

Get Ready

Name: _____ Date: _____

Add and Subtract Fractions

To add fractions with like denominators, add the numerators.

$$\begin{array}{r} \frac{1}{5} \\ + \frac{2}{5} \\ \hline = \frac{3}{5} \end{array}$$

Each fraction in the above sum is a **proper fraction**, because the denominator is greater than the numerator.

To subtract fractions with unlike denominators, use a **common denominator**. This is a common multiple of the denominators.

$$\begin{array}{r} \frac{1}{2} - \frac{1}{6} = \\ \frac{3}{6} \\ - \frac{1}{6} \\ \hline = \frac{2}{6} \end{array}$$

Write the answer in lowest terms.

$$\begin{array}{c} \div ? \\ \frac{2}{6} = \frac{1}{3} \\ \div ? \end{array}$$

What is a common factor of 2 and 6?

1. Add. Write each answer in lowest terms.

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

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

c) $\frac{3}{10} + \frac{2}{5}$

2. Subtract. Write each answer in lowest terms.

a) $\frac{7}{8} - \frac{5}{8}$

b) $\frac{4}{5} - \frac{3}{10}$

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

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Add and Subtract Mixed Numbers

A **mixed number** includes a whole number and a fraction.

Write the improper fraction as a mixed number.

$$1\frac{3}{8} + 2\frac{7}{8} = 3 + \frac{10}{8} = 3 + \frac{8}{8} + \frac{2}{8}$$

To subtract mixed numbers, use a common denominator.

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

If the second fraction is bigger than the first, use one of the following methods.

Use an Improper Fraction

$$\begin{aligned} 4\frac{2}{4} - 2\frac{3}{4} &= \frac{18}{4} - \frac{11}{4} \\ &= \frac{7}{4} \\ &= 1\frac{3}{4} \end{aligned}$$

Use Regrouping

$$\begin{aligned} \text{Regroup 1 whole from } 4\frac{2}{4}. \\ 4\frac{2}{4} &= 3 + \frac{4}{4} + \frac{2}{4} \\ &= 3 + \frac{6}{4} \\ 3\frac{6}{4} - 2\frac{3}{4} &= 1\frac{3}{4} \end{aligned}$$

Subtract the whole numbers and subtract the fractions.

Literacy Link

An improper fraction has a numerator greater than the denominator.

3. Add or subtract. Write each answer in lowest terms.

a) $1\frac{1}{5} + 2\frac{3}{5}$

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

c) $2\frac{3}{5} - 1\frac{2}{5}$

d) $2\frac{6}{7} + 2\frac{4}{7}$

4. Add. Write each answer in lowest terms.

a) $1\frac{5}{8} + 2\frac{3}{4}$

b) $3\frac{1}{2} + 3\frac{4}{5}$

5. Subtract. Write each answer in lowest terms.

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

b) $3\frac{3}{4} - 1\frac{1}{2}$

Order of Operations

The **order of operations** is the correct sequence of steps for a calculation.

$$\begin{aligned} &30 - 14 \div (5 - 3) \times 4 + 6 \\ &= 30 - 14 \div 2 \times 4 + 6 \\ &= 30 - 28 + 6 \\ &= 8 \end{aligned}$$

Do brackets first.

Multiply and divide, from left to right.

Add and subtract, from left to right.

6. Calculate. Show your thinking.

a) $3 - 12 \div 2 + 4$

b) $8 + 18 \div 3 - 2 \times (4 + 1)$

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6.1 Multiplying a Fraction and a Whole Number

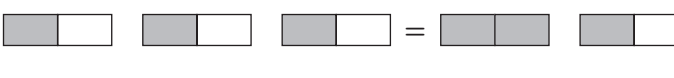
MathLinks 8, pages 198–203

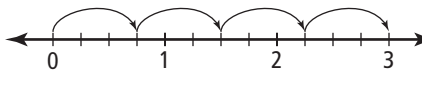
Key Ideas Review

For #1 and #2, unscramble the letters to form a word that correctly completes the statement. Then, complete the examples.

