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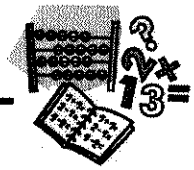
Math 9 K&E

Fractions

Proper Fractions



Fractions are used in many daily activities and expressions. For example, you might say that it is half an hour until the bell rings, or that there is a quarter of a pizza left. These are both fractions.

Fractions are a way of showing a certain part of a whole.

For example:

This shape has **4** equal parts.
1 part is shaded.
Fraction: $\frac{1}{4}$

This shape has **8** equal parts.
3 parts are shaded.
Fraction: $\frac{3}{8}$

Other examples of fractions: $\frac{2}{3}$ $\frac{4}{9}$ $\frac{10}{17}$

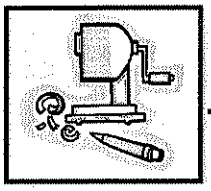
The **numerator** is the **top** part of the fraction and represents **part** of the total. → 3

The **denominator** is the **bottom** part of the fraction and represents the **total** amount. → 8

In **proper fractions**, the numerator is smaller than the denominator.

Think About ...

Think of ten examples of when you have used a fraction recently (e.g., in sports activities, in the kitchen, describing something to a friend).

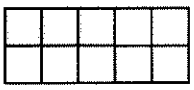


Practice: Identifying and Representing Proper Fractions

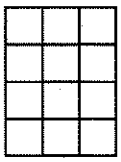
1. Examine the shapes below and identify the proper fraction. The number of squares shaded represents the top number (numerator). The number of total squares represents the bottom number (denominator).

   Compare your answers with a classmate or your teacher.

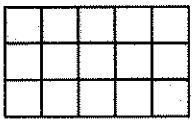
   a)

   b)

   c)

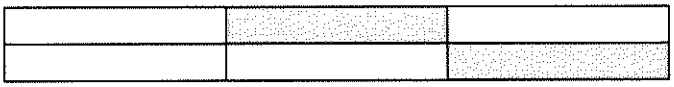
2. Michelle is on student council. She is helping organize a pep rally and wants to know the number of students who will attend. There are 23 students in the Grade 7 classroom. Fourteen say they will attend the after-school pep rally: 9 girls and 5 boys.

   a) What fraction of the whole class will attend the pep rally?

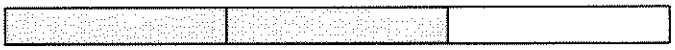
   b) Of those who will attend, write the fraction:
   - representing the number of girls
   - representing the number of boys.

3. Identify the fraction represented by each shape below. The first one has been done for you.

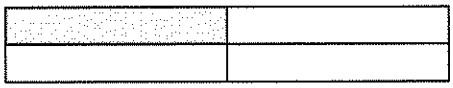
Fraction: $\frac{2}{6}$



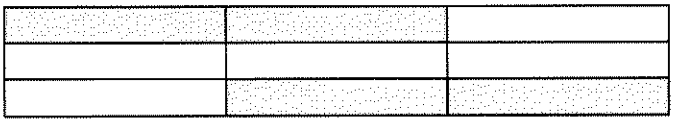
Fraction: _____



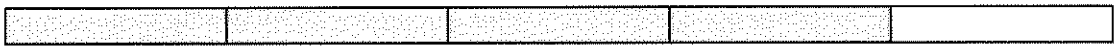
Fraction: _____



Fraction: _____

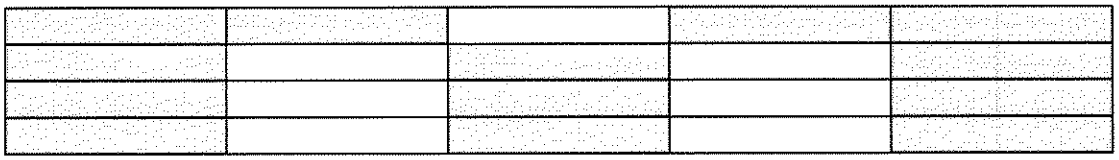


Fraction: _____



Fraction: _____

Fraction: _____



Fraction: _____

4. Shirley invites friends over for pizza, pie and a movie one evening. Look at the charts below and indicate how much was eaten.

Type of pizza	Total number of slices	Slices eaten	Fraction of pizza eaten
Cheese	8	7	
Pepperoni	12	9	
Hawaiian	12	5	
Supreme	16	12	

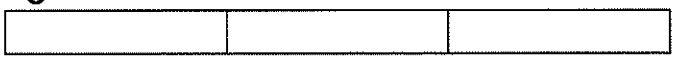
5. Fill in the missing blanks.

Type of pie	Total number of slices	Slices eaten	Fraction of pie eaten
Cherry		4	$\frac{4}{8}$
Pumpkin	10		$\frac{6}{10}$
Apple	16		$\frac{14}{16}$
Strawberry/Rhubarb		7	$\frac{7}{12}$

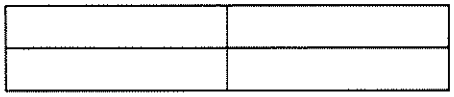
6. Colour or shade the appropriate sections to represent the following fractions.

$\frac{4}{6}$

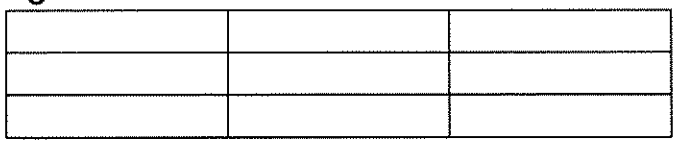
$\frac{1}{3}$



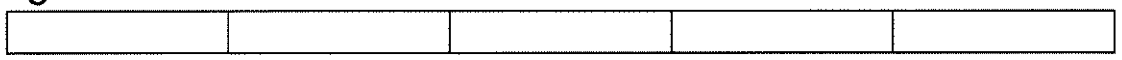
$\frac{3}{4}$



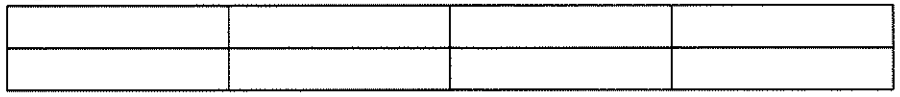
$\frac{5}{9}$



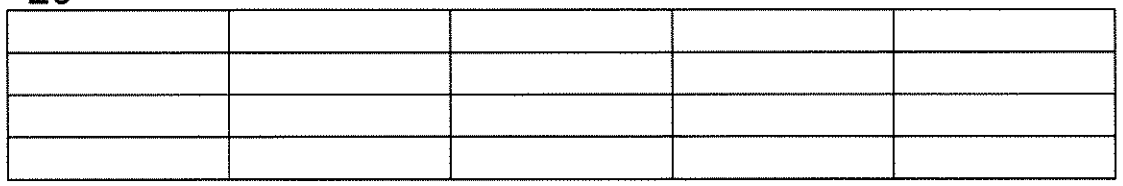
$\frac{2}{5}$



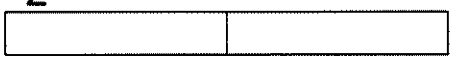
$\frac{5}{8}$



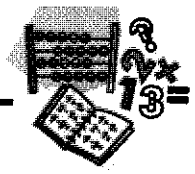
$\frac{17}{20}$



$\frac{1}{2}$



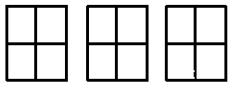
Mixed Numbers and Improper Fractions



Fractions that have numerators larger than their denominators are called **improper fractions**.

Example

Here are three identical shapes.
Two of the shapes have all four squares shaded.
One square out of four is shaded in the last shape.



In total, 9 fourths are shaded.

$\frac{9}{4}$ is an improper fraction.

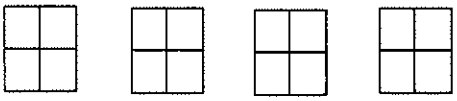
Improper fractions can also be shown as **mixed numbers**.

Mixed numbers have a whole number and a fraction; for example, $2\frac{1}{2}$, $3\frac{1}{4}$, $7\frac{3}{4}$.

Mixed numbers and equivalent improper fractions represent the same quantity.

Examples

A)



3 whole shapes are shaded = 3

plus 2 of 4 parts are shaded = $\frac{2}{4}$

In total, there are $3\frac{2}{4}$ shaded. $3\frac{2}{4}$ is a mixed number.

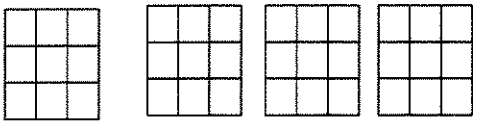
OR There are 4 parts shaded in 3 shapes
plus 2 parts shaded in 1 shape.
14 parts are shaded.

