moving onto mixed numbers.

These skills require understanding of equivalent fractions.

Equivalent Fractions

Notes and Guidance

Children explore equivalent fractions using models and concrete representations.

They use models to make the link to multiplication and division. Children then apply the abstract method to find equivalent fractions.

It is important children have the conceptual understanding before moving on to just using an abstract method.

Mathematical Talk

What equivalent fractions can we find by folding the paper?
How can we record these?

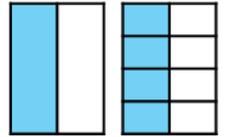
What is the same and what is different about the numerators and denominators in the equivalent fractions?

How does multiplication and division help us find equivalent fractions? Where can we see this in our model?

Varied Fluency

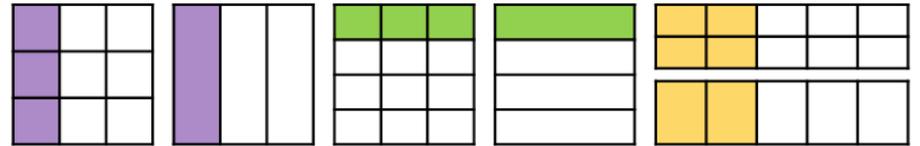


- Take two pieces of paper the same size. Fold one piece into two equal pieces. Fold the other into eight equal pieces. What equivalent fractions can you find?

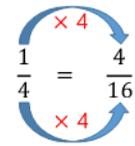
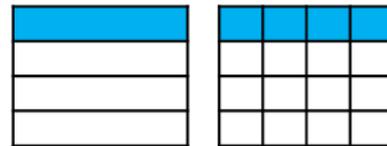


$$\frac{1}{2} = \frac{4}{8}$$

Use the models to write equivalent fractions.



- Eva uses the models and her multiplication and division skills to find equivalent fractions.



Use this method to find equivalent fractions to $\frac{2}{4}$, $\frac{3}{4}$ and $\frac{4}{4}$ where the denominator is 16

Eva uses the same approach to find equivalent fractions for these fractions. How will her method change?

$$\frac{4}{12} = \frac{\square}{3}$$

$$\frac{6}{12} = \frac{\square}{4}$$

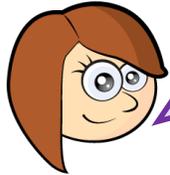
$$\frac{6}{12} = \frac{\square}{2}$$

Equivalent Fractions

Reasoning and Problem Solving



Rosie says,



To find equivalent fractions, whatever you do to the numerator, you do to the denominator.

Using her method, here are the equivalent fractions Rosie has found for $\frac{4}{8}$

$$\frac{4}{8} = \frac{8}{16} \quad \frac{4}{8} = \frac{6}{10}$$

$$\frac{4}{8} = \frac{2}{4} \quad \frac{4}{8} = \frac{1}{5}$$

Are all Rosie's fractions equivalent?
Does Rosie's method work?
Explain your reasons.

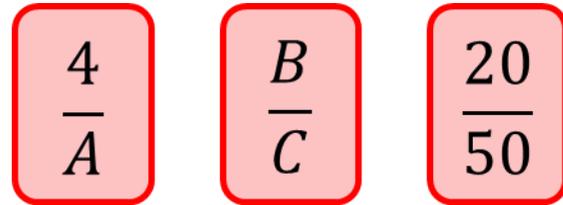
$\frac{4}{8} = \frac{1}{5}$ and $\frac{4}{8} = \frac{6}{10}$ are incorrect.

Rosie's method doesn't always work. It works when multiplying or dividing both the numerator or denominator but not when adding or subtracting the same thing to both.

Ron thinks you can only simplify even numbered fractions because you keep on halving the numerator and denominator until you get an odd number.

Do you agree?
Explain your answer.

Here are some fraction cards.
All of the fractions are equivalent.



$A + B = 16$
Calculate the value of C.

Ron is wrong. For example $\frac{3}{9}$ can be simplified to $\frac{1}{3}$ and these are all odd numbers.

$A = 10$
 $B = 6$
 $C = 15$

Simplify Fractions

Notes and Guidance

Children use their understanding of the highest common factor to simplify fractions, building on their knowledge of equivalent fractions in earlier years.

Children apply their understanding when calculating with fractions and simplifying their answers. Encourage children to use pictorial representations to support simplifying e.g. a fraction wall.

Mathematical Talk

- Can you make a list of the factors for each number?
- Which numbers appear in both lists? What do we call these (common factors)?
- What is the highest common factor of the numerator and denominator?
- Is a simplified fraction always equivalent to the original fraction? Why?
- If the HCF of the numerator and denominator is 1, can it be simplified?

Varied Fluency

Alex is simplifying $\frac{8}{12}$ by dividing the numerator and denominator by their highest common factor.

Factors of 8: 1, 2, **4**, 8
 Factors of 12: 1, 2, 3, **4**, 6, 12
 4 is the highest common factor.

$$\begin{array}{c} \div 4 \\ \curvearrowright \\ \frac{8}{12} = \frac{2}{3} \\ \curvearrowleft \\ \div 4 \end{array}$$



Use Alex's method to simplify these fractions:

$$\frac{6}{9} \quad \frac{6}{18} \quad \frac{10}{18} \quad \frac{10}{15} \quad \frac{15}{50}$$

Mo has 3 boxes of chocolates. 2 boxes are full and one box is $\frac{4}{10}$ full.



To simplify $2\frac{4}{10}$, keep the whole number the same and simplify the fraction. $\frac{4}{10}$ simplifies to $\frac{2}{5}$

$$2\frac{4}{10} = 2\frac{2}{5}$$

Use Mo's method to simplify:

$$3\frac{4}{8}, 5\frac{9}{21}, 2\frac{7}{21}, \frac{32}{10}, \frac{32}{6}$$

Simplify Fractions

Reasoning and Problem Solving

Find the total of the fractions.
Give your answer in its simplest form.

$$\frac{5}{9} + \frac{1}{9} = \quad \frac{5}{9} + \frac{3}{9} = \quad \frac{5}{9} + \frac{7}{9} =$$

Do all the answers need simplifying?
Explain why.

$$\frac{5}{9} + \frac{1}{9} = \frac{6}{9} = \frac{2}{3}$$

$$\frac{5}{9} + \frac{3}{9} = \frac{8}{9}$$

$$\frac{5}{9} + \frac{7}{9} = 1\frac{3}{9} = 1\frac{1}{3}$$

$\frac{8}{9}$ does not need simplifying because the HCF of 8 and 9 is 1

Tommy is simplifying $4\frac{12}{16}$

$$4\frac{12}{16} = 1\frac{3}{4}$$

Explain Tommy's mistake.

Tommy has divided the whole number by 4 instead of just simplifying $\frac{12}{16}$ by dividing the numerator and denominator by 4

Sort the fractions into the table.

| Simplifies to $\frac{1}{2}$ | Simplifies to $\frac{1}{3}$ | Simplifies to $\frac{1}{4}$ |
|-----------------------------|-----------------------------|-----------------------------|
| | | |

$$\frac{5}{15} \quad \frac{2}{4} \quad \frac{4}{16} \quad \frac{8}{16} \quad \frac{5}{10} \quad \frac{3}{9} \quad \frac{6}{12} \quad \frac{2}{8}$$

Can you see any patterns between the numbers in each column?

What is the relationship between the numerators and denominators?

Can you add three more fractions to each column?

Complete the sentence to describe the patterns:

When a fraction is equivalent to _____, the numerator is _____ the denominator.

Simplifies to $\frac{1}{2}$ -

$$\frac{2}{4}, \frac{8}{16}, \frac{5}{10}, \frac{6}{12}$$

Simplifies to $\frac{1}{3}$ -

$$\frac{5}{15}, \frac{3}{9}$$

Simplifies to $\frac{1}{4}$ -

$$\frac{4}{16}, \frac{2}{8}$$

When a fraction is equivalent to a half, the numerator is half the denominator.

Children could also discuss the denominator being double the numerator.

Repeat for $\frac{1}{3}$ and $\frac{1}{4}$

Improper to Mixed Numbers

Notes and Guidance

Children convert improper fractions to mixed numbers for the first time. An improper fraction is a fraction where the numerator is greater than the denominator. A mixed number is a number consisting of an integer and a proper fraction.

It is important for children to see this process represented visually to allow them to make the connections between the concept and what happens in the abstract.

Mathematical Talk

How many parts are there in a whole?

What do you notice happens to the mixed number when the denominator increases and the numerator remains the same?

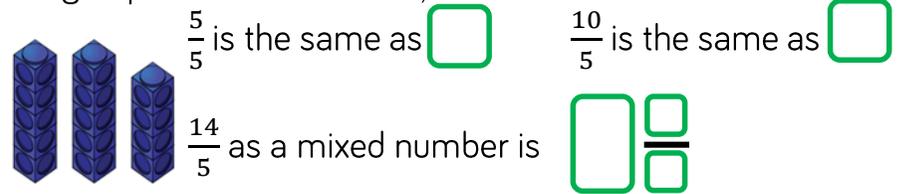
What happens when the numerator is a multiple of the denominator?