1. Manipulatives and diagrams can be used to model a _____ statement.
ACIILLMNOPTTU

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


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




c) $4 \times \frac{\square}{4} = \frac{\square}{4} = \square$ 


2. Multiplying a _____ and a whole number in _____ order gives the same result.
EEHIRT



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

Practise and Apply

3. Write the multiplication statement that each diagram represents. A  represents one whole.

a)  = 
= 

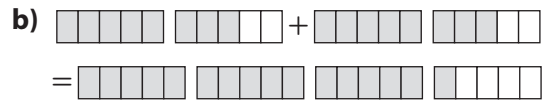
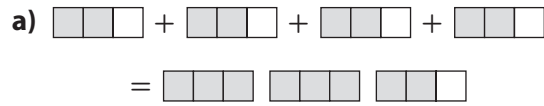
b)  = 

c)  = 

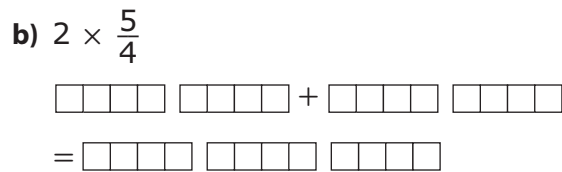
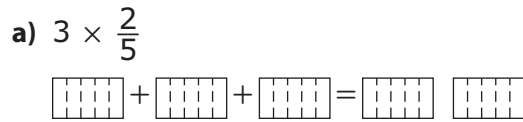
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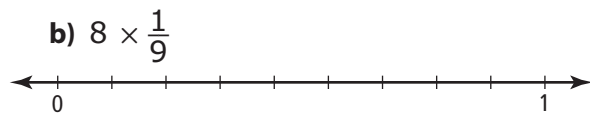
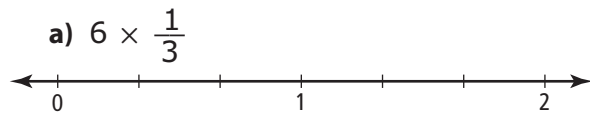
4. Write the multiplication statement represented by each diagram.



5. Shade each set of diagrams to determine the product.



6. Complete each number line to determine the product.



7. Determine each product. Show your thinking.

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

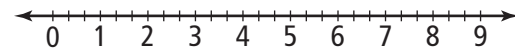
b) $5 \times \frac{1}{8}$

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

d) $3 \times \frac{5}{3}$

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

8. In the her first week on the job, Trindis worked 9 hours. In the second week she worked $\frac{2}{3}$ of that amount. Complete the number line to determine how many hours Trindis worked in the second week.



9. Marik had 11 friends at his birthday party. Each person ate $\frac{1}{4}$ of a pizza. How many pizza's did Marik and his friends eat? Write a multiplication statement to answer the question, then find the product.

10. Jeremy ran around a 150-m track $1\frac{1}{2}$ times. Show two different methods of finding the product of $1\frac{1}{2} \times 150$. How far did Jeremy run?

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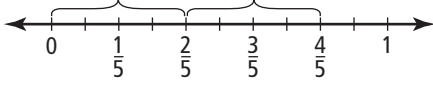
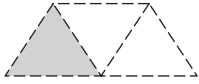
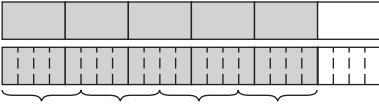
Date: _____

6.2 Dividing a Fraction by a Whole Number


MathLinks 8, pages 204–209

Key Ideas Review

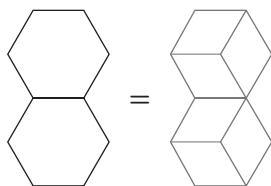
Match each model in column B to a division statement in column A.

A	B
1. $\frac{1}{3} \div 3$ _____	a) 
2. $\frac{5}{6} \div 4$ _____	b) 
3. $\frac{4}{5} \div 2$ _____	c) 

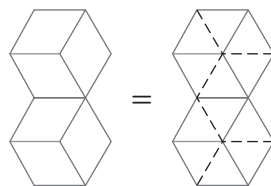
Practise and Apply

4. Determine each quotient. Use the pattern blocks to show your thinking. In this question,  represents 1 whole.

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

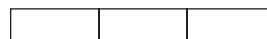


b) $\frac{5}{6} \div 2$

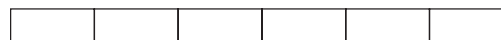


5. Determine each quotient. Use the fraction strips to show your thinking.

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



b) $\frac{5}{6} \div 3$

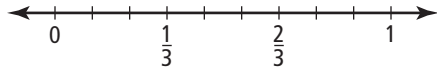


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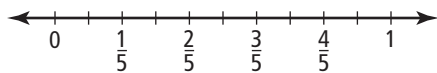
Date: _____

6. Determine each quotient by completing the number lines.

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



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



7. Jim and two friends offered to help Jim's father paint a room. There is $\frac{2}{3}$ of a can of paint left. If the paint is shared evenly, how much paint will each person get?

a) Write a division statement to answer this problem.

b) Use a model to determine the quotient.