In total, there are $\frac{14}{4}$ shaded. $\frac{14}{4}$ is an improper fraction.

$$3\frac{2}{4} = \frac{14}{4}$$

B)

Here are 4 identical shapes.
Three of the shapes are completely shaded.
Four of the squares are shaded in the last shape.



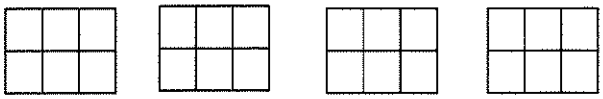
$1 + 1 + 1 + \frac{4}{9} = 3\frac{4}{9}$

$\frac{31}{9} = 3\frac{4}{9}$

OR

Three whole shapes are shaded.
Four of 9 are shaded in the last shape.
In total, 31 ninths are shaded $\frac{31}{9}$.

C)



In the shapes above, there are:
3 whole shapes shaded = 3
2 of 6 parts shaded = $\frac{2}{6}$

In total, there are, $3\frac{2}{6}$ shaded.

$3\frac{2}{6}$ is a mixed number.

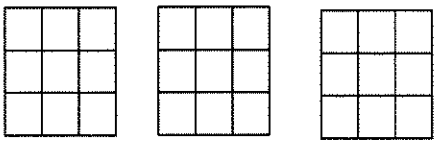
OR

There are 6 parts in each shape.
In total, 20 parts are shaded.

$\frac{20}{6}$ is an improper fraction.

$$3\frac{2}{6} = \frac{20}{6}$$

D)



In the shapes above, there are:
2 whole shapes shaded = 2
3 of 9 parts shaded = $\frac{3}{9}$
In total, there are $2\frac{3}{9}$.

OR

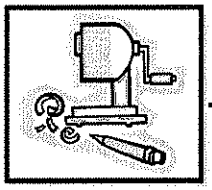
$$2\frac{3}{9} = \frac{21}{9}$$

There are:
9 equal parts in each shape
21 squares are shaded = 21.
In total, there are $\frac{21}{9}$.

Number Lines

Mixed numbers can also be represented on a number line.

Example: $3\frac{1}{5}$



Practice: Identifying Proper and Improper Fractions

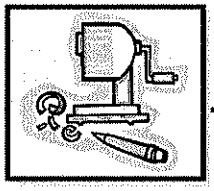
1. Identify the following as proper and improper fractions by placing a checkmark in the appropriate column.

Fraction	Proper Fraction	Improper Fraction
$\frac{16}{14}$		☑
$\frac{5}{9}$	☑	
$\frac{12}{13}$		
$\frac{5}{6}$		
$\frac{7}{10}$		
$\frac{8}{6}$		
$\frac{3}{7}$		
$\frac{9}{6}$		
$\frac{12}{5}$		

2. Identify four other proper fractions. Represent each using a diagram.

3. Identify four new improper fractions. Represent each using a diagram.

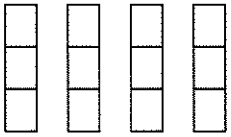
4. Write out a rule for identifying improper fractions, using the terms numerator and denominator.



Practice: Identifying Improper Fractions and Mixed Numbers

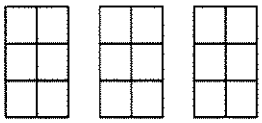
1. Examine the shapes below. Write each as a mixed number.
   Hint: How many shapes are completely shaded? What fraction of the final shape is shaded?

a)



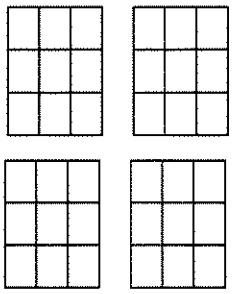
Mixed number: _____

b)



Mixed number: _____

c)



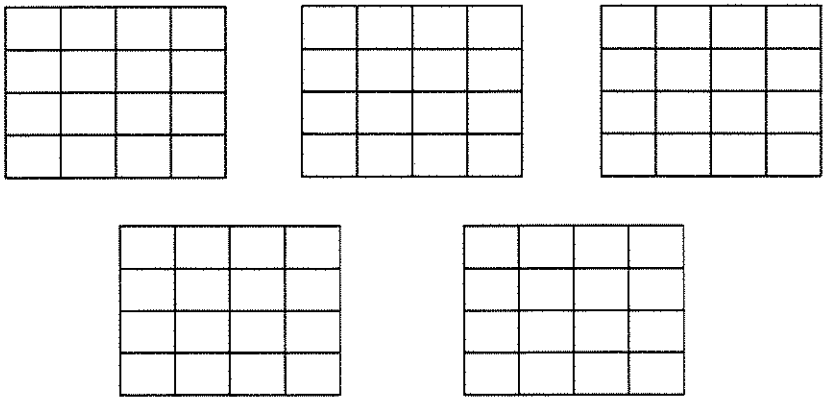
Mixed number: _____

Compare your answers with a classmate or your teacher.

2. Use number lines to illustrate each of answers to the question above.

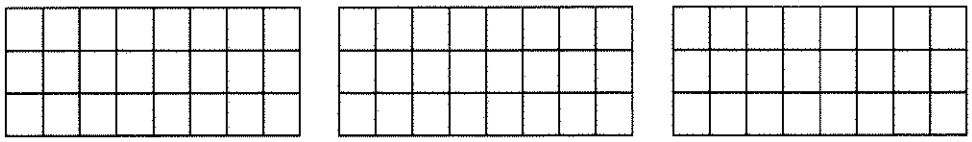
3. Identify the following shapes in mixed number and improper fraction forms.

a.



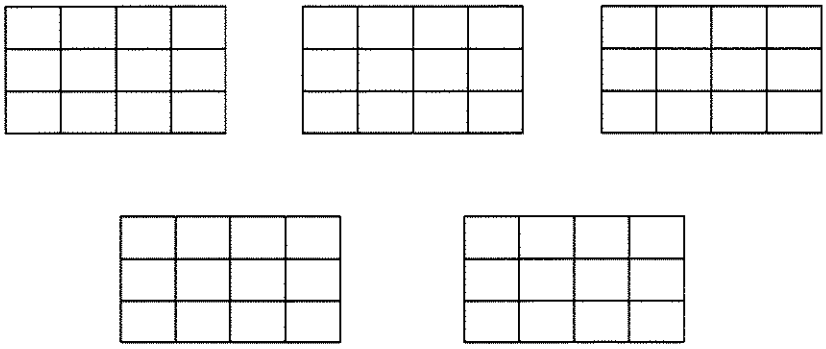
Mixed Number: _____ Improper Fraction: _____

b.



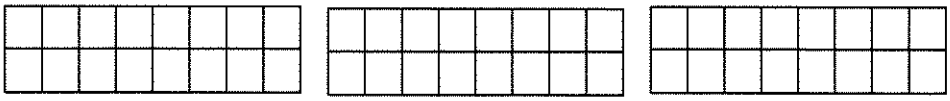
Mixed Number: _____ Improper Fraction: _____

c.



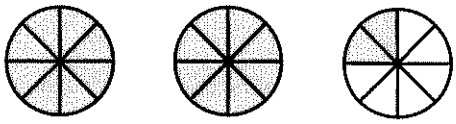
Mixed Number: _____ Improper Fraction: _____

d.



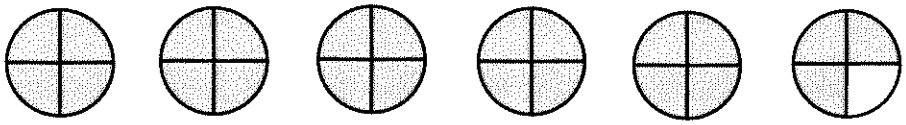
Mixed Number: _____ Improper Fraction: _____

e.

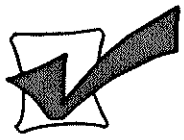


Mixed Number: _____ Improper Fraction: _____

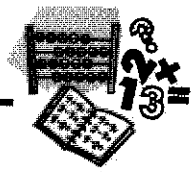
f.



Mixed Number: _____ Improper Fraction: _____



Comparing and Converting Fractions and Mixed Numbers



- When comparing fractions with the same denominator, the size of the numerator indicates the size of the fraction.

Examples

A) $\frac{3}{4} >$ (is greater than) $\frac{1}{4}$

B) $\frac{4}{5} > \frac{2}{5}$

- When comparing mixed numbers, the greater the whole number, the greater the mixed fraction. If the whole numbers are the same, compare the fraction.

