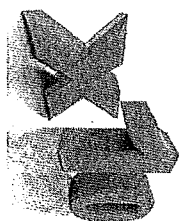


Vocabulary in Action



- A power of 10 is the number 10 multiplied by itself a number of times.
- For each time 10 is multiplied, a zero is added: $10 \times 10 = 100$, $10 \times 10 \times 10 = 1,000$, $10 \times 10 \times 10 \times 10 = 10,000$, and so on.
- A power of 10 can be written with an exponent, a small number written to the top right of the number, telling you how many times 10 was multiplied and how many zeros appear in the product: $10^2 = 10 \times 10 \times 10 = 1,000$; 3 zeros
- Place value is determined by powers of 10.
- $10^0 = 1$, $10^1 = 10$, $10^2 = 100$, $10^3 = 1,000$, and so on.
- Each place value is 10 times larger than the place to the right and $\frac{1}{10}$ as much as the place to the left.
- The value of a digit is determined by its place value.

	$\times 10$	$\times 10$	$\times 10$	
1	2	.	3	6
tens	ones	tenths	hundredths	
$\times \frac{1}{10}$	$\times \frac{1}{10}$	$\times \frac{1}{10}$		

- In the diagram above, the value of the digit 1 is 10 because it is in the tens place.
- The value of the digit 2 is 2 because it is in the ones place.
- The value of the digit 3 is 0.3 because it is in the tenths place.
- The value of the digit 6 is 0.06 because it is in the hundredths place.
- Multiplying and dividing by a power of 10 are inverse operations.
- Multiplying by a power of 10 shifts the digits to the left of the decimal point the same number of places as the exponent: $354.56 \times 10^2 = 354.56 \times 100 = 35,456$. Each digit is 100 times larger.
- Dividing by a power of 10 shifts the digits to the right of the decimal point the same number of places as the exponent: $354.56 \div 10^2 = 3.5456$. Each digit is 100 times smaller.

[2]

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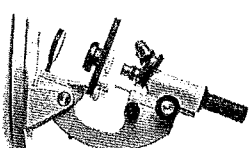
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EXAMPLE

What is 49.33×100 ?

You are multiplying by 10 two times, so the digits shift to the left two places. Each digit is 100 times larger:

$$49.33 \times 100 = 49.33 \times 10 \times 10 = 4,933$$



A microscope can magnify very small things by powers of 10.

When multiplying or dividing by a power of 10, the power will often be written as an exponent. It is much easier to write 5.4×10^3 than $5.4 \times 1,000,000,000$.

EXAMPLE

What is 7.92×10^4 ?

$$7.92 \times 10^4 = 7.92 \times 10 \times 10 \times 10 \times 10 = 79,200$$

You are multiplying by 10 four times. The exponent tells to you shift the digits to the left four places.



A telescope lets us see things that are distant by magnifying by powers of 10.

TURN AND TALK

When you write a whole number, where is the decimal point?

THINK ABOUT IT

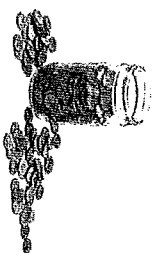
The zeros were added after 792 as place holders so that we know that the 7, 9, and 2 shifted 4 places to the left.

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[3]

GUIDED INSTRUCTION



Money is one situation where you multiply or divide by powers of 10. If you have \$4.35, you have 4.35×100 pennies, or 435 pennies.

1. Compare the value of the 6 in the number 0.26 to the value of the 6 in the number 6.13.

Step One What is the value of the digit 6 in 0.26?

0	0	2	6
tens	ones	tenths	hundredths

The value of the digit 6 is 0.06.

Step Two What is the value of the digit 6 in 6.13?

0	6	1	3
tens	ones	tenths	hundredths

The value of the digit 6 is 6 ones.

Step Three Compare the values.

The value of the 6 in 0.26 is $\frac{1}{100}$ the value of the 6 in 6.13.
The value of 6 in 6.13 is 100 times the value of the 6 in 0.26.

2. Write the number 100,000 as a power of 10 using an exponent.

Step One How many zeros are in 100,000?

There are 5 zeros in 100,000.

Step Two 10 is multiplied 5 times.

$$100,000 = 10 \times 10 \times 10 \times 10 \times 10$$

Step Three The exponent is 5.

$$100,000 = 10^5$$

3. What is $49.33 \div 100$?

Step One Change 100 to its power of 10.

$$49.33 \div 100 =$$

Step Two Change division to multiplication.

$$49.33 \times \frac{1}{100} =$$

Step Three Since you are multiplying by $\frac{1}{100}$, each place value shifts 2 places to the right.

$$49.33 \times \frac{1}{100} = 0.4933$$

4. Use the numbers in the box to make the equations correct.

The numbers cannot be used more than once. Write each number in the appropriate box.

0.021 0.21 2.1 21 210

$$0.21 \times 100 = \underline{21}$$

$$0.21 \div 10 = \underline{0.021}$$

$$\underline{2.1} \times 100 = 210$$

TURN AND TALK

Why is multiplying by $\frac{1}{100}$ the same as dividing by 100?

HINT, HINT

Will the decimal number be smaller or larger after it is multiplied? Will it be smaller or larger after it is divided?





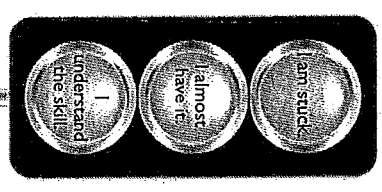
How Am I Doing?

What questions do you have?

TURN AND TALK

Work with a partner. Exponents are often used in science to describe very large or small measures. Using exponential form eliminates working with too many zeros. The planet Jupiter is an average of 4.8×10^8 miles from the sun. What is that number when multiplied?

Color in the traffic signal that shows how you are doing with the skill.



INDEPENDENT PRACTICE

Answer the questions.

1. How many zeros are in $20 \times 100,000$?

- ☐ A 1
- ☐ B 5
- ☐ C 6
- ☐ D 7

2. Select TWO expressions that are equivalent to 1,000,000.

- ☐ A $1 \times 1 \times 1 \times 1 \times 1 \times 1$
- ☐ B $10 \times 10 \times 10 \times 10 \times 10 \times 10$
- ☐ C $10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10$
- ☐ D 1^6
- ☐ E 10^6

3. Which answer best completes the statement "The value of 2 in 21.3 is _____ the value of 2 in the number '12.7'?"

- ☐ A 10 more than
- ☐ B 100 more than
- ☐ C 10 times
- ☐ D 100 times

4. Which symbols will make the equations correct? Write each symbol in the appropriate box.

$2.31 \div 1,000 = 0.00231$ $2.31 \times 10 = 23.1$

TIPS AND TRICKS

Each incorrect answer in a multiple-choice question represents a common mistake. Try to identify the mistake that could lead to each answer choice.

WORK SPACE

WORK SPACE

5. Write numbers in the boxes to make the equations correct.

$$0.4 \times 1,000 = \boxed{400}$$

$$0.04 \times 10,000 = \boxed{400}$$

$$\boxed{4,000} \times \frac{1}{100} = 40$$

6. Part A

What is 1.76×10^3 ?

Write your answer in the box.

$\boxed{1,760}$

Part B

Explain how you found your answer.

Sample answer: When multiplying by a power of 10, the digits shift to the left the same number of places as the number in the exponent. Because the exponent is 3, I moved the digits three places to the left and used a zero as a placeholder in the ones place.

TIPS AND TRICKS

When you are asked to explain your answer, explain both what you did and why you did it.

7.

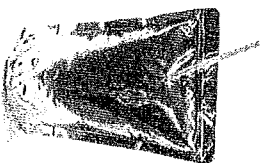
Ravi says that the product of 30 and 10^4 has 4 zeros. Explain why Ravi is incorrect.

Sample answer: When multiplying by a power of 10, the exponent determines the number of zeros that are added to the end of the other factor. The number 30 already has 1 zero, so the product will have a total of 5 zeros, not 4.

EXIT TICKET

5.NBT.1.5.NBT.2

Now that you've mastered multiplying and dividing by powers of 10, let's solve the problem in the Real-World Connection.
Watson Elementary School is collecting and recycling used juice pouches. The school will receive \$0.19 for each juice pouch it collects. How much money will the school receive if it collects 10, 100, 1,000, or 10,000 juice pouches?



10 pouches: \$1.90

100 pouches: \$19.00

1,000 pouches: \$190.00

10,000 pouches: \$1,900.00

$$0.19 \times 10, \text{ or } 0.19 \times 10^1 = 1.9$$

$$0.19 \times 100, \text{ or } 0.19 \times 10^2 = 19$$

$$0.19 \times 1,000, \text{ or } 0.19 \times 10^3 = 190$$

$$0.19 \times 10,000 \text{ or } 0.19 \times 10^4 = 1,900$$

CHAPTER 1

WORD TO KNOW
partial product

Lesson 2

MULTIPLY WHOLE NUMBERS 5.NBT.5

INTRODUCTION

Real-World Connection

The students at Laura's school picked strawberries. They placed 35 berries in each basket. They filled 18 baskets. How many strawberries did they pick? Let's practice the skills in the Guided Instruction and Independent Practice and see how the students solve this problem at the end of the lesson!

What I Am Going to Learn

- How to multiply multi-digit numbers
- How to use partial products in multiplication

What I May Already Know 4.NBT.5, 3.OA.5

- I know how to multiply a number up to 4 digits by a single-digit number.
- I know how to multiply two 2-digit numbers.
- I know how to use the Distributive Property.

Vocabulary in Action

- Multiplication problems can be solved using partial products.
- Partial products are the result of breaking the problem into smaller multiplication problems that can be added together.
- For example, 43×23 can be thought of as $43 \times 3 + 43 \times 20$.
- You may recognize the Distributive Property in partial products.
- Remember problems like $8 \times 9 = 8(5 + 4) = 8 \times 5 + 8 \times 4$?
- For multi-digit multiplication, one number is broken by place value: $534 \times 187 = 534 \times 7 + 534 \times 80 + 534 \times 100$



EXAMPLE

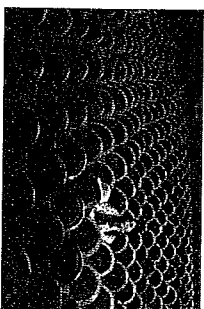
What is 43×23 ?

$$\begin{array}{r} 43 \\ \times 23 \\ \hline 129 \\ + 860 \\ \hline 989 \end{array}$$

Step One Find the first partial product (3×43).

Step Two Find the second partial product (20×43).

Step Three Add to find the total product.



A theater might have 23 rows of 43 seats, for a total of 989 seats.

Regardless of the number of digits, the same process can be used.

EXAMPLE

What is 534×187 ?

$$\begin{array}{r} 534 \\ \times 187 \\ \hline 3738 \\ 42720 \\ + 53400 \\ \hline 99,858 \end{array}$$

There are three partial products:

$$\begin{array}{l} 534 \times 7 = 3,738 \\ 534 \times 80 = 42,720 \\ 534 \times 100 = 53,400 \end{array}$$

HINT, HINT

You can break 3×43 into $3 \times 3 + 3 \times 40$ and 20×43 into $20 \times 3 + 20 \times 40$.

THINK ABOUT IT

You can use estimation to see if your answer is reasonable. 534×187 is about 500×200 , or about 100,000. So, 99,858 is reasonable.

EXAMPLE

What is $2,486 \times 28$?

$$\begin{array}{r} 2,486 \\ \times 28 \\ \hline 19,888 \\ + 49,720 \\ \hline 69,608 \end{array}$$

Step One Multiply $8 \times 2,486 = 19,888$

Step Two Multiply $20 \times 2,486 = 49,720$

Step Three Add $19,888 + 49,720 = 69,608$

GUIDED INSTRUCTION

1. $38 \times 36 =$

Step One Write the problem vertically, lining up the factors by place value.

$$\begin{array}{r} 38 \\ \times 36 \\ \hline \end{array}$$

Step Two Multiply 38 by 6. Regroup to find the partial product.

$$\begin{array}{r} 38 \\ \times 36 \\ \hline 228 \end{array}$$

Step Three Multiply 38 by 30. Regroup to find the partial product.

$$\begin{array}{r} 38 \\ \times 36 \\ \hline 228 \\ 1140 \end{array}$$

Step Four Add the partial products to find the solution.

$$\begin{array}{r} 38 \\ \times 36 \\ \hline 228 \\ + 1140 \\ \hline 1368 \end{array}$$



2. Find the product of 1,304 and 32.

Step One Find the partial products.

$$\begin{array}{r} 1,304 \\ \times 32 \\ \hline 26,080 \\ + 39,120 \\ \hline 41,728 \end{array}$$

TIPS AND TRICKS

Regrouping can be confusing when multiplying multi-digit numbers. After you use a regrouped number, cross it out so you don't use it again.

Step Two Add the partial products to find the solution.

$$\begin{array}{r} 1,304 \\ \times 32 \\ \hline 26,080 \\ + 39,120 \\ \hline 41,728 \end{array}$$

3. Select TWO expressions that are equal to 352.

- ☐ A 22×16
- ☐ B 88×4
- ☐ C 16×24
- ☐ D 19×23
- ☐ E 24×18

HINT, HINT

Look at the ones digits of the factors. See if you can eliminate any answer choices based on the ones digit of the product.

SKETCH IT

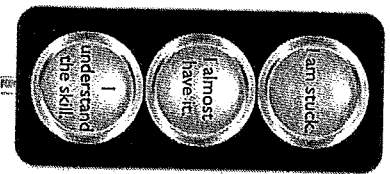
In the space below, make a drawing to show a multiplying of multi-digit numbers.

How Am I Doing?

What questions do you have?

What is the first step in multiplying using partial products?

Color in the traffic signal that shows how you are doing with the skill.



INDEPENDENT PRACTICE

Answer the questions.

1. Find the product.

$$69 \times 47 = \square$$

- Ⓐ 483 Ⓑ 759
Ⓒ 2,143 Ⓓ 3,243

2. Complete the multiplication problem. Write your answers in the boxes.

$$\begin{array}{r} 367 \\ \times 52 \\ \hline 734 \\ + 18350 \\ \hline 19,084 \end{array}$$

3. Which equation is incorrect?

- Ⓐ $88 \times 19 = 1,842$
Ⓑ $88 \times 19 = 1,672$
Ⓒ $88 \times 33 = 2,904$
Ⓓ $88 \times 15 = 1,320$

4. What is $2,367 \times 34$?

Write your answer in the box.

80,478

TIPS AND TRICKS

Each incorrect answer in a multiple-choice question represents a common mistake. Try to identify the mistake that could lead to each answer choice.

WORK SPACE

WORK SPACE

5. What is the product of 54×77 ?
 (A) 378 (B) 756
 (C) 4,158 (D) 7,560
6. What is the product of 712×19 ?
 (A) 1,424 (B) 2,136
 (C) 13,528 (D) 27,768

Part A

Anna multiplied 543×82 .

$$\begin{array}{r} 543 \\ \times 82 \\ \hline 1086 \\ + 434400 \\ \hline 435,486 \end{array}$$

What error did Anna make?

Sample answer: Anna multiplied 543 by 800, not 80.

Part B

What is the correct product for the expression in Part A? Write your answer in the box.

44,526

8. Without doing the multiplication, explain how you can tell that the product of 38 and 62 is not 236.

Sample answer: The product is not great enough.

38×62 is about 40×60 , or around 2,400.

236 is about 10 times too low.

EXIT TICKET

Now that you have mastered multiplying multi-digit numbers, let's solve the problem in the Real-World Connection.

The students at Laura's school picked strawberries. They placed 35 berries in each basket. They filled 18 baskets. How many strawberries did they pick? Show your work.



They picked 630 strawberries.

Multiply 18×35 .

$$\begin{array}{r} 35 \\ \times 18 \\ \hline 280 \\ + 350 \\ \hline 630 \end{array}$$

Or, $18 \times 35 = 20 \times 35 - 2 \times 35$
 $= 700 - 70$
 $= 630$

CHAPTER 1

WORDS TO KNOW
partial quotient
place value
area model
array
expanded notation



Lesson 3

DIVIDE WHOLE NUMBERS 5.NBT.6

INTRODUCTION

Real-World Connection

A florist receives an order of 182 roses. She needs to put the same number of roses into each of 14 vases. How many roses will go in each vase? Let's practice the skills in the Guided Instruction and Independent Practice and see how many roses will go in each vase!

What I Am Going to Learn

- How to divide numbers up to 4 digits by numbers up to 2 digits
- How to use partial quotients to make the dividing easier

What I May Already Know 4.NBT.6

- I know how to find the quotient and remainder for a number up to 4 digits divided by a single digit number.
- I know the relationship between multiplication and division.

Vocabulary in Action

- Division problems can be broken into smaller division problems.
- Each of the smaller problems has its own quotient. These are called partial quotients and are added together to find the total quotient.
- The number being divided is often broken up by place value.
- There are several strategies you can use to solve multi-digit division problems.
- An area model can be used to visualize the partial quotients and see the relationship to multiplication. In an area model, the two factors are the length and width, and the product is the area.

- An array can be used to see groups in rows.
- Expanded notation can be used to break up the number being divided by place value: $182 \div 14 = (100 + 80 + 2) \div 14$

EXAMPLE

What is $252 \div 12$?

You can use an area model and number facts to divide. Find multiples of 12 that add to 252.

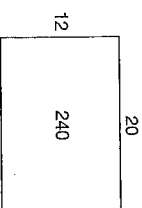
Step One Find a multiple of 12 that is close to, but less than, 252.

You know that $12 \times 2 = 24$.

$$12 \times 20 = 240$$

$$240 \div 12 = 20$$

Step Two Draw this in an area model.



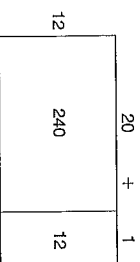
Step Three Find the amount remaining: $252 - 240 = 12$.

Step Four Find the multiple of 12 that is 12.

You know that $12 \times 1 = 12$.

$$12 \div 12 = 1$$

Step Five Add this to the model.



Step Six $20 + 1 = 21$, so there are 21 groups of 12 in 252.

$$252 \div 12 = 21$$

SKETCH IT

Could you have started with 10 groups of 12 and split the area model into $10 + 10 + 1$? Use a sketch to help you decide if it still works.

Sometimes when you divide there is a remainder.

EXAMPLE

What is $229 \div 5$?

You can use an array to divide.

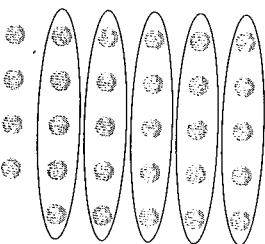
Step One Break the problem into parts.
You can break up 229 into 200 and 29.

$$229 \div 5 = (200 \div 5) + (29 \div 5).$$

Step Two Divide 200 by 5.

$20 \div 5 = 4$, so $200 \div 5 = 40$. There are 40 groups so far and 29 is left.

Step Three Create an array for the amount that is left.
An array of 29 in rows of 5:



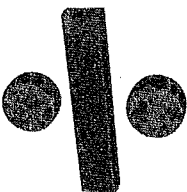
Step Four Divide with the array.
The array shows 5 groups of 5 and 4 left.

Step Five Add the two parts and solve.
There are $40 + 5 = 45$ groups in all, with a remainder of 4:

$$229 \div 5 = 45 \text{ R}4.$$

THINK ABOUT IT

Can the remainder ever be equal to or greater than the number you are dividing by?



You can use expanded notation and divide each place value.

EXAMPLE

What is $144 \div 16$?

Step One Break the larger number up using expanded notation.
 $144 \div 16 = (100 + 40 + 4) \div 16$

Step Two Use number sense to find the partial quotient for the hundreds place.
The hundreds place is 100.

$$16 \times 6 = 96, \text{ so } 100 \div 16 = 6 \text{ with 4 left over.}$$

Step Three Find the partial quotient for the tens place.
The tens place is 40.

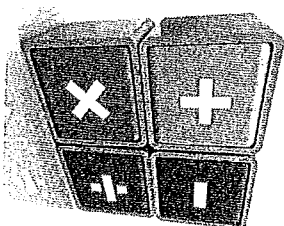
$$16 \times 2 = 32, \text{ so } 40 \div 16 = 2 \text{ with 8 left over.}$$

Step Four Add the remaining values and divide it by 16 for the last partial quotient.
There are 4 left for the ones place, plus the 4 left from the hundreds place, and 8 left over from the tens place.

$$4 + 4 + 8 = 16, \text{ so there is one more group.}$$

$$16 \times 1 = 16, \text{ so } 16 \div 16 = 1.$$

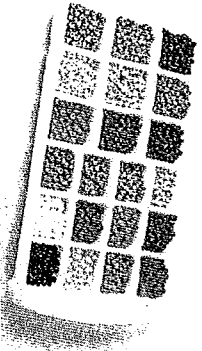
Step Five Add the partial quotients.
 $6 + 2 + 1 = 9$, so $144 \div 16 = 9$.



GUIDED INSTRUCTION

Use what you know about place value to divide multi-digit numbers.

- Peter has 2,508 beads to divide equally into 6 bags. How many beads will be in each bag?



TIPS AND TRICKS

When you divide, you are finding the number of groups. How you find all the groups and keep track of adding them together is your choice and might depend on the problem.

Step One Break the larger number up using expanded notation.
 $2,508 \div 6 = (2,000 + 500 + 8) \div 6$

Step Two Find the partial quotient of the thousands place.

The thousands place is 2,000, so find $2,000 \div 6$.

$6 \times 300 = 1,800$, so $2,000 \div 6 = 300$ with 200 left over.