8. A board that is $\frac{3}{5}$ of a metre long is cut in half. What fraction of a metre is each piece?

a) Write a division statement to answer this problem.

b) Use a model to determine the quotient.

9. Teresa finds $\frac{9}{12}$ of a chocolate bar to share with 3 friends. What fraction of a chocolate bar does each person get?

a) Write a division statement to answer this problem.

b) Use a model to determine the quotient.

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6.3 Multiplying Proper Fractions

MathLinks 8, pages 210–215

Key Ideas Review

Choose from the following terms to complete #1 to #3.

estimate

multiply

numerators

paper folding

- Two proper fractions can be multiplied using _____ or diagrams.
- A rule for multiplying two proper fractions is to multiply the _____ and _____ the denominators.
- You can _____ the product of two proper fractions by first deciding whether each fraction is closer to 0, $\frac{1}{2}$, or 1.

Practise and Apply

4. Estimate and calculate each product. Show your thinking and express your answer in lowest terms.

a) $\frac{2}{3} \times \frac{5}{6}$

Circle the closest estimate: 0 $\frac{1}{2}$ 1

b) $\frac{4}{9} \times \frac{1}{5}$

Circle the closest estimate: 0 $\frac{1}{2}$ 1

c) $\frac{2}{5} \times \frac{3}{8}$

Circle the closest estimate: 0 $\frac{1}{2}$ 1

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

Circle the closest estimate: 0 $\frac{1}{2}$ 1

e) $\frac{7}{8} \times \frac{3}{5}$

Circle the closest estimate: 0 $\frac{1}{2}$ 1

f) $\frac{9}{10} \times \frac{8}{9}$

Circle the closest estimate: 0 $\frac{1}{2}$ 1

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5. Tamara lives $\frac{3}{4}$ km from school. She runs $\frac{1}{3}$ of the distance and then walks the rest of the way to her house. How far does Tamara run? Show your thinking.
8. Vancouver's population is approximately $\frac{2}{5}$ the population of Toronto. Québec City's population is approximately $\frac{1}{3}$ of Vancouver's population. Compare Québec City's population to Toronto's population.

6. In a grade 8 class, $\frac{1}{2}$ of the students play piano. Of these students, $\frac{1}{4}$ also play guitar. What fraction of this class play both piano and guitar?



9. Hayden's hard drive is $\frac{2}{5}$ filled. The operating system takes up $\frac{1}{10}$ of that space. How much of the whole hard drive is filled by the operating system? Use a model to show your thinking.

7. On a Saturday, Sid helped his father do yard work for $\frac{5}{6}$ of the afternoon. He mowed lawn for $\frac{3}{5}$ of this time. What fraction of the afternoon did Sid spend mowing the lawn? Estimate, then solve.

Estimate:

Solution:

10. An order of bruschetta for 4 uses $\frac{1}{3}$ of a loaf of French bread. How much of a loaf does each person get when they share the order equally?

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6.4

Multiplying Improper Fractions and Mixed Numbers*MathLinks 8, pages 216–221***Key Ideas Review**

1. Decide whether each of the following statements is true or false. Circle the word *True* or *False*. If the statement is false, rewrite it to make it true.

a) **True/False** You can model the multiplication of two mixed numbers or improper fractions using partial areas of a rectangle.

b) **True/False** You can calculate the product of two mixed numbers or improper fractions by multiplying the whole numbers closest to them.

c) **True/False** Two mixed numbers can be multiplied by expressing them as improper fractions and then multiplying the numerators by the denominators.

Practise and Apply

2. Express each improper fraction as a mixed number.

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

b) $\frac{13}{6}$

3. Express each mixed number as an improper fraction.

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

b) $4\frac{2}{3}$

4. Use a model to determine each product.

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

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

5. Estimate and calculate. Show your thinking.

a) $\frac{2}{3} \times \frac{6}{5}$

Estimate: _____

Calculate: _____

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

Estimate: _____

Calculate: _____

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

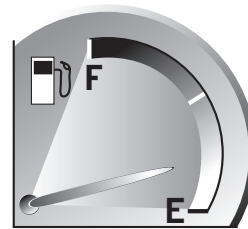
Estimate: _____

Calculate: _____

Name: _____

Date: _____

6. One week, Kristi worked 3 days at a department store for $3\frac{1}{2}$ h each day. She was paid \$9/h.
- How many hours did Kristi work that week? Show your thinking.
 - How much did Kristi earn that week?
7. Jupiter completes about $2\frac{2}{5}$ rotations every 24 hours (an Earth day). How many rotations does Jupiter complete in one Earth week? Show your thinking.