Examples

A) $3\frac{3}{8} >$ (is greater than) $2\frac{7}{8}$

B) $5\frac{1}{6} > 4\frac{5}{6}$

C) $5\frac{5}{6} > 5\frac{3}{6}$

- When comparing a mixed number and an improper fraction with the same denominators, you will need to convert the mixed number to an improper fraction, or convert the improper fraction to a mixed number.

Example

$\frac{29}{8} > 3\frac{3}{8}$ because $\frac{29}{8} = 3\frac{5}{8}$

To convert improper fractions and mixed numbers, use the process on the next page.

Converting Mixed Numbers into Improper Fractions

Example Convert the mixed number $4\frac{1}{3}$ into an improper fraction.

Process	Illustration
Multiply the denominator by the whole number.	$3 \times 4 = 12$
Add the numerator to the answer.	$12 + 1 = 13$
This answer is the numerator.	$\frac{13}{?}$
Keep the same denominator.	$\frac{13}{3}$

$4\frac{1}{3} = \frac{13}{3}$ (thirteen thirds)

Converting Improper Fractions into Mixed Numbers

Example Convert the improper fraction $\frac{17}{4}$ into a mixed number.

Process	Illustration
Divide the denominator into the numerator. This answer becomes the whole number.	4 goes into 17 → 4 times 4 r1 4 17 −16 1
The remainder becomes the numerator.	1/?
The denominator remains the same.	$4\frac{1}{4}$

$\frac{17}{4} = 4\frac{1}{4}$ (4 and one fourth or 4 and one quarter)

Converting fractions using diagrams

Example

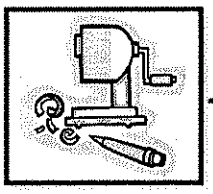
If there are $3\frac{2}{6}$ pies left over, how many people could get a piece the size of $\frac{1}{6}$ of a pie?

Solution: Convert mixed numbers to improper fractions.

In the circles above:
3 circles are shaded = 3
2 of 6 parts are shaded = $\frac{2}{6}$
$3\frac{2}{6}$ is the mixed number that

OR
6 equal parts in 3 circles
and 2 in the fourth circle are shaded.
20 parts are shaded.
$\frac{20}{6}$ is the improper fraction that represents the circles.

Twenty people would each get $\frac{1}{6}$ of a pie.



Practice: Comparing and Converting Fractions and Mixed Numbers

1. Kyle, the baker, knows the importance of adding ingredients to his dishes in the proper order. In the two recipes below, he must add the ingredients in order from greatest to least. Using the charts below, record the order in which Kyle should add the ingredients.

Ingredient	Amount (in cups)	Order (1^{st}, 2^{nd}, 3^{rd} and 4^{th})
Sugar	$1\frac{1}{4}$	
Flour	$\frac{3}{4}$	
Salt	$\frac{1}{4}$	
Milk	$1\frac{3}{4}$	

Ingredient	Amount (in teaspoons)	Order (1^{st}, 2^{nd}, etc.)
Salt	$\frac{1}{6}$	
Baking Soda	$\frac{5}{6}$	
Sugar	$1\frac{4}{6}$	
Pepper	$\frac{3}{6}$	
Baking Powder	$1\frac{2}{6}$	
Cream of Tartar	$\frac{4}{6}$	

2. Convert the following mixed numbers into improper fractions using mathematical operations.

   a) $3\frac{1}{2}$

   b) $5\frac{1}{3}$

   c) $6\frac{2}{5}$

   d) $1\frac{3}{4}$

   e) $2\frac{2}{7}$

3. Convert the following improper fractions into mixed numbers using mathematical operations.

   a) $\frac{24}{5}$

   b) $\frac{14}{3}$

   c) $\frac{11}{2}$

   d) $\frac{27}{6}$

   e) $\frac{18}{4}$

4. Sasha's home economics teacher is also her math teacher. Today he is having Sasha's class make a German bread called Reehah. He writes the recipe on the board as follows:

   $\frac{10}{3}$ cups of flour

   $\frac{12}{4}$ eggs

   $\frac{16}{8}$ teaspoons of salt

   $\frac{21}{5}$ cups of milk

   $\frac{18}{6}$ tablespoons oil

   Sasha is using standard measuring utensils to make Reehah. Convert the recipe above into standard measuring terms (mixed numbers).

5. With a partner, use a variety of strategies, such as cut-out or shaded shapes, fraction circles and/or number lines to display and compare fractions and mixed numbers with the same denominator.

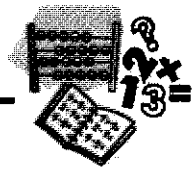
6. Complete the following chart by converting improper fractions into mixed numbers and mixed numbers into improper fractions.

Improper Fraction	Mixed Number
$\frac{19}{7}$	
$\frac{33}{4}$	
	$4\frac{5}{6}$
$\frac{22}{5}$	
	$3\frac{2}{9}$
	$9\frac{4}{5}$
$\frac{38}{6}$	
	$6\frac{1}{4}$
	$5\frac{3}{8}$
$\frac{11}{2}$	
	$9\frac{2}{3}$
$\frac{25}{8}$	
$\frac{14}{3}$	
	$10\frac{4}{5}$

7. Complete the following chart by converting improper fractions into mixed numbers and mixed numbers into improper fractions.

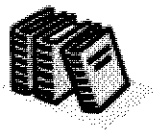
Improper Fraction	Mixed Number
$\frac{17}{4}$	
$\frac{29}{7}$	
	$3\frac{4}{6}$
$\frac{18}{5}$	
	$2\frac{5}{9}$
	$6\frac{1}{5}$
$\frac{31}{6}$	
	$5\frac{2}{3}$
	$7\frac{3}{8}$
$\frac{9}{2}$	
	$4\frac{2}{7}$
$\frac{16}{3}$	
$\frac{27}{8}$	
	$7\frac{2}{3}$

Equivalent Fractions



Identifying equivalent fractions is useful to:

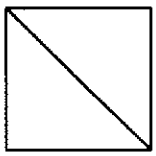
- compare quantities or amounts that the fractions represent
- reduce fractions to their lowest form
- add and subtract fractions.



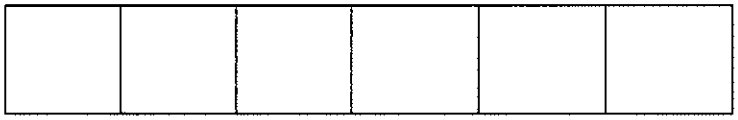
Equivalent fractions are fractions that represent the same amount but have different numerators and denominators.

Examples

A) In both of the shapes below, half of the shape is shaded.



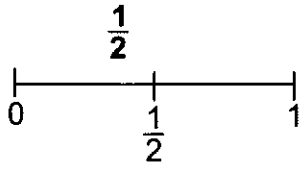
This shape has two parts.
One part is shaded.
This equals $\frac{1}{2}$.

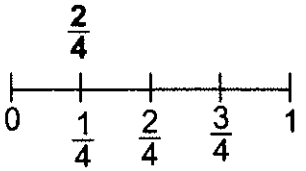


This shape has 6 parts.
3 parts are shaded.
This equals $\frac{3}{6}$, which is the same amount as $\frac{1}{2}$.

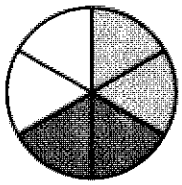
$\frac{3}{6}$ and $\frac{1}{2}$ are equivalent fractions.

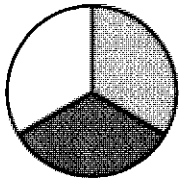
B) $\frac{1}{2}$ and $\frac{2}{4}$ have different numerators and denominators, but they represent the same amount. They are equivalent fractions.





C) Pumpkin pie is Dave's favourite pie.
Would he rather have $\frac{1}{3}$ or $\frac{2}{6}$ of the pie?





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

Answer: $\frac{1}{3}$ and $\frac{2}{6}$ are equivalent fractions. They represent the same amount of pie.

Identifying Equivalent Fractions Using Multiplication

Multiply the numerator and the denominator of a fraction by the same number to get an equivalent fraction.

Examples

A) Are $\frac{2}{6}$ and $\frac{6}{18}$ equivalent fractions?

$\frac{2}{6} \times 3 = \frac{6}{18}$ $\frac{2}{6}$ and $\frac{6}{18}$ are equivalent fractions.

B) Are $\frac{4}{5}$ and $\frac{16}{20}$ equivalent fractions?

$\frac{4}{5} \times 4 = \frac{16}{20}$ $\frac{4}{5}$ and $\frac{16}{20}$ are equivalent fractions.

C) Are $\frac{3}{4}$ and $\frac{21}{28}$ equivalent fractions?