$6 \times 300 = 1,800$, and $1,800 + 200 = 2,000$.

Step Three Add the 200 left over to 500 and find the next partial quotient, $700 \div 6$.

$6 \times 100 = 600$, so $700 \div 6 = 100$ with 100 left over.

$6 \times 100 = 600$, and $600 + 100 = 700$.

Step Four There are 100 + 8 left.

Find the last partial quotient, $108 \div 6$.

$6 \times 18 = 108$, so $108 \div 6 = 18$.

Step Five Add the partial products and solve.

$300 + 100 + 18 = 418$

$2,508 \div 6 = 418$

- What is $1,530 \div 30$?

Step One Break the larger number up using expanded notation.
 $1,530 = 1,500 + 30$

Step Two Find each partial quotient.

$1,500 \div 30 = 50$

$30 \div 30 = 1$

Step Three Add the partial quotients and solve.

$50 + 1 = 51$

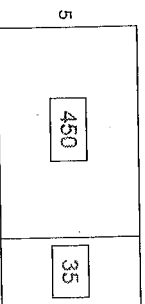
$1,530 \div 30 = 51$

- Use the numbers in the box to complete an area model that models $485 \div 5$.

Each number will be used once. Write each number in the appropriate box.

97	450	90	7	35
----	-----	----	---	----

$$\boxed{90} + \boxed{7} = \boxed{97}$$



HINT, HINT

The partial quotients will be numbers that are smaller to work with. Think of ways 485 can be broken up.

▶ TURN AND TALK

Work with a partner: Laurie has this information: $(65 \times 10) \div (65 \times 8) = 1,170$. Use it to write a division statement.

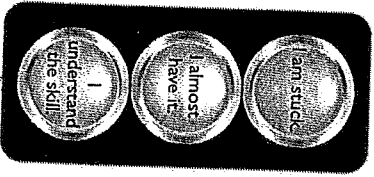
How Am I Doing?

What questions do you have?

Which strategy for dividing multi-digit numbers is most comfortable for you? When might this not be the best strategy?

What is a situation where you would need to divide a multi-digit number?

Color in the traffic signal that shows how you are doing with the skill.



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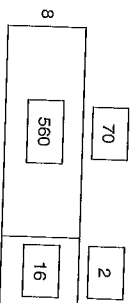
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INDEPENDENT PRACTICE

Answer the questions.

1. Which equation is represented by the area model?



- A $560 \div 8 = 72$
- B $576 \div 8 = 72$
- C $72 \div 8 = 576$
- D $56,016 \div 8 = 702$

2. What is $7,042 \div 7$?

Write your answer in the box.

1,006

3. Which equation is correct?

- A $104 \div 26 = 6$
- B $200 \div 26 = 8$
- C $42 \div 26 = 2$
- D $182 \div 26 = 7$

▶ THINK ABOUT IT

Think of ways of breaking up the dividend. What multiplication and division facts involving 7 could help you find the quotient?

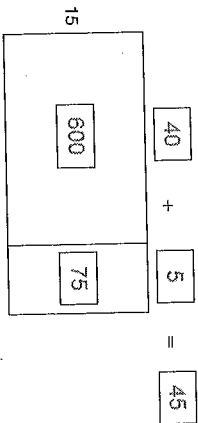
▶ TIPS AND TRICKS

You can use inverse operations to check equations. Use multiplication to check each division equation.

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WORK SPACE

4. Complete an area diagram that models $675 \div 15$.
Write your answers in the boxes.



5. Find the quotient.
Write your answer in the box.
 $1,852 \div 40 =$

48 R12

6. Explain how you can use multiplication to find $369 \div 9$.
Sample answer: I can think of multiples of 9. If I break up 369 into 360 and 9, I can use $9 \times 40 = 360$ and $9 \times 1 = 9$. The quotient is 41.
-
-
-
-
-

WORK SPACE

7. Part A
Rashid and his classmates are setting up chairs in the gym for the school talent show. There are 209 chairs. If the students place 19 chairs in each row, how many rows will there be?
Write your answer in the box.

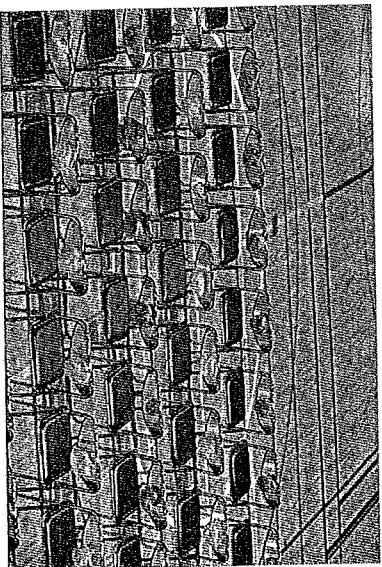
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rows

- Part B
Explain how you found your answer.
Sample answer: To find the number of chairs in each row, I wrote the equation $209 \div 19 =$

11

. Because $19 \times 10 = 190$, I knew there would be at least 10 rows. $209 - 190 = 19$ and $19 \times 1 = 19$, so there is 1 more row.
-
-
-
-
-

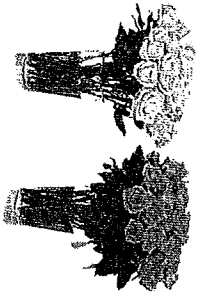


EXIT TICKET

5.NBT.6

Now that you have mastered dividing multi-digit numbers, let's solve the problem in the Real-World Connection.

A florist receives an order of 182 roses. She needs to put the same number of roses in each of 14 vases. How many roses will go in each vase?



There would be 13 roses in each vase.

Divide 182 by 14.

$$14 \times 10 = 140 \text{ with } 42 \text{ left over.}$$

$$14 \times 3 = 42$$

$$10 + 3 = 13, \text{ so } 182 \div 14 = 13$$

Lesson 4

WRITE AND INTERPRET NUMERICAL EXPRESSIONS 5.OA.1, 5.OA.2

INTRODUCTION

Real-World Connection

Lily won a new music poster for her bedroom wall! The poster she has now is 2 feet wide and 3 feet long. The new poster is 1 foot wider and 2 feet longer. She can use an expression to find the area of her new poster. Let's practice the skills in the Guided Instruction and Independent Practice and see how Lily finds the area of the poster at the end of the lesson!

What I Am Going to Learn

- How to write a numerical expression from a written description
- How to use parentheses or brackets in numerical expressions
- How to evaluate expressions that include parentheses, brackets, or braces
- How to compare numerical expressions without evaluating them

What I May Already Know 4.OA.2, 4.MD.3

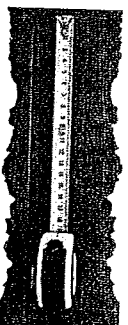
- I know how to use multiplication and division to solve word problems.
- I know how to write multiplication equations from a description or from a multiplicative comparison.

Vocabulary in Action

- An expression is a group of numbers and operations (+, -, ×, and ÷) with no equals sign.
- When you evaluate an expression, you find its value.
- You can write an expression from a written description:
Multiply the sum of 4 and 5 by 2 can be written as $2 \times (4 + 5)$.

WORDS TO KNOW

expression
operation
evaluate
parentheses
brackets
braces



- To evaluate an expression, follow the order of operations:
- Operations inside parentheses $()$, brackets $[\]$, and braces $\{ \}$ are done first.
- Next, multiply and divide, from left to right.
- Last, add and subtract, from left to right.
- You can compare some expressions without evaluating them.
- For example, $4 \times (813 + 927)$ is four times greater than $(813 + 927)$ because there are 4 groups of $(813 + 927)$.

EXAMPLE

Evaluate the expression $15 \div (3 + 2)$.

Step One Add the numbers in parentheses.

$$15 \div (3 + 2) = 15 \div 5$$

Step Two Divide 15 by 5.

$$15 \div 5 = 3$$

$$\text{So, } 15 \div (3 + 2) = 3.$$

You can write an expression from a written description.

EXAMPLE

Write and evaluate the expression that is described:

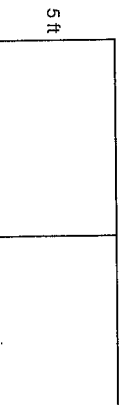
The sum of 8 and 7 is multiplied by 5.

Use parentheses to show the sum of 8 and 7 is to be multiplied by 5.

$$(8 + 7) \times 5 =$$

$$15 \times 5 = 75$$

It is not correct to write $8 + 7 \times 5$ thinking that $8 + 7$ is the sum that is then multiplied by 5. Written this way and following the order of operations, the product of 7 and 5 would be added to 8.



The area of the two rectangles together is $5 \times (8 + 7) = 75$, or 75 square feet.

GUIDED INSTRUCTION

To evaluate a complicated expression, complete one step at a time and record each step.

1. Evaluate the expression: $8 \div (6 - 2) + 3 \times [2 + 4 \times (5 - 3)]$.

Step One The expression has parentheses and brackets. Complete the operations inside the parentheses.

$$8 \div (6 - 2) + 3 \times [2 + 4 \times (5 - 3)]$$

$$8 \div 4 + 3 \times [2 + 4 \times 2]$$

Step Two Complete the operations inside the brackets following the order of operations; multiply and then add.

$$8 \div 4 + 3 \times [2 + 4 \times 2] =$$

$$8 \div 4 + 3 \times [2 + 8] =$$

$$8 \div 4 + 3 \times 10 =$$

Step Three Complete the multiplication and division from left to right.

$$8 \div 4 + 3 \times 10 =$$

$$2 + 30 =$$

Step Four Complete the addition.

$$2 + 30 = 32$$

THINK ABOUT IT

What changes in each step when evaluating an expression?



2. Write the expression, The product of 5 and the quotient of 72 and 4 less than 12.

Step One The product of means multiplication.

$$\boxed{} \times \boxed{}$$

Step Two The product of 5 and ... means that the first factor is 5.

$$5 \times \boxed{}$$

Step Three The second factor is the quotient of 72 and 4 less than 12. The quotient of means division.

$$5 \times [72 \div \boxed{}]$$

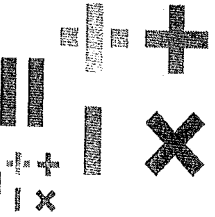
Step Four The divisor is 4 less than 12. "Less than" means subtraction. Parentheses are needed so that the subtraction is done before the division. Complete the expression on your own.

$$\boxed{5} \times [72 \div (\boxed{12} - \boxed{4})]$$

THINK ABOUT IT

A quantity is multiplied by 6. Which choices show the same quantity multiplied by a number larger than 6?

3. Select TWO quantities that are greater than $6 \times (217 + 546)$.
- ☐ A $(217 + 546)$
 - ☐ B $3 \times (217 + 546)$
 - ☐ C $(217 + 546) \div 8$
 - ☐ D $11 \times (217 + 546)$
 - ☐ E $8 \times (217 + 546)$



How Am I Doing?

What questions do you have?

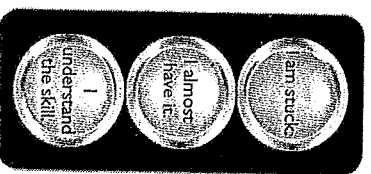
When evaluating an expression, what operation is done first? If you write an expression, how do you show what operation you want be done first?

Write an expression in words. Ask a partner to write the correct mathematical expression and then evaluate it. Do your expressions and answers match?

TURN AND TALK

Work with a partner. Explain how using grouping symbols could change the value of the expression $4 \times 3 + 6$.

Color in the traffic signal that shows how you are doing with the skill.



WORK SPACE

INDEPENDENT PRACTICE

Answer the questions.

- Which of the following expressions correctly records the computation the product of the difference between 12 and 10 and the sum of 8 and 4?

- ☐ A $(12 - 10) + (8 + 4)$
- ☐ B $12 \times (10 - 8 + 4)$
- ☐ C $(12 - 10) \times (8 + 4)$
- ☐ D $12 - 10 \times 8 + 4$

- Expressions A, B, and C are shown below.

A: $6 \times (8 - 5) + 4 \times (7 + 2)$

B: $9 \times [80 \div (5 + 11)]$

C: $5 \times (9 - 3) + 18$

Compare the values of expressions A, B, and C in the boxes.

A	>	C	>	B
---	---	---	---	---

- Select the expression that is 5 times greater than $2 \times (196 \div 14)$.

- ☐ A $(5 \times 2) \times (196 \div 14)$
- ☐ B $5 \times (196 \div 14)$
- ☐ C $7 \times (196 \div 14)$
- ☐ D $(1 \times 6) \times (196 \div 14)$

- Evaluate the expression. Write your answer in the box.

$3 \times [(10^2 - 45) \div 11]$

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THINK ABOUT IT

An exponent tells you how many times to multiply a factor by itself. Should you evaluate the exponent before or after you subtract?

- The expression below has a value of 16. Write the number that will correctly complete the expression.

$7 \times (9 - 5) - 4 \times [(15 - \boxed{14}) \times 3]$

HINT, HINT

First, simplify $7 \times (9 - 5)$. Then, decide what number should be subtracted from it to get 16.

- Which of the following expressions has the greatest value?

- ☐ A $(5 + 6) \times 8 - 4 + 2$
- ☐ B $5 + 6 \times (8 - 4) + 2$
- ☐ C $5 + 6 \times (8 - 4 + 2)$
- ☐ D $5 + 6 \times 8 - 4 + 2$

WORK SPACE

- Select THREE of the following steps that are needed to evaluate the expression $2 \times (9 - 5) + 24 \div 8$.

- ☐ A $9 - 5$
- ☐ B 2×9
- ☐ C $5 + 24$
- ☐ D 2×4
- ☐ E $32 \div 8$
- ☐ F $8 + 3$

8. Part A

Complete the statement using *greater than*, *less than*, or *equal to*.

$(15 \times 13) + 9$ is greater than $(15 \times 13) - 12$

TIPS AND TRICKS

Explain your answer and the reasoning you used.

Part B

Explain how you can compare the expressions $(15 \times 13) + 9$ and $(15 \times 13) - 12$ using only addition and subtraction.

Sample answer: The products inside the parentheses are the same, so the only difference is the number added or subtracted. Adding 9 is more than subtracting 12, so $(15 \times 13) + 9$ is greater than $(15 \times 13) - 12$.

WORK SPACE

9. Part A

Tyler says the expression $8 \times 4 + 6 \div 2$ has a value of 19 because the order of operations says to perform the operations from left to right. What mistake did Tyler make?

Sample answer: Tyler performed the addition before the division. The order of operations says to perform multiplication and division from left to right, and then addition and subtraction from left to right, so he should have multiplied, then divided, then added.

Part B

Write the value of the expression $8 \times 4 + 6 \div 2$ in the box.

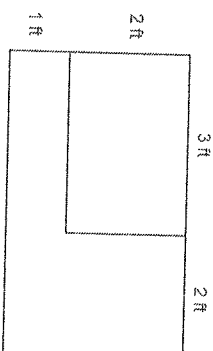
35

EXIT TICKET

Now that you have mastered evaluating and writing expressions, let's solve the problem in the Real-World Connection.

Lily won a new music poster for her bedroom wall. The poster she has now is 2 feet wide and 3 feet long. The new poster is 1 foot wider and 2 feet longer. Write the expression that she can use to find the area of her new poster.

$(2 + 1) \times (3 + 2)$



Area is length multiplied by width.

The poster is 2 ft + 1 ft long and 3 ft + 2 ft wide.

$(2 + 1) \times (3 + 2)$

The area of the poster in square feet is $(2 + 1) \times (3 + 2) = 3 \times 5 = 15$.

PRACTICE TEST

Answer the questions.

1. Which answer correctly completes the statement?

The value of 9 in the number 1.09 is _____ the value of 9 in the number 2.93.

- Ⓐ $\frac{1}{100}$
 Ⓑ $\frac{1}{10}$
 Ⓒ 10 more than
 Ⓓ 100 times

2. Write the numbers in the boxes to show how each power of 10 can be written using an exponent.

$$100 = 10^{\boxed{2}} \quad 10,000 = 10^{\boxed{4}}$$

3. Select THREE partial products that you would use in the following multiplication problem.

$$\begin{array}{r} 565 \\ \times 354 \\ \hline \end{array}$$

- Ⓐ 2,260
 Ⓑ 2,825
 Ⓒ 16,950
 Ⓓ 28,250
 Ⓔ 169,500

4. Part A

What is 2.16×10^4 ?

Write your answer in the box.

$\boxed{21,600}$

Part B

Explain how you found your answer.

Sample answer: When multiplying by a power of 10, the digits shift to the left the same number of places as the number in the exponent. Because the exponent is 4, I moved the digits four places to the left and used a zero as a placeholder in the tens and ones places.

5. What is 489×27 ?

Write your answer in the box.

$\boxed{13,203}$

6. Which equation is incorrect?

- Ⓐ $66 \times 15 = 990$
 Ⓑ $66 \times 22 = 1,452$
 Ⓒ $66 \times 42 = 2,838$
 Ⓓ $66 \times 17 = 1,122$

7. What is the product of 816×17 ?

- Ⓐ 27,744
 Ⓑ 13,872
 Ⓒ 8,160
 Ⓓ 27,744

CHAPTER 1

8. Complete the multiplication problem. Write your answers in the boxes.

$$\begin{array}{r} 246 \\ \times \quad 43 \\ \hline 738 \\ + 9840 \\ \hline 10,578 \end{array}$$

9. Which equation is correct?

- Ⓐ $232 \div 29 = 9$
 Ⓑ $400 \div 26 = 14$
 Ⓒ $42 \div 14 = 4$
 Ⓓ $462 \div 66 = 7$

10. Part A

Tom made an error when using place value to find $2,709 \div 9$.

- $27 \text{ tens} \div 9 = 3 \text{ tens}$
 $9 \text{ ones} \div 9 = 1 \text{ one}$
 $2,709 \div 9 = 31$

Explain Tom's error:

Sample answer: 2,700 is 27 hundreds, not 27 tens. Tom should have found 27 hundreds $\div 9 = 3$ hundreds.

Part B

Find the correct quotient from Part A.

Write your answer in the box.

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11. Find the quotient. Write your answer in the box.

$$2,254 \div 20 = \boxed{112 \text{ R}14}$$

12. Expressions A, B, and C are shown below.

A: $4 \times (7 - 5) + 4 \times (6 + 2)$

B: $8 \times [45 \div (5 + 10)]$

C: $(7 - 3) + 12$

Compare the values of expressions A, B, and C in the boxes.

$$\boxed{C} < \boxed{B} < \boxed{A}$$

13. Select FOUR of the following steps needed to evaluate the expression $32 \div 8 + 3 \times (7 - 5)$.

- Ⓐ $7 - 5$
 Ⓑ $8 + 3$
 Ⓒ $5 + 24$
 Ⓓ 3×2
 Ⓔ $32 \div 8$
 Ⓕ $4 + 6$

14. The expression below has a value of 48. Write the number in the box that will correctly complete the expression.

$$9 \times (9 - 3) - 2 \times [(10 - \boxed{9}) \times 3]$$

15. Which expression is 6 times greater than $2 \times (144 \div 12)$?

- Ⓐ $(4 \times 2) \times (144 \div 12)$
 Ⓑ $6 \times (144 \div 12)$
 Ⓒ $(6 \times 2) \times (144 \div 12)$
 Ⓓ $10 \times (144 \div 12)$

CHAPTER 2

WORDS TO KNOW
decimal
expanded form
place value

Lesson 5

READ, WRITE, AND COMPARE
DECIMALS 5.NBT.3, 5.NBT.3a, 5.NBT.3b

INTRODUCTION

Real-World Connection

Kelly has 0.613 pound of blueberries. Hannah has sixty-four hundredths of a pound of blueberries. Who has a greater amount of blueberries? Let's see who has the greater amount of blueberries at the end of the lesson after we practice the skills in the Guided Instruction and Independent Practice!

What I Am Going to Learn

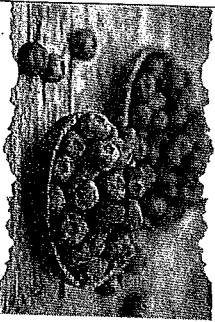
- How to read and write decimal numbers
- How to compare decimal numbers
- How to write decimal numbers in expanded form

What I May Already Know 4.NF.6, 4.NF.7

- I know how to use decimal notation for fractions with a denominator of 10 or 100.
- I know how to compare decimals to hundredths.

Vocabulary in Action

- Decimals can be written in words.
- When you write a decimal in words you say "and" for the decimal point.
- For example, 34.56 is *thirty-four and fifty-six hundredths*.



- Decimals can be written in expanded form.
- When you use expanded form, each digit is multiplied by its place value.
- For example, 34.56 is $3 \times 10 + 4 \times 1 + 5 \times 0.1 + 6 \times 0.01$
- Decimals written as numbers can be compared by place value.
- $34.56 < 34.6$ because they each have 34, but 34.6 is greater than 34.5 in the tenths place.

EXAMPLE

Write the number 213.675 in words.

Step One Write the whole number part. Use "and" for the decimal point.
two hundred thirteen and ...

Step Two For the decimal part, look at the place value of the last digit.

The last digit is 5 and is in the thousandths place, so there are six hundred seventy-five thousandths.

Step Three Write the number.

213.675 is two hundred thirteen and six hundred seventy-five thousandths.

Ones			Decimals			
Hundreds	Tens	Ones	.	Tenths	Hundredths	Thousandths
2	1	3	.	6	7	5



TURN AND TALK
Why is it important to say "and" for the decimal point?

EXAMPLE

Write 578.429 in expanded form.