8. A sailboat is sailing at $8\frac{1}{2}$ km/h. If the weather conditions and the current do not change, how far will the sailboat travel in $1\frac{1}{3}$ h? Show your thinking.
11. Owen is $2\frac{1}{4}$ times as old as Robin. When Robin celebrates his 8th birthday, how old will Owen be?



12. The karate club is arranging a grading for its members. It takes $3\frac{1}{4}$ hours to test a group of 4 candidates. How long will the club need the gym in order to process 3 groups of 4 candidates each?

Name: _____

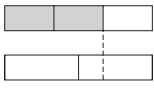
Date: _____

6.5 Dividing Fractions and Mixed Numbers

MathLinks 8, pages 222–229


Key Ideas Review

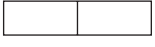

Match each method in column A with the example in column B that best matches it.

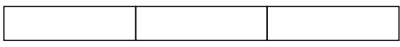
A	B
1. Use diagrams to estimate the quotient of two fractions. _____	a) $3\frac{3}{4} \div 1\frac{1}{2} = \frac{15}{4} \div \frac{3}{2}$ $= \frac{15}{4} \div \frac{6}{4}$ $= \frac{15}{6}$ or $2\frac{1}{2}$
2. Estimate the quotient of two improper fractions or mixed numbers by dividing the whole numbers closest to them. _____	b) 
3. Divide two fractions by writing them with a common denominator, and dividing the numerators. _____	c) $5\frac{1}{5} \div 1\frac{2}{3} \approx 5 \div 2$ $\approx \frac{5}{2}$ or $2\frac{1}{2}$
4. Divide a fraction by multiplying by its reciprocal. _____	d) $\frac{3}{5} \div \frac{6}{7} = \frac{3}{5} \times \frac{7}{6}$ $= \frac{21}{30} = \frac{7}{10}$



Practise and Apply

5. Complete the diagrams to determine each quotient.

a) $\frac{5}{6} \div \frac{1}{3}$ 

b) $1\frac{1}{2} \div \frac{3}{4}$  

c) $\frac{1}{3} \div \frac{1}{2}$ 

d) $1\frac{3}{4} \div \frac{2}{3}$  

7. Divide using multiplication.

a) $\frac{5}{8} \div \frac{2}{3}$

b) $7 \div 4\frac{2}{3}$

c) $1\frac{5}{6} \div \frac{7}{12}$

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

6. Divide using a common denominator. Show your thinking.

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

b) $1\frac{7}{8} \div \frac{3}{4}$

c) $3\frac{3}{10} \div 2\frac{2}{5}$

d) $1\frac{2}{3} \div 2\frac{5}{9}$

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8. Estimate, then divide using a common denominator. Show your thinking.

a) $1\frac{7}{8} \div 1\frac{1}{4}$ Estimate: _____
Calculate:

b) $5\frac{7}{10} \div 3\frac{9}{10}$ Estimate: _____
Calculate:

c) $2\frac{1}{6} \div 1\frac{5}{12}$ Estimate: _____
Calculate:

9. Estimate, then divide using multiplication. Show your thinking.

a) $6\frac{5}{6} \div 3\frac{1}{2}$ Estimate: _____
Calculate:

b) $8\frac{1}{3} \div 2\frac{3}{4}$ Estimate: _____
Calculate:

c) $7\frac{1}{8} \div 4$ Estimate: _____
Calculate:

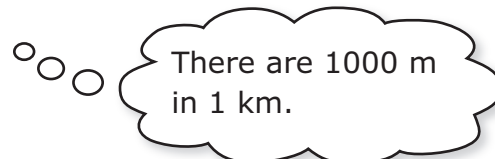
10. Carlos got $\frac{5}{6}$ of the test questions correct. This was 15 questions. How many questions were on the test? Show your thinking.

11. Alisha needed $\frac{3}{4}$ L of gasoline to mow the lawn. There was $3\frac{3}{4}$ L of gasoline in the container. How many times can she mow the lawn before refilling the container? Show your thinking.



12. Jean-Pierre walked $4\frac{1}{2}$ km in $1\frac{1}{4}$ h. If he walked at a steady pace, how fast did he walk in kilometres per hour? Show your thinking.

13. A running track used in competition is $\frac{2}{5}$ km. How many laps is the 1500 m race? Show two ways to solve the problem.



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6.6

Applying Fraction Operations

MathLinks 8, pages 230–235

Key Ideas Review

- Circle the correct response to complete each statement.
 - You need to decide which (operation/manipulation) to perform on fractions to solve problems.
 - Some fraction problems can involve the (computation/order) of operations.
- Number the statements to put the operations in the correct order.