Varied Fluency



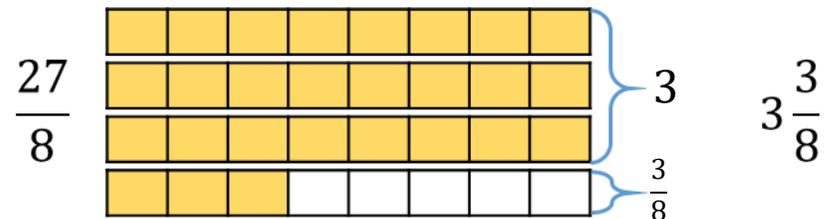
Whitney converts the improper fraction $\frac{14}{5}$ into a mixed number using cubes.

She groups the cubes into 5s, then has 4 left over.



Use Whitney's method to convert $\frac{11}{3}$, $\frac{11}{4}$, $\frac{11}{5}$ and $\frac{11}{6}$

Tommy converts the improper fraction $\frac{27}{8}$ into a mixed number using bar models.



Use Tommy's method to convert $\frac{25}{8}$, $\frac{27}{6}$, $\frac{18}{7}$ and $\frac{32}{4}$

Improper to Mixed Numbers

Reasoning and Problem Solving



Amir says,

$\frac{28}{3}$ is less than $\frac{37}{5}$
because 28 is less than 37



Do you agree?
Explain why.

Possible answer

I disagree because
 $\frac{28}{3}$ is equal to $9\frac{1}{3}$
and $\frac{37}{5}$ is equal to
 $7\frac{2}{5}$

$$\frac{37}{5} < \frac{28}{3}$$

Spot the mistake

- $\frac{27}{5} = 5\frac{1}{5}$
- $\frac{27}{3} = 8$
- $\frac{27}{4} = 5\frac{7}{4}$
- $\frac{27}{10} = 20\frac{7}{10}$

What mistakes have been made?

Can you find the correct answers?

Correct answers

- $5\frac{2}{5}$ (incorrect number of fifths)
- 9 (incorrect whole)
- $6\frac{3}{4}$ (still have an improper fraction)
- $2\frac{7}{10}$ (incorrect number of wholes)

Mixed Numbers to Improper

Notes and Guidance

Children now convert from mixed numbers to improper fractions using concrete and pictorial methods to understand the abstract method.

Ensure children always write their working alongside the concrete and pictorial representations so they can see the clear links to the abstract.

Mathematical Talk

How many quarters/halves/eighths/fifths are there in a whole?

How does multiplication support us in converting from mixed numbers to improper fractions?

Can you explain the steps in converting an improper fraction to a mixed number? Use the vocabulary: numerator, denominator, multiply, add

How could we use the previous bar model to help?

Varied Fluency

R

Whitney converts $3\frac{2}{5}$ into an improper fraction using cubes.



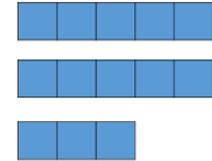
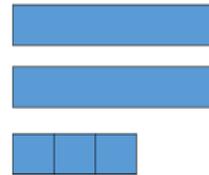
1 whole is equal to fifths.

3 wholes are equal to fifths.

fifths + two fifths = fifths

Use Whitney's method to convert $2\frac{2}{3}$, $2\frac{2}{4}$, $2\frac{2}{5}$ and $2\frac{2}{6}$

Jack uses bar models to convert a mixed number into an improper fraction.



$2\frac{3}{5} =$ wholes + fifths

2 wholes = fifths
 fifths + fifths = fifths

Use Jack's method to convert $2\frac{1}{6}$, $4\frac{1}{6}$, $4\frac{1}{3}$ and $8\frac{2}{3}$

Mixed Numbers to Improper

Reasoning and Problem Solving

R

Three children have incorrectly converted $3\frac{2}{5}$ into an improper fraction.



$$3\frac{2}{5} = \frac{6}{15}$$



$$3\frac{2}{5} = \frac{15}{5}$$



$$3\frac{2}{5} = \frac{32}{5}$$

What mistake has each child made?

Annie has multiplied the numerator and denominator by 3

Mo has multiplied the correctly but then forgotten to add on the extra 2 parts.

Dexter has just placed 3 in front of the numerator.

Fill in the missing numbers.

How many different possibilities can you find for each equation?

$$2\frac{\square}{8} = \frac{\square}{8}$$

$$2\frac{\square}{5} = \frac{\square}{5}$$

Compare the number of possibilities you found.

$$2\frac{1}{8} = \frac{17}{8} \quad 2\frac{2}{8} = \frac{18}{8}$$

$$2\frac{3}{8} = \frac{19}{8} \quad 2\frac{4}{8} = \frac{20}{8}$$

$$2\frac{5}{8} = \frac{21}{8} \quad 2\frac{6}{8} = \frac{22}{8}$$

$$2\frac{7}{8} = \frac{23}{8}$$

There will be 4 solutions for fifths.

Teacher notes:
Encourage children to make generalisations that the number of solutions is one less than the denominator.

Fractions on a Number Line

Notes and Guidance

Children count forwards and backwards in fractions. They compare and order fractions with the same denominator or denominators that are multiples of the same number. Encourage children to draw extra intervals on the number lines to support them to place the fractions more accurately. Children use the divisions on the number line to support them in finding the difference between fractions.

Mathematical Talk

Which numbers do I say when I count in eighths and when I count in quarters?

Can you estimate where the fractions will be on the number line?

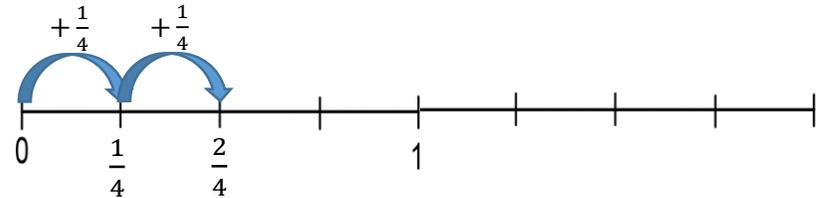
Can you divide the number line into more intervals to place the fractions more accurately?

How can you find the difference between the fractions?

Varied Fluency

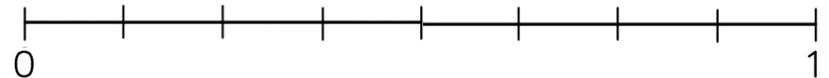
Jack is counting in quarters. He writes each number he says on a number line.

Complete Jack's number line.



Can you simplify any of the fractions on the number line?
Can you count forward in eighths? How would the number line change?

Place $\frac{1}{4}$, $\frac{1}{2}$, $\frac{1}{8}$, $\frac{5}{8}$, $\frac{7}{8}$ and $\frac{3}{16}$ on the number line.



Which fractions were the easiest to place?
Which fractions were the hardest to place?
Which fraction is the largest? Which fraction is the smallest?
What is the difference between the largest and smallest fraction?

Fractions on a Number Line

Reasoning and Problem Solving

Rosie is counting backwards in fifths. She starts at $3\frac{2}{5}$ and counts back nine fifths. What number does Rosie end on? Show this on a number line.

Rosie ends on $1\frac{3}{5}$

How many ways can you show a difference of one quarter on the number line?

Various answers available.

Plot the sequences on a number line.

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

$\frac{13}{4}, \frac{15}{4}, \frac{17}{4}, \frac{19}{4}, \frac{21}{4}, \frac{23}{4}$

$5\frac{5}{8}, 5\frac{1}{8}, 4\frac{5}{8}, 4\frac{1}{8}, 3\frac{5}{8}, 3\frac{1}{8}$

$3\frac{1}{8}, 3\frac{3}{8}, 3\frac{5}{8}, 3\frac{7}{8}, 4\frac{1}{8}, 4\frac{3}{8}$

Children may choose different sequences for different reasons. First sequence: the only one containing 6 or it is the only one containing whole numbers. Second sequence: only one using improper fractions. Third sequence: the only one going backwards. Fourth sequence: only one not counting in halves.

Which sequence is the odd one out? Explain why.

Can you think of a reason why each of the sequences could be the odd one out?

Compare & Order (Denominator)

Notes and Guidance

Children use their knowledge of equivalent fractions to compare fractions where the denominators are not multiples of the same number.

They find the lowest common multiple of the denominators in order to find equivalent fractions with the same denominators. Children then compare the numerators to find the larger or smaller fraction. Encourage children to also use their number sense to visualise the size of the fractions before converting.

Mathematical Talk

When I know the lowest common multiple, how do I know what to multiply the numerator and denominator by to find the correct equivalent fraction?

How is comparing mixed numbers different to comparing proper fractions? Do I need to compare the whole numbers? Why? If the whole numbers are the same, what do I do?

Can you plot the fractions on a number line to estimate which is the smallest? Which fractions are larger/smaller than a half? How does this help me order the fractions?

Varied Fluency

Use the bar models to compare $\frac{3}{4}$ and $\frac{2}{3}$

| | | | |
|--|--|--|--|
| | | | |
|--|--|--|--|

_____ is greater than _____

_____ is less than _____

Dora is comparing $\frac{5}{6}$ and $\frac{3}{4}$ by finding the lowest common multiple of the denominators.