$\frac{3}{4} \times 7 = \frac{21}{28}$ $\frac{3}{4}$ and $\frac{21}{28}$ are equivalent fractions.

Identifying Equivalent Fractions Using Division

Divide the numerator and denominator by the same number to get equivalent fractions and to reduce fractions to their **lowest form**.

Examples

A) Are $\frac{6}{10}$ and $\frac{3}{5}$ equivalent fractions?

$\frac{6}{10} \div 2 = \frac{3}{5}$

$\frac{6}{10}$ and $\frac{3}{5}$ are equivalent fractions.

B) Are $\frac{9}{24}$ and $\frac{3}{8}$ equivalent fractions?

$\frac{9}{24} \div 3 = \frac{3}{8}$

C) Are $\frac{6}{36}$ and $\frac{1}{6}$ equivalent fractions?

$\frac{6}{36} \div 6 = \frac{1}{6}$

Identifying Equivalent Fractions Using LCM

Lowest Common Multiples (LCM) can be used to find a common denominator when adding and subtracting fractions and mixed numbers.

To find equivalent fractions of two or more fractions, list multiples of each denominator.

Identify the smallest (lowest) multiple that is present in both sets.

Examples

A) Find LCMs to add $\frac{2}{3} + \frac{1}{4}$.

Identify the multiples of 3 and 4.

The multiples of 3: 3, 6, 9, 12, 15, ...
The multiples of 4: 4, 8, 12, 16, ...

The smallest multiple that is the same in both sets is 12.

The lowest common multiple, also called **lowest common denominator (LCD)** for 3 and 4 is 12.

Identify equivalent fractions of $\frac{2}{3}$ and $\frac{1}{4}$ using 12 (LCM) as the denominator.

$\frac{2}{3} = \frac{?}{12}$ What number multiplied by 3 equals 12? The number is 4. Multiply the numerator 2 by 4 = 8.

$\frac{2 \times 4}{3 \times 4} = \frac{8}{12}$

$\frac{1}{4} = \frac{?}{12}$ What number multiplied by 4 equals 12? The number is 3. Multiply the numerator 1 by 3 = 3.

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

Now, add the equivalent fractions.

$\frac{8}{12} + \frac{3}{12} = \frac{11}{12}$

> Remember, to find equivalent fractions, multiply or divide the numerator and denominator by the same number.

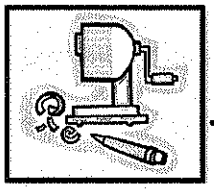
B) Find LCMs to add $\frac{3}{8} + \frac{4}{6}$.

The multiples of 8: 8, 16, **24**, 32, ...
The multiples of 6: 6, 12, 18, **24**, ...

The LCD or LCM is 24.

$\frac{3 \times 3}{8 \times 3} = \frac{9}{24}$ $\frac{4 \times 4}{6 \times 4} = \frac{16}{24}$

$\frac{9}{24} + \frac{16}{24} = \frac{25}{24} = 1\frac{1}{24}$



Practice: Identifying Equivalent Fractions

1. Use fraction circles or other strategies to show that the following fractions are equivalent; that is, they represent the same amount.

   $\frac{2}{4}$ and $\frac{4}{8}$ $\qquad$ $\frac{4}{6}$ and $\frac{12}{18}$

   $\frac{1}{3}$ and $\frac{3}{9}$ $\qquad$ $\frac{6}{7}$ and $\frac{12}{14}$

   $\frac{2}{5}$ and $\frac{6}{15}$ $\qquad$ $\frac{1}{2}$ and $\frac{9}{18}$

2. Use multiplication to find 3 equivalent fractions for each of the following. Prepare to explain your strategy.

   a) $\frac{1}{4}$ $\qquad$ c) $\frac{3}{8}$

   b) $\frac{4}{9}$ $\qquad$ d) $\frac{7}{12}$

3. Use division to find 2 equivalent fractions for each of the following. Prepare to explain your strategy.

   a) $\frac{40}{60}$ $\qquad$ c) $\frac{24}{36}$

   b) $\frac{30}{100}$ $\qquad$ d) $\frac{100}{1000}$

4. Four friends all work on the school newspaper. For this month's edition, Garth contributed $1\frac{1}{4}$ pages, Graham contributed $2\frac{3}{4}$ pages, Cody contributed $3\frac{1}{3}$ pages and Carrie contributed $\frac{1}{2}$ page. The principal wrote a full page that was also added to the paper.

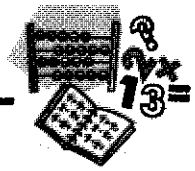
   To make the paper a full 9 pages, how many more pages must be added?

   How many pages does the paper have?

5. Selma is a cook at a busy diner. The lunch-hour rush is about to begin and she has misplaced some of her measuring utensils. Look at the following chart and fill in the missing numerator or denominator. Supply the correct answer so that Selma's meals remain tasty! The first one has been done for you.

Amount of ingredient necessary	Multiply by	Equivalent measuring amount
$\frac{2}{3}$	$\frac{2}{3} \times \frac{2}{2}$	$\frac{4}{6}$
$\frac{3}{4}$		$= \frac{?}{8}$
$\frac{1}{5}$		$= \frac{3}{?}$
$\frac{1}{2}$		$= \frac{8}{?}$
$\frac{4}{6}$		$= \frac{?}{8}$
$\frac{5}{7}$		$= \frac{15}{?}$

Reducing Fractions to Lowest Form



Solutions for fraction problems should be shown in their lowest form or smallest equivalent fraction.

Reducing Fractions Using Division

Find a number that can be divided into both the numerator and denominator. Divide, then repeat until the numerator and denominator cannot be divided further.

Example

$\underline{36} \div 2 = \underline{18} \div 3 = \underline{6} \div 2 \underline{3}$
$48 \div 2 = 24 \div 3 = 8 \div 2 \; 4$

$\underline{24} \div 3 = \underline{8} \div 2 = \underline{4}$
$30 \div 3 = 10 \div 2 = 5$

$\frac{3}{4}$ is the lowest form of $\frac{36}{48}$

Reducing Fractions Using Greatest Common Factors

Identify factors and the greatest common factor (GCF) of the numbers.

Example To reduce $\frac{21}{28}$ to its lowest form, identify the factors of 21 and 28.

The set of factors for 21: 1, 3, 7, 21.
The set of factors for 28: 1, 2, 4, 7, 14, 28.

The GCF of 21 and 28 is 7.

Divide $\underline{21} \div 7 = \underline{3}$
$28 \div 7 = 4$

$\frac{3}{4}$ is the lowest form of $\frac{21}{28}$

Reducing Improper Fractions to Lowest Form

To reduce an improper fraction to its lowest form, divide the denominator into the numerator. When you reduce an improper fraction to its lowest form, you get a mixed number.

Examples

A) $\frac{9}{7}$

$$7\overline{)\,9}\;\begin{matrix}1\\ -7\\ \hline 2\end{matrix} \quad = 1\tfrac{2}{7}$$

B) $\frac{24}{8}$

$$8\overline{)\,24}\;\begin{matrix}3\\ \\ \hline \end{matrix} \quad = 3$$

C) $\frac{17}{5}$

$$5\overline{)\,17}\;\begin{matrix}3\\ -15\\ \hline 2\end{matrix} \quad = 3\tfrac{2}{5}$$

D) $\frac{7}{8}+\frac{1}{8}=\frac{8}{8}=1$ $\frac{8}{8}$ represents 1 whole

E) $\frac{3}{4}+\frac{2}{4}=\frac{5}{4}$ $\frac{5}{4}$ represents 1 whole and $\frac{1}{4} = \rightarrow 1\frac{1}{4}$

F) $4\frac{2}{3}+1\frac{2}{3}=5\frac{4}{3}$, $\frac{4}{3}$ represents 1 whole and $\frac{1}{3} \rightarrow 1\frac{1}{3}$

Reducing Mixed Improper Numbers to Lowest Form

Examples

A) $6\frac{1}{2}$

$+\ 1\frac{1}{2}$ $\frac{2}{2}$ represents 1 whole

$7\frac{2}{2}$ Add 7 + 1 = **8**

B) $2\frac{4}{5}$

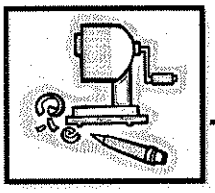
$+\ \frac{3}{5}$ $\frac{7}{5}$ represents 1 whole and the fraction $\frac{2}{5}$

$3\frac{7}{5}$ Add 3 + 1 + $\frac{2}{5}$ = $4\frac{2}{5}$

C) $7\frac{8}{9}$ $\frac{15}{9}$ represents 1 whole and the fraction $\frac{6}{9}$

$+\ 1\frac{7}{9}$ Add 8 + 1 + $\frac{6}{9}$

$8\frac{15}{9}$ Reduce to lowest form = $9\frac{2}{3}$



Practice: Reducing Fractions

1. Use fraction circles, drawings, a computer or other methods to identify one equivalent fraction for each of the following:

$$\frac{1}{4}, \frac{2}{12}, \frac{5}{10}, \frac{3}{12}, \frac{6}{8}, \frac{4}{6}, \frac{9}{12}, \frac{2}{4}$$

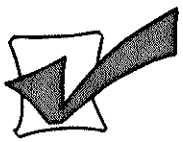
   Identify the **lowest forms** of the fractions above.