Each digit in the number is multiplied by its place value, the same as you would do with whole numbers. The decimal place values can be fractions or decimals.

Step One Find the value of each digit.

Ones			Decimals			
Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths	
5	7	8	.	4	2	9

$$5 \text{ is } 500 = 5 \times 100$$

$$7 \text{ is } 70 = 7 \times 10$$

$$8 \text{ is } 8 = 8 \times 1$$

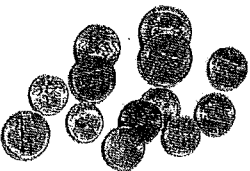
$$4 \text{ is } 0.4 = 4 \times \frac{1}{10}$$

$$2 \text{ is } 0.02 = 2 \times \frac{1}{100}$$

$$9 \text{ is } 0.009 = 9 \times \frac{1}{1,000}$$

Step Two Combine the values.

$$5 \times 100 + 7 \times 10 + 8 \times 1 + 4 \times \frac{1}{10} + 2 \times \frac{1}{100} + 9 \times \frac{1}{1,000}$$



We use decimal notation for amounts of money. Pennies are hundredths of a dollar and dimes are tenths of a dollar.

You can use place value to compare decimal numbers in the same way you compare whole numbers.

EXAMPLE

Is 0.4 greater than, less than, or equal to 0.3?

Step One Write the numbers as fractions with the same denominator.

$$0.4 = \frac{4}{10}, \quad 0.3 = \frac{3}{10}$$

Step Two Compare the numerators.

$$\frac{4}{10} > \frac{3}{10} \text{ so } 0.4 > 0.3.$$

Is 0.21 greater than, less than, or equal to 0.4?

Step One Write the numbers as fractions with the same denominator.

$$0.21 = \frac{21}{100}, \quad 0.4 = \frac{4}{10} = \frac{40}{100}$$

Step Two Compare the numerators.

$$\frac{21}{100} < \frac{40}{100} \text{ so } 0.21 < 0.4.$$

GUIDED INSTRUCTION

- Write 86.03 in words.

Step One Write the whole number followed by "and."

eighty-six and...

Step Two Use a place value chart to see the place value of the last decimal digit.

Ones			Decimals			
Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths	
0	8	6	.	0	3	0

The last decimal digit is 3 and is in the hundredths place.

Step Three Write 86.03 in words

eighty-six and three hundredths

HINT, HINT

When you say a decimal number, do not say, "86 point 03." Say, "86 and 3 hundredths." This will help you to think about the place value.



2. Write 27.304 in expanded form.

Step One Arrange the digits in a place value chart.

Ones				Decimals			
Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths		
2	7	.	3	0	4		

Step Two Write the value of each digit, using decimal fractions.

2 is $20 = 2 \times 10$

7 is $7 = 7 \times 1$

3 is $0.3 = 3 \times \frac{1}{10}$

4 is $0.004 = 4 \times \frac{1}{1,000}$

Step Three Write an equation showing the sum.

$27.304 = 2 \times 10 + 7 \times 1 + 3 \times \frac{1}{10} + 4 \times \frac{1}{1,000}$

3. Compare 0.056 and 0.59.

Step One Write the decimals in fraction form with the same denominator.

$0.056 = \frac{56}{1,000}$

$0.59 = \frac{59}{100} = \frac{590}{1,000}$

Step Two Compare the fractions.

$\frac{56}{1,000} < \frac{590}{1,000}$

So, $0.056 < 0.59$

TIPS AND TRICKS

Make sure you evaluate each answer. Do not stop after you find the first correct answer.

4. Select THREE expressions that are equal to 113.082.

- ☐ A $100 + 10 + 3 + 0.8 + 0.02$
- ☐ B $100 + 10 + 3 + 0.08 + 0.002$
- ☐ C $100 + 10 + 3 + \frac{8}{10} + \frac{2}{100}$
- ☐ D $100 + 10 + 3 + \frac{8}{100} + \frac{2}{1,000}$
- ☐ E $1 \times 100 + 1 \times 10 + 3 \times 1 + 8 \times \frac{1}{100} + 2 \times \frac{1}{1,000}$
- ☐ F $1 \times 100,000 + 1 \times 10,000 + 3 \times 1,000 + 8 \times 10 + 2 \times 1$

How Am I Doing?

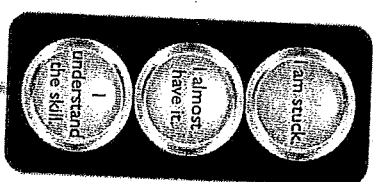
What questions do you have?

Imagine what the price might be of something you enjoy. Write the price, and then write it again in expanded form.

TURN AND TALK

Pretend you are going to teach younger students about decimals. Think about how you would teach someone to compare decimals to thousandths. Then, working with a partner, create a short demonstration. You can use grids, pictures, place-value blocks, technology, or any other method other than place-value charts. Then present your demonstration to the class.

Color in the traffic signal that shows how you are doing with the skill.



INDEPENDENT PRACTICE

Answer the questions.

1. What is 51,017 in word form?

HINT, HINT
When reading a number in word form, write out each number next to the words.

- (A) fifty-one thousand and seventeen
(B) fifty-one and seventeen hundredths
(C) fifty-one and seventeen tenths
(D) fifty-one and seventeen thousandths

2. Compare the decimals. Write the correct symbol in each box.

$$0.04 \quad < \quad 0.14 \quad 1.5 \quad > \quad 1.15 \quad 3.01 \quad = \quad 3.010$$

3. What is 195,438 in expanded form using decimals?

Write your answer in the box.

$$100 + 90 + 5 + 0.4 + 0.03 + 0.008$$

HINT, HINT

When there is a 0 in a number you are writing in expanded form, be sure to pay close attention to the place values of the other digits.

4. Write an expression for 105,067 in expanded form by multiplying each digit by a decimal fraction.

Write your answer in the box.

$$1 \times 100 + 5 \times 1 + 6 \times \frac{1}{100} + 7 \times \frac{1}{1,000}$$

5. Which statement is true?
(A) $621.071 > 621.711$
(B) $621.071 = 621.711$
(C) $621.071 < 621.711$

6. Which statement is true?

- (A) $0.910 = 0.91$
(B) $45.234 < 45.134$
(C) $6.71 = 6.071$
(D) $79.012 > 79.012$

7. Part A

George's backpack weighs 15.207 pounds. Stephen's backpack weighs 15.216 pounds. Whose backpack weighs more?

Write your answer in the box.

Stephen's

Part B

Explain how you found your answer: Write an expression using $>$, $=$, or $<$ to record the results of your comparison.

Sample answer: Both weights start with the same

whole number, so I changed the decimals to

fractions to compare them. $15.207 = 15 \frac{207}{1,000}$ and

$$15.216 = 15 \frac{216}{1,000} \quad 15 \frac{207}{1,000} < 15 \frac{216}{1,000}$$

so $15.207 < 15.216$.

TIPS AND TRICKS

Compare the digits one at a time, using place value and starting at the left.

WORK SPACE

WORK SPACE

8. Felix wrote an expression for the expanded form of 307.043 by multiplying each digit by a decimal fraction. His work is shown below.

$$307.043 = 3 \times 100 + 7 \times 1 + 4 \times \frac{1}{10} + 3 \times \frac{1}{100}$$

Is Felix correct? If not, explain the error he made and write the correct expression.

Sample answer: Felix is not correct. $3 \times 100 + 7 \times$

$$1 + 4 \times \frac{1}{10} + 3 \times \frac{1}{100} = 300 + 7 + 0.4 + 0.03 =$$

307.43, not 307.043. Felix did not account for the

place value of the zero after the decimal. The correct expression is $3 \times 100 + 7 \times 1 + 4 \times \frac{1}{100} + 3 \times \frac{1}{1,000}$.



EXIT TICKET

SYNOPSIS: EXIT TICKET

Now that you have mastered reading, writing, and comparing decimal numbers, let's solve the problem in the Real-World Connection.

Kelly has 0.613 pounds of blueberries. Hannah has sixty-fourth hundredths of a pound of blueberries. Who has the greater amount of blueberries?



Hannah has a greater amount of blueberries than Kelly.

$$0.613 = \frac{613}{1,000}$$

$$\text{sixty-four hundredths} = \frac{64}{100} = \frac{640}{1,000}$$

$$\frac{613}{1,000} < \frac{640}{1,000}$$

So, Hannah has a greater amount of blueberries than Kelly.

CHAPTER 2

WORD TO KNOW
rounding

Lesson 6

ROUND DECIMALS 5.NBT.4

INTRODUCTION

Real-World Connection

Alex ran a 5-mile race in 40.127 minutes. The school record for the 5-mile race is 40.13 minutes. Although Alex's time was recorded to the thousandths place, school records are written to the hundredths place. When rounded to the nearest hundredth, did Alex's race time break the school record? Let's practice the skills in the Guided Instruction and Independent Practice and see if Alex broke the school record at the end of the lesson!

What I Am Going to Learn

- How to round decimal numbers to any place value

What I May Already Know 4.NBT.3, 4.NF.5

- I know how to round a whole number to any place value.
- I know how to write decimal numbers to hundredths.

Vocabulary in Action

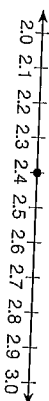
- Rounding is a way to reduce the digits in a number while keeping its value similar.
- Decimals can be rounded to any place value and will have digits up to that place.
- Rounding to the nearest whole number means the number will not have digits after the decimal point.
- You can use a number line to help you see where to round.



EXAMPLE

Round 2.4 to the nearest whole number.

Step 1 Draw a number line that includes the number. 2.4 is between the whole numbers 2 and 3. There are 10 tenths between 2 and 3.



Step 2 Round 2.4 to the closer whole number.

The number 2.4 is 4 tenths from 2 and 6 tenths from 3.

Since 2.4 is closer to 2, 2.4 rounds to 2.

THINK ABOUT IT

Rounding is used when you estimate, especially when an accurate answer is not necessary.

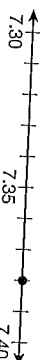
Rounding to the nearest tenth means the number line needs to show which tenths the number is between.

EXAMPLE

Round 7.38 to the nearest tenth.

7.38 is between 7.3 and 7.4.

Draw a number line from 7.30 to 7.40, marked by hundredths.



You can see that 7.38 is much closer to 7.4 than it is to 7.3. So, 7.38 rounds to 7.4.

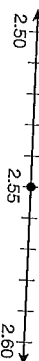
Sometimes the number you are rounding is the same distance from the two numbers it is between. If this happens, round to the higher number.

EXAMPLE

Round 2.55 to the nearest tenth.

2.55 is between 2.5 and 2.6.

Draw a number line from 2.50 to 2.60 and marked by hundredths.



2.55 is halfway between 2.5 and 2.6, so you round up. So, 2.55 rounds to 2.6.

TURN AND TALK

What digit will a decimal number end in if it is halfway between two numbers? Why?

The halfway point between 0 and 10 is 5. If the digit being rounded is less than 5, round down. If it is 5 or more, round up.

EXAMPLE

Round 2.648 to the nearest tenth.

Step One Find the digit to be rounded.

The number 6 is in the tenths place.

Step Two Find the next digit to the right and compare it to 5.

The digit to the right of 6 is 4, and $4 < 5$.

Step Three If the digit is 5 or greater, round up. If it is less than 5, round down.

Round down to 2.6.

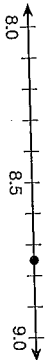
HINT, HINT

Notice that there are no decimal places after the rounded digit.

GUIDED INSTRUCTION

1. Round 8.75 to the nearest whole number.

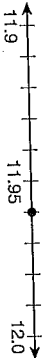
Step One Use a number line to show where 8.75 is between 8 and 9.



Step Two Choose the whole number that is closer to 8.75. 8.75 is closer to 9, so 8.75 rounded to the nearest whole number is 9.

2. Round 11.96 to the nearest tenth.

Step One Use a number line to show 11.96 is between 11.9 and 12.0.



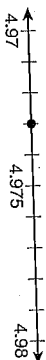
Step Two Choose the number to the nearest tenth that is closer to 11.96.

Because 11.96 is closer to 12.0, round up.

So, 11.96 rounded to the nearest tenth is 12.0.

3. Round 4.973 to the nearest hundredth.

Step One Use a number line to show 4.973 is between 4.97 and 4.98.



Step Two Choose the number to the nearest hundredth that is closer to 4.973.

Because 4.973 is closer to 4.97, round down.

So, 4.973 rounded to the nearest hundredth is 4.97.

4. Round 17.279 to the nearest tenth.

Step One Find the place value you are rounding to. The number 2 is in the tenths place.

Step Two Look at the digit to the right.

The digit to the right of 2 is 7.

Because $7 > 5$, round up.

So, 17.279 rounded to the nearest tenth is 17.3.

5. Select TWO numbers written as 23.4 when rounded to the nearest tenth.

- ☐ A 23.36
☐ B 23.312
☐ C 23.445
☐ D 25.510
☐ E 23.49

TIPS AND TRICKS

When solving rounding problems, pay close attention to place value. Reread the question to make sure you are rounding to the correct place. Check your work to make sure your answers make sense.

THINK ABOUT IT

Even though the tenths place is zero, it is still shown because we are rounding to the nearest tenth.

TURN AND TALK

Gina needs to round 12.9726 to the nearest tenth. She looks at the digits but isn't sure what to do. Work with a partner to round the number. Explain your thinking.

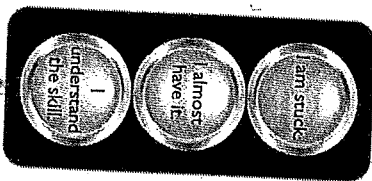
How Am I Doing?

What questions do you have?

Look at the current time. What is the time rounded to the nearest 10 minutes?

Can you think of a situation when you would not round? Can you think of when you would want as accurate a value as possible?

Color in the traffic signal that shows how you are doing with the skill.



INDEPENDENT PRACTICE

Answer the questions.

- What is 4.204 rounded to the nearest hundredth?

Write your answer in the box.

4.20

- What is 11.487 rounded to the nearest tenth?

- (A) 11.4
- (B) 11.49
- (C) 11.5
- (D) 11.65

- Select TWO numbers written as 7 when rounded to the nearest whole number.

- (A) 6.6
- (B) 7.467
- (C) 6.321
- (D) 7.513
- (E) 6.49
- (F) 6.124

- Postage costs \$0.55 per ounce when the package weight is rounded to the nearest ounce. Valerie's package weighs 6.75 ounces. How much postage will she pay?

Write your answer in the box.

\$3.85

TIPS AND TRICKS

You can round numbers using a number line or the rounding rule. Use one method to find the answer and use the other method to check your answer.

HINT, HINT

When rounding to whole numbers, consider the digits on both sides of the decimal.

5. Which statement is true?

- (A) 6.38 rounded to the nearest tenth is 6.8.
- (B) 0.265 rounded to the nearest hundredth is 0.26.
- (C) 1.099 rounded to nearest whole number is 2.0.
- (D) 49.765 rounded to the nearest hundredth is 49.77.

6. Part A

David wants to buy a \$12.95 book and a \$4.25 magazine. About how much money will he spend, rounded to the nearest dollar?

Write your answer in the box.

\$17

TIPS AND TRICKS

Word problems may be solved in more than one way. Be sure to explain how you found your answer clearly, so others can understand your reasoning.

Part B

Explain how you found your answer to Part A.

Sample answer: I rounded \$12.95 to \$13 since 12.95 is between 12 and 13 and is closer to 13. I rounded \$4.25 to \$4 because 4.25 is between 4 and 5 and is closer to 4. Then, I added \$13 + \$4 to get \$17.

7. Paty rounded 120.349 to the nearest tenth and got 120.4. She explains her reasoning below.

120.349 rounded to the nearest hundredth is 120.35, and 120.35 rounded to the nearest tenth is 120.4.

Is Paty correct? If not, explain her error and round correctly.

Sample answer: Paty is not correct. Instead of looking at just the digit to the right of the tenths place, she began by rounding to the hundredths place. The correct answer is 120.3.

EXIT TICKET

Now that you have mastered rounding decimal numbers, let's solve the problem in the Real-World Connection.

Alex ran a 5-mile race in 40.127 minutes. The school record for the 5-mile race is 40.13 minutes. Although Alex's time was recorded to the thousandths place, the school records are recorded to the nearest hundredths place.

When rounded to the nearest hundredth, did Alex's race time break the school record? Use this number line to help.



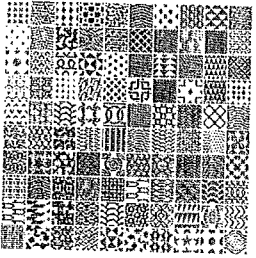
Alex did not break the school record.

Alex's time of 40.127 minutes needs to be rounded to the hundredths place.

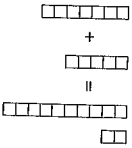
The number 2 is in the hundredths place and 7 is to the right.

Because $7 > 5$, 2 rounds up to 3. And 40.127 rounded to the nearest hundredth is 40.13.

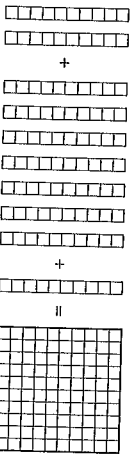
So, Alex did not break the school record, but he did tie the record.



Work from right to left, the same as you would when you are adding whole numbers. Add the hundredths blocks: $7 + 5 = 12$. Regroup 12 hundredths as 1 tenth and 2 hundredths.

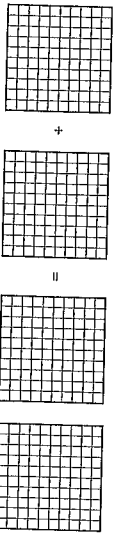


Step Two Now add the tenths blocks: $2 + 7 + 1 = 10$.



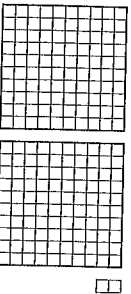
Regroup 10 tenths as 1 one and zero tenths.

Step Three Add the ones: $1 + 1 = 2$.



Step Four Finally, add all the groups.

The sum of 2 ones, 0 tenths, and 2 hundredths is 2.02.

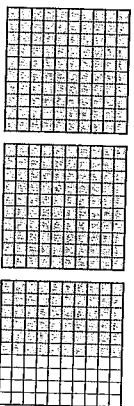


$1.27 + 0.75 = 2.02$, Johanna bought 2.02 pounds of fruit.

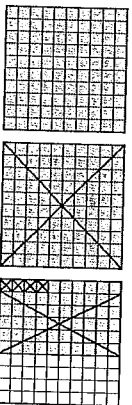
EXAMPLE

Use base-ten blocks to subtract $\$2.60 - \1.54 .

Step One To show $\$2.60$, shade 2 whole grids and 6 of the 10 parts of a whole grid.



Step Two To subtract $\$1.54$, cross out 1 whole grid and 54 parts of the 100 parts in the third grid.



Step Three Count the remaining squares. $\$2.60 - \$1.54 = \$1.06$.

GUIDED INSTRUCTION

1. Use place values to find the sum of 8.8 feet + 3.3 feet.

Step One Begin by arranging the terms vertically. Align the decimal points in each term.

$$\begin{array}{r} 8.8 \\ + 3.3 \\ \hline \end{array}$$

TIPS AND TRICKS
Use the base-ten blocks to check the sum of 8.8 and 3.3.

Step Two Add each column of digits, starting on the right and working left. Position the decimal point in the answer directly under the decimal points in the terms. If the sum of a column is more than 10, rename digits to the next column on the left. Since $8 + 3 = 11$, 1 is moved to the next place to the left.

$$\begin{array}{r} 1 \\ 8.8 \\ + 3.3 \\ \hline .1 \end{array}$$

Step Three Add $8 + 1 + 3 = 12$. Write 12 to the left of the decimal point.

The sum of 8.8 feet + 3.3 feet is 12.1 feet.

$$\begin{array}{r} 1 \\ 8.8 \\ + 3.3 \\ \hline 12.1 \end{array}$$

TIPS AND TRICKS

You can add to check answers to subtraction problems and subtract to check answers to addition problems.

SKETCH IT

Sketch base-ten blocks to check the difference between 6.60 and 0.87.

2. Use place values to find the difference between $6.6 - 0.87$.

Step One Subtract the columns working from right to left. Position the decimal point in the answer directly under the decimal points in the terms.

$$\begin{array}{r} 6.60 \\ - 0.87 \\ \hline \end{array}$$

Step Two Regroup 1 from the tenths place to subtract $10 - 7 = 3$ in the hundredths place. The number in the tenths place is 5. Borrow 1 from the ones place to subtract $15 - 8$ in the tens column. Subtract $5 - 0$ in the ones column.

$$\begin{array}{r} 5\cancel{.}1 \\ 6.60 \\ - 0.87 \\ \hline 5.73 \end{array}$$

Step Three Check your answer by adding 5.73 to the second term. If the sum is the same as the first term, the answer is correct.

$$\begin{array}{r} 5.73 \\ + 0.87 \\ \hline 6.60 \end{array}$$

HINT, HINT

Use your estimating and rounding skills before actually finding the sums to see if you can eliminate any of the answer choices first.

3. Select THREE addition sentences that are true.

- ☐ A $12.08 + 1.2 = 12.20$
- ☐ B $0.12 + 0.3 = 0.42$
- ☐ C $12.08 + 3.3 = 15.38$
- ☐ D $0.28 + 3.3 = 1.61$
- ☐ E $12.08 + 30.3 = 42.38$

How Am I Doing?

What questions do you have?