Multiples of 6: 6, **12**, 18, 24
 Multiples of 4: 4, 8, **12**, 16,
 12 is the LCM of 4 and 6

$$\frac{5}{6} = \frac{10}{12} \quad \frac{3}{4} = \frac{9}{12}$$

$$\frac{10}{12} > \frac{9}{12}$$



Use Dora's method to compare the fractions.

$$\frac{4}{5} \bigcirc \frac{3}{4} \quad \frac{3}{5} \bigcirc \frac{4}{7} \quad \frac{3}{4} \bigcirc \frac{7}{10} \quad 2\frac{2}{5} \bigcirc 2\frac{3}{8}$$

Order the fractions in descending order.

$$\frac{3}{8}, \frac{11}{20}, \frac{1}{2}, \frac{2}{5}, \frac{3}{4}, \frac{7}{10}$$

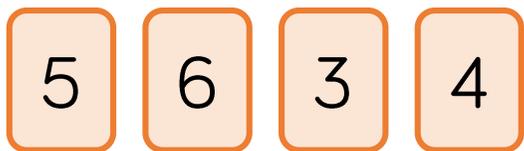
Which fraction is the greatest?

Which fraction is the smallest?

Compare & Order (Denominator)

Reasoning and Problem Solving

Use the digit cards to complete the statements.



$$\frac{\square}{4} > \frac{\square}{6} \quad \frac{\square}{4} < \frac{6}{\square}$$

Find three examples of ways you could complete the statement.

$$\frac{\square}{\square} < \frac{\square}{\square}$$

Can one of your ways include an improper fraction?

$$\frac{5}{4} > \frac{3}{6}$$

$$\frac{3}{4} < \frac{6}{5} \quad \text{or} \quad \frac{5}{4} < \frac{6}{3}$$

$$\frac{3}{5} < \frac{6}{4}$$

$$\frac{3}{4} < \frac{6}{5}$$

$$\frac{4}{5} < \frac{6}{3}$$

More answers available.

Teddy is comparing $\frac{3}{8}$ and $\frac{5}{12}$



To find the lowest common multiple, I will multiply 8 and 12 together.
 $8 \times 12 = 96$
 I will use a common denominator of 96

Is Teddy correct?
 Explain why.

Teddy is incorrect because the LCM of 8 and 12 is 24. 96 is a common multiple so he would still compare the fractions correctly but it is not the most efficient method.

Compare & Order (Numerator)

Notes and Guidance

Building on their prior knowledge of comparing unit fractions, children look at comparing fractions by finding a common numerator. They focus on the idea that when the numerators are the same, the larger the denominator, the smaller the fraction.

Children consider the most efficient method when comparing fractions and decide whether to find common numerators or common denominators.

Mathematical Talk

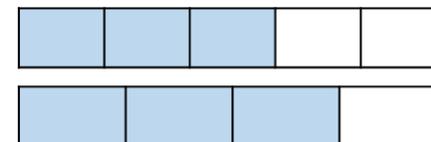
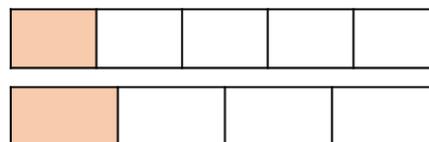
What's the same and what's different about the fractions on the bar models? How can we compare them? Can you use the words greatest and smallest to complete the sentences?

Do you need to change one or both numerators? Why?

How can you decide whether to find a common numerator or denominator?

Varied Fluency

Compare the fractions.



$\frac{1}{5} \bigcirc \frac{1}{4}$

$\frac{1}{5} \bigcirc \frac{3}{5}$

$\frac{1}{4} \bigcirc \frac{3}{4}$

$\frac{3}{5} \bigcirc \frac{3}{4}$

When the denominators are the same, the _____ the numerator, the _____ the fraction.

When the numerators are the same, the _____ the denominator, the _____ the fraction.

Jack is comparing $\frac{2}{5}$ and $\frac{4}{7}$ by finding the LCM of the numerators.



The LCM of 2 and 4 is 4

$\frac{2}{5} = \frac{4}{10}$

$\frac{4}{10} < \frac{4}{7}$

Use Jack's method to compare the fractions.

$\frac{3}{5} \bigcirc \frac{12}{17}$

$\frac{6}{11} \bigcirc \frac{3}{5}$

$\frac{5}{9} \bigcirc \frac{4}{7}$

$\frac{8}{5} \bigcirc \frac{12}{7}$

Compare & Order (Numerator)

Reasoning and Problem Solving

Mo is comparing the fractions $\frac{3}{7}$ and $\frac{6}{11}$

He wants to find a common denominator.

Explain whether you think this is the most effective strategy.

This is not the most effective strategy because both denominators are prime. He could find a common numerator by changing $\frac{3}{7}$ into $\frac{6}{14}$ and comparing them by using the rule 'when the numerator is the same, the smaller the denominator, the bigger the fraction' $\frac{6}{11}$ is bigger.

Two different pieces of wood have had a fraction chopped off.

Here are the pieces now, with the fraction that is left.



Which piece of wood was the longest to begin with?

Explain your answer.

Can you explain your method?

The second piece was longer because $\frac{1}{4}$ is greater than $\frac{1}{6}$. Children can explain their methods and how they compared one quarter and one sixth.

Add & Subtract Fractions (1)

Notes and Guidance

Children add and subtract fractions within 1 where the denominators are multiples of the same number. Encourage children to find the lowest common multiple in order to find a common denominator. Ensure children are confident with the understanding of adding and subtracting fractions with the same denominator. Bar models can support this, showing children that the denominators stay the same whilst the numerators are added or subtracted.

Mathematical Talk

If the denominators are different, when we are adding or subtracting fractions, what do we need to do? Why?

How does finding the lowest common multiple help to find a common denominator?

Can you use a bar model to represent Eva's tin of paint? On which day did Eva use the most paint? On which day did Eva use the least paint? How much more paint did Eva use on Friday than Saturday?

Varied Fluency

- Whitney is calculating $\frac{5}{8} + \frac{3}{16}$. She finds the lowest common multiple of 8 and 16 to find a common denominator.

LCM of 8 and 16 is 16 $\frac{5}{8} = \frac{10}{16}$ $\frac{10}{16} + \frac{3}{16} = \frac{13}{16}$

Use this method to calculate:

$$\frac{1}{3} + \frac{2}{9} = \quad \frac{3}{7} + \frac{7}{21} = \quad \frac{8}{15} + \frac{1}{5} = \quad \frac{3}{16} + \frac{3}{8} + \frac{1}{4} =$$

- Find a common denominator for each pair of fractions by using the lowest common multiple. Subtract the smaller fraction from the larger fraction in each pair.

$$\frac{3}{4}, \frac{5}{8} \quad \frac{7}{12}, \frac{1}{3} \quad \frac{11}{16}, \frac{3}{4} \quad \frac{14}{15}, \frac{2}{5} \quad \frac{8}{9}, \frac{1}{3}$$

- Eva has a full tin of paint. She uses $\frac{1}{3}$ of the tin on Friday, $\frac{1}{21}$ on Saturday and $\frac{2}{7}$ on Sunday. How much paint does she have left?

Add & Subtract Fractions (1)

Reasoning and Problem Solving

Use the same digit in both boxes to complete the calculation.

Is there more than one way to do it?

$$\frac{\boxed{}}{\boxed{20}} + \frac{\boxed{1}}{\boxed{}} = \frac{\boxed{9}}{\boxed{20}}$$

$$\frac{4}{20} + \frac{1}{4} = \frac{9}{20}$$

$$\frac{5}{20} + \frac{1}{5} = \frac{9}{20}$$

Dexter subtracted $\frac{3}{5}$ from a fraction and his answer was $\frac{8}{45}$

What fraction did he subtract $\frac{3}{5}$ from?

Give your answer in its simplest form.

$$\frac{8}{45} + \frac{3}{5} = \frac{8}{45} + \frac{27}{45}$$

$$\frac{8}{45} + \frac{27}{45} = \frac{35}{45} = \frac{7}{9}$$

Dexter subtracted $\frac{3}{5}$ from $\frac{7}{9}$

Alex is adding fractions.

$$\frac{3}{5} + \frac{1}{15} = \frac{4}{20} = \frac{1}{5}$$

Do you agree with her?

Explain your answer.

Alex is wrong because she has added the numerators and the denominators rather than finding a common denominator.

It should be

$$\frac{3}{5} + \frac{1}{15} = \frac{6}{15} + \frac{1}{15} = \frac{7}{15}$$

Add & Subtract Fractions (2)

Notes and Guidance

Children add and subtract fractions where the denominators are not multiples of the same number. They continue to find the lowest common multiple, but now need to find equivalent fractions for both fractions in the calculation to find a common denominator.

When the denominators are not multiples of the same number, support children to notice that we need to multiply the denominators together in order to find the LCM.

Mathematical Talk

What is the same about all the subtractions? ($\frac{3}{4}$)

What do you notice about the LCM of all the denominators?

Which of the subtractions has the biggest difference? Explain how you know. Can you order the differences in ascending order?

How can we find the LCM of three numbers? Do we multiply them together? Is 120 the LCM of 4, 5 and 6?

Varied Fluency

- Amir is calculating $\frac{7}{9} - \frac{1}{2}$
He finds the lowest common multiple of 9 and 2
LCM of 9 and 2 is 18

$$\frac{7}{9} - \frac{1}{2} = \frac{14}{18} - \frac{9}{18} = \frac{5}{18}$$

Use this method to calculate:

$$\frac{3}{4} - \frac{1}{3} = \quad \frac{3}{4} - \frac{3}{5} = \quad \frac{3}{4} - \frac{2}{7} = \quad \frac{3}{4} - \frac{7}{11} =$$

- Eva has a bag of carrots weighing $\frac{3}{4}$ kg and a bag of potatoes weighing $\frac{2}{5}$ kg. She is calculating how much they weigh altogether.