2. Use reducing strategies, such as identifying GCF, to convert the following fractions to their lowest terms. The first one has been done for you.

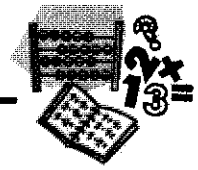
Fraction	Divided by	Lowest form
$\frac{14}{18}$	$\frac{14 \div 2}{18 \div 2}$	$\frac{7}{9}$
$\frac{20}{24}$		
$\frac{18}{27}$		
$\frac{10}{25}$		
$\frac{12}{18}$		
$\frac{16}{36}$		

3. Use GCF, LCM or other strategies to fill in the missing sections in the table below. The first one has been done for you.

Fraction	Lowest form
$\frac{12}{16}$	$\frac{3}{4}$
	$\frac{5}{6}$
	$\frac{3}{4}$
$\frac{18}{24}$	
	$\frac{1}{4}$
$\frac{20}{55}$	
	$\frac{2}{3}$
$\frac{28}{42}$	



Adding and Subtracting Fractions with Like Denominators



Adding Fractions with Like Denominators

To add fractions they must have a common denominator.

To add proper or improper fractions with the same denominator:

- add the numerators together
- the denominator stays the same.

Examples

A) $\frac{2}{8} + \frac{3}{8} = \frac{5}{8}$

8 parts
2 shaded
$\frac{2}{8}$ shaded

8 parts
3 shaded
$\frac{3}{8}$ shaded

8 parts
5 shaded
$\frac{5}{8}$ shaded

B) $\frac{6}{21} + \frac{11}{21} = \frac{17}{21}$

21 parts
6 shaded
$\frac{6}{21}$ shaded

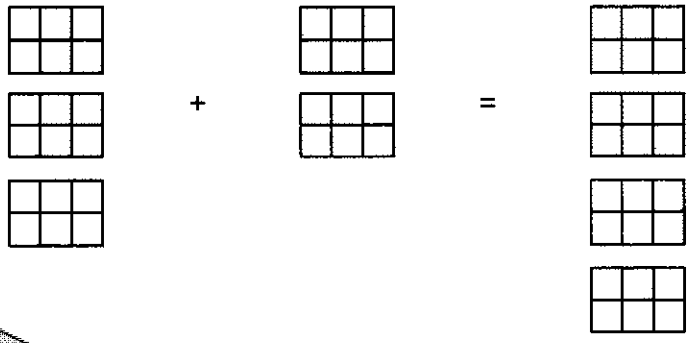
21 parts
11 shaded
$\frac{11}{21}$ shaded

21 parts
17 shaded
$\frac{17}{21}$ shaded

To add mixed numbers with the same denominator:

- add the whole numbers together
- add the numerators
- the denominator stays the same.

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



Examples

A) $2\frac{2}{6}$

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

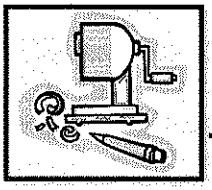
$3\frac{3}{6} \rightarrow$ reduce to lowest form = $3\frac{1}{2}$

B) $4\frac{1}{16}$

$+3\frac{5}{16}$

$+\frac{6}{16}$

$7\frac{12}{16} \rightarrow$ reduce to lowest form = $7\frac{3}{4}$



Practice: Adding Fractions with Like Denominators

1. Use paper and pencil, fraction circles or other methods to demonstrate adding the following fractions and solve. Reduce answers to **lowest forms**. The first two questions have been done for you.

   a) $\frac{4}{5} + \frac{1}{5} = \frac{5}{5} = 1$

   b) $\frac{3}{8} + \frac{2}{8} = \frac{5}{8}$

   c) $\frac{3}{24} + \frac{8}{24} =$ _____

   d) $\frac{6}{10} + \frac{3}{10} =$ _____

   e) $\frac{3}{9} + \frac{4}{9} =$ _____

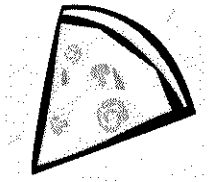
   f) $\frac{5}{12} + \frac{6}{12} =$ _____

   g) $\frac{9}{14} + \frac{2}{14} =$ _____

   h) $\frac{1}{6} + \frac{3}{6} =$ _____

2. After painting her room, Maryann had $\frac{3}{8}$ cans of burgundy and $\frac{4}{8}$ cans of taupe paint left. How much paint in all did Maryann have left over?

3. At the end of the class pizza party, Frank tried to determine how much pizza was left. Each pizza originally had 8 slices. There was 1 slice of pepperoni left, 2 slices of Hawaiian and 3 slices of supreme. In fraction form, how much pizza was left?



4. Jim needs 2 inches of ribbon to finish his project. He measured the three scraps of ribbon leftover and he had $\frac{1}{3}$ inch, $\frac{5}{8}$ inch and $\frac{3}{4}$ inch. How much ribbon does Jim have leftover? Does Jim have enough ribbon left over to finish his project?

5. Use paper and pencil, fraction circles, a calculator or another method to add the following.

   a) $\frac{4}{8} + \frac{1}{8} =$

   b) $2\frac{3}{7} + 1\frac{2}{7} =$

   c) $14\frac{1}{5} + \frac{3}{5} =$

   d) $\frac{2}{9} + 6\frac{3}{9} =$

6. Fay made two pies for a picnic. $\frac{2}{6}$ of her apple pie and $\frac{1}{6}$ of her cherry pie were left. How much pie in total did she take home?

7. Jeff did schoolwork for almost one hour, as shown below.
   - Review: 15 min $\rightarrow \frac{15}{60}$
   - Reading notes: 7 min $\rightarrow \frac{7}{60}$
   - Practicing math: 20 min $\rightarrow \frac{20}{60}$

   Show Jeff's total time for doing schoolwork in lowest fraction form.

Subtracting Fractions with Like Denominators

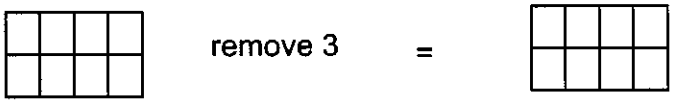
To subtract fractions, they must have a common denominator.

To subtract proper or improper fractions with the same denominator:

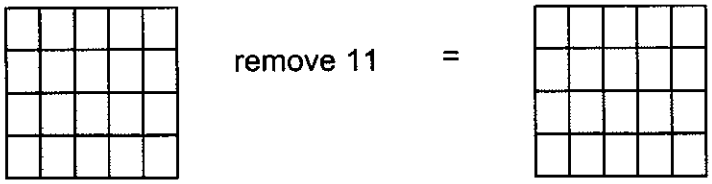
- subtract the numerators
- the denominator stays the same.

Examples

A) $\frac{4}{8} - \frac{3}{8} = \frac{1}{8}$



B) $\frac{15}{20} - \frac{11}{20} = \frac{4}{20}$

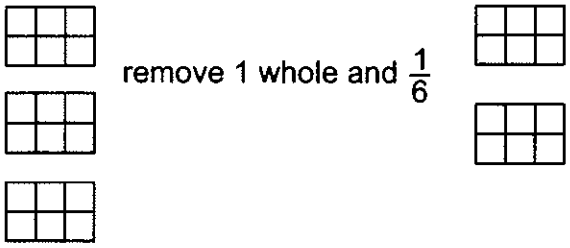


To subtract mixed numbers with the same denominator:

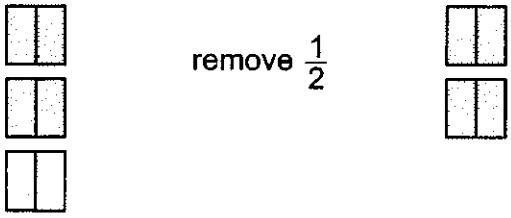
- subtract the whole number
- subtract the numerators
- the denominator stays the same.

Examples

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



$2\frac{1}{2} - \frac{1}{2} = 2$



Special Cases of Subtraction

Subtracting from 1

Fractions that have the same numerator and denominator represent one whole.