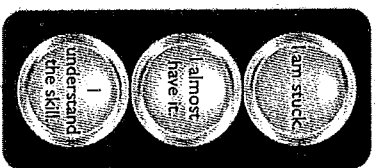
How can using base-ten blocks be helpful in adding numbers?

Choose two numbers. Describe the steps you would take to add these numbers together using the base-ten blocks.

TURN AND TALK

Work with a partner. In Terry's town, the average monthly rainfall in May is 5.79 inches. This May, he records these rainfall figures, in inches: 1.04, 2.36, 0.29, and 0.5. Is the monthly rainfall for this May above or below average? Show your work.

Color in the traffic signal that shows how you are doing with the skill.



INDEPENDENT PRACTICE

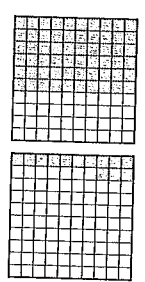
Answer the questions.

1. Subtract. $25.01 - 8.44 = \square$

- ☐ A 16.57
- ☐ B 17.57
- ☐ C 23.43
- ☐ D 27.67

HINT, HINT

Cross out the squares on the right from the squares on the left. Then count the number of squares remaining.



$0.6 - 0.13 = 0.47$

2. Use the model to subtract $0.6 - 0.13$. Write the correct answer in the box.

3. Which addition or subtraction sentence is correct?
- ☐ A $1.0 + 0.98 = 10.8$
 - ☐ B $7.6 - 0.73 = 6.87$
 - ☐ C $5 - 0.71 = 4.39$
 - ☐ D $3.6 + 0.36 = 7.2$

4. Solve. $3.27 + \square = 6.01$

- ☐ A 2.74
- ☐ B 3.26
- ☐ C 3.84
- ☐ D 9.28

TIPS AND TRICKS

Eliminate unreasonable answers such as addends that are greater than the sum.

WORK SPACE

5. Which expression is not equal to 1.5?

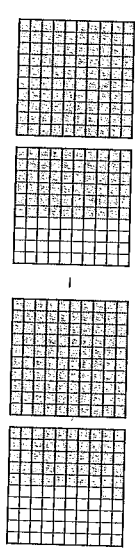
- ☐ A $8.29 - 6.79$
- ☐ B $19.32 - 17.82$
- ☐ C $23.01 - 20.51$
- ☐ D $30.5 - 29$

6. Subtract the numbers and write your answer in the box.

$$\begin{array}{r} 31.02 \\ - 5.75 \\ \hline \end{array}$$

Part A

Dorothy says the model shows the subtraction problem $2.6 - 1.26$.



Is Dorothy's claim correct? Explain your answer.

Sample answer: Dorothy is not correct. The model for the first number shows 1 whole shaded and 60 hundredths shaded. The model for the second number shows 1 whole shaded and 52 hundredths shaded. So, the model represents the subtraction problem $1.60 - 1.52$.

Part B

Solve the subtraction problem actually modeled and find the difference.

Sample answer: $1.60 - 1.52 = 0.08$

EXIT TICKET

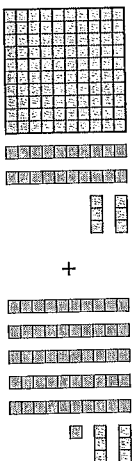
WORK SPACE

8. Select TWO numbers that complete the addition sentence.

$$\square + \square = 16.82$$

- (A) 6.8
- (B) 7.5
- (C) 9.05
- (D) 12
- (E) 10.02

9. Which addition sentence is shown in the model below?



(A)
$$\begin{array}{r} 1.62 \\ + 0.75 \\ \hline \end{array}$$

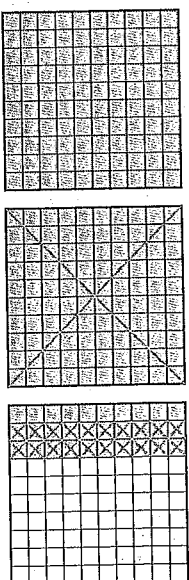
(B)
$$\begin{array}{r} 16.2 \\ + 7.5 \\ \hline \end{array}$$

(C)
$$\begin{array}{r} 1.26 \\ + 0.57 \\ \hline \end{array}$$

(D)
$$\begin{array}{r} 12.6 \\ + 5.7 \\ \hline \end{array}$$

Now that you have mastered adding and subtracting decimals using base-ten blocks and place value, let's solve the problem in the Real-World Connection.
Camellia decides to walk 2.3 miles around a lake. She walks 1.2 miles and stops to rest. How much farther does Camellia have left to walk? Use the base-ten blocks shown below to help you solve the problem.

Camellia has 1.1 miles left to walk.



The model shows that Camellia still has $2.3 - 1.2 = 1.1$ miles left to walk.

TURN AND TALK

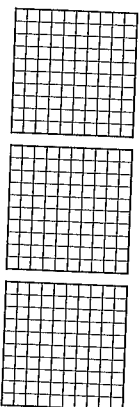
There are two decimal places in the expression 0.3×2.5 and 2 decimal places in the product: 0.75 . Why does the method of counting places work?

EXAMPLE

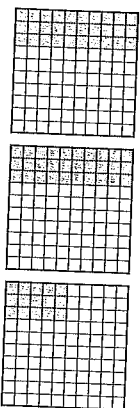


The coach at Valley Elementary had his students run three-tenths of the way around the school as a warm-up before practice. If the distance around the school is 2.5 miles, how many total miles did the students run each day as a warm-up? Use a model to multiply the two numbers.

Step One Draw three 10×10 grids, each representing 1 whole. Each square equals 0.01, and each row represents 0.1.



You need 2.5, or 2 and $\frac{1}{2}$, groups of $\frac{3}{10}$. So, shade $\frac{3}{10}$ of the first two squares, and $\frac{1}{2}$ of $\frac{3}{10}$ in the third square.



Step Two Count all the squares, remembering that each square equals 0.01.

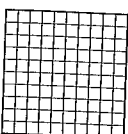
There are 75 hundredths squares shaded. So, $0.3 \times 2.5 = 0.75$. The students ran 0.75 miles each day as a warm-up.

GUIDED INSTRUCTION

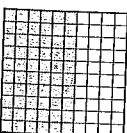


1. Mr. and Mrs. Berry bought a piece of land to open Berry's Patch Farm. If the land measured 0.6 miles by 0.7 miles, how many total square miles is their farm? Use a decimal model to show the product of 0.6×0.7 .

Step One Draw a 10 by 10 square grid representing 1 whole. Each square represents 0.01.



Step Two Shade 6 tenths in one color. This represents the decimal number 0.6.



THINK ABOUT IT

Notice that when you multiply tenths by tenths you will get hundredths. What do you think you will get by multiplying hundredths by hundredths?

Step Three Shade $\frac{7}{10}$ of each tenth, or $\frac{7}{100}$.

There are 42 squares shaded with both colors.

The decimal value is equal to 42 out of 100 is 0.42.

Therefore, $0.6 \times 0.7 = 0.42$.

Berry's Patch Farm is 0.42 square miles.



TALK ABOUT IT

Can you ever have a multiplication problem where one or both of the factors have decimal places but the product has none?

2. Calculate 0.9×0.11 using place values.

Step One Multiply 9 by 11.

$$9 \times 11 = 99$$

Step Two Count the number of decimal places in the factors.

0.9 has 1 decimal place.

0.11 has 2 decimal places.

There are 3 decimal places in all.

Step Three Move the decimal point 3 places to the left in the product, 99.

99 has 2 digits, so add a 0 in the front of 99.

$$0.9 \times 0.11 = 0.099$$

The answer is 0.099.

HINT, HINT

Look to see which sets of numbers will result in products that have 2 decimal places after the decimal point.

3. Select THREE decimal numbers that when multiplied give a product of 0.24.

- ☐ A 0.03×0.8
- ☐ B 0.06×0.4
- ☐ C 1.2×0.2
- ☐ D 0.3×0.8
- ☐ E 2.4×0.1

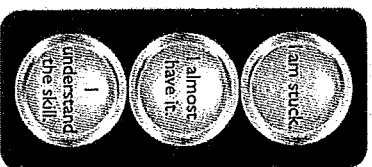
How Am I Doing?

What questions do you have?

Write a multiplication problem with decimals where the product will have 1 decimal place. Can you write a problem where the product will have 2 decimal places? Another with 3 decimal places? Yet another with 4 decimal places?

Explain the advantages and disadvantages to using the base-ten blocks and the place value method to solve problems involving multiplying decimals. Share with a partner.

Color in the traffic signal that shows how you are doing with the skill.



INDEPENDENT PRACTICE

Answer the questions.

HINT, HINT

Remember what each color of shading represents.

1. Which expression represents the multiplication of two decimal numbers shown by the model below? Each row represents one tenth.



WORK SPACE

- (A) 0.08×0.02
(B) 0.08×0.2
(C) 0.8×0.2
(D) 0.8×0.02

2. Calculate 1.4×0.28 .

Write your answer in the box.

0.392

3. Which product is correct?

- (A) $0.3 \times 1.6 = 0.48$
(B) $2.71 \times 0.5 = 13.55$
(C) $5.5 \times 0.03 = 1.65$
(D) $1.8 \times 3.1 = 55.8$

TIPS AND TRICKS

Think about the numbers and what is reasonable to narrow down answer choices. What is 0.21×2 ? How does this help?

WORK SPACE

4. What is the product of 0.21×2.1 ?

- (A) 0.0441
(B) 0.441
(C) 04.41
(D) 044.1

5. Part A

Multiply: 5×0.7

Write your answer in the box.

3.5

Part B

Explain how you got your answer, without counting decimal places. Why is your answer reasonable?

Sample answer: I multiplied 7 and 5 and got the product 35. However, 0.7 is 10 times smaller than 7, so the product is 10 times smaller than 35, or 3.5. My answer is reasonable because 5×0.7 says to take a little less than 1 group of 5, so a product a little less than 5 makes sense.

WORK SPACE

6. **Part A**
Use the grids to model 1.4×0.6 .



Part B

Use the model to calculate 1.4×0.6 .

Write your answer in the box.

0.84

7. **Part A**

The nutrition label on a vegan mayonnaise bottle says that 1 serving has 2.5 grams of fat. How many grams of fat do 1.5 servings of vegan mayonnaise have?

3.75 grams

Part B

Explain and show how you got your answer.

$$\begin{array}{r} 2.5 \\ \times 1.5 \\ \hline \end{array}$$

$$\begin{array}{r} 125 \\ + 250 \\ \hline \end{array}$$

375

Sample answer: Multiply 25 and 15. There are

2 decimal places in 2.5 and 1.5. Move the decimal

point 2 places to the left in the product, 375, to get

3.75 grams.

EXIT TICKET

Now that you have mastered using drawings, base-ten models, and place values to multiply decimals, let's solve the problem in the Real-World Connection.

Rita bought a hat that cost \$19.50. The tax can be calculated by multiplying the cost of the hat by 0.08 because Rita pays 8¢ tax for each dollar she spends. What was the total amount she paid for the hat?

She paid \$21.06 for the hat.

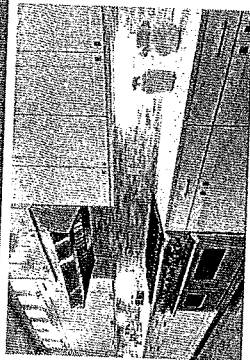
$$\begin{array}{r} 19.5 \\ \times 0.08 \\ \hline 1560 \\ + 0000 \\ \hline 1.560 \end{array}$$



There is 1 decimal place in 19.5 and 2 decimal places in 0.08. Move the decimal point 3 places to the left in the product, 1,560, to get $19.50 \times 0.08 = 1.560 = \1.56 .

Now, add the \$1.56 of tax to the price of the hat to find the total amount she paid for the hat: $\$19.50 + \$1.56 = \$21.06$.

EXAMPLE



Some of the kitchen tiles on the Aguilar's kitchen wall need to be replaced. The area is 0.6 feet high and each small tile is 0.05 feet high. How many tiles can fit in this area? Use a model to find the quotient of $0.6 \div 0.05$.

Make a model and partition the model into parts by shading it.



Each small square represents 0.01. The model shows 0.6 or 60 hundredths.

Dividing by 0.05 means finding how many groups of 5 hundredths are in 60 hundredths.

The model shows that 60 hundredths can be partitioned into 12 sets of 5 hundredths.

So, $0.6 \text{ ft} \div 0.05 \text{ ft} = 12$ tiles.

EXAMPLE

Divide $3.6 \div 0.12$ without base-ten blocks.

Step One Since 0.12 has 2 decimal places, multiply the dividend and divisor by 100 to make 0.12 into 12. This gives you $(3.6 \times 100) \div (0.12 \times 100) = 360 \div 12$.

Step Two Divide the whole numbers as you have previously. $360 \div 12 = 30$, so $3.6 \div 0.12 = 30$.

THINK ABOUT IT

What would happen if you only multiplied the dividend by 100 and not the divisor? Would you still get 30 as your answer?

GUIDED INSTRUCTION

1. A monthly magazine costs \$4.68 for a 6-month subscription. How much does each month's issue cost?

Step One Estimate the quotient of $4.68 \div 6$.

The quotient will be close to 1 because $6 \div 6 = 1$, and 4.68 is a little less than 6.

Step Two 6 is a whole number, so you can place the decimal point in the quotient above the decimal point in the dividend.

$$\begin{array}{r} 0.78 \\ 6 \overline{)4.68} \end{array}$$

Step Three Divide 46 tenths by 6.

$$\begin{array}{r} 0.7 \\ 6 \overline{)4.68} \\ \underline{-42} \\ 4 \end{array}$$

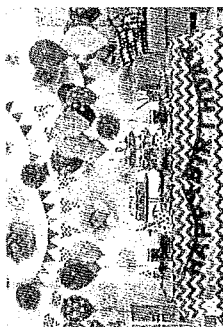
Step Four There are 48 hundredths left. Divide 48 hundredths by 6.

So, each month's issue costs \$0.78.

$$\begin{array}{r} 0.78 \\ 6 \overline{)4.68} \\ \underline{-42} \\ 48 \\ \underline{-48} \\ 0 \end{array}$$

TURN AND TALK

How can you determine if the answer is reasonable?



2. Mrs. Jackman spent \$15.75 on invitations to her daughter's birthday party. If each invitation cost \$0.45, how many invitations did she buy?

Step One Estimate the quotient of $15.75 \div 0.45$. The quotient will be close to 32 because 0.5 goes into 16 exactly 32 times.

$$0.45 \times 100 = 45$$

$$15.75 \times 100 = 1,575$$

Step Two Multiply the dividend and divisor by 100, so the divisor becomes a whole number.

$$45 \overline{) 1,575}$$

Step Three Write the new whole numbers as a division problem.

Step Four Divide the whole numbers. Enter the ones digit and subtract on your own.

$$\begin{array}{r} 35 \\ 45 \overline{) 1,575} \\ \underline{-135} \\ 225 \\ \underline{-225} \\ 0 \end{array}$$

So, Mrs. Jackman bought 35 invitations.

3. Select TWO quotients that equal 40.

- ☐ A $3.6 \div 9$
☐ B $4.6 \div 0.16$
☐ C $0.8 \div 0.02$
☐ D $24.4 \div 0.61$
☐ E $160 \div 0.4$

TURN AND TALK

Try to use estimation to determine which of the answer choices would give you a reasonable answer before you try either of the two methods presented in the lesson to find the exact quotient.

TURN AND TALK

What word in this question about John makes you think of division?

4. John babysat his little brother for his parents. He earned \$17.00. He babysat for 4 hours. How much did he earn per hour?

First, you can estimate. You know $4 \times 4 = 16$, so the answer is a little more than \$4.00. There is \$1 left to divide by 4, for \$0.25 more per hour. John earned \$4.25 per hour.

How Am I Doing?

What questions do you have?

Think of a time when you saw a decimal in your everyday life.

Write a division word problem with that decimal and give it to a partner to solve.

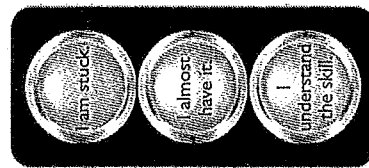
Explain the differences and similarities to the methods presented in the lesson. Which method is fastest to solve a problem with? Which method is the easiest to explain to a classmate?

TURN AND TALK

Work with a small group to write a 2 to 4 minute skit that you will perform for your class. The topic of the skit is "Dividing Decimals." In the skit, you should answer these questions:

- How do you make the divisor a whole number?
 - What can you do if there's not enough places in the dividend to move the decimal point to the right?
 - Where does the decimal point go in the quotient?
- You get to choose the setting and the characters for the skit. Afterwards, discuss with the class how well you presented the answers to the questions.

Color in the traffic signal that shows how you are doing with the skill.



INDEPENDENT PRACTICE

Answer the questions.

1. Geri has \$7.50 in quarters in a jar. How many quarters does Geri have in the jar?

(A) 3
(B) 30
(C) 300
(D) 3,000

HINT, HINT

A quarter is \$0.25, and 4 quarters make \$1. Estimate before you choose your answer.

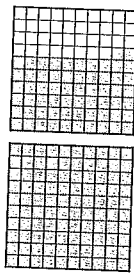
TIPS AND TRICKS

Use the model if it will help you.

2. What is the quotient of $1.62 \div 6$?

Write your answer in the box.

0.27



3. Which quotient is greater than 1? Select two correct answers.

(A) $3.45 \div 6.9$
(B) $0.28 \div 0.4$
(C) $0.48 \div 0.06$
(D) $85.4 \div 12$

4. Complete the statement by using *greater than*, *less than*, or *equal to*.

$7.75 \div 0.5$ is greater than $11.2 \div 0.8$.

5. Complete each equation. Write your answer in each box.

$$9.6 \div 32 = \boxed{0.3}$$

$$156 \div 5.2 = \boxed{30}$$

$$12 \div 0.04 = \boxed{300}$$

$$2.7 \div 0.9 = \boxed{3}$$

$$8.4 \div 2.8 = \boxed{3}$$

$$5.4 \div 18 = \boxed{0.3}$$

Part A

Leo earned \$170 last week. He worked 15 hours and earned a bonus of \$27.50. How much money did Leo earn per hour, not including the bonus?

Write your answer in the box.

\$9.50

HINT, HINT

\$170 is the total amount Leo earned, including the bonus.

Part B

Explain how you found how much money Leo earned per hour.

Sample answer: I subtracted \$27.50 from \$170 to get \$142.50, which is the amount Leo earned without the bonus. To find Leo's pay per hour, I divided \$142.50 by 15 to get \$9.50. I knew he earned almost \$10 per hour because $\$10 \times 15 = \150 .

TIPS AND TRICKS

Explain your answer and the reasoning you used.

WORK SPACE

7. Which of the following expressions has the greatest value?

- ☒ A $1.75 \div 0.2$
☐ B $3.2 \div 0.4$
☐ C $0.96 \div 0.16$
☐ D $0.36 \div 2$

8. Explain how you would divide 0.25 by 0.05. Include the answer to the problem.

Sample answer: I would multiply each number by 100. The problem becomes 25 divided by 5, which is 5. So 0.25 divided by 0.05 is equal to 5.

$$\begin{array}{r}
 1.45 \\
 5 \overline{) 7.25} \\
 \underline{-5} \\
 22 \\
 \underline{-20} \\
 25 \\
 \underline{-25} \\
 0
 \end{array}$$

EXIT TICKET

Now that you have mastered how to use drawings, base-ten models, and place values to divide decimals, let's solve the problem in the Real-World Connection.

Sam and his sister saw on television that during a 5-hour period, 7.25 inches of snow fell in their hometown. How many inches of snow fell per hour? Find the answer, and then explain how you can tell that the estimate is reasonable?

1.45 inches of snow fell per hour. I know this is reasonable because 7.25 is between 5 and 10 . Since $5 \div 5 = 1$ and $10 \div 5 = 2$, $7.25 \div 5$ is between 1 and 2 .

PRACTICE TEST

PRACTICE TEST Chapter 2

Answer the questions.

1. Compare the decimals. Write the appropriate symbol in each box.

$$0.67 \boxed{=} 0.670 \quad 3.45 \boxed{<} 3.751 \quad 763.02 \boxed{<} 763.027$$

2. What is 761.045 in expanded form using decimals?

Write your answer in the box.

$$\boxed{700 + 60 + 1 + 0.04 + 0.005}$$

3. Complete the statement by using *greater than*, *less than*, or *equal to*.

$$621.071 \text{ is } \boxed{\text{less than}} \boxed{621.771}$$

4. Which statement is *not* correct?

- ☐ A 7.78 rounded to the nearest tenth is 7.8.
☐ B 2.252 rounded to the nearest hundredth is 2.25.
☐ C 8.099 rounded to the nearest whole number is 9.0.
☐ D 52.865 rounded to the nearest hundredth is 52.87.

5. Which number is written as 13.6 when rounded to the nearest tenth?

- ☐ A 13.653
☐ B 13.579
☐ C 13.267
☐ D 13.719

6. What is 19.657 rounded to the nearest hundredth?

Write your answer in the box.

$$\boxed{19.66}$$

7. Select TWO numbers that complete the addition sentence.

$$\square + \square = 15.61$$

- ☐ A 1.2
☐ B 3.5
☐ C 4.5
☐ D 11.11
☐ E 15.11

8. Complete the statement by using *greater than*, *less than*, or *equal to*.

$$8.25 \div 0.25 \text{ is } \boxed{\text{greater than}} \boxed{10.35 \div 0.5}.$$

9. Add the numbers and write your answer in the box.

$$\begin{array}{r} 4.96 \\ + 0.57 \\ \hline \end{array} \quad \boxed{5.53}$$

Chapter 2 PRACTICE TEST

10. Select TWO subtraction sentences that are NOT true.

- ☐ A $19.8 - 16.9 = 2.9$
- ☐ B $7 - 4.8 = 2.2$
- ☐ C $9.67 - 2.35 = 7.32$
- ☐ D $10.5 - 5.99 = 4.06$
- ☐ E $12 - 7.35 = 4.65$
- ☐ F $0.84 - 0.55 = 0.31$

11. Part A

Multiply: 4×0.9

Write your answer in the box.