The LCM of 4 and 5 is 20. I will convert the fractions to twentieths.

$$\frac{3}{4} + \frac{2}{5} = \frac{15}{20} + \frac{8}{20} = \frac{23}{20} = 1\frac{3}{20} \text{ kg}$$

Use this method to calculate:

$$\frac{1}{4} + \frac{2}{5} = \quad \frac{7}{8} + \frac{1}{3} = \quad \frac{5}{6} + \frac{5}{7} = \quad \frac{13}{20} + \frac{2}{3} =$$

- On Friday, Ron walks $\frac{5}{6}$ km to school, $\frac{3}{4}$ km to the shops and $\frac{4}{5}$ km home. How far does he walk altogether?

Add & Subtract Fractions (2)

Reasoning and Problem Solving

A car is travelling from Halifax to Brighton.

In the morning, it completes $\frac{2}{3}$ of the journey.

In the afternoon, it completes $\frac{1}{5}$ of the journey.

What fraction of the journey has been travelled altogether?

What fraction of the journey is left to travel?

If the journey is 270 miles, how far did the car travel in the morning?

How far did the car travel in the afternoon?

How far does the car have left to travel?



The car has travelled $\frac{13}{15}$ of the journey altogether.

There is $\frac{2}{15}$ of the journey left to travel.

The car travelled 180 miles in the morning.

The car travelled 54 miles in the afternoon.

The car has 36 miles left to travel.

Mr and Mrs Rose are knitting scarves.

Mr Rose's scarf is $\frac{5}{9}$ m long.

Mrs Rose's scarf is $\frac{1}{5}$ m longer than Mr Rose's scarf.

How long is Mrs Rose's scarf?

How long are both the scarves altogether?

Mrs Rose's scarf is $\frac{34}{45}$ m long.

Both scarves together are $1\frac{14}{45}$ m long.

Fill in the boxes to make the calculation correct.

$$1\frac{\square}{10} = \frac{3}{\square} + \frac{\square}{10}$$

Various answers available. E.g.

$$1\frac{1}{10} = \frac{3}{5} + \frac{5}{10}$$

Add Mixed Numbers

Notes and Guidance

Children move on to adding two fractions where one or both are mixed numbers or improper fractions.

They will use a method of adding the wholes and then adding the parts. Children will record their answer in its simplest form.

Children can still draw models to represent adding fractions.

Mathematical Talk

How can we partition these mixed numbers into whole numbers and fractions?

What will the wholes total? Can I add the fractions straight away?

What will these mixed numbers be as improper fractions?

If I have an improper fraction in the question, should I change it to a mixed number first? Why?

Varied Fluency

R

$1\frac{1}{3} + 2\frac{1}{6} = 3 + \frac{3}{6} = 3\frac{3}{6}$ or $3\frac{1}{2}$

Add the fractions by adding the whole first and then the fractions. Give your answer in its simplest form.

$$1 + 2 = 3$$

$$\frac{1}{3} + \frac{1}{6} = \frac{2}{6} + \frac{1}{6} = \frac{3}{6}$$

$$3\frac{1}{4} + 2\frac{3}{8}$$

$$4\frac{1}{9} + 3\frac{2}{3}$$

$$2\frac{5}{12} + 2\frac{1}{3}$$



$$1\frac{3}{4} + 2\frac{1}{8} = \frac{7}{4} + \frac{17}{8} = \frac{14}{8} + \frac{17}{8} = \frac{31}{8} = 3\frac{7}{8}$$

Add the fractions by converting them to improper fractions.

$$1\frac{1}{4} + 2\frac{5}{12}$$

$$2\frac{1}{9} + 1\frac{1}{3}$$

$$2\frac{1}{6} + 2\frac{2}{3}$$



Add these fractions.

$$4\frac{7}{9} + 2\frac{1}{3}$$

$$\frac{17}{6} + 1\frac{1}{3}$$

$$\frac{15}{8} + 2\frac{1}{4}$$

How do they differ from previous examples?

Add Mixed Numbers

Reasoning and Problem Solving



Jack and Whitney have some juice.

Jack drinks $2\frac{1}{4}$ litres and Whitney drinks $2\frac{5}{12}$ litres.

How much do they drink altogether?

Complete this using two different methods.

Which method do you think is more efficient? Why?

They drink $4\frac{2}{3}$ litres altogether.

Encourage children to justify which method they prefer and why. Ensure children discuss which method is more or less efficient.

Fill in the missing numbers.

$$4\frac{5}{6} + \begin{array}{|c|} \hline \square \\ \hline \square \\ \hline \end{array} = 10\frac{1}{3}$$

$5\frac{3}{6}$ or $5\frac{1}{2}$

Add Fractions

Notes and Guidance

Children explore adding mixed numbers. They look at different methods depending on whether the fractions total more than one. They add fractions with any denominators, building on their understanding from the previous steps.

Encourage children to draw bar models to support them in considering whether the fractions will cross the whole. They continue to simplify answers and convert between improper fractions and whole numbers when calculating.

Mathematical Talk

How many wholes are there altogether?

Can you find the LCM of the denominators to find a common denominator?

Do you prefer Tommy or Whitney's method? Why?

Does Tommy's method work when the fractions add to more than one? How could we adapt his method?

Does Whitney's method work effectively when there are large whole numbers?

Varied Fluency

- Tommy is adding mixed numbers. He adds the wholes and then adds the fractions. Then, Tommy simplifies his answer.

$$1\frac{1}{2} + 2\frac{1}{6} = 1\frac{3}{6} + 2\frac{1}{6} = 3\frac{4}{6} = 3\frac{2}{3}$$



Use Tommy's method to add the fractions.

$$3\frac{1}{2} + 2\frac{3}{8} = \quad 34\frac{1}{9} + 5\frac{2}{5} = \quad 12\frac{5}{12} + 2\frac{1}{7} =$$

- Whitney is also adding mixed numbers. She converts them to improper fractions, adds them, and then converts them back to a mixed number.

$$1\frac{1}{2} + 2\frac{1}{6} = \frac{3}{2} + \frac{13}{6} = \frac{9}{6} + \frac{13}{6} = \frac{22}{6} = 3\frac{4}{6} = 3\frac{2}{3}$$



Use Whitney's method to add the fractions.

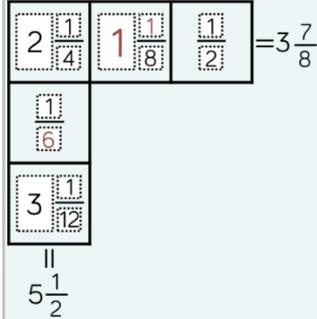
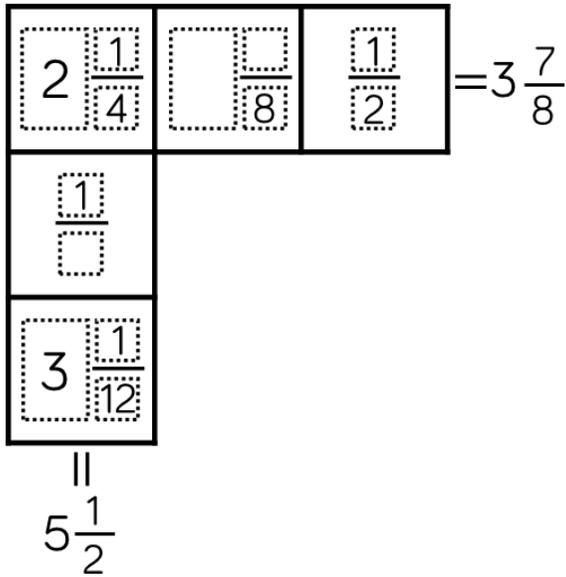
$$3\frac{1}{2} + 2\frac{3}{8} \quad 2\frac{1}{9} + 2\frac{2}{5} \quad 2\frac{7}{9} + 2\frac{2}{5} \quad 4\frac{3}{4} + 3\frac{11}{15}$$

- Jug A has $2\frac{3}{4}$ litres of juice in it. Jug B has $3\frac{4}{5}$ litres of juice in it. How much juice is there in Jug A and Jug B altogether?

Add Fractions

Reasoning and Problem Solving

Each row and column adds up to make the total at the end.
Use this information to complete the diagram.



Dora is baking muffins.
She uses $2\frac{1}{2}$ kg of flour, $1\frac{3}{5}$ kg of sugar and $1\frac{1}{4}$ kg of butter.

How much flour, sugar and butter does she use altogether?

How much more flour does she use than butter?

How much less butter does she use than sugar?

Dora uses $5\frac{7}{20}$ kg of flour, sugar and butter altogether.

Dora uses $1\frac{1}{4}$ kg more flour than butter.

Dora uses $\frac{7}{20}$ kg less butter than sugar.

Subtract Mixed Numbers (1)

Notes and Guidance

Children apply their understanding of subtracting fractions where one denominator is a multiple of the other to subtract proper fractions from mixed numbers.

They continue to use models and number lines to support their understanding.