Examples

A) $\frac{4}{4} = 1$

B) $\frac{8}{8} = 1$

C) $\frac{250}{250} = 1$

1 is one whole and can represent any fraction as needed.

Examples

A) $1 = \frac{6}{6}$

B) $1 = \frac{7}{7}$

C) $1 = \frac{40}{40}$

To add or subtract fractions, the same denominator is needed.

Examples

A) To subtract $1 - \frac{2}{5}$, convert the 1 into the fraction $\frac{5}{5}$.

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

B) To subtract $1 - \frac{4}{7}$, change 1 to the fraction $\frac{7}{7}$.

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

Subtracting from a whole number 2 or greater

Examples

A) To subtract $2 - \frac{1}{6}$, borrow 1 whole from 2.

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

The borrowed 1 becomes the fraction $\frac{6}{6}$, because the denominator of $\frac{1}{6}$ is 6.

B) To subtract $5 - \frac{7}{8}$, borrow 1 whole from 5.

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

The borrowed 1 becomes the fraction $\frac{8}{8}$, because the denominator in $\frac{1}{8}$ is 8.

Subtracting a fraction of greater value from a fraction of less value in mixed numbers

Examples

A)

$3\frac{1}{6} - \frac{3}{6} = 2\frac{7}{6} - \frac{3}{6} = 2\frac{4}{6} = 2\frac{2}{3}$

$\frac{3}{6}$ is larger than $\frac{1}{6}$, so 1 must be borrowed from 3.

The borrowed 1 becomes $\frac{6}{6}$ because 6 is the denominator. Add $\frac{1}{6} + \frac{6}{6} = \frac{7}{6}$.

Subtract $7 - 3 = 4$

Reduce to lowest form

B)

$8\frac{2}{7} - 3\frac{4}{7} = 7\frac{9}{7} - 3\frac{4}{7} = 4\frac{5}{7}$

$\frac{2}{7} <$ (is smaller than) $\frac{4}{7}$. Borrow 1 whole from 8.

The borrowed 1 becomes $\frac{7}{7}$ because 7 is the denominator.
Add $\frac{2}{7} + \frac{7}{7} = \frac{9}{7}$.

Subtract $7 - 3 = 4$

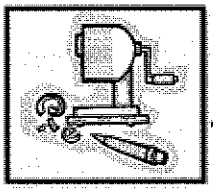
Subtract $9 - 4 = 5$

Subtracting a whole number from a mixed number

Example

$2\frac{1}{2} - 1 = 1\frac{1}{2}$

Subtract the whole number. $2 - 1 = 1$
Subtract 0 from $\frac{1}{2}$.



Practice: Subtracting Fractions and Mixed Numbers with Like Denominators

1. Use paper and pencil, fraction circles, calculators or other methods to subtract the following. Reduce to lowest form.

   a) $\frac{6}{7} - \frac{2}{7}$

   b) $\frac{10}{10} - \frac{3}{10}$

   c) $\frac{10}{12} - \frac{3}{12}$

   d) $\frac{6}{12} - \frac{5}{12}$

   e) $\frac{9}{14} - \frac{2}{14}$

   f) $\frac{3}{6} - \frac{1}{6}$

2. Tilly was working on a science project. To manage her time, she divided her project into 9 parts. If Tilly has already completed $\frac{4}{9}$ of her project, how much of her project, in fraction form, does she have left?

3. Kari usually takes $\frac{40}{60}$ h to feed the chickens. Today she took only $\frac{35}{60}$ h. How much extra time does Kari have? Show your answer in fraction form.

4. Use paper and pencil, fraction circles, a calculator or another method to solve the following.

a) $4\frac{5}{7} - 2\frac{3}{7}$

b) $3 - 1\frac{1}{4}$

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

d) $10\frac{1}{5} - 9\frac{4}{5}$

5. Mr. Cardinal had $4\frac{3}{4}$ cans of paint and used $3\frac{1}{4}$. How much paint does he have left?

6. Judy was to run $6\frac{5}{8}$ laps to train for a race. She ran $5\frac{2}{8}$. How many laps does she need to run to complete her training?

7. Kalia brought $3\frac{1}{4}$ packages of balloons to decorate the gym. When they were done, there was $\frac{3}{4}$ of a package of balloons left. How many packages were used to decorate the gym?

8. Solve the following. Record each answer in a complete sentence and in lowest terms.
   1. A bannock recipe calls for $2\frac{3}{4}$ cups of flour. Robert added $1\frac{1}{4}$ cups and then ran out of flour. How much more flour needs to be added?

   2. Les baked 48 cookies for the bake sale at school, and sold 36 of them. In fraction form, how many cookies did Les sell?

   3. When making homemade turkey soup, Lora added $8\frac{3}{6}$ cups of water to make the broth. After adding the vegetables, she added another $3\frac{2}{6}$ cups of water. How much water did Lora add all together?

Adding and Subtracting Fractions with Unlike Denominators

Adding fractions is important when dealing with measurement. For example, a carpenter makes several measurements such as:

$\frac{1}{8}$ inch, $\frac{1}{2}$ inch and $\frac{3}{4}$ inch

Now how does he or she add the measurements to figure out the total length needed? Finds the LCD, of course!

When adding or subtracting fractions, the fractions must have a common denominator. You can get a common denominator by finding the equivalent fractions with the lowest common denominator (LCD).

Examples **A)** $\frac{5}{10}+\frac{13}{15}=?$

Step 1: Find the lowest common multiple of the denominators (this will be the lowest common denominator).

10: 10, 20, 30, 40, ...
15: 15, 30, 45, ...

The LCD of 10 and 15 is 30.

Step 2: Find the equivalent fractions with the lowest common denominator.

$$\frac{5}{10}\times\frac{3}{3}=\frac{15}{30} \qquad \frac{13}{15}\times\frac{2}{2}=\frac{26}{30}$$

Step 3: Add the two fractions.

$$\frac{15}{30}+\frac{26}{30}=\frac{41}{30}$$

Step 4: Reduce the improper fraction by dividing the denominator into the numerator.

$$30\overline{)41}\ \begin{array}{l}1\\ \text{-}30\\ 11\end{array} \quad = 1\frac{11}{30}$$

B) $2\frac{5}{6} + 3\frac{1}{7} = ?$

The set of multiples of 6: 6, 12, 18, 24, 30, 36, 42, ...
The set of multiples of 7: 7, 14, 21, 28, 35, 42, ...

The LCD is 42.

$$2\frac{5 \times 7}{6 \times 7} = \frac{35}{42}$$
$$+3\frac{1 \times 6}{7 \times 6} = \frac{6}{42}$$
$$\frac{41}{42} = 5\frac{41}{42}$$

C) If a punch recipe calls for $1\frac{1}{4}$ c of pop, $\frac{2}{3}$ c of raspberry juice and $\frac{3}{4}$ c of cranberry juice, how much punch will there be in total?

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

Find the LCM of 4 and 3.

The set of multiples of 4: 4, 8, 12, 16, ...
The set of multiples of 3: 3, 6, 9, 12, ...

The LCD is 12.

Calculate equivalent fractions with denominators of 12.

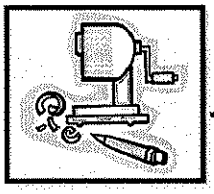
$$1\frac{1 \times 3}{4 \times 3} = 1\frac{3}{12}$$

$$\frac{2 \times 4}{3 \times 4} = \frac{8}{12}$$

$$\frac{3 \times 3}{4 \times 3} = \frac{9}{12}$$

Add and reduce to lowest form.

$$1\frac{3}{12} + \frac{8}{12} + \frac{9}{12} = 1\frac{20}{12}, \quad 12\overline{)\,20}\ \begin{matrix}1\\ -12\\ \hline 8\end{matrix} \quad = 1\frac{8}{12} + 1 = 2\frac{2}{3}$$



Practice: Adding and Subtracting Fractions and Mixed Numbers with Unlike Denominators

1. Find a partner. Each partner writes down two fractions with different denominators. Exchange papers and add the fractions together.

2. Bob is responsible for stocking shelves at a busy grocery store. His boss has asked him to calculate how many boxes he is able to unpack between customers. Complete the chart below. The first one has been done for you.

Day of the week	Boxes unpacked in the morning	Boxes unpacked in the afternoon	Lowest Common Denominator	Conversions		Operation	Total (Morning + Afternoon)
				Morning	Afternoon		
Monday	$\frac{3}{4}$	$\frac{2}{3}$	12	$\frac{3}{4}=\frac{9}{12}$	$\frac{2}{3}=\frac{8}{12}$	$\frac{9}{12}+\frac{8}{12}$	$\frac{17}{12}=1\frac{5}{12}$
Tuesday	$\frac{1}{2}$	$\frac{5}{6}$					
Wednesday	$\frac{4}{5}$	$\frac{1}{2}$					
Thursday	$\frac{4}{7}$	$\frac{2}{3}$					
Friday	$2\frac{1}{3}$	$1\frac{1}{2}$					

Answer the following questions in complete sentences:

a) How many more boxes were unpacked on Friday than Tuesday?

b) On which day were the most boxes unpacked? The least?