- _____ Add and subtract in order from left to right.
- _____ Brackets
- _____ Multiply and divide in order from left to right.

Practise and Apply

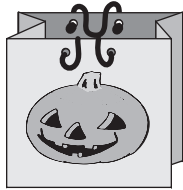
- Circle the first step in calculating the answer, then solve.
 - $\frac{5}{6} - \frac{1}{3} \times \frac{3}{4}$
 - $3\frac{1}{2} \div \frac{3}{4} - \left(1\frac{1}{2} + \frac{5}{6}\right)$
 - $\frac{7}{8} + \frac{2}{3} - \frac{1}{4}$
 - $1\frac{1}{2} \times \frac{1}{3} \div \frac{2}{3}$
- Calculate. Show your thinking.
 - $3 \div \frac{3}{4} + 5 \times \frac{1}{2}$
 - $\frac{2}{3} + \frac{1}{6} \times 1\frac{2}{3}$
 - $\frac{3}{4} \times (12 - 8) - \frac{3}{8}$
 - $3\frac{7}{10} \div \left(1\frac{3}{10} + 1\frac{9}{10}\right)$

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5. Tracy earns \$12 an hour as a cashier in a grocery store. One week she worked 8 hours a day for 5 days. One of these days was a holiday, for which she earned time-and-a-half. How much did Tracy earn that week?

6. Graham saved $1\frac{1}{2}$ bags of Halloween candy to share with two friends. Graham's father asked him to save $\frac{1}{4}$ of a bag for his younger brother. If Graham and his friends each get equal amounts of what is left, how much candy will each of them get?



8. Here is a way of using four 3s and the order of operations to write an expression that equals 5.

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

Use four 3s and the order of operations to write expressions with each of the following values.

a) 0

b) 1

c) 2

d) 3

7. Add one pair of brackets to the left side of each equation to make it true.

a) $\frac{1}{2} + \frac{5}{8} \times \frac{4}{3} + \frac{3}{2} = 3$

b) $1\frac{1}{4} - \frac{1}{8} \div 1\frac{1}{2} - \frac{3}{4} = 1\frac{1}{12}$

c) $\frac{13}{5} - \frac{3}{10} + \frac{7}{10} \div \frac{1}{2} - \frac{3}{5} = 0$

d) $1\frac{1}{4} \times 2\frac{2}{5} \div 2\frac{1}{6} - 1\frac{1}{3} = \frac{2}{39}$

9. Lake Huron has about 2000 km of shoreline. Lake Superior's shoreline is $\frac{1}{2}$ plus $\frac{1}{5}$ of that distance. Write an expression to determine the length of shoreline in Lake Superior, then solve.

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Link It Together

The school band sold juice at the dance as a fundraiser. They bought a concentrate that cost \$2/L. Each litre of concentrate made 4 L of juice. The sizes of the drinks, the cost of each drink, and the number sold are shown in the table.

Size of Drink	Price	Number Sold
Small ($\frac{1}{6}$ L)	\$0.50	16
Medium ($\frac{1}{4}$ L)	\$0.75	27
Large ($\frac{1}{2}$ L)	\$1.00	13



1. How much juice was sold?

a) Estimate the answer. Show your thinking.

b) Calculate.

2. How much money did they raise? Show your thinking.

3. The band bought enough concentrate to make 20 L of juice. How much concentrate did they buy? Use a model to show your thinking.

4. What profit did the band make? Justify your response.

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Vocabulary Link

Unscramble the letters of each term. The terms are one to three words long. Use the clues to help you solve the puzzles.

A	B
1. $\frac{3}{4}$ ← _____	ONODTRIEMAN
2. For $\frac{5}{6}$, this would be $\frac{6}{5}$. _____	AOPCELR CIR
3. You can add or multiply two numbers in any order. For example, $a + b = b + a$ and $a \times b = b \times a$. _____	RTUEECIOOMPVMATYRT
4. $\frac{11}{12}$ ← _____	EANTRMROU
5. $\frac{2}{3}$ _____	ETRNOPRRFAPC IO
6. answer to a division question _____	OETNQITU
7. answer to a multiplication question _____	DURTOPC
8. This would include the following list: <ul style="list-style-type: none"> • brackets • multiply and divide in order • add and subtract in order _____	DEREROROFOIONPATS
9. $2\frac{4}{5}$ _____	BENIMEXMDUR
10. number you are dividing into _____	DDDNIEV
11. $\frac{15}{6}$ _____	PERPINC FOMORRIAT
12. number you are dividing by _____	SIIODVR