Mathematical Talk

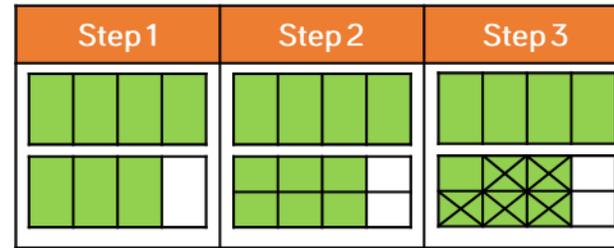
Which fraction is the greatest? How do you know?

If the denominators are different, what can we do?

Can you simplify your answer?

Which method do you prefer when subtracting fractions: taking away or finding the difference?

Varied Fluency



$$1\frac{3}{4} - \frac{5}{8} = 1\frac{1}{8}$$

Use this method to help you solve:

$$2\frac{3}{5} - \frac{3}{10}$$

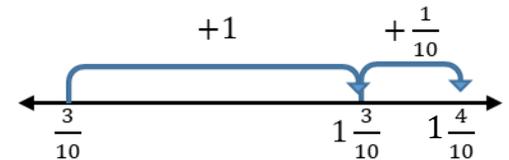
$$1\frac{2}{3} - \frac{1}{6}$$

$$1\frac{5}{6} - \frac{7}{12}$$



Use a number line to find the difference between $1\frac{2}{5}$ and $1\frac{3}{10}$

$$1\frac{2}{5} = 1\frac{4}{10}$$



Use a number line to find the difference between:

$$3\frac{5}{6} \text{ and } \frac{1}{12}$$

$$5\frac{5}{7} \text{ and } \frac{3}{14}$$

$$2\frac{7}{9} \text{ and } \frac{11}{18}$$



Solve:

$$1\frac{2}{3} - \frac{5}{6}$$

$$1\frac{3}{4} - \frac{7}{8}$$

$$2\frac{3}{8} - \frac{11}{16}$$

Subtract Mixed Numbers (1)

Reasoning and Problem Solving



Amir is attempting to solve $2\frac{5}{14} - \frac{2}{7}$

Here is his working out:



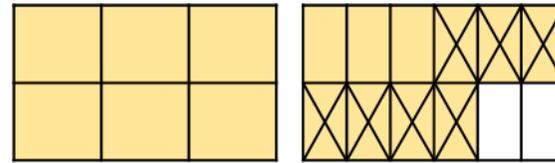
$$2\frac{5}{14} - \frac{2}{7} = 2\frac{3}{7}$$

Do you agree with Amir?
Explain your answer.

Possible answer:

Amir is wrong because he hasn't found a common denominator when subtracting the fractions he has just subtracted the numerators and the denominators. The correct answer is $2\frac{1}{14}$

Here is Rosie's method.
What is the calculation?



Can you find more than one answer?
Why is there more than one answer?

The calculation could be $1\frac{5}{6} - \frac{7}{12}$
or $1\frac{10}{12} - \frac{7}{12}$

There is more than one answer because five sixths and ten twelfths are equivalent. Children should be encouraged to write the question as $1\frac{5}{6} - \frac{7}{12}$ so that all fractions are in their simplest form.

Subtract Fractions

Notes and Guidance

Children subtract mixed numbers. They explore different methods including exchanging wholes for fractions and subtracting the wholes and fractions separately and converting the mixed number to an improper fraction. Encourage children to consider which method is the most efficient depending on the fractions they are subtracting. Bar models can support to help children to visualise the subtraction and understand the procedure.

Mathematical Talk

- How many eighths can we exchange for one whole?
- What is the same about the first set of subtractions?
- What is different about the subtractions? (How does this affect the subtraction?)
- Do you prefer Annie’s or Amir’s method? Why?
- Look at Amir’s calculation, what do you notice about the relationship between $3\frac{2}{5}$ and $1\frac{7}{10}$? ($3\frac{2}{5}$ is double $1\frac{7}{10}$)

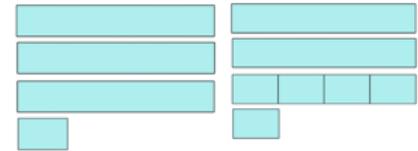
Varied Fluency

Annie is calculating $3\frac{1}{4} - 1\frac{3}{4}$



I can’t subtract the wholes and fractions separately because $\frac{1}{4}$ is less than $\frac{3}{4}$. I will exchange 1 whole for 4 quarters. $3\frac{1}{4} = 2\frac{5}{4}$

$$3\frac{1}{4} - 1\frac{3}{4} = 2\frac{5}{4} - 1\frac{3}{4} = 1\frac{2}{4} = 1\frac{1}{2}$$



Use Annie’s method to calculate:

$$3\frac{1}{8} - 1\frac{3}{8} = \quad 3\frac{1}{8} - 1\frac{1}{2} = \quad 3\frac{1}{8} - 1\frac{1}{5} = \quad 3\frac{1}{8} - 1\frac{3}{5} =$$

Amir is calculating $3\frac{2}{5} - 1\frac{7}{10}$

He converts the mixed numbers to improper fractions to subtract them.

$$3\frac{2}{5} - 1\frac{7}{10} = \frac{17}{5} - \frac{17}{10} = \frac{34}{10} - \frac{17}{10} = \frac{17}{10} = 1\frac{7}{10}$$



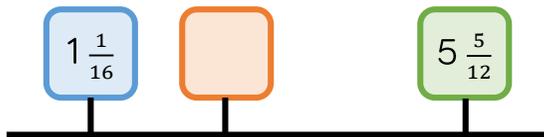
Convert the mixed numbers to improper fractions to calculate:

$$4\frac{4}{5} - 1\frac{9}{10} = \quad 2\frac{1}{7} - 1\frac{1}{3} = \quad 3\frac{5}{12} - 1\frac{7}{9} = \quad 3\frac{5}{11} - 1\frac{4}{5} =$$

Subtract Fractions

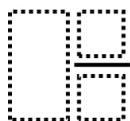
Reasoning and Problem Solving

A blue, orange and green box are on a number line.

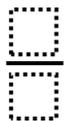


The number in the green box is $3\frac{2}{3}$ more than the orange box.

The number in the orange box is:



The number in the orange box is $\frac{\quad}{\quad}$ greater than the number in the blue box.



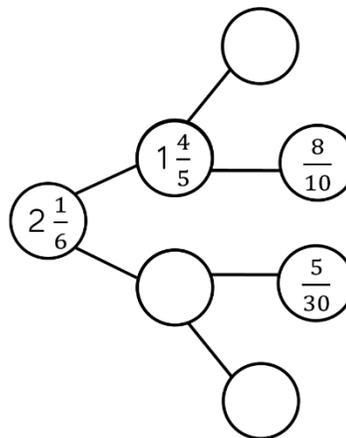
$$5\frac{5}{12} - 3\frac{2}{3} = 1\frac{9}{12}$$

The orange box is $1\frac{3}{4}$

$$1\frac{3}{4} - 1\frac{1}{16} = \frac{11}{16}$$

The orange box is $\frac{11}{16}$ greater than the blue box.

Complete the part-whole model.



Jack is calculating $4\frac{2}{7} - 2\frac{6}{7}$

He adds $\frac{1}{7}$ to both numbers.



$$4\frac{2}{7} - 2\frac{6}{7} = 4\frac{3}{7} - 3$$

so the answer is $1\frac{3}{7}$

Explain why Jack is correct.

$$2\frac{1}{6} - 1\frac{4}{5} = 1\frac{11}{30}$$

$$1\frac{4}{5} - \frac{8}{10} = 1$$

$$1\frac{11}{30} - \frac{5}{30} = 1\frac{6}{30} =$$

$$1\frac{1}{5}$$

Jack has increased both mixed numbers by $\frac{1}{7}$ so the difference has remained constant.

Mixed Addition & Subtraction

Notes and Guidance

Children solve problems that involve adding and subtracting fractions and mixed numbers. Encourage children to consider the most efficient method of adding and subtracting fractions and to simplify their answers when possible.

Children can use bar models to represent the problems and support them in deciding whether they need to add or subtract. They can share their different methods to gain a flexible approach to calculating with fractions.

Mathematical Talk

Can you draw a bar model to represent the problem? Do we need to add or subtract the fractions?

How do I know if my answer is simplified fully?

What is the lowest common multiple of the denominators?

How can I calculate the area covered by each vegetable? If you know the area for carrots and cabbages, how can you work out the area for potatoes? Can you think of 2 different ways?

Varied Fluency



Alex has 5 bags of sweets.

On Monday she eats $\frac{2}{3}$ of a bag and gives $\frac{4}{5}$ of a bag to her friend.

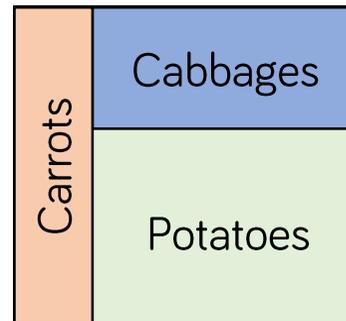
On Tuesday she eats $1\frac{1}{3}$ bags and gives $\frac{2}{5}$ of a bag to her friend.

What fraction of her sweets does Alex have left?

Give your answer in its simplest form.



Here is a vegetable patch. $\frac{1}{5}$ of the patch is for carrots. $\frac{3}{8}$ of the patch is for cabbages.