3. Julie is a plumber and makes many house calls. She bills her clients by the hour and records each job in fraction form. Complete the chart below to indicate Julie's hours for the week. The first one has been done for you.

Day of the week	Billable hours in the morning	Billable hours in the afternoon	Lowest Common Denominator	Conversions		Total hours (Morning + Afternoon)
				Morning	Afternoon	
Monday	$1\frac{1}{4}$	$2\frac{2}{3}$	12	$\frac{1}{4}=\frac{3}{12}(+1)$	$\frac{2}{3}=\frac{8}{12}(+2)$	$3+\frac{8+3}{12}=3\frac{11}{12}$
Tuesday	$4\frac{3}{4}$	$1\frac{1}{2}$				
Wednesday	$3\frac{4}{5}$	$1\frac{1}{3}$				
Thursday	$1\frac{1}{8}$	$2\frac{5}{6}$				
Friday	$\frac{1}{2}$	$3\frac{4}{6}$				

4. Sonya stacked shelves in a warehouse using a mechanical stacker. Each day, a goal was set in the morning for her to achieve by the end of the day. These goals were set according to what she was stacking. She recorded the amount of shelves she stacked at noon to evaluate her progress. Use Sonya's chart to determine how many more shelves she needs to stack to reach the daily goals. The first one has been done for you.

Day of the week	Goal	Noon	Lowest Common Denominator	Conversions		Operation	Amount she needs to stack to reach her goal
				Goal	Noon		
Monday	$12\frac{3}{8}$	$5\frac{1}{5}$	8: 8, 16, 24, 32, 40 5: 5, 10, 15, 20, 40 40	$\frac{3}{8}\times\frac{5}{5}=\frac{15}{40}$	$\frac{1}{5}\times\frac{8}{8}=\frac{8}{40}$	$12\frac{15}{40}$ $-5\frac{8}{40}$ $7\frac{7}{40}$	$7\frac{7}{40}$
Tuesday	$20\frac{1}{6}$	$10\frac{2}{4}$					
Wednesday	$16\frac{4}{9}$	$9\frac{1}{3}$					
Thursday	22	$10\frac{1}{2}$					
Friday	$18\frac{3}{8}$	11					

5. Terry biked to the west coast and returned using a different route. His trip to the coast took him $12\frac{3}{4}$ h and his return trip was $9\frac{3}{12}$ h. How much time did he save on his return trip?

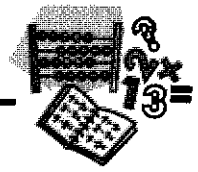
6. Selina loaded boxes of corn onto a truck after school. The boxes were not always full. Selina estimated and recorded the amount in each box, then totaled the amount at the end of her shift. The following chart represents one shift.

Box	Estimate of Amount
1	$\frac{3}{4}$ full
2	$\frac{2}{3}$ full
3	$\frac{7}{8}$ full
4	$\frac{3}{4}$ full
5	$\frac{5}{6}$ full

Use a variety of strategies, such as LCM and LCD, to total Selina's estimates for her shift.

7. Brad poured $3\frac{7}{8}$ L of oil into his car following an oil and filter change. In two months, he added another $2\frac{4}{5}$ L of oil. How much oil had Brad's car used in the two months?

Multiplying Fractions



How well do you know your multiplication facts?
Review Multiplying Whole Numbers

To multiply fractions:

- Multiply the numerators together.
- Multiply the denominators together.
- Reduce to lowest form.

Examples

Multiply the numerators

A) $\frac{3}{4} \times \frac{2}{3} = \frac{3 \times 2}{4 \times 3} = \frac{6}{12} \Rightarrow \frac{6 \div 6}{12 \div 6} = \frac{1}{2}$

Multiply the denominators

Reduce to lowest form

B) $\frac{4}{5} \times \frac{5}{7} = \frac{4 \times 5}{5 \times 7} = \frac{20}{35} \Rightarrow \frac{20 \div 5}{35 \div 5} = \frac{4}{7}$

C) Paige was reading a thick book. She was $\frac{3}{4}$ of the way through the book. If she read $\frac{1}{2}$ of the remaining pages in one night, how much would she have left to read?

To find $\frac{1}{2}$ of $\frac{1}{4}$ you have to multiply.

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

Paige has $\frac{1}{8}$ of her book left to read.

Multiplying Mixed Numbers

Mixed numbers can be multiplied using the method below.

Examples **A)** $2\frac{1}{3} \times 3\frac{3}{4}$

Procedure	Example
Convert each mixed number to an improper fraction.	$2\frac{1}{3}=\frac{7}{3}$ $3\frac{3}{4}=\frac{15}{4}$
Multiply the numerators.	$15 \times 7 = 105$
Multiply the denominators.	$3 \times 4 = 12$
Convert the fraction to a mixed number by dividing the denominator into the numerator and reduce to lowest terms.	$\frac{105}{12} = 12\overline{)105}$ $= 6\frac{1}{4}$

B) Nora saw jeans on sale for 1/3 off the regular price of $24. How much will Nora save if she purchases the jeans?

Find $\frac{1}{3}$ of $24

$\frac{1}{3} \times \frac{24}{1} = \frac{1 \times 24}{3 \times 1} = \frac{24}{3}$

$24 \div 3 = 8$. Nora will save $8.00.

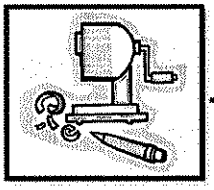
C) Nakita has a novel to read for her English class. It has 175 pages. She must have $\frac{2}{3}$ of the book read by the end of next week. How many pages must Nakita read?

Find $\frac{2}{3}$ of 175

$\frac{2}{3} \times \frac{175}{1} = \frac{350}{3} = 116.66 = 117$

Nakita has 117 pages to read.

Notice that the answer is rounded to the nearest whole number.



Practice: Multiplying Fractions

1. In your notebook, answer the following questions using the pencil/paper method. Reduce to lowest form.

a) $\frac{1}{2} \times \frac{1}{4} =$

b) $\frac{3}{4} \times \frac{1}{3} =$

c) $\frac{1}{4} \times \frac{2}{3} =$

d) $\frac{4}{6} \times \frac{1}{2} =$

e) $\frac{3}{5} \times \frac{4}{9} =$

f) $\frac{2}{6} \times \frac{3}{4} =$

g) $\frac{6}{7} \times \frac{1}{5} =$

h) $\frac{2}{4} \times \frac{7}{8} =$

i) $\frac{9}{10} \times \frac{3}{6} =$

2. Solve the following:

   a) $1\frac{1}{4} \times 3\frac{2}{3}$

   b) $4\frac{2}{5} \times 2\frac{1}{2}$

   c) $2\frac{3}{4} \times 3\frac{4}{5}$

   d) $3\frac{4}{5} \times 2\frac{1}{3}$

   e) $4\frac{1}{2} \times 3\frac{3}{4}$

3. Samuel is a carpenter and his first job of the day is to install hinges and knobs on an antique dresser that a client has purchased. Solve the following calculations using diagrams or other strategies. Compare your solution with a classmate.

   a) The wood the dresser is made of is $\frac{3}{4}$ cm thick. Samuel must screw a hinge into the halfway point of the wood. What is $\frac{1}{2}$ of $\frac{3}{4}$?

   b) The length of one of the door handles is $\frac{4}{5}$ cm. What is $\frac{1}{3}$ of the way across the handle. What is $\frac{1}{3}$ of $\frac{4}{5}$?

   c) The width of the dresser's mirror frame is $6\frac{4}{5}$ cm. Samuel must install a decorative metal bar $2\frac{1}{3}$ of the way in from the outside edge of the frame. What is $2\frac{1}{3}$ of $6\frac{4}{5}$?

4. Amanda is adding topsoil to the garden. In total, Amanda has to haul $5\frac{1}{2}$ wheelbarrows of soil to the garden and has completed $\frac{3}{4}$ of the job. How many of the total number of wheelbarrows needed has Amanda hauled?

   Calculate $\frac{3}{4}$ of $5\frac{1}{2}$.