3.6

Part B

Explain how you got your answer, without counting decimal places. Why is your answer reasonable?

Sample answer: I multiplied 9 and 4 and got the product 36. However, 0.4 is 10 times smaller than 4, so the product is 10 times smaller than 36, or 3.6.

My answer is reasonable because 4×0.9 says to take a little less than 1 group of 4, so a product a little less than 4 makes sense.

12. Which product is correct?

- ☐ A $3.7 \times 0.06 = 2.22$
- ☐ B $5.3 \times 0.04 = 2.12$
- ☐ C $0.81 \times 3.4 = 2.754$
- ☐ D $0.4 \times 2.01 = 0.402$

PRACTICE TEST Chapter 2

13. A student multiplies 8.3×0.02 as shown below. Identify and explain the error in the student's work. Include the correct answer.

$$83 \times 2 = 176. \text{ So, } 8.3 \times 0.02 = 1.76$$

Sample answer: The student incorrectly multiplied 83 by 2 as 176 instead of 166. Then the placement of the decimal in the final answer is incorrect. The correct answer is: 0.166

There are 3 decimal places in 8.3 and 0.02. Move the decimal point 3 places to the left in the product 166, to get 0.166.

14. Reggie has the following values of coins in a jar.

- \$1.90 in nickels
- \$3.20 in dimes
- \$8.75 in quarters

Compare the number (not the value) of nickels, dimes, and quarters in the boxes.

nickels > quarters > dimes

15. Part A

Leslie divided $2.4 \div 0.02$ by multiplying 2.4 times 10 and 0.02 times 100 to get $24 \div 2 = 12$. What mistake did Leslie make?

Sample answer: Leslie did not multiply the dividend and divisor by the same number. She should have multiplied both the dividend and divisor by 100, so that the divisor was a whole number. She would have gotten 240 divided by 2.

Part B

Enter the quotient of $2.4 \div 0.02$ in the box

120

CHAPTER 3

WORDS TO KNOW
equivalent fractions
common denominator



Lesson 10

ADD AND SUBTRACT FRACTIONS 5.NF.1

INTRODUCTION

Real-World Connection

Kyra makes trail mix by combining $\frac{1}{4}$ cup nuts and $\frac{1}{5}$ cup dried fruit. What is the total amount of ingredients in Kyra's trail mix? To find the total amount of ingredients, Kyra can use equivalent fractions to add fractions with unlike denominators. Let's practice the skills in the Guided Instruction and Independent Practice and see how Kyra added the fractions with unlike denominators at the end of the lesson!

What I Am Going to Learn

- How to add and subtract fractions with unlike denominators
- How to find the common denominator for fractions
- How to replace a fraction with an equivalent fraction with a common denominator

What I May Already Know

3.NF.3a, 3.NF.3b, 4.NF.1, 4.NF.2

- I know two fractions are equivalent if they are at the same point on the number line.
- I know how to recognize and generate equivalent fractions.
- I know how to compare two fractions with different numerators and denominators.

Vocabulary in Action

- Equivalent fractions are fractions that name the same amount.
- Equivalent fractions can be used to add or subtract fractions with unlike denominators.

- To find a common denominator, find a number that is a multiple of both denominators.
- One way to find a common denominator is to multiply the denominators.
- You can also list multiples of each denominator until you find one in common.

EXAMPLE

Add $\frac{1}{5} + \frac{1}{2}$.

Step One Multiply the denominators to find a common denominator:

$$5 \times 2 = 10$$

Step Two Write equivalent fractions using the common denominator:

$$\frac{1}{5} = \frac{2}{10} \quad \frac{1 \times 2}{5 \times 2} = \frac{2}{10}$$

$$\frac{1}{2} = \frac{5}{10} \quad \frac{1 \times 5}{2 \times 5} = \frac{5}{10}$$

Step Three Add the fractions.

$$\frac{2}{10} + \frac{5}{10} = \frac{7}{10}$$

$$\text{So, } \frac{1}{5} + \frac{1}{2} = \frac{7}{10}.$$

EXAMPLE

Subtract $\frac{5}{6} - \frac{2}{3}$.

Step One Think of multiples of 6 and 9.

$6 \times 9 = 54$, but is there a smaller multiple?

Multiples of 6: 6, 12, 18 Multiples of 9: 9, 18

Step Two Write equivalent fractions using a common denominator.

$$\frac{5}{6} = \frac{15}{18} \quad \frac{5 \times 3}{6 \times 3} = \frac{15}{18}$$

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

Step Three Subtract the fractions.

$$\frac{15}{18} - \frac{4}{6} = \frac{11}{18}$$

$$\text{So, } \frac{5}{6} - \frac{2}{3} = \frac{11}{18}.$$

TURN AND TALK

Why is it necessary to find a common denominator?

You can use equivalent fractions to add or subtract mixed numbers. Sometimes one denominator is a multiple of the other.

EXAMPLE

Add $1\frac{1}{3} + 3\frac{1}{6}$.

Step One Think of multiples of 3 and 6.

6 is a multiple of 3, so only one equivalent fraction is needed.

Step Two Add the fractions. Then add the whole numbers.

$$\begin{array}{r} 1\frac{1}{3} = 1\frac{2}{6} \\ + 3\frac{1}{6} = + 3\frac{1}{6} \\ \hline 4\frac{3}{6} \end{array}$$

THINK ABOUT IT

How can you quickly tell that $4\frac{3}{6}$ is not in simplest form?

Step Three Write the answer in simplest form.

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

EXAMPLE

Subtract $2\frac{3}{4} - 1\frac{1}{6}$.

Step One Multiply the denominators to find a common denominator.

$$4 \times 6 = 24$$

Step Two Write equivalent fractions using the common denominator.

$$\begin{array}{r} 2\frac{3}{4} = 2\frac{18}{24} \\ 1\frac{1}{6} = 1\frac{4}{24} \end{array}$$

Step Two Use the common denominator to write equivalent fractions.

$$\begin{array}{r} 2\frac{1}{3} = \frac{1 \times 8}{3 \times 8} = 2\frac{8}{24} \\ + 1\frac{5}{6} = \frac{5 \times 4}{6 \times 4} = 1\frac{20}{24} \end{array}$$

Step Three Add the fractions and add the whole numbers.

$$2\frac{8}{24} + 1\frac{20}{24} = 3\frac{28}{24}$$



GUIDED INSTRUCTION

1. Add $2\frac{1}{3} + 1\frac{5}{6}$

Step One Find a common denominator for the two fractions. Multiply the denominators together, or think of the multiples of one number until you find one in common with the other.

Multiples of 8: 8, 16, 24

24 is also a multiple of 3.

The common denominator is 24.

TURN AND TALK

How can you determine the common denominator?

2. Subtract $\frac{5}{6} - \frac{1}{2}$

Step One Find a common denominator for the two fractions. 6 is a multiple of 2, so 6 can be the common denominator.

Step Two Use the common denominator to write equivalent fractions.

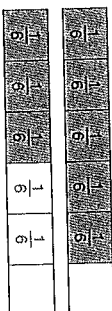
$$\frac{5}{6} - \frac{1}{2}$$

Step Three Subtract the fractions and then write the answer in simplest form.

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

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

You can also use a visual model to solve the problem.



$$\frac{5}{6} - \frac{1}{2} = \frac{2}{6} \text{ or } \frac{1}{3}$$

3. Select THREE expressions that are equivalent to $\frac{2}{3} + \frac{1}{6}$.

HINT, HINT

Check for expressions that show denominators that are common multiples of 3 or 6. Then, check each expression for equivalency.

- A $\frac{12}{18} + \frac{3}{18}$
- B $\frac{8}{12} + \frac{2}{12}$
- C $\frac{20}{32} + \frac{6}{32}$
- D $\frac{16}{28} + \frac{4}{28}$
- E $\frac{4}{7} + \frac{1}{7}$

How Am I Doing?

What questions do you have?

How can you find the common denominator of two fractions?

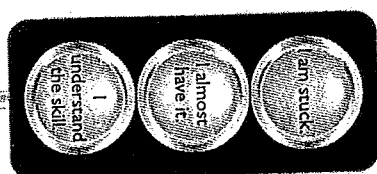
Do you prefer using a visual model to solve addition and subtraction problems? Explain how to use multiples to find the common denominator.

Do you prefer using a visual model to solve addition and subtraction problems? Explain how to use multiples to find the common denominator.

TURN AND TALK

Mariah subtracted $\frac{2}{3}$ from $\frac{5}{6}$. She found a difference of $\frac{1}{6}$. With a partner, discuss the mistake she made, and how to correct it to find the right answer.

Color in the traffic signal that shows how you are doing with the skill.



WORK SPACE

INDEPENDENT PRACTICE

Answer the questions.

1. Part A

Solve. $\frac{4}{9} - \frac{1}{6} = \square$

- (A) $\frac{5}{18}$
(B) $\frac{11}{18}$
(C) $\frac{3}{9}$
(D) $\frac{8}{27}$

Part B

How did you find the common denominator? Explain your answer.

Sample answer: I made a list of the multiples of

9 and 6.

Multiples of 9: 9, 18

Multiples of 6: 6, 12, 18

18 was the first common multiple that I found.

2. Find the sum.

Write your answer in the box. Use simplest form.

$$\begin{array}{r} 1\frac{1}{4} \\ + 2\frac{1}{12} \\ \hline \end{array}$$

$\frac{31}{3}$

3. Select THREE expressions that are equivalent to $2\frac{1}{4} - 1\frac{1}{2}$.

- (A) $2\frac{1}{4} - 1\frac{1}{2}$
(B) $2\frac{2}{8} - 1\frac{4}{8}$
(C) $2\frac{2}{10} - 1\frac{5}{10}$
(D) $2\frac{4}{14} - 1\frac{7}{14}$
(E) $1\frac{10}{8} - 1\frac{4}{8}$

HINT, HINT

Check for expressions that show denominators that are common multiples of 4 and 2. Then, check each expression for equivalency.

4. Add $7\frac{2}{4} + 4\frac{3}{4}$. Use the numbers in the box to show the result of each step.

The numbers cannot be used more than once. Write each number in the appropriate box.

$\frac{8}{20}$	$\frac{6}{20}$	$10\frac{1}{20}$	$\frac{21}{20}$	$\frac{15}{20}$	$\frac{23}{20}$	$12\frac{3}{20}$
----------------	----------------	------------------	-----------------	-----------------	-----------------	------------------

$7\frac{8}{20} + 4\frac{15}{20} = 11\frac{23}{20} = 12\frac{3}{20}$

5. Solve. $\frac{5}{8} + \frac{1}{4} = \square$

- (A) $\frac{3}{8}$
(B) $\frac{1}{2}$
(C) $\frac{2}{3}$
(D) $\frac{7}{8}$

SKETCH IT

Use the margin to draw a fraction model to help you solve the problem. Draw a bar with 8 parts. Shade 5 parts, and then shade another $\frac{1}{4}$ of it. How many parts are shaded?

6. Which expression is equivalent to $\frac{1}{6} + \frac{3}{8}$?

- Ⓐ $\frac{8}{48} + \frac{18}{48}$
 Ⓑ $\frac{6}{36} + \frac{15}{36}$
 Ⓒ $\frac{8}{20} + \frac{6}{20}$
 Ⓓ $\frac{2}{12} + \frac{4}{12}$

Part A

Find the missing fraction.
Write your answer in the box.

$$\frac{1}{2} - \frac{\boxed{3}}{10} = \frac{1}{5}$$

Part B

Explain how you solved the problem.

Sample answer: I multiplied 2 and 5 to find a

common denominator for the two given fractions

($2 \times 5 = 10$). I know that $\frac{5}{10}$ is equivalent to

$\frac{1}{2}$ and $\frac{2}{10}$ is equivalent to $\frac{1}{5}$. I know that if I subtract $\frac{3}{10}$

from $\frac{5}{10}$, I will get $\frac{2}{10}$, so $\frac{2}{10}$ is the missing fraction.

TIPS AND TRICKS

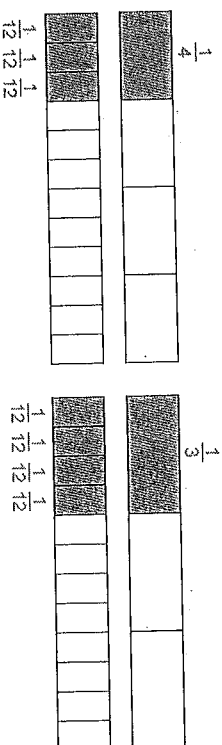
Explain the steps you used and explain your reasoning for taking each step.

EXIT TICKET

Now that you have mastered finding common denominators, let's solve the problem in the Real-World Connection.

Kyra makes trail mix by combining $\frac{1}{4}$ cup nuts and $\frac{1}{3}$ cup dried fruit. What is the total amount of ingredients in Kyra's trail mix? To find the total amount of ingredients, Kyra can use equivalent fractions to add fractions with unlike denominators.

Solve by using a visual model.



The total amount of ingredients in Kyra's trail mix is $\frac{7}{12}$ cup.

Method 2 Write an equation to solve the problem.

Step One Write an equation to represent the problem.
The words "in all" tell you to add.
 $\frac{1}{16} + \frac{3}{8} = ?$

Step Two Rewrite the problem using a common denominator.
 $\frac{3}{8} = \frac{3 \times 2}{8 \times 2} = \frac{6}{16}$
 $\frac{1}{16} + \frac{3}{8} = \frac{1}{16} + \frac{6}{16} = ?$

Step Three Find the sum.
 $\frac{1}{16} + \frac{6}{16} = \frac{7}{16}$

You can use your estimate to check that your answer is reasonable.
 $\frac{7}{16}$ is a little less than $\frac{1}{2}$, so the answer is reasonable.

You can use number sense and your knowledge of fractions to think about fraction problems.

EXAMPLE

Sarah needs to subtract $\frac{6}{10} - \frac{7}{12}$, but she thinks $\frac{7}{12} > \frac{6}{10}$ and that her answer will be negative. Is she correct?

Step One Find a benchmark fraction that each fraction is close to. Each fraction is close to $\frac{1}{2}$.

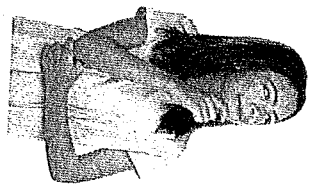
Step Two Compare each fraction to the benchmark fraction.
 $\frac{6}{10}$ is $\frac{1}{10}$ more than $\frac{1}{2}$, and $\frac{7}{12}$ is $\frac{1}{12}$ more than $\frac{1}{2}$.

Step Three Use number sense to draw a conclusion about the difference.

Since both fractions are close to $\frac{1}{2}$, the difference will be close to 0. $\frac{1}{2} - \frac{1}{2} = 0$

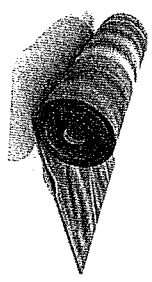
Step Four Solve and check your answer.
 $\frac{6}{10} - \frac{7}{12} = \frac{36}{60} - \frac{35}{60} = \frac{1}{60}$

The answer is close to the estimate of 0. The answer is reasonable.



GUIDED INSTRUCTION

1. Trey has $\frac{7}{8}$ of a yard of fabric. He uses $\frac{1}{4}$ of a yard to patch some shirts. How much fabric does Trey have left?



Step One Estimate using a benchmark for $\frac{7}{8}$.
 $1 - \frac{1}{4} = \frac{3}{4}$

Step Two Use fraction models to represent the problem. Then, find fraction strips with the same denominator that fit exactly under the difference.

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

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

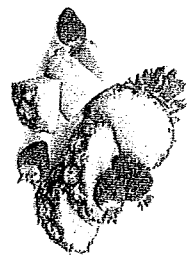
Step Three Check that your answer is reasonable.
 $\frac{3}{4}$ is close to the estimated $\frac{3}{4}$ because $\frac{6}{8} = \frac{3}{4}$.
Trey has $\frac{3}{4}$ of a yard of fabric left.

2. Halile makes a fruit salad with $\frac{2}{3}$ cup strawberries and $\frac{5}{6}$ cup pineapple. How much fruit is in Halile's salad?

Step One Estimate using benchmarks.

$\frac{2}{3}$ is a little less than $\frac{1}{2}$.
 $\frac{5}{6}$ is a little less than 1.

The sum will be a little less than $1\frac{1}{2}$.



Step 1: Write Write an equation to represent the problem.
 $\frac{2}{3} + \frac{5}{6} = ?$

TURN AND TALK
 Did you write the same equation as your neighbor? If you wrote different equations, were both equations reasonable?

Step 2: Write Write equivalent fractions with the same denominator and add.
 $\frac{12}{30} + \frac{25}{30} = \frac{37}{30}$
 $\frac{37}{30} = 1\frac{7}{30}$

Step 3: Check Check that your answer is reasonable.
 $1\frac{7}{30}$ is close to $1\frac{1}{2}$, so the answer is reasonable.
 There are $1\frac{7}{30}$ cups of fruit in Haile's salad.

3. Darcy and her family are driving to Washington, DC. On the first day they travel $\frac{1}{3}$ of the total distance. On the morning of the second day they travel $\frac{2}{8}$ of the total distance. How much of the distance have they traveled after the morning of the second day?

Order each step from 1–5.

Order	Step
2	Rewrite as $\frac{8}{24} + \frac{15}{24}$.
3	Add to get $\frac{23}{24}$.
1	Estimate the addition: $\frac{1}{2} + \frac{1}{2} = 1$.
5	They have traveled $\frac{23}{24}$ of the total distance after the morning of the second day.
4	Check: $\frac{23}{24}$ is close to 1.

HINT, HINT

You are asked to show the steps you would use to solve the problem in the order you would use them. What is the first thing you should always do?

How Am I Doing?

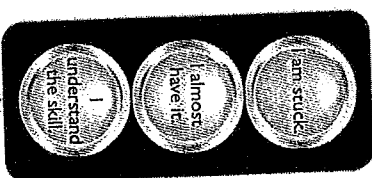
What questions do you have?

How can you find the common denominator of two fractions?

TURN AND TALK

Aaliyah spent $\frac{1}{2}$ of her birthday money on a book and $\frac{2}{3}$ of her birthday money on a toy. What fraction of her birthday money did she spend? With a partner, estimate the answer using a benchmark fraction. Then, solve the problem using a fraction model and an equation. Talk about which method you prefer and why?

Color in the traffic signal that shows how you are doing with the skill.



INDEPENDENT PRACTICE

Answer the questions.

SKETCH IT

Use the margin to draw a fraction model to help you add the fractions. Start by dividing the fraction model into 6 parts.

1. Cleo is wrapping a present. She uses $\frac{2}{3}$ of a yard of red ribbon and $\frac{1}{6}$ of a yard of blue ribbon. How much ribbon does she use in all?

- ☐ A $\frac{3}{6}$ of a yard
☐ B $\frac{4}{6}$ of a yard
☐ C $\frac{5}{6}$ of a yard
☐ D $\frac{3}{3}$ of a yard

2. There is $\frac{11}{12}$ of a pizza left. James eats another $\frac{1}{3}$ of the original pizza. How much pizza is left?

Write your answer in the box. Use simplest form.

$\frac{7}{12}$

THINK ABOUT IT

What would be a reasonable estimate if Raj had walked $\frac{2}{3}$ of a mile on Monday and $\frac{1}{3}$ of a mile on Wednesday?

3. Raj walks $\frac{2}{3}$ of a mile on Monday. He walks $\frac{3}{8}$ of a mile on Wednesday. Raj wants to know about how much farther he walked on Monday than on Wednesday. Which is a reasonable estimate?
- ☐ A $\frac{1}{2} - \frac{1}{2} = 0$ miles
☐ B $1 - 1 = 0$ miles
☐ C $1 - \frac{1}{2} = \frac{1}{2}$ mile
☐ D $1 - 0 = 1$ mile

WORK SPACE

4. Thea has $\frac{5}{12}$ of a ball of yarn. The pattern calls for $\frac{1}{4}$ of a ball of yarn to knit a hat. How much yarn does Thea have left? Write your answer in the box. Use simplest form.

$\frac{1}{6}$

of a ball of yarn

5. Logan runs $\frac{1}{2}$ of a mile. Lisa runs $\frac{7}{8}$ of a mile. How much farther than Logan does Lisa run? Order the steps from 1–5.

Order	Step
3	Subtract to get $\frac{3}{8}$.
1	Estimate: $1 - \frac{1}{2} = \frac{1}{2}$
4	Check: $\frac{3}{8}$ is close to $\frac{1}{2}$.
5	Lisa runs $\frac{3}{8}$ mile farther than Logan.
2	Rewrite to get $\frac{7}{8} - \frac{4}{8}$.

6. Use the numbers in the box to compare each fraction to an appropriate benchmark. The numbers can be used more than once. Write each number in the appropriate box.