What fraction of the patch is for carrots and cabbages altogether?

What fraction of the patch is for potatoes?

What fraction more of the patch is for potatoes than cabbages?

Give your answers in their simplest form.

The vegetable patch has an area of 80 m²

What is the area covered by each vegetable?

Mixed Addition & Subtraction

Reasoning and Problem Solving

The mass of Annie’s suitcase is $29\frac{1}{2}$ kg.

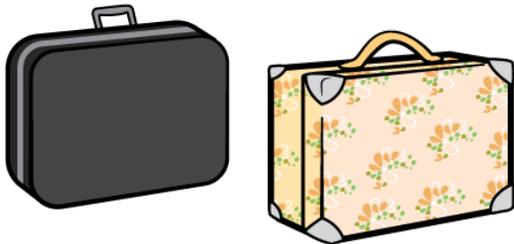
Teddy’s suitcase is $2\frac{1}{5}$ kg lighter than Annie’s.

How much does Teddy’s suitcase weigh?

How much do the suitcases weigh altogether?

There is a weight allowance of 32 kg per suitcase.

How much below the weight allowance are Annie and Teddy?



Teddy’s suitcase weighs $27\frac{3}{10}$ kg

The suitcases weigh $56\frac{4}{5}$ kg altogether.

Annie is $2\frac{1}{2}$ kg under the weight allowance.

Teddy is $4\frac{7}{10}$ kg under the weight allowance.

Find the value of the 

$$\text{heart} + 3\frac{4}{9} = 6\frac{1}{3}$$

$$8\frac{1}{10} - \text{heart} = \text{sun}$$

The value of the  is $2\frac{8}{9}$

The value of the  is $5\frac{19}{90}$

Multiply Fractions by Integers

Notes and Guidance

Children multiply fractions and mixed numbers by integers. They use diagrams to highlight the link between multiplication and repeated addition. This supports the children in understanding why the denominator stays the same and we multiply the numerator.

When multiplying mixed numbers, children partition into wholes and parts to multiply more efficiently. They compare this method with multiplying improper fractions.

Mathematical Talk

How is multiplying fractions similar to adding fractions?

How does partitioning the mixed number into wholes and fractions support us to multiply?

Do you prefer partitioning the mixed number or converting it to an improper fraction to multiply? Why?

Does it matter if the integer is first or second in the multiplication sentence? Why?

Varied Fluency

Complete:

$4 \times \frac{7}{8}$

$3 \times \frac{2}{3}$

$2 \frac{2}{5} \times 7$

$?$

$?$

$?$

Eva partitions $2 \frac{3}{5}$ to help her to calculate $2 \frac{3}{5} \times 3$

$2 \times 3 = 6$
 $\frac{3}{5} \times 3 = \frac{9}{5} = 1 \frac{4}{5}$
 $6 + 1 \frac{4}{5} = 7 \frac{4}{5}$

Use Eva's method to calculate:

$$2 \frac{5}{6} \times 3 \quad 1 \frac{3}{7} \times 5 \quad 2 \frac{2}{3} \times 3 \quad 4 \times 1 \frac{1}{6}$$

Convert the mixed number to an improper fraction to multiply.

$$2 \frac{3}{5} \times 3 = \frac{13}{5} \times 3 = \frac{39}{5} = 7 \frac{4}{5}$$

Use this method to calculate:

$$3 \times 2 \frac{2}{5} \quad 1 \frac{5}{7} \times 3 \quad 2 \times 1 \frac{3}{4} \quad 2 \times 1 \frac{1}{6}$$

Multiply Fractions by Integers

Reasoning and Problem Solving

There are 9 lamp posts on a road. There is $4\frac{3}{8}$ of a metre between each lamp post.

What is the distance between the first and last lamp post?

Use pattern blocks, if  is equal to 1 whole, work out what fraction the other shapes represent.

Use this to calculate the multiplications. Give your answers in their simplest form.

 $\times 5 =$

 $\times 5 =$

 $\times 5 =$

$$8 \times 4\frac{3}{8} = 8 \times \frac{35}{8}$$

$$= \frac{280}{8} = 35$$

The distance between the first and last lamp post is 35 metres.

 $\times 5 = \frac{5}{6}$

 $\times 5 = \frac{5}{3} = 1\frac{2}{3}$

 $\times 5 = \frac{5}{2} = 2\frac{1}{2}$

Eva and Amir both work on a homework project.



I spent $4\frac{1}{4}$ hours a week for 4 weeks doing my project.

I spent $2\frac{3}{4}$ hours a week for 5 weeks doing my project.



Who spent the most time on their project?

Explain your reasoning.

$$4 \times 4\frac{1}{4} = \frac{68}{4}$$

$$= 17 \text{ hours}$$

$$5 \times 2\frac{3}{4} = \frac{55}{4}$$

$$= 13\frac{3}{4} \text{ hours}$$

Eva spent $3\frac{1}{4}$ hours longer on her project than Amir did.

Multiply Fractions by Fractions

Notes and Guidance

Children use concrete and pictorial representations to support them to multiply fractions. Support children in understanding the link between multiplying fractions and finding fractions of an amount: $\frac{1}{3} \times \frac{1}{2}$ is the same as $\frac{1}{3}$ of $\frac{1}{2}$

Encourage children to spot the patterns of what is happening in the multiplication, to support them in unpicking the procedure of multiplying fractions by multiplying the numerators and multiplying the denominators.

Mathematical Talk

Could you use folding paper to calculate $\frac{2}{3} \times \frac{1}{2}$? How? Use a piece of paper to model this to a friend.

How are the diagrams similar to folding paper? Which do you find more efficient?

What do you notice about the product of the fractions you have multiplied? What is the procedure to multiply fractions?

Does multiplying two numbers always give you a larger product? Explain why.

Varied Fluency

Dexter is calculating $\frac{1}{3} \times \frac{1}{2}$ by folding paper. He folds a piece of paper in half. He then folds the half into thirds. He shades the fraction of paper he has created. When he opens it up he finds he has shaded $\frac{1}{6}$ of the whole piece of paper.

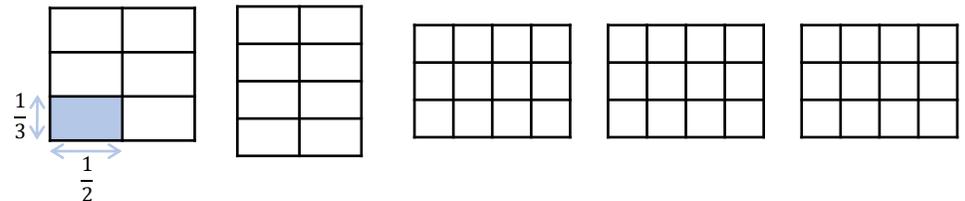


$\frac{1}{3} \times \frac{1}{2}$ means $\frac{1}{3}$ of a half. Folding half the paper into three equal parts showed me that $\frac{1}{3} \times \frac{1}{2} = \frac{1}{6}$

Represent and calculate the multiplications by folding paper.

$$\frac{1}{4} \times \frac{1}{2} = \quad \frac{1}{4} \times \frac{1}{3} = \quad \frac{1}{4} \times \frac{1}{4} =$$

Alex is drawing diagrams to represent multiplying fractions.



Shade the diagrams to calculate:

$$\frac{1}{3} \times \frac{1}{2} = \quad \frac{1}{4} \times \frac{1}{2} = \quad \frac{1}{3} \times \frac{1}{4} = \quad \frac{2}{3} \times \frac{1}{4} = \quad \frac{2}{3} \times \frac{3}{4} =$$

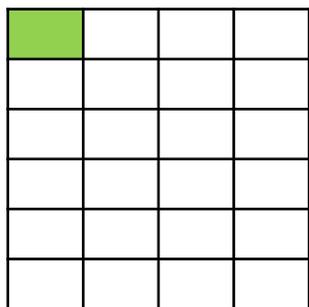
Write your answers in their simplest form.

Multiply Fractions by Fractions

Reasoning and Problem Solving

The shaded square in the grid below is the answer to a multiplying fractions question.

What was the question?



$$\frac{1}{6} \times \frac{1}{4}$$

How many ways can you complete the missing digits?

$$\begin{array}{c} \text{purple} \\ \frac{\quad}{\quad} \end{array} \times \frac{3}{\quad} = \frac{6}{12}$$

$$= \frac{\text{green}}{2}$$

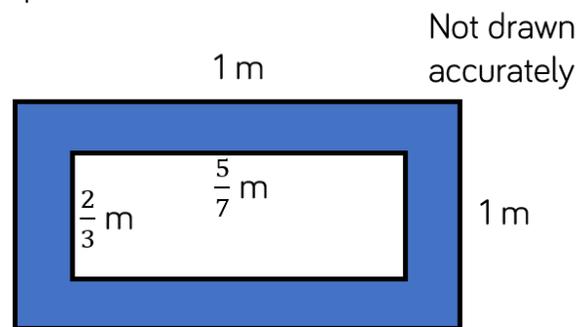
Possible answers:

$$\frac{2}{3} \times \frac{3}{4} = \frac{6}{12} = \frac{1}{2}$$

$$\frac{2}{2} \times \frac{3}{6} = \frac{6}{12} = \frac{1}{2}$$

Children could also use improper fractions.