5. Fill in the missing blanks in the chart below. The first two have been done for you.

	Multiply numerators	**Multiply denominators**	**Fraction**	**Round to appropriate terms**
$\frac{3}{4}$ of $26.50	3 × $26.50 = $79.50	4 × 1 = 4	$\frac{\$79.50}{4}$	$19.88
$\frac{5}{6}$ of 197	5 × 197 = 985	6 × 1 = 6	$\frac{985}{6}$	164.17
$\frac{1}{2}$ of 463				
$\frac{1}{2}$ of $19.80				
$\frac{2}{3}$ of $25.12				
$\frac{4}{7}$ of 281				
$\frac{1}{3}$ of $14.95				
$\frac{5}{8}$ of $32.99				
$\frac{1}{3}$ of 126				
$\frac{9}{10}$ of $45.68				

6. Casey works for a temp agency and accepts different jobs each day. Each job requires a different number of hours and each job pays a different daily rate.

   Complete the chart to calculate how much money Casey made each day. Round each answer to the nearest hundredth (cent). The first one has been done for you.

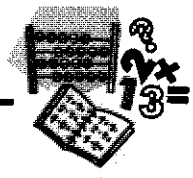
Day	Daily Rate	Time Worked	Solution	Rounded to nearest hundredth
Monday	$186.50	$\frac{2}{3}$ of the day	124.33333 ...	$124.33
Tuesday	$75.00	$\frac{1}{3}$ of the day		
Wednesday	$86.85	$\frac{1}{4}$ of the day		
Thursday	$65.15	$\frac{3}{4}$ of the day		
Friday	$57.28	$\frac{1}{2}$ of the day		

Write the solution in complete sentences.

a) How much time did Casey work in total for the week?

b) How much money did Casey make in total for the week?

Dividing Fractions



Reciprocals

A reciprocal is a fraction that is written upside down. The numerator becomes the denominator and the denominator becomes the numerator.

Check out the reciprocals below.

Fraction	→	Reciprocal
$\frac{5}{6}$	→	$\frac{6}{5}$
$\frac{12}{7}$	→	$\frac{7}{12}$
$\frac{4}{8}$	→	$\frac{8}{4}$
$\frac{6}{5}$	→	$\frac{5}{6}$

When a fraction and its reciprocal are multiplied together, the answer is always 1.

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

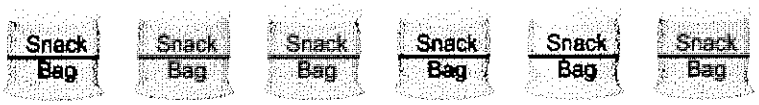
Dividing Fractions Using Mathematical Operations

When dividing fractions, the dividend is multiplied by the reciprocal of the divisor.

Examples A) $\frac{3}{4} \div \frac{1}{2}$

Process	Example
Change the divisor to its reciprocal.	$\frac{1}{2} \times \frac{2}{1}$
Change the division sign to a multiplication sign.	$\frac{3}{4} \times \frac{2}{1}$
Multiply the fractions.	$\frac{3}{4} \times \frac{2}{1} = \frac{6}{4}$
Reduce to the lowest form.	$4\overline{)\,6}\ = 1\frac{2}{4} = 1\frac{1}{2}$ -4 2

B) Seth is planning a high school band trip. He packed 6 bags of his favourite snacks. If he eats $\frac{1}{2}$ of a bag each day, how many days will his snacks last?



$$\frac{6}{1} \div \frac{1}{2} \longrightarrow \frac{6}{1} \times \frac{2}{1} = \frac{12}{1} = 12$$

His snacks will last 12 days.

If Seth eats $\frac{3}{4}$ of a bag of snacks each day, how many days will his snacks last?

$$\frac{6}{1} \div \frac{3}{4} \longrightarrow \frac{6}{1} \times \frac{4}{3} = \frac{24}{3} = 8$$

His snacks will last 8 days.

Dividing Fractions Using Diagrams

Examples

A) What is $\frac{1}{2} \div \frac{1}{4}$?

The shape represents $\frac{1}{2}$ because one part is shaded out of two parts.

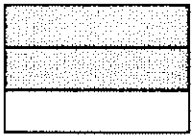
Separate the shape into 4 equal parts.

Now look at the new parts. There are 2 squares that are shaded.
Therefore, $\frac{1}{2} \div \frac{1}{4} = 2$

$$\frac{1}{2} \div \frac{1}{4} \longrightarrow \frac{1}{2} \times \frac{4}{1} = \frac{4}{2} = 2$$

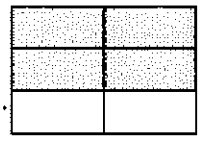
B) Divide $\frac{2}{3}$ by $\frac{1}{6}$.

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



The shape represents $\frac{2}{3}$.

Separate the shape into 6 equal parts.



4 squares are shaded in the new diagram. Therefore, $\frac{2}{3} \div \frac{1}{6} = 4$.

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

Dividing Mixed Numbers

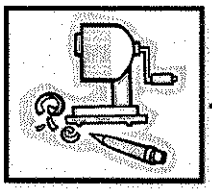
Divide mixed numbers by converting to improper fractions.

Example If Seth ate $1\frac{1}{2}$ bags of snacks each day, how many days would his 6 bags of snacks last?

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

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

His snacks will last 4 days.



Practice: Dividing Fractions

1. Write the reciprocal of each fraction.

   a) $\frac{5}{9}$

   b) $\frac{3}{12}$

   c) $\frac{1}{3}$

   d) $\frac{3}{4}$

   e) $\frac{11}{9}$

   f) $\frac{6}{8}$

   g) $\frac{4}{5}$

   h) $\frac{9}{5}$

   Multiply the fraction by its reciprocal. What solution do you get each time?

2. Solve using diagrams and/or mathematical operations.

   a) $\frac{5}{8} \div \frac{1}{2}$

   b) $4 \div \frac{1}{3}$

   c) $\frac{4}{6} \div \frac{2}{3}$

   d) $1\frac{3}{5} \div \frac{1}{4}$

   e) $\frac{3}{4} \div \frac{1}{8}$

   f) $\frac{5}{6} \div 3\frac{2}{3}$

3. Four friends equally shared $3\frac{1}{5}$ of a pizza. How much pizza will each friend get?

4. To save time during the week, Kolton makes five lunches on Sunday and freezes them. This week, he decided to make five meat pies for his lunches.

Part A: Use diagrams and mathematical operations to determine how long the pies will last in the following situations.

a) If Kolton eats $\frac{1}{2}$ of a pie each day, how many days will the pies last?
Kolton's pies will last _____ days.

b) If Kolton eats $\frac{1}{4}$ of a pie each day, how many days will the pies last?
Kolton's pies will last _____ days.

c) If Kolton eats $\frac{3}{4}$ of a pie each day, how many days will the pies last?
Kolton's pies will last _____ days.

d) If Kolton eats $1\frac{1}{4}$ pies each day, how many days will the pies last?
Kolton's pies will last _____ days.

Part B: Kolton's pies last for 7 days. How many pies did Kolton eat each day?

5 pies divided by 7 days

$5 \div 7 \qquad 5 \times \frac{1}{7} = \frac{5}{7}$

Kolton ate $\frac{5}{7}$ of a pie each day.

a) Kolton's pies lasted for 8 days. How many pies did he eat each day?
Kolton ate _____ (of a) pie(s) each day.

b) Kolton's pies lasted for 12 days. How many pies did he eat each day?
Kolton ate _____ (of a) pie(s) each day.

5. Priya has been performing volunteer work at a centre for inner-city children. She decides to treat the children to a sub lunch. Look at the following chart and determine how many children her orders will feed. Two have been done for you.

Number of subs ordered	Number of subs eaten per student	Division equation	Rewrite the equation	Number of people that the order will feed
5	$\frac{1}{2}$	$\frac{5}{1} \div \frac{1}{2}$	$\frac{5}{1} \times \frac{2}{1}$	10
5	$\frac{1}{3}$			
5	$\frac{1}{4}$			
6	$\frac{1}{2}$			
6	$\frac{1}{3}$			
6	$\frac{1}{4}$			
6	$\frac{3}{4}$	$\frac{6}{1} \div \frac{3}{4}$	$\frac{6}{1} \times \frac{4}{3}$	8
8	$\frac{1}{2}$			
8	$\frac{1}{3}$			
8	$\frac{1}{4}$			

6. Use drawings and/or mathematical operations to solve the following.

a) Klayton has $4\frac{3}{8}$ cans of paint to paint $2\frac{1}{2}$ rooms. How much paint will he use per room?

b) Su-Lin has $7\frac{1}{7}$ m of 1m × 1m plywood to place on 3 walls. How much plywood will she put on each wall?

c) Anton walked $4\frac{1}{2}$ km in 2 hours. How far did he walk in 1 hour?