0

$\frac{1}{2}$

1

$\frac{9}{16} \approx$

$\frac{1}{2}$

$\frac{4}{5} \approx$

1

$\frac{1}{12} \approx$

0

$\frac{11}{20} \approx$

$\frac{1}{2}$

7. Part A

Explain how you know that $\frac{7}{10} + \frac{3}{5}$ is greater than 1 without adding the fractions.

Sample answer: I know that each fraction is greater than $\frac{1}{2}$, and $\frac{1}{2} + \frac{1}{2} = 1$, so the sum of the fractions must be greater than 1.

Part B

Find the sum of $\frac{7}{10} + \frac{3}{5}$. Explain each step and show your work.

Sample answer: Estimate: $1 + \frac{1}{2} = 1\frac{1}{2}$. Rewrite the expression with equivalent fractions and add: $\frac{7}{10} + \frac{6}{10} = \frac{13}{10}$. Write in simplest form: $\frac{13}{10} = 1\frac{3}{10}$.

Compare with estimate to check: Yes, $1\frac{3}{10}$ is close to $1\frac{1}{2}$.

8.

Tom adds $\frac{4}{9} + \frac{4}{7}$ and gets a sum of $\frac{36}{63}$. Is his answer reasonable?

Use estimation to explain your thinking.

Sample answer: Tom's answer is not reasonable. $\frac{4}{9}$ is a little less than $\frac{1}{2}$ and $\frac{4}{7}$ is a little more than $\frac{1}{2}$.

So, the total should be close to 1. However, Tom's total is close to $\frac{1}{2}$.

TIPS AND TRICKS

Explain the steps you used and explain your reasoning for taking each step.

EXIT TICKET

Now that you have mastered word problems and benchmark fractions, let's solve the problem in the Real-World Connection. Each morning, Gia and Ned walk to school. Gia walks $\frac{9}{10}$ mile from her home to school. Ned walks $\frac{2}{5}$ mile from his home to school. How much farther does Gia walk than Ned? Use subtraction to solve. Then use benchmark fractions to explain if your answer is reasonable.

Gia walks $\frac{1}{2}$ mile farther than Ned. This answer is reasonable because $\frac{9}{10}$ is close to 1 , $\frac{2}{5}$ is close to $\frac{1}{2}$, and $1 - \frac{1}{2} = \frac{1}{2}$.

Use subtraction to solve.

$$\frac{9}{10} - \frac{2}{5}$$

10 is a multiple of 5, so change $\frac{2}{5}$ to $\frac{4}{10}$.

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

Estimate using benchmarks.

$\frac{9}{10}$ is $\frac{1}{10}$ from 1, so it is close to 1.

$\frac{2}{5}$ is close to $\frac{1}{2}$ because 2 is a little less than $\frac{1}{2}$ of 5.

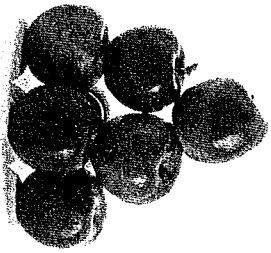
$$\frac{9}{10} - \frac{4}{10} = \frac{5}{10}$$

Rewrite with a common denominator and subtract.

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

Write the answer in simplest form.

Subtract to estimate. $1 - \frac{1}{2} = \frac{1}{2}$

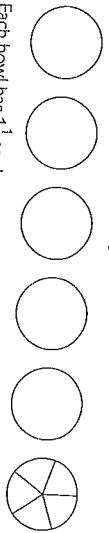


EXAMPLE

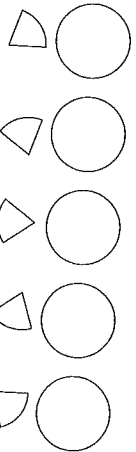
6 apples are divided equally into 5 bowls. How much apple is in each bowl?

$$6 \div 5 = ?$$

There are enough apples to have one in each bowl. The last apple will be divided into fifths, with $\frac{1}{5}$ in each bowl.



Each bowl has $1\frac{1}{5}$ apples.



1 whole apple is $\frac{5}{5}$, so we could also say that each bowl has 6 fifths of an apple.

$$\text{So, } 6 \div 5 = \frac{6}{5} = 1\frac{1}{5}.$$

You can solve division problems using fractions, especially when it is inconvenient to draw a model.

EXAMPLE

TURN AND TALK
What steps do you take to convert $\frac{39}{5}$ to a mixed number?

Frank buys a 39-pound bag of dog food for his 6 dogs. How many pounds will each dog get, if the dog food is shared evenly?

$$\text{Divide: } \frac{39}{6} = 6\frac{3}{6} = 6\frac{1}{2}$$

Each dog will get $6\frac{1}{2}$ pounds of dog food.

Notice:

If the dividend is more than the divisor, the quotient is > 1 :
 $\frac{39}{6} = 6\frac{1}{2}$

If the dividend is less than the divisor, the quotient is < 1 :
 $3 \div 4 = \frac{3}{4}$

GUIDED INSTRUCTION

1. There are 4 artists painting a mural that is 13 ft long. If the mural is divided equally between the artists, how much of the mural will each artist paint?

Step One What is the problem asking? Write a division equation for the problem.

How can 13 feet be divided among 4 evenly? $13 \div 4 = ?$

Step Two How many whole feet does each artist get?
 $4 \times 3 = 12$, so each artist gets 3 feet.

Step Three Divide the remaining foot into 4 equal parts, or fourths.



Each artist gets $\frac{1}{4}$ of the last foot.

Step Four Add the whole to the part.
 $3 + \frac{1}{4} = 3\frac{1}{4}$

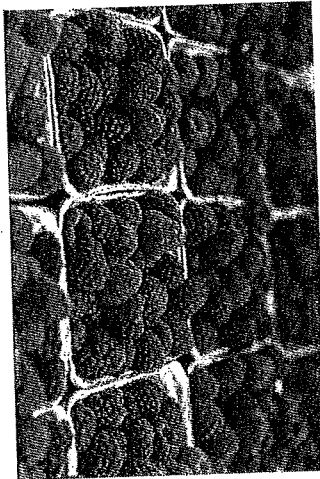
Step Five Solve the problem.

Each artist will paint $3\frac{1}{4}$ ft of the mural.

TIPS AND TRICKS

You can also solve the problem by writing it as a fraction:
 $13 \div 4 = \frac{13}{4} = 3\frac{1}{4}$

2. Marni has 3 lb of raspberries. She divides the raspberries into 8 equal groups for 8 pies. How many pounds are in each group?



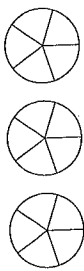
Step One Write a division equation for the problem.
 $3 \div 8 = ?$

Step Two Use a fraction to find the quotient.
 $3 \div 8 = \frac{3}{8}$

Step Three Solve the problem.

There are $\frac{3}{8}$ lb of raspberries in each group.

3. Five people equally share three pies. Select **THREE** expressions that describe the amount of pie each person receives.



- Ⓐ $5 \div 3$ Ⓑ $\frac{5}{3}$
 Ⓒ $\frac{3}{5}$ Ⓓ $3 \div 5$
 Ⓔ three-fifths Ⓕ five-thirds

HINT, HINT
 In a fraction, the numerator is the number of pies, and the denominator is the number of people.



How Am I Doing?

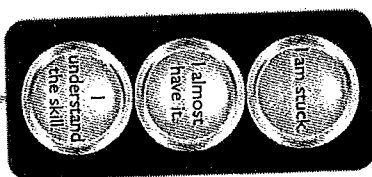
What questions do you have?

Describe a time you had to divide something among a few different people. What fraction represents this situation?

What is an example of a problem you might have where the amount you need to divide is a smaller value than the number of groups you have? How do you know how many belongs in each group?

TURN AND TALK

With a partner solve this problem:
 Nine friends want to share 2 gallons of ice cream. Explain how they can decide how much each friend should get if they want to share evenly.

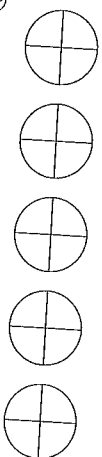


Color in the traffic signal that shows how you are doing with the skill.

INDEPENDENT PRACTICE

Answer the questions.

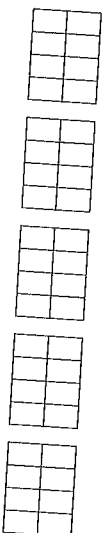
1. 4 friends equally share 5 oranges. Which describes the amount each friend receives?



- Ⓐ Less than 1 orange
Ⓑ More than 1 orange
Ⓒ Exactly 1 orange
Ⓓ Exactly 2 oranges

WORK SPACE

2. 5 cakes are shared equally between 8 friends. How much cake does each friend receive? Write the numbers in the appropriate box.



$$\boxed{5} \div \boxed{8} = \frac{\boxed{5}}{\boxed{8}}$$

3. Which expression is $8 \div 9$ like?

- Ⓐ $\frac{9}{8}$
Ⓑ $\frac{8}{9}$
Ⓒ $1\frac{1}{9}$
Ⓓ $1\frac{1}{8}$

SKETCH IT

Use the WORK SPACE below to draw a model of $2\frac{1}{3}$ peaches for each number of friends in the choices. Which adds up to the correct number of peaches?

4. Some friends equally share some peaches. Each friend receives $2\frac{1}{3}$ peaches. Which describes the number of friends and the number of peaches?
- Ⓐ 3 friends equally share 2 peaches.
Ⓑ 2 friends equally share 3 peaches.
Ⓒ 7 friends equally share 3 peaches.
Ⓓ 3 friends equally share 7 peaches.
5. Nine yards of ribbon are divided equally between two dresses. Select FOUR expressions that describe the amount of ribbon on each dress.
- Ⓐ $\frac{9}{2}$
Ⓑ $2 \div 9$
Ⓒ nine halves
Ⓓ $4\frac{1}{2}$
Ⓔ two-ninths
Ⓕ $9 \div 2$

WORK SPACE

6. What does the fraction $\frac{7}{8}$ mean?

- Ⓐ $8 \div 7$
Ⓑ $1 \div 7$
Ⓒ $7 \div 8$
Ⓓ $8 \div 1$

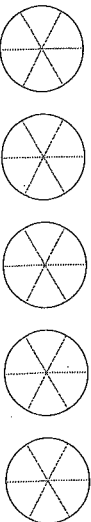
7. 8 families share a neighborhood garden. The families equally share the vegetables they grow. They grow 35 lb of tomatoes. How much will each family receive?

$$\boxed{35 \div 8 = \frac{35}{8} = 4\frac{3}{8}} \text{ lb}$$

WORK SPACE

8. Part A

Six friends equally share five melons. Draw lines to show each friend's share.



Part B

How much melon does each friend receive? Write an equation and solve. Explain how your equation matches the model from Part A.

Sample answer: Each friend gets $\frac{5}{6}$ of a melon.

Using the model, they get $\frac{1}{6}$ of each of the

5 melons: $\frac{1}{6} \times 5 = \frac{5}{6}$. Also, $5 \div 6 = \frac{5}{6}$.

My equation matches the model because the model shows how to divide 5 into 6 equal groups.

9.

Doug says that $4 \div 5 = 5 \div 4$, just like $4 \times 5 = 5 \times 4$. Explain Doug's mistake.

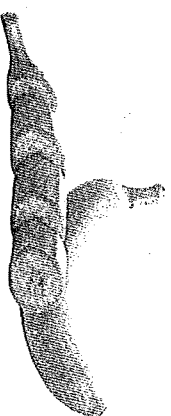
Sample answer: $4 \div 5 \neq 5 \div 4$. $4 \div 5$ means to

divide 4 things into 5 groups, which will be less than 1 for each group, $\frac{4}{5}$. $5 \div 4$ means to divide 5 things

into 4 groups, which will be more than 1 for each group, $\frac{5}{4}$.

EXIT TICKET

Now that you have mastered writing fractions to solve grouping problems, let's solve the problem in the Real-World Connection.

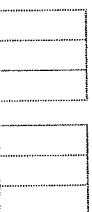


3 friends want to share 2 bananas equally. How much banana will each friend receive?

Each friend receives $\frac{2}{3}$ of a banana.

2 bananas divided among 3 people: $2 \div 3$

Divide 2 bananas into 3 equal parts each.



Each person receives $\frac{1}{3}$ of each banana, and there are 2 bananas.

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

You can use what you know about division and fractions to check your

$$\text{answer: } 2 \div 3 = \frac{2}{3}$$

Each friend receives $\frac{2}{3}$ of a banana.

EXAMPLE

Multiply $\frac{5}{6} \times 3$ using the Commutative Property of Multiplication.

Step One Think of the fraction as a whole number multiplied by a unit fraction.

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

Step Two Rewrite the expression.

$$\frac{5}{6} \times 3 = (5 \times \frac{1}{6}) \times 3$$

Step Three Regroup using the Commutative Property of Multiplication.

$$(5 \times \frac{1}{6}) \times 3 = \frac{1}{6} \times (5 \times 3)$$

Step Four Multiply the whole numbers and convert into a fraction.

$$\frac{1}{6} \times (5 \times 3) = \frac{1}{6} \times 15 = \frac{15}{6}$$

EXAMPLE

Multiply: $\frac{2}{3} \times 9$

Step One Multiply the numerators.

In the number 9, 9 is the numerator.

$$2 \times 9 = 18$$

Step Two Divide by the denominator.

$$\frac{18}{3} = 6$$

$$\text{So, } \frac{2}{3} \times 9 = \frac{2 \times 9}{3} = \frac{18}{3} = 6.$$

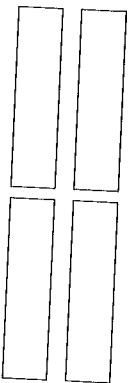
TURN AND TALK

Think about Hannah's problem from the beginning of the lesson. Do you think drawing a picture might help her solve the problem?

GUIDED INSTRUCTION

1. Find the product: $\frac{7}{12} \times 4$

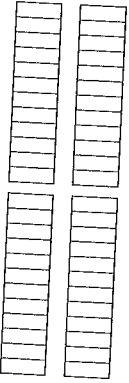
Step One Draw four wholes.



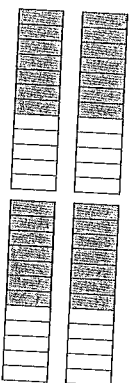
SKETCH IT

Start by drawing a shape for each whole number.

Step Two Divide each whole into 12 equal parts.



Step Three Shade seven parts of each whole.



Step Four Find how many wholes the shaded areas represent.

Ten shaded parts from the right could be moved to fill the two wholes at left, leaving behind a third of another whole shaded.

$\frac{28}{12}$ are shaded.

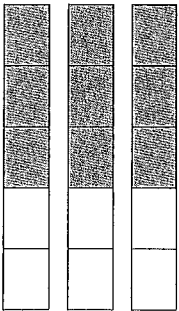
$$\frac{28}{12} = 2\frac{4}{12} = 2\frac{1}{3}$$

Step Five Or, solve by multiplying.

$$\frac{7}{12} \times 4 = \frac{7 \times 4}{12} = \frac{28}{12}$$

$$\frac{28}{12} = \frac{12 + 12 + 4}{12} = 2\frac{4}{12} = 2\frac{1}{3}$$

2. What multiplication expression does the model show?



Step One One factor is the number of wholes in the model. There are 3 wholes, so the expression is $\underline{\hspace{1cm}} \times 3$.

Step Two The other factor is the portion of each whole that is shaded.

Each whole is divided into fifths, with $\frac{3}{5}$ shaded, so the expression is $\frac{3}{5} \times 3$.

HINT, HINT

Think about how each expression could be modeled visually. If the expression can be modeled the same way as $\frac{4}{5} \times 10$, it is an equivalent expression.

3. Select THREE expressions that are equivalent to $\frac{4}{5} \times 10$.

- ☐ A $\frac{40}{5}$
- ☐ B $\frac{5}{4} \times 10$
- ☐ C $4 \times \frac{10}{5}$
- ☐ D $\frac{4 \times 10}{5}$
- ☐ E $\frac{5 \times 10}{4}$

How Am I Doing?

What questions do you have?

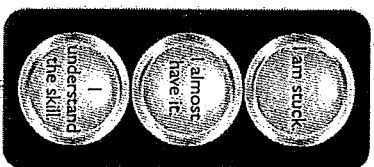
How can the Commutative Property of Multiplication help you multiply by a fraction?

How could a model help you multiply fractions and a whole number? Give an example.

TURN AND TALK

With a partner, use the Commutative Property of Multiplication to help you answer this question: Keisha has $\frac{3}{8}$ of the students are boys, how many boys are in the drama class?

Color in the traffic signal that shows how you are doing with the skill.



INDEPENDENT PRACTICE

TIPS AND TRICKS

The question might tell you to enter your answer in simplest terms. If it doesn't, you may simplify your answer, but you do not need to.

Answer the questions.

1. What is $\frac{3}{5} \times 15$?

Write your answer in the box.

45

5

9

WORK SPACE

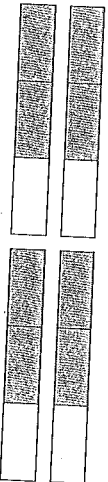
2. Write the product in the table for each expression.

Expression	Product
$\frac{1}{2} \times 7$	$3\frac{1}{2}$
$\frac{3}{10} \times 5$	$1\frac{1}{2}$
$\frac{4}{9} \times 3$	$1\frac{1}{3}$
$\frac{2}{3} \times 5$	2
$\frac{5}{6} \times 2$	$1\frac{2}{3}$

3. Which multiplication equation is true?

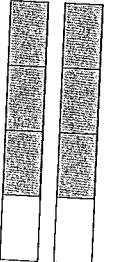
- (A) $\frac{3}{5} \times 15 = \frac{1}{5}$
(B) $\frac{5}{8} \times 4 = 2\frac{1}{2}$
(C) $\frac{7}{10} \times 4 = 3\frac{1}{2}$
(D) $\frac{4}{5} \times 6 = 2$

4. Which model shows the product of $\frac{3}{4} \times 2$?

(A) 

(B) 

(C) 

(D) 

5. Solve. $\frac{5}{12} \times 4 = \square$

- (A) $1\frac{1}{3}$
(B) $1\frac{2}{3}$
(C) $2\frac{1}{2}$
(D) $2\frac{3}{4}$

Part A

Draw lines and shade to model $\frac{2}{3} \times 4$.

SKETCH IT

In the WORK SPACE sketch your own model and then compare it to the answer choices.

WORK SPACE

TIPS AND TRICKS

There may be more than one way to find the product, but the question asks about your model. Be sure to refer to your model in your answer.

Part B

What is $\frac{2}{3} \times 4$? Use your model from Part A to justify your answer.

Sample answer: $\frac{8}{3}$ or $2\frac{2}{3}$. My model shows 4 wholes divided into thirds. $\frac{2}{3}$ of each whole is shaded.

There are 8 shaded thirds, which represent $2\frac{2}{3}$.

WORK SPACE

7. Select THREE story problems that can be solved with $\frac{3}{4} \times 24$.

- (A) There are 24 students in the 5th grade class. Three-fourths of the students ride the bus to school. How many 5th grade students ride the bus to school?
- (B) Ryan bought a 24-pack of bottled water. He has used $\frac{3}{4}$ of the pack. How many bottles has Ryan used?
- (C) Tina has a piece of ribbon that is $\frac{3}{4}$ of a yard long. She wants to cut it into 24 equal pieces. How long is each piece?
- (D) James is riding in a 24-mile bike race. He has $\frac{3}{4}$ mile left to ride. How many miles did James already ride?
- (E) Emily has a rectangular piece of cardboard that is 24 inches long. Emily needs $\frac{3}{4}$ the length. How long is the piece of cardboard Emily needs?

8. Write a story problem that can be solved with the expression $\frac{2}{3} \times 30$.

Sample answer: A math test has 30 questions. $\frac{2}{3}$ of the questions are multiple choice. How many multiple-choice questions are on the test?

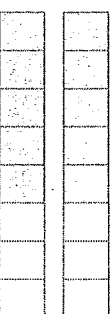
EXIT TICKET

Now that you have mastered multiplying fractions by whole numbers, let's solve the problem in the Real-World Connection.

Hannah's family likes to jog in the park on weekends. The path at the park is 2 miles long. Hannah's family jogs $\frac{5}{8}$ of the way and walks the rest of the way. How far did Hannah's family jog? Solve by using a model.

Hannah's family jogged $1\frac{1}{4}$ miles.

$$\frac{5}{8} \text{ of } 2 = \frac{5}{8} \times 2$$



Draw a model with 2 wholes partitioned into 8 equal parts. Shade 5 parts of each whole.

$$\frac{10}{8} \text{ are shaded. } \frac{10}{8} = \frac{12}{8} = \frac{11}{4}$$

$$\text{Or, } 2 \times \frac{5}{8} = \frac{(2 \times 5)}{8} = \frac{10}{8} = \frac{12}{8} = \frac{11}{4}$$

The shaded part of the model is $\frac{5}{4}$, or $1\frac{1}{4}$.

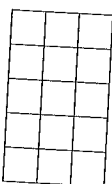
So, Hannah's family jogged $1\frac{1}{4}$ miles.

To use an area model to find the product of two fractions, divide each dimension into the number of parts given by the denominator of each fraction. This will make the number of parts that will be the denominator of the product. The number of shaded rectangles is the numerator of the product.

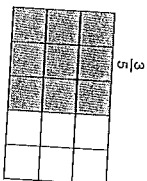
EXAMPLES

Use an area model to show $\frac{2}{3} \times \frac{3}{5}$.