Find the area of the shaded part of the shape.



$$1 \times 1 = 1$$

$$\frac{2}{3} \times \frac{5}{7} = \frac{10}{21}$$

$$1 - \frac{10}{21} = \frac{11}{21}$$

The shaded area is $\frac{11}{21} \text{ m}^2$.

Alex says,



$\frac{1}{4} \times \frac{1}{2}$ is the same as $\frac{1}{2}$ of a quarter.

Do you agree?

Explain why.

Alex is correct.

Multiplication is commutative so

$\frac{1}{4} \times \frac{1}{2}$ is the same

as $\frac{1}{2}$ of a quarter or

$\frac{1}{4}$ of a half.

Divide Fractions by Integers (1)

Notes and Guidance

Children are introduced to dividing fractions by integers for the first time. They focus on dividing fractions where the numerator is a multiple of the integer they are dividing by. Encourage children to spot the pattern that the denominator stays the same and the numerator is divided by the integer. Children link dividing fractions to multiplying by unit fractions. Use the diagrams children drew for multiplying fractions to discuss how and why the calculations are similar.

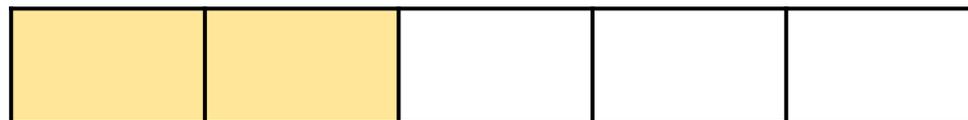
Mathematical Talk

How could you represent this fraction?
Is the numerator divisible by the integer?
Why doesn't the denominator change?

What pattern can you see when dividing elevenths?
How can we use the pattern to help us to calculate a mixed number by an integer? Can you convert it to an improper fraction?

Varied Fluency

- Dexter has $\frac{2}{5}$ of a chocolate bar. He shares it with his friend. What fraction of the chocolate bar do they each get?

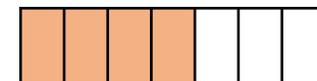
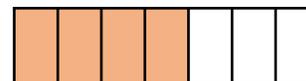
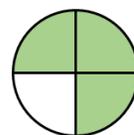


- Use the diagrams to help you calculate.

$$\frac{3}{4} \div 3 =$$

$$\frac{4}{7} \div 4 =$$

$$\frac{4}{7} \div 2 =$$



- Calculate.

$$\frac{1}{11} \div 1 =$$

$$\frac{2}{11} \div 2 =$$

$$\frac{3}{11} \div 3 =$$

$$\frac{4}{11} \div 4 =$$

$$\frac{2}{11} \div 2 =$$

$$\frac{4}{11} \div 2 =$$

$$\frac{6}{11} \div 2 =$$

$$\frac{8}{11} \div 2 =$$

$$\frac{3}{11} \div 3 =$$

$$\frac{6}{11} \div 3 =$$

$$\frac{9}{11} \div 3 =$$

$$1\frac{1}{11} \div 3 =$$

Divide Fractions by Integers (1)

Reasoning and Problem Solving

Tommy says,



Dividing by 2 is the same as finding half of a number so $\frac{4}{11} \div 2$ is the same as $\frac{1}{2} \times \frac{4}{11}$

Do you agree? Explain why.

Tommy is correct. It may help children to understand this by reinforcing that $\frac{1}{2} \times \frac{4}{11}$ is the same as $\frac{1}{2}$ of $\frac{4}{11}$

Match the equivalent calculations.

$$\frac{1}{4} \times \frac{12}{13}$$

$$\frac{12}{13} \div 2$$

$$\frac{1}{6} \times \frac{12}{13}$$

$$\frac{12}{13} \div 6$$

$$\frac{1}{2} \times \frac{12}{13}$$

$$\frac{12}{13} \div 4$$

$$\frac{1}{3} \times \frac{12}{13}$$

$$\frac{12}{13} \div 3$$

$$\frac{1}{4} \times \frac{12}{13} = \frac{12}{13} \div 4$$

$$\frac{1}{6} \times \frac{12}{13} = \frac{12}{13} \div 6$$

$$\frac{1}{2} \times \frac{12}{13} = \frac{12}{13} \div 2$$

$$\frac{1}{3} \times \frac{12}{13} = \frac{12}{13} \div 3$$

Complete the missing integers.

$$\frac{15}{16} \div \square = \frac{5}{16}$$

$$\frac{15}{16} \div \square = \frac{3}{16}$$

$$\frac{20}{23} \div \square = \frac{4}{23}$$

$$\frac{20}{23} \div \square = \frac{5}{23}$$

3
5
5
4

Rosie walks for $\frac{3}{4}$ of an hour over 3 days. She walks for the same amount of time each day. How many minutes does Rosie walk each day?

Rosie walks for $\frac{1}{4}$ of an hour each day. She walks for 15 minutes each day.

Divide Fractions by Integers (2)

Notes and Guidance

Children divide fractions where the numerator is not a multiple of the integer they are dividing by.

They draw diagrams to divide fractions into equal parts and explore the link between multiplying by a unit fraction and dividing by an integer.

Children find equivalent fractions to support the divisions and draw diagrams to model how this works.

Mathematical Talk

How is Mo's method of dividing fractions similar to multiplying $\frac{1}{2}$ by $\frac{1}{2}$?

Do you prefer Mo's or Annie's method? Explain why.

Why does finding an equivalent fraction help us to divide fractions by integers?

What multiplication can I use to calculate $\frac{3}{5} \div 2$? Explain how you know.

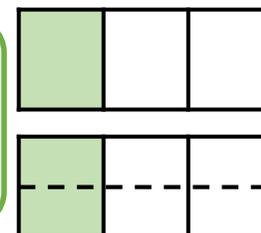
Varied Fluency

Mo is dividing $\frac{1}{3}$ by 2



I have divided one third into 2 equal parts. Each part is worth $\frac{1}{6}$

$$\frac{1}{3} \div 2 = \frac{1}{6}$$



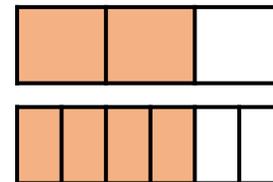
Draw diagrams to calculate:

$$\frac{1}{3} \div 3 = \quad \frac{2}{3} \div 3 = \quad \frac{1}{5} \div 3 = \quad \frac{2}{5} \div 3 =$$

Annie is dividing $\frac{2}{3}$ by 4



The numerator isn't a multiple of the integer I am dividing by so I will find an equivalent fraction to help me divide the numerator equally.



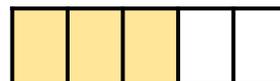
$$\frac{2}{3} = \frac{4}{6} \quad \frac{4}{6} \div 4 = \frac{1}{6}$$

$$\frac{2}{3} \div 3$$

Find equivalent fractions to calculate:

$$\frac{3}{5} \div 2$$

$$\frac{1}{3} \div 3$$



Divide Fractions by Integers (2)

Reasoning and Problem Solving

Alex says,



I can only divide a fraction by an integer if the numerator is a multiple of the divisor.

Do you agree?
Explain why.

Alex is wrong, we can divide any fraction by an integer.

Calculate the missing fractions and integers.

$$\square \div 4 = \frac{7}{36}$$

$$\frac{3}{20} \div \square = \frac{3}{80}$$

$$\square \div \square = \frac{2}{5}$$

Is there more than one possibility?

$\frac{7}{9}$

4

There are many possibilities in this last question. Children could look for patterns between the fractions and integers.

Four Rules with Fractions

Notes and Guidance

Children combine the four operations when calculating with fractions.

This is a good opportunity to recap the order of operations as children calculate equations with and without brackets.

Encourage children to draw bar models to represent worded problems in order to understand which operation they need to use?

Mathematical Talk

Which part of the equation do we calculate first when we have more than one operation?

What do you notice about the six questions that begin with $3\frac{1}{3}$?

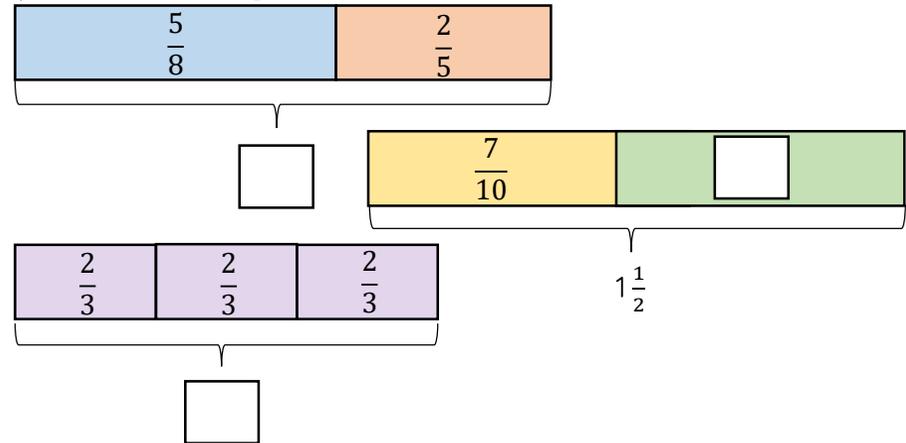
What's the same about the equations? What's different?

Which equation has the largest answer? Can you order the answers to the equations in descending order?

Can you write the worded problem as a number sentence?

Varied Fluency

Complete the missing boxes.



Calculate:

$$3\frac{1}{3} + \frac{1}{3} - 2 = \quad 3\frac{1}{3} + \frac{1}{3} + 2 = \quad 3\frac{1}{3} + \frac{1}{3} \times 2 =$$

$$3\frac{1}{3} + \frac{1}{3} \div 2 = \quad (3\frac{1}{3} + \frac{1}{3}) \times 2 = \quad (3\frac{1}{3} + \frac{1}{3}) \div 2 =$$

Jack has one quarter of a bag of sweets and Whitney has two thirds of a bag of sweets. They combined their sweets and shared them equally between themselves and Rosie.

What fraction of the sweets does each child receive?

Four Rules with Fractions

Reasoning and Problem Solving

Add two sets of brackets to make the following calculation correct:

$$\frac{1}{2} + \frac{1}{4} \times 8 + \frac{1}{6} \div 3 = 6\frac{1}{18}$$

Explain where the brackets go and why.
Did you find any difficulties?

$$\left(\frac{1}{2} + \frac{1}{4}\right) \times 8 + \left(\frac{1}{6} \div 3\right)$$

Match each calculation to the correct answer.

$$\left(\frac{2}{3} + \frac{2}{9}\right) \div 4$$

$$\frac{5}{9}$$

$$\frac{2}{3} - \frac{1}{3} \div 3$$

$$\frac{2}{9}$$

$$\frac{1}{3} \times 2 - \left(1\frac{1}{9} \div 2\right)$$

$$\frac{1}{9}$$

$$\left(\frac{2}{3} + \frac{2}{9}\right) \div 4 = \frac{2}{9}$$

$$\frac{2}{3} - \frac{1}{3} \div 3 = \frac{5}{9}$$

$$\frac{1}{3} \times 2 - \left(1\frac{1}{9} \div 2\right) = \frac{1}{9}$$

Fraction of an Amount

Notes and Guidance

Children calculate fractions of an amount. They recognise that the denominator is the number of parts the amount is being divided into, and the numerator is the amount of those parts we need to know about.

Encourage children to draw bar models to support the procedure of dividing by the denominator and multiplying by the numerator to find fractions of amounts.

Mathematical Talk

What is the value of the whole?

How many equal parts are there altogether?

How many equal parts do we need?

What is the value of each equal part?

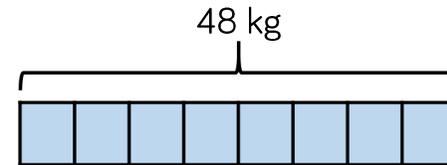
Can you see a pattern in the questions starting with $\frac{1}{5}$ of 30?

What would the next column to the right of the questions be?

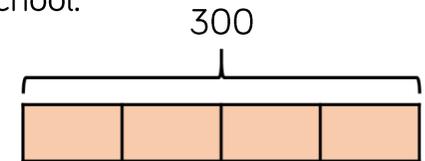
What would the next row of questions underneath be? How do you know? How can you predict the answers?

Varied Fluency

- A cook has 48 kg of potatoes. He uses $\frac{5}{8}$ of the potatoes. How many kilograms of the potatoes does he have left? Use the bar model to find the answer to this question.



- A football team has 300 tickets to give away. They give $\frac{3}{4}$ of them to a local school. How many tickets are left?



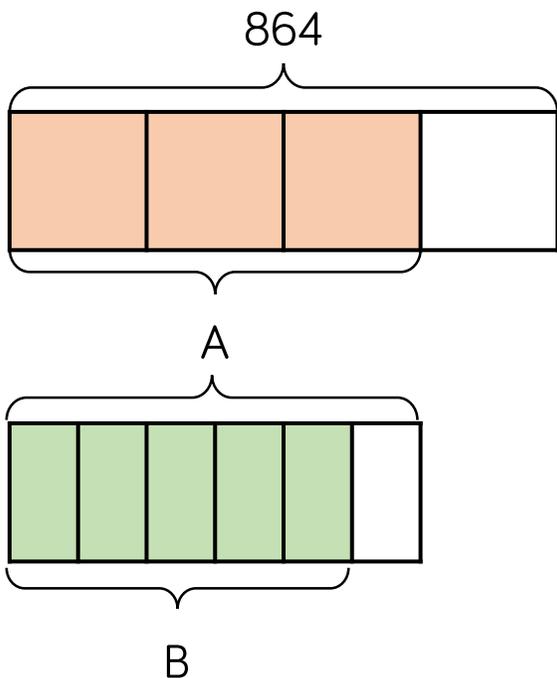
- Calculate:

| | | | |
|-----------------------|--------------------------|-------------------------|-------------------------|
| $\frac{1}{5}$ of 30 = | $\frac{1}{5}$ of 60 = | $\frac{1}{5}$ of 120 = | $\frac{1}{5}$ of 240 = |
| $\frac{2}{5}$ of 30 = | $\frac{1}{5}$ of 600 = | $\frac{1}{10}$ of 120 = | $\frac{6}{5}$ of 240 = |
| $\frac{4}{5}$ of 30 = | $\frac{1}{5}$ of 6,000 = | $\frac{1}{20}$ of 120 = | $\frac{11}{5}$ of 240 = |

Fraction of an Amount

Reasoning and Problem Solving

What is the value of A?
What is the value of B?



A = 648
B = 540

Two fashion designers receive $\frac{3}{8}$ of 208 metres of material.

One of them says:



We each receive 26 m

Is she correct?
Explain your reasoning.

She is incorrect because 26 is only one eighth of 208. She needs to multiply her answer by 3 so that they each get 78 m each.

Calculate the missing digits.

$$\frac{3}{8} \text{ of } 40 = \frac{?}{10} \text{ of } 150$$

1

$$\frac{1}{5} \text{ of } 315 = \frac{?}{8} \text{ of } 72$$

7

Find the Whole

Notes and Guidance

Children find the whole amount from the known value of a fraction. Encourage children to continue to use bar models to support them in representing the parts and the whole. Children will consider looking for patterns when calculating the whole. Highlight the importance of multiplication and division when calculating fractions of amounts and how knowing our times-tables can support us to calculate the whole more efficiently.

Mathematical Talk

How many equal parts are there altogether?

How many equal parts do we know?

What is the value of each equal part?

What is the value of the whole?

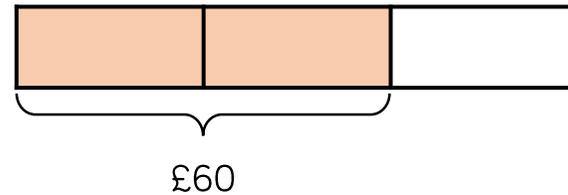
Can you see a pattern in the questions?

How can we find the whole?

Can you estimate what the answer is? Can you check the answer using a bar model?

Varied Fluency

- Jack has spent $\frac{2}{3}$ of his money. He spent £60, how much did he have to start with?



Use a bar model to represent and solve the problems.

- Rosie eats $\frac{2}{5}$ of a packet of biscuits. She eats 10 biscuits. How many biscuits were in the original packet?
- In an election, $\frac{3}{8}$ of a town voted. If 120 people voted, how many people lived in the town?

- Calculate:

$$\frac{1}{4} \text{ of } \underline{\quad} = 12$$

$$\frac{1}{4} \text{ of } \underline{\quad} = 36$$

$$\frac{1}{4} \text{ of } \underline{\quad} = 108$$

$$\frac{1}{12} \text{ of } \underline{\quad} = 12$$

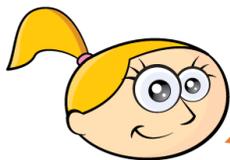
$$\frac{3}{4} \text{ of } \underline{\quad} = 36$$

$$\frac{4}{4} \text{ of } \underline{\quad} = 108$$

Find the Whole

Reasoning and Problem Solving

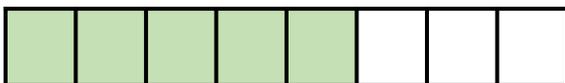
Eva lit a candle while she had a bath. After her bath, $\frac{2}{5}$ of the candle was left. It measured 13 cm. Eva says:



Before my bath the candle measured 33 cm

Is she correct?
Explain your reasoning.

Write a problem which this bar model could represent.

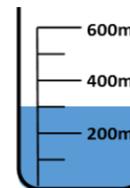


She is incorrect.
 $13 \div 2 = 6.5$
 $6.5 \times 5 = 32.5\text{cm}$

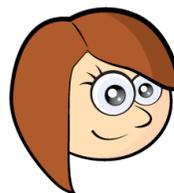
She either didn't halve correctly or didn't multiply correctly

Many possibilities.
 $\frac{5}{8}$ of children have blue eyes. 15 children do not have blue eyes. How many children are there altogether?

Rosie and Jack are making juice. They use $\frac{6}{7}$ of the water in a jug and are left with this amount of water:



To work out how much we had originally, we should divide 300 by 6 then multiply by 7



No, we know that 300ml is $\frac{1}{7}$ so we need to multiply it by 7

Who is correct?
Explain your reasoning.

Rosie is correct. Jack would only be correct if $\frac{6}{7}$ was remaining but $\frac{6}{7}$ is what was used. Rosie recognised that $\frac{1}{7}$ is left in the jug therefore multiplied it by 7 to correctly find the whole.