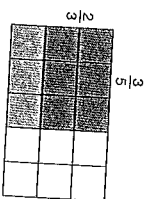
Step One Draw a rectangle. Divide one dimension into thirds. Divide the other dimension into fifths.



Step Two Shade $\frac{2}{3}$.



Step Three Shade $\frac{3}{5}$ of $\frac{2}{3}$ in a darker color.



Step Four Count the number of darkly shaded parts and compare to the total number of parts.

There are 6 darkly shaded parts and 15 total parts. So, the area of the shaded region is $\frac{6}{15}$. There are 15 parts in the rectangle, so each $\frac{2}{3} \times \frac{3}{5} = \frac{6}{15}$.

TURN AND TALK

The final numerator (6) is the product of the numerators of the factors (2×3). The final denominator (15) is the product of the denominators of the factors (3×5). Look at the area model to see why this makes sense.

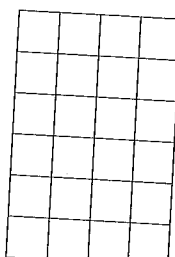
GUIDED INSTRUCTION

1. Find the product: $\frac{3}{4} \times \frac{5}{6}$

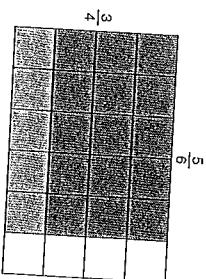
Step One Draw a rectangle.

Divide one dimension into fourths and the other dimension into sixths.

There are 4×6 , or 24 parts. Each part is $\frac{1}{24}$ of the whole rectangle.



Step Two Shade $\frac{3}{4}$ and then $\frac{5}{6}$ of $\frac{3}{4}$.



Step Three Count the number of shaded rectangles.

There are 3×5 , or 15 shaded rectangles.

There are 4×6 , or 24 parts in the whole.

$$\frac{3}{4} \times \frac{5}{6} = \frac{15}{24}$$

Step Four

Solve.

The shaded region is $\frac{15}{24}$, reduced to $\frac{5}{8}$, of the whole.

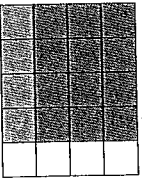
SKETCH IT

Start by making a box with the total number of smaller boxes that would equal the product of the denominators.

HINT, HINT

Count the total boxes to find the denominator.

2. What equation is shown in the area model?



- (A) $\frac{4}{5} \times \frac{1}{4} = \frac{4}{20}$
- (B) $\frac{2}{3} \times \frac{4}{5} = \frac{8}{15}$
- (C) $\frac{6}{8} \times \frac{2}{3} = \frac{12}{24}$
- (D) $\frac{3}{4} \times \frac{4}{5} = \frac{12}{20}$

3. Multiply: $\frac{1}{2} \times \frac{3}{8}$

Explain how to find the product.

$$\frac{1}{2} \times \frac{3}{8} = \frac{3}{16}$$

The area model needs eighths to show $\frac{3}{8}$ and halves to take $\frac{1}{2}$ of the $\frac{3}{8}$, so I know there will be 16 parts in the whole. There will be 3 groups of 1 shaded, or $\frac{3}{16}$ of the whole.

How Am I Doing?

What questions do you have?

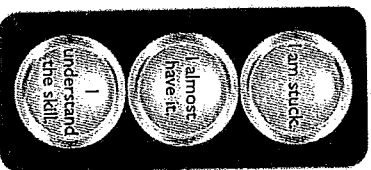
What is an area model?

How does an area model help you find the product of two fractions?

SKETCH IT

Think of two fractions you could multiply. In the margin below, sketch an area model to represent the product.

Color in the traffic signal that shows how you are doing with the skill.



WORK SPACE

INDEPENDENT PRACTICE

Answer the questions.

1. Part A

Which word correctly completes the sentence?
The product of two fractions less than 1 is _____ less than 1.

- ☐ A always
- ☐ B sometimes
- ☐ C never

Part B

Use what you know about area models to justify your answer in Part A.

Sample answer: You are starting with a fraction less than 1, and then taking a fraction of it, making it even smaller.

2. Which equation is true?

- ☐ A $\frac{2}{3} \times \frac{4}{6} = \frac{8}{48}$
- ☐ B $\frac{1}{3} \times \frac{2}{3} = \frac{2}{3}$
- ☐ C $\frac{3}{7} \times \frac{2}{4} = \frac{6}{28}$
- ☐ D $\frac{2}{5} \times \frac{1}{3} = \frac{3}{15}$

HINT, HINT

The products may be written as equivalent fractions. Be sure to find each product, rather than just looking at the denominators in the equation.

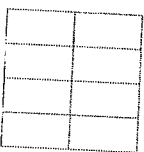
3. Multiply. Write your answer in the box.

$\frac{1}{5} \times \frac{3}{6} =$ $\frac{3}{30}$ or $\frac{1}{10}$

WORK SPACE

4. Draw an area model to represent the product $\frac{1}{2} \times \frac{1}{4}$. Partition the rectangle to show the factors. Then shade a region that represents the product.

Sample answer:



5. Select THREE products that could be represented by an area model that is divided into 12 equal parts.

- ☐ A $\frac{1}{6} \times \frac{3}{4}$
- ☐ B $\frac{5}{12} \times \frac{11}{12}$
- ☐ C $\frac{5}{6} \times \frac{1}{2}$
- ☐ D $\frac{3}{4} \times \frac{3}{4}$
- ☐ E $\frac{2}{3} \times \frac{2}{4}$
- ☐ F $\frac{3}{4} \times \frac{1}{3}$

6. Part A

Eva is making a birdhouse. She has a piece of wood that is $\frac{5}{6}$ of a yard long. She uses $\frac{2}{3}$ of the piece of wood. How long is the piece of wood that Eva has now?

Write your answer in the box.

$\frac{5}{6} \times \frac{2}{3} =$ $\frac{10}{18}$ or $\frac{5}{9}$ of a yard

WORK SPACE

Part B

Explain how to use an area model to find your answer.

Sample answer: I divided a rectangle into sixths and thirds, with 18 parts in the whole rectangle.

I shaded $\frac{2}{3}$ of the rectangle and then $\frac{5}{6}$ of the $\frac{2}{3}$. 10 of the 18 parts were shaded, or $\frac{10}{18}$.

7. Part A

Ernesto bought $\frac{3}{4}$ of a square yard of green fabric. He used $\frac{1}{4}$ of the fabric to make a flag. How many square yards of fabric did Ernesto use to make the flag?

- (A) $\frac{3}{16}$
- (B) $\frac{1}{2}$
- (C) $\frac{3}{4}$
- (D) 1

Part B

Explain how you can use an area model to find the answer to Part A.

Sample answer: I can divide both dimensions of a rectangle into fourths. There will be 16 small rectangles, each $\frac{1}{16}$ of the whole. I can shade a region that is $\frac{1}{4}$ by $\frac{3}{4}$. There will be 3 shaded parts, so the area of the shaded region is $\frac{3}{16}$.

EXIT TICKET

Now that you have mastered multiplying fractions by fractions, let's solve the problem in the Real-World Connection.

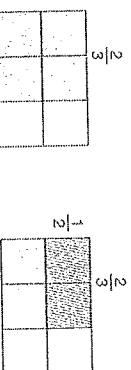
Terry's neighbors hired him to mow their lawn. The lawn has an area of $\frac{2}{3}$ acre. Terry mowed $\frac{1}{2}$ of the lawn before lunch. Use multiplication or an area model to find out how much grass Terry has mowed.

The total area that Terry has mowed is $\frac{2}{6}$ or $\frac{1}{3}$ acre.

Divide one dimension into thirds.

Divide the other dimension into halves.

Shade $\frac{2}{3}$ and then $\frac{1}{2}$ of the $\frac{2}{3}$.



The rectangle is divided into 2 rows of 3, or 6 parts. Each part is $\frac{1}{6}$ of the whole.

There are two shaded parts, 1 group of 2, so the product is $\frac{2}{6}$.

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

The total area that Terry has mowed is $\frac{2}{6}$ or $\frac{1}{3}$ acre.



When multiplying a whole number by a fraction, think about how the product compares to multiplying by 1.

EXAMPLE

Scott's mom says he can have $\frac{5}{6}$ cup of juice, 1 cup of juice, or $\frac{10}{9}$ cups of juice. Which amount should Scott choose if he is very thirsty?
 $\frac{5}{6} < 1$, so Scott will get less than 1 cup of juice.
 $1 = 1$, so Scott will get 1 cup of juice.
 $\frac{10}{9} > 1$, so Scott will get more than 1 cup of juice.
He should choose $\frac{10}{9}$ cups to get the most juice.

GUIDED INSTRUCTION

1. Compare the quantities without multiplying.

18×2
 $18 \times \frac{2}{2}$

Step One Compare 18×2 to 18.
 18×2 is greater than 18.

Step Two Compare $18 \times \frac{2}{2}$ to 18.

When you multiply by a fraction less than 1, your product will be less than the original number. So $18 \times \frac{2}{2}$ is less than 18.

Step Three Compare the products.
 18×2 is greater than $18 \times \frac{2}{2}$.

2. Compare the quantities without multiplying.

$25 \times \frac{6}{3}$
 25×1

Step One Compare $25 \times \frac{6}{3}$ to 25.

$\frac{6}{3}$ is greater than 1. When you multiply by a fraction greater than 1, your product will be more than the original number.
So, $25 \times \frac{6}{3}$ is greater than 25.

Step Two Compare 25×1 to 25.
Multiplying by 1 does not change the number. So, 25×1 is 25.

Step Three Compare the products.
 $25 \times \frac{6}{3}$ is greater than 25×1 .

3. Compare the products in these multiplication expressions.
 14×4
 14×8

Step One Decide which is greater.
8 is greater than 4, so 14×8 has a greater product than 14×4 .

Step Two Compare the products.
The product of 14 and 8 is twice the product of 14 and 4 because

8 is twice as much as 4

4. Without multiplying, decide how each product compares to 17.
Write $<$, $>$, or $=$ in the space.

$17 \times \frac{5}{6} < 17$ $17 \times \frac{6}{5} > 17$ $17 \times \frac{3}{3} = 17$

Step One Decide how to compare the factors.
The "17" is the same in both expressions. On the right side of the equation, $17 = 17 \times 1$, so 1 is a "hidden" factor.

Compare the hidden "1" and $\frac{5}{6}$.

Step Two Compare the factors.

The fraction $\frac{5}{6}$ is less than 1. So, the product will be less than 17.

$17 \times \frac{6}{5} > 17$

The fraction $\frac{6}{5}$ is greater than 1. So, the product will be greater than 17.

$17 \times \frac{3}{3} = 17$

The fraction $\frac{3}{3}$ is equal to 1. So, the product will be equal to 17.

HINT, HINT

Remember that $>$ means "greater than" and $<$ means "less than".

HINT, HINT

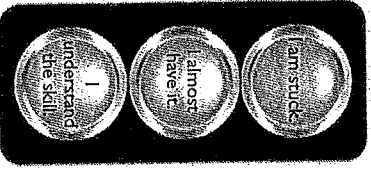
Find all of the pairs of expressions where one factor is the same and the other factor is 3 times as great.

5. Select **THREE** pairs of expressions that show one product that is 3 times as great as the other product.
- ☐ 19×36 and 19×12 ☐ 24×6 and 28×18
☐ 347×8 and 347×24 ☐ 10×7 and 30×21
☐ 67×3 and 67×9

TURN AND TALK

With a partner, answer this question: Hannah collects erasers and stores them in small jars. She has 120 erasers and keeps 6 erasers in each jar. How will the number of jars change if she decides to keep twice as many erasers in each jar? Show multiplication equations to support your answer.

Color in the traffic signal that shows how you are doing with the skill.



How Am I Doing?

What questions do you have?

What kinds of fractions make a number greater when multiplied by that number?

What is an example of a fraction that you use every day?

INDEPENDENT PRACTICE

WORK SPACE

Answer the questions.

1. Which number completes the statement below when 4×11 is compared to 4×44 ?

4×11 is _____ times less than 4×44 .

- ☐ 4
☐ 3
☐ 2
☐ 1

2. Which product is more than 25?

- ☐ $25 \times \frac{1}{2}$
☐ $\frac{6}{2} \times 25$
☐ $\frac{1}{9} \times 25$
☐ $25 \times \frac{3}{2}$

3. If $7 \times 12 = 84$, how can you compare the product and factors?

- ☐ 7 is 84 times greater than 12.
☐ 7 is 12 times greater than 84.
☐ 12 is 84 times less than 7.
☐ 84 is 12 times greater than 7.

▶ THINK ABOUT IT

Look at the numbers that 13 is multiplied by.

4. Which number completes the statement below when 13×3 is compared to 13×9 ?
 13×3 is _____ times less than 13×9 .

- (A) 4
 (B) 3
 (C) 2
 (D) 1

WORK SPACE

5. Which product is greater?

$17 \times \frac{5}{6}$ $17 \times \frac{8}{7}$

Write your answer in the box.

$17 \times \frac{8}{7}$

6. Which product is greater?

7×1 or $7 \times \frac{8}{9}$

Write your answer in the box.

7×1

7. Which product is greater?

$12 \times \frac{14}{9}$ $12 \times \frac{8}{9}$

Write your answer in the box.

$12 \times \frac{14}{9}$

8. Write the numbers shown below in the boxes so that the products are listed from least to greatest. Each number is used once.

5	4	4	3	4	4
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WORK SPACE

$31 \times \frac{3}{4}$ $31 \times \frac{4}{4}$ $31 \times \frac{5}{4}$

Sample answer is shown.

9. Part A

Janel and Mario both walk to school. Mario walks $\frac{5}{7}$ of the distance that Janel walks. Who walks farther in 5 days?

Write your answer in the box.

Janel

Part B

Explain how you know the answer to Part A without multiplying.

Sample answer: $\frac{5}{7}$ is less than 1, so no matter how many days they walk, Janel's walk is always more.

5-NF5, 5-NF5a, 5-NF5b

Now that you can compare products by comparing factors, let's solve the problem in the Real-World Connection.

Steve has a set of 16 golf clubs. He cannot take all the clubs with him, but he thinks he can fit $\frac{3}{4}$ of them in his bag. Austin is taking $\frac{5}{8}$ of 16 golf clubs. Find who is taking more golf clubs without multiplying. Explain how you know.

Sample answer: Austin is taking more golf clubs.

Steve is taking $16 \times \frac{3}{4}$ golf clubs. Austin is taking $16 \times \frac{5}{4}$ golf clubs.

$\Delta \omega$	$\Delta \omega$
Λ	Λ
\rightarrow	\rightarrow

The product of 16 and $\frac{3}{4}$ will be less than 16, and the product of 16 and

5/4 will be more than 16, so Austin will take more clubs than Steve.

[illegible]

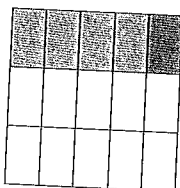
EXAMPLE

Divide: $\frac{1}{3} \div 5$

Step One Draw a model for $\frac{1}{3}$. Divide a whole into thirds.



Step Two Each third is divided into 5 equal parts. Since each part is a part of the whole, the whole needs to be divided into 5 equal parts. Draw horizontal lines.



Step Three Now, each $\frac{1}{3}$ part is divided into 5 equal parts. Find the fraction for each part.

There are 15 parts in the whole, so each part is $\frac{1}{15}$.

EXAMPLE

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

Step One Start with $\frac{1}{2}$.



Step Two Divide each half into 6 equal parts.

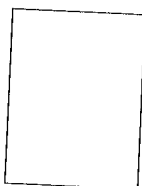


Step Three There are 12 parts in the whole, so each part is $\frac{1}{12}$.

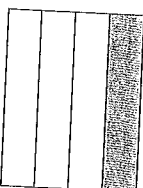
GUIDED INSTRUCTION

1. Use a model to solve $\frac{1}{4} \div 6$.

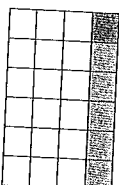
Step One Start by drawing a box. It is one whole.



Step Two Divide it into fourths. Shade one fourth.



Step Three Draw vertical lines to divide all the parts into six equal parts. Double-shade one of those six parts that is inside one fourth.



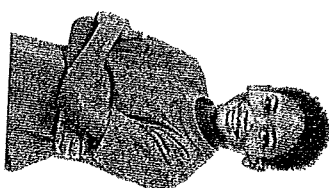
Step Four Read the model to determine the answer.

The double-shaded part is one out of 24 parts, or of the whole.

So, $\frac{1}{4} \div 6 =$

$\frac{1}{24}$

$\frac{1}{24}$



2. What is $\frac{1}{8} \div 2$?

Step One Start by drawing a box. It is one whole.

Step Two Divide it into eighths. Shade one eighth.

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Step Three Draw a horizontal line to divide all the parts in half. Double-shade the intersection of one of those two parts with the shaded eighth.

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Step Four Read the model to determine the answer.

The double-shaded part is $\frac{1}{16}$ of the whole.

So, $\frac{1}{8} \div 2 = \frac{1}{16}$.

3. Which equation matches this model?

--	--	--	--	--

- A $\frac{1}{2} \div 2 = \frac{1}{12}$
- B $\frac{1}{2} \div 3 = \frac{1}{6}$
- C $\frac{1}{4} \div 2 = \frac{1}{8}$
- D $\frac{1}{2} \div 4 = \frac{1}{24}$

TURN AND TALK

What does the shaded section on the left represent? How many pieces are each side divided into?

How Am I Doing?

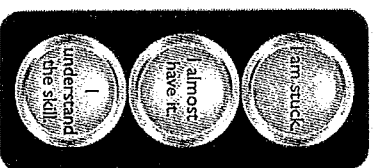
What questions do you have?

How would you use a model to show how to share $\frac{1}{2}$ of a pizza with 6 people?

What is a situation in which you would divide a fraction by a whole number?

SKETCH IT

In the margin below, draw a model that represents $\frac{1}{2}$ divided by 2. Underneath the model, write your answer.



Color in the traffic signal that shows how you are doing with the skill.

INDEPENDENT PRACTICE

HINT, HINT

Before you can divide by the whole number, you need to divide the model to show the fraction.

Answer the questions.

1. What is $\frac{1}{9} \div 3$?

Write your answer in the box.

$\frac{1}{27}$

WORK SPACE

2. To solve $\frac{1}{6} \div 4$, you first divide a model into how many equal parts?

- (A) 2
(B) 4
(C) 5
(D) 6

3. What is $\frac{1}{2} \div 8$?

Write your answer in the box.

$\frac{1}{16}$

4. What is $\frac{1}{2} \div 9$?

- (A) $\frac{1}{18}$
(B) $\frac{9}{2}$
(C) $\frac{2}{9}$
(D) $\frac{1}{17}$

WORK SPACE

5. When solving $\frac{1}{3} \div 5$, you divide each third into how many equal pieces?

- (A) 2
(B) 4
(C) 5
(D) 6

6. What is $\frac{1}{3} \div 4$?

Write your answer in the box.

$\frac{1}{12}$

7. To solve $\frac{1}{8} \div 5$, you first divide a model into how many equal pieces?

- (A) 7
(B) 8
(C) 9
(D) 10

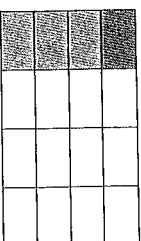
8. How do you use a model to divide a fraction by a whole number? Explain your answer.

Sample answer: Divide the whole into parts to represent the fraction. Then divide the fraction into the number of groups that the whole number represents. One part out of the number of parts in the whole is the answer.

WORK SPACE

9. Part A

Which equation matches this model?



- (A) $\frac{1}{4} \div 4 = \frac{1}{8}$
- (B) $\frac{1}{2} \div 4 = \frac{1}{8}$
- (C) $\frac{1}{4} \div 4 = \frac{1}{16}$
- (D) $\frac{1}{6} \div 4 = \frac{1}{24}$

Part B

How did you know which fraction your division equation needed to start with?

Sample answer: $\frac{1}{4}$ of the rectangle/whole is lightly shaded, so it is $\frac{1}{4}$ that is divided by 4.

EXIT TICKET

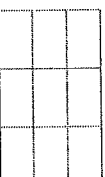
Now that you have mastered dividing unit fractions by whole numbers, let's solve the problem in the Real-World Connection.
Julia and her two brothers equally share $\frac{1}{4}$ of a box of marbles. How much of the box does each get?

They each get $\frac{1}{12}$ of the box.

Julia and her 2 brothers equally shared $\frac{1}{4}$ of the box of marbles. Start with one-fourth of a whole to represent $\frac{1}{4}$ of the box.



3 people shared that $\frac{1}{4}$ of the box, so divide each $\frac{1}{4}$ into 3 parts.

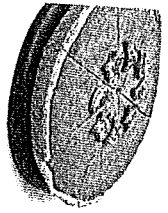


There are 12 parts in the whole, so each part is $\frac{1}{12}$.
Each of the 3 people gets $\frac{1}{12}$ of the box of marbles.

GUIDED INSTRUCTION

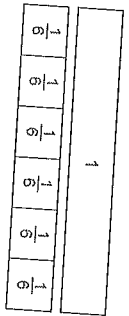
Many things are divided into equal parts. Food is often divided equally, so everyone can get the same amount.

1. Jamal has 6 pies. He slices each pie into sixths. How many slices of pie does he have?



Step One Write an equation to solve the problem.
 $6 \div \frac{1}{6} = \square$

Step Two Use a model to show 1 whole and 1 whole divided into sixths.



Step Three Find the number of sixths in 6 wholes.
There are 6 sixths in 1 whole.
There are 36 sixths in 6 wholes.

Step Four Complete the equation and solve the problem.
 $6 \div \frac{1}{6} = 36$
Jamal has 36 slices of pie.

2. Find $4 \div \frac{1}{10}$ using multiplication.

Step One What is the problem asking?
How many groups of $\frac{1}{10}$ are in 4?

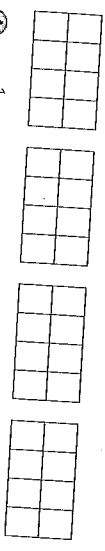
Step Two Write the matching multiplication equation.
 $4 \div \frac{1}{10} = \square \quad \square \times \frac{1}{10} = 4$

Step Three Solve the problem.
 $4 \div \frac{1}{10} = 40 \quad 40 \times \frac{1}{10} = 4$

3. Select TWO equations that are correct.

- A $4 \div \frac{1}{2} = 12$
- B $2 \div \frac{1}{6} = 12$
- C $5 \div \frac{1}{8} = \frac{5}{8}$
- D $1 \div \frac{1}{4} = 1$
- E $3 \div \frac{1}{3} = 15$

4. Which equations could the model show, if each large rectangle is 1 whole? Select TWO correct answers.



- A $4 \div \frac{1}{8} = 32$
- B $4 \times 8 = 32$
- C $32 \times \frac{1}{8} = 4$
- D $\frac{1}{8} \div 4 = 32$
- E $\frac{1}{8} \times 4 = 32$

TURN AND TALK
Why are the two equations symmetrical? Are these two equations part of a fact family?

THINK ABOUT IT
Division asks, How many groups of the divisor (the fraction in this case) are in the dividend (the whole number)?

HINT, HINT
How many groups is each rectangle divided in? Remember, just as with whole numbers, multiplication and division go together.



How Am I Doing?

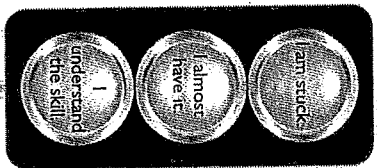
What questions do you have?

SKETCH IT
Use the margin below to sketch a real-world example of dividing a whole number of something into equal parts.

How can you find the number of equal parts in a number of wholes? Is it easier for you to multiply or to divide? Explain your reasoning.

In real life, have you ever divided a whole number of something into equal parts? Did you know you were dividing with fractions? Explain how you were dividing with fractions.

Color in the traffic signal that shows how you are doing with the skill.



INDEPENDENT PRACTICE

Answer the questions.

1. Draw lines to divide the model to show $3 \div \frac{1}{3}$. Then solve the equation. Write your answer in the appropriate box.

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$$3 \div \frac{1}{3} = \boxed{9}$$

TIPS AND TRICKS
On a computer-based test, you may be given lines to draw to show a model of a fraction.

2. Which equation is incorrect?

- (A) $7 \div \frac{1}{2} = 35$
- (B) $12 \div \frac{1}{4} = 3$
- (C) $10 \div \frac{1}{5} = 50$
- (D) $9 \div \frac{1}{3} = 27$

3. Which equation is correct?

- (A) $9 \div \frac{1}{3} = 3$
- (B) $36 \div \frac{1}{2} = 18$
- (C) $12 \div \frac{1}{3} = 36$
- (D) $1 \div \frac{1}{6} = 4$

4. Mr. Kim's cell phone bill shows that the average length of each of his phone calls was $\frac{1}{5}$ hour. The bill also shows that he spent a total of 4 hours on the phone. About how many calls did he make? Write your answer in each box.

4	÷	$\frac{1}{5}$	=	20
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SKETCH IT

Use the margin below to draw a model to solve these problems. Draw the number of rectangles in the dividend, and then divide into the number of parts indicated by the divisor.

HINT, HINT

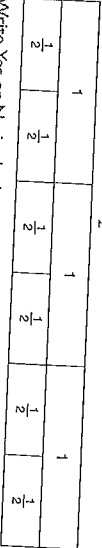
Remember you are dividing and not multiplying.

WORK SPACE

5. Select THREE problems that can be solved by finding $6 \div \frac{1}{3}$.
- (A) Natalie has 6 cats. She feeds each cat $\frac{1}{3}$ of a cup of food each day. How many cups of food does she feed her cats each day?
 - (B) Each recipe calls for $\frac{1}{3}$ of a cup of lemon juice. Mark has 6 cups of lemon juice. How many recipes can he make?
 - (C) George has 6 friends. He gives each friend $\frac{1}{3}$ lb. of apples. How many pounds of apples does George give his friends?
 - (D) Francine has 6 chapters to read. She plans to read $\frac{1}{3}$ of a chapter each day. How many days will it take her to read all the chapters?
 - (E) Each bowl holds 6 gallons of sand. Henry has a measuring cup that holds $\frac{1}{3}$ of a gallon. How many times will Henry need to fill the measuring cup to fill the bowl?

6. Part A

Does the model show $3 \div \frac{1}{2}$?



Write Yes or No in the box.

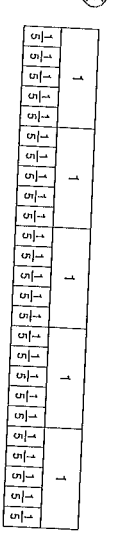
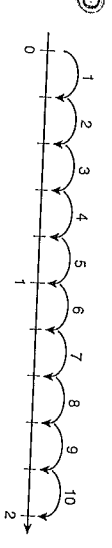
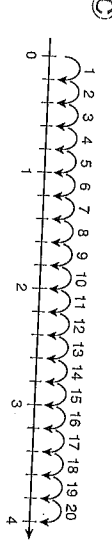
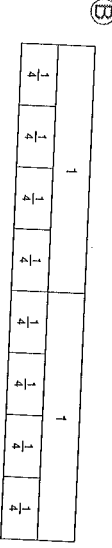
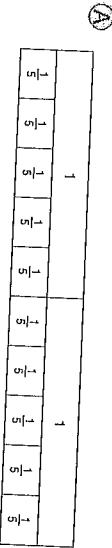
Yes

Part B

Explain your answer to Part A. Solve $3 \div \frac{1}{2}$.

Sample answer: The model does show the expression because the model shows 3 wholes and each whole divided into halves. $3 \div \frac{1}{2} = 6$

7. Select TWO models that can be used to solve $2 \div \frac{1}{5}$.



8. Write a short story problem that could be solved using the equation.

$4 \div \frac{1}{3} =$

Sample answer: Sam has 4 bags of dog food. Each serving of dog food uses $\frac{1}{3}$ of a bag. How many servings are in 4 bags?

EXIT TICKET

5.NF.7, 5.NF.7b

Now that you have mastered dividing a whole number by a unit fraction, let's solve the problem in the Real-World Connection.

A dress designer has a strip of fabric that is 5 inches long. He cuts the fabric into smaller pieces that are each $\frac{1}{4}$ inch long. How many pieces of fabric does he make?

The dress designer makes 20 smaller pieces.

5 inches is divided into $\frac{1}{4}$ inch pieces: $5 \div \frac{1}{4}$

$$5 \div \frac{1}{4} = \underline{\hspace{2cm}} \quad \underline{\hspace{2cm}} \times \frac{1}{4} = 5$$

There are 20 fourths in 5.

Each inch of the 5 inches has 4 fourths, or 4 pieces: $5 \times 4 = 20$

So, $5 \div \frac{1}{4} = 20$ and $20 \times \frac{1}{4} = 5$

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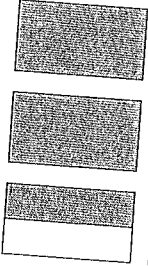
- Multiply a fraction by a fraction to find a portion of a fraction:
 $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$ $\frac{1}{2}$ of $\frac{1}{2}$ is $\frac{1}{4}$.
- Multiply a fraction by a mixed number; a number that contains both a whole number and a fraction. Rewrite the mixed number(s) as an improper fraction, a fraction that is greater than 1, and multiply:
 $\frac{1}{2} \times 4\frac{1}{2} = \frac{1}{2} \times \frac{9}{2} = \frac{9}{4} = 2\frac{1}{4}$
- You can divide whole numbers and fractions two ways.
- Divide a fraction by a whole number: $\frac{1}{2} \div 2 = \frac{1}{4}$
 If $\frac{1}{2}$ is divided into 2 groups, how much is in each group? $\frac{1}{4}$
- Divide a whole number by a fraction: $2 \div \frac{1}{3} = 6$
 How many $\frac{1}{3}$'s are in 2? 6

EXAMPLE

Imagine that $2\frac{1}{2}$ kilograms of apples are washed and sliced. Imagine that $\frac{2}{5}$ of the apples are used in pies. How many kilograms of apples are used in the pies?

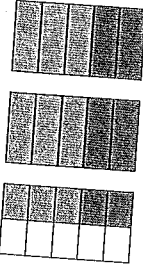
The question asks, "How much is $\frac{2}{5}$ of $2\frac{1}{2}$?" You can solve the problem using a fractional model.

Step One Draw a fractional model of $2\frac{1}{2}$.



The shaded part represents $2\frac{1}{2}$ kilograms.

Step Two Since you want $\frac{2}{5}$ of this, divide each whole into fifths and shade two of the fifths.



THINK ABOUT IT

Notice that when you multiply by $\frac{2}{5}$ you first divide by 5 and then multiply by 2.

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Step Three Add the shaded parts.

The shaded parts of the first two wholes are $\frac{2}{5}$ of the whole. The shaded parts of the half are $\frac{2}{10}$ of the whole.

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

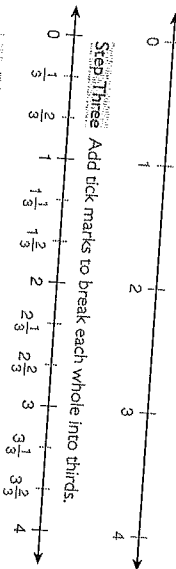
$$\text{or } \frac{2}{5} \times 2\frac{1}{2} = \frac{2}{5} \times \frac{5}{2} = \frac{10}{10} = 1$$

GUIDED INSTRUCTION

1. DeJuan has 4 pounds of cedar chips. He divides them into bags with $\frac{2}{3}$ of a pound in each bag. How many bags of cedar chips does DeJuan have?

Step One Write an equation for the problem.
 $4 \div \frac{2}{3} = \square$

Step Two Use a number line to show the number of pounds of cedar chips.



Step Four Count jumps of $\frac{2}{3}$.

Step Five Complete the equation.

There are 6 jumps.

$$4 \div \frac{2}{3} = \square$$

DeJuan has 6 bags of cedar chips.

HINT, HINT

You can check division by multiplying.
 Does $6 \times \frac{2}{3} = 4$?

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HINT, HINT

Remember you are dividing and not multiplying.

2. Amanda has $\frac{1}{2}$ of a large pizza. She shares it evenly between herself and 2 friends. Select TWO of the models and equations that show how much of a large pizza each person receives.

A

1 Whole pizza

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

$\frac{1}{2}$ pizza

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

B

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

C

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

D

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

How Am I Doing?

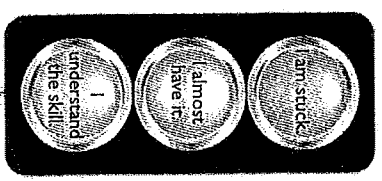
What questions do you have?

Explain how to multiply a mixed number by a fraction.

What is an example of a situation in real life where you needed to multiply two or more fractions?

SKETCH IT

Use the margin below sketch to a picture to show how to multiply a mixed number by a fraction.



Color in the traffic signal that shows how you are doing with the skill.

WORK SPACE

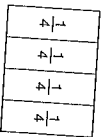
INDEPENDENT PRACTICE

Answer the questions.

1. Part A

Sam has $\frac{1}{2}$ pound of turkey. He divides it equally on 4 sandwiches. How much turkey is on each sandwich?

Rachel solved the problem using a fraction model.



There is $\frac{1}{4}$ pound of turkey on each sandwich.

What did Rachel do wrong?

Sample answer: Rachel divided 1 pound of turkey into 4 equal parts. She should have divided $\frac{1}{2}$ pound of turkey into 4 equal parts.

Part B

Write an equation to find the correct answer to Part A. Write the equation with the solution in the box.

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

HINT, HINT

What operation would you use to solve the problem? This choice will eliminate two answer choices.

2. At the fabric store, Sheila buys $3\frac{3}{8}$ yards of fabric. Theresa buys $\frac{2}{3}$ as much fabric as Sheila. How many yards of fabric does Theresa buy?

- (A) $3\frac{3}{8} \div \frac{2}{3} = 5\frac{1}{16}$ yards
 (B) $3\frac{3}{8} \div \frac{2}{3} = 2\frac{17}{24}$ yards
 (C) $3\frac{3}{8} \times \frac{2}{3} = 2\frac{1}{4}$ yards
 (D) $3\frac{3}{8} \times \frac{2}{3} = 3\frac{1}{4}$ yards

WORK SPACE

3. Brianna walks $\frac{3}{4}$ mile each day. How many miles does she walk in a week?

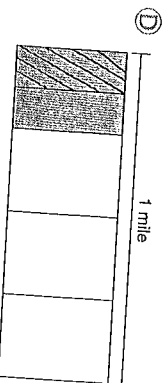
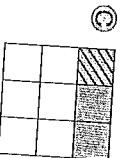
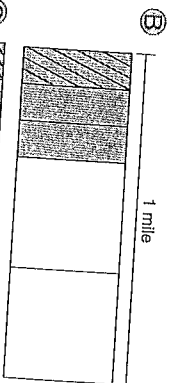
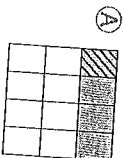
Write your answer as a whole number or a mixed number in the box.

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

4. Shane has 3 pounds of coffee. He divides the coffee into $\frac{1}{6}$ pound bags. How many bags did Shane make?

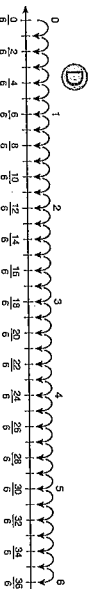
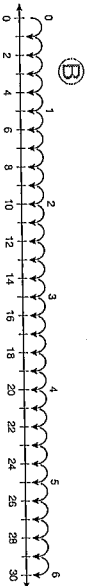
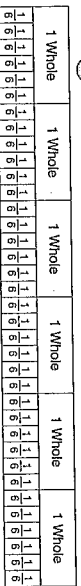
- (A) $3 \div \frac{1}{6} = 18$ bags
 (B) $3 \div \frac{1}{6} = 2$ bags
 (C) $3 \times \frac{1}{6} = \frac{1}{2}$ bags
 (D) $3 \times \frac{1}{6} = 9$ bags

5. The path at a park is $\frac{1}{3}$ mile long. 3 park benches are being placed along the path. 1 bench is at the beginning of the path. 1 bench is halfway down the path. 1 bench is at the end of the path. Select TWO of the models that can be used to find the distance between 2 of the park benches.



WORK SPACE

6. A clerk has 6 pounds of green tea that he packages into bags. Each bag contains $\frac{1}{2}$ pound of leaves. How many bags does the clerk use?
Select the TWO models that can be used to find the number of bags the clerk uses.



7. Melinda makes a soup recipe that calls for $\frac{3}{4}$ cup of barley per batch. She makes 5 batches of soup. How much barley does she use?

Write your answers in the boxes.

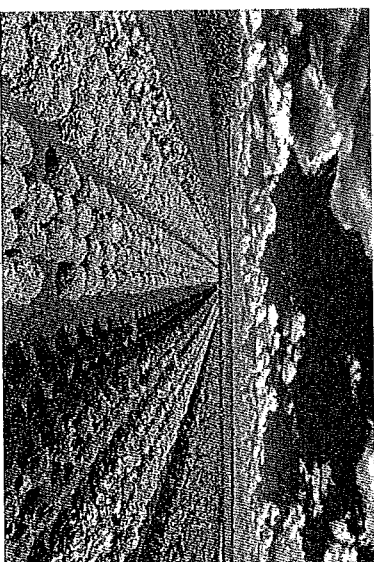
$\frac{3}{4}$	\times	5	=	$3\frac{3}{4}$	cups
---------------	----------	---	---	----------------	------

8. Alan uses $\frac{1}{4}$ acre of land for a garden. He plants 5 different vegetables. Each vegetable uses an equal area of the garden. How much land does each vegetable use?

WORK SPACE

Write your answers in the boxes.

$\frac{1}{4}$	\div	5	=	$\frac{1}{20}$	acre
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EXIT TICKET

5.NF.6.5.NF.7.5.NF.7E

Now that you have mastered solving problems involving multiplying and dividing fractions, let's solve the problem in the Real-World Connection.
A baker divides a $\frac{1}{2}$ -pound bag of wheat flour equally into 5 containers. How much wheat flour is in each container? Write an equation and draw a model to show how to solve the problem.

There is $\frac{1}{10}$ of a pound of wheat flour in each container.

Equation:

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

Sample model:



The shaded part represents $\frac{1}{2}$ a pound of wheat flour. There needs to be 5 groups, so the $\frac{1}{2}$ will be divided into 5 parts. This means that the whole is divided into 10 parts.

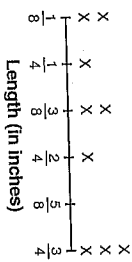
Each shaded part is $\frac{1}{10}$ of the whole. So, if $\frac{1}{2}$ is divided into 5 groups, there will be $\frac{1}{10}$ in each group. And, 5 groups of $\frac{1}{10}$ is $\frac{1}{2}$.
 $\frac{1}{2} \div 5 = \frac{1}{10}$ and $5 \times \frac{1}{10} = \frac{1}{2}$.

THINK ABOUT IT

There were no $\frac{5}{8}$ -inch long nails. The $\frac{5}{8}$ data point is shown because it is part of the number line and so we can see that none of the nails were $\frac{5}{8}$ -inch long.

EXAMPLE

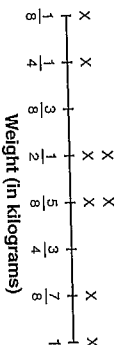
Glenn measured the lengths of a set of copper nails to the nearest $\frac{1}{8}$ inch. He displayed his data on the line plot below.



How many of the copper nails were either $\frac{1}{4}$ inch long or less? The graph shows that there were 3 copper nails $\frac{1}{4}$ inch long or less. One is $\frac{1}{8}$ inch and 2 are $\frac{1}{4}$ inch.

GUIDED INSTRUCTION

- The weights of a set of objects found in a classroom are displayed in the line plot below.



Use the line plot to find the total weight of all the objects.

Step One Each X represents one piece of data, the weight of one object. Add all the values for each X. There are 8 X's, so check that you are adding 8 numbers.

$$\frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} = 1$$

Step Two Find a common denominator and rewrite the fractions with equivalent fractions. The common denominator is 8.

$$\frac{1}{8} + \frac{2}{8} + \frac{4}{8} + \frac{4}{8} + \frac{5}{8} + \frac{5}{8} + \frac{7}{8} + \frac{8}{8} = \frac{36}{8}$$

Step Three Reduce the sum to a mixed number:

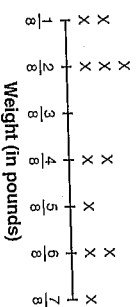
$$\frac{36}{8} = 4\frac{4}{8} = 4\frac{1}{2}$$

The total weight of all the objects is $4\frac{1}{2}$ kilograms.

TIPS AND TRICKS

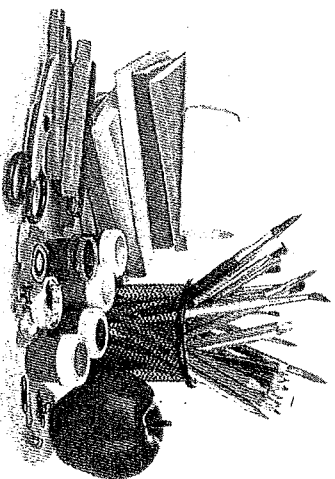
For each fraction on the list, you can draw a line through one of the Xs in the line plot. If an X does not have a line through it, or if there is not an X, do draw a line through, you know that weight is listed incorrectly in the line plot.

- Davina weighed different objects from around her classroom. She recorded the weights, in pounds: $\frac{1}{8}$, $\frac{1}{8}$, $\frac{1}{8}$, $\frac{1}{8}$, $\frac{1}{8}$, $\frac{1}{8}$, $\frac{1}{8}$, $\frac{1}{8}$, $\frac{1}{8}$, $\frac{1}{8}$. She put her results into the line plot below.



Select FOUR weights that have the correct number of values on the line plot.

- (A) $\frac{1}{8}$
- (B) $\frac{2}{8}$
- (C) $\frac{3}{8}$
- (D) $\frac{4}{8}$
- (E) $\frac{5}{8}$
- (F) $\frac{6}{8}$
- (G) $\frac{7}{8}$



TURN AND TALK

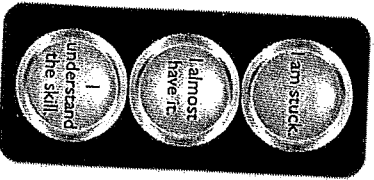
With a partner, answer these questions: What is a line plot? How can you identify the most common data value from a line plot? What does it mean if no Xs are written above a value on a line plot?

How Am I Doing?

What questions do you have?

Describe how to look at a line plot and get information about the data.

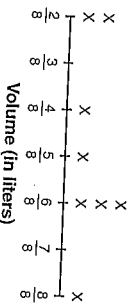
Color in the traffic signal that shows how you are doing with the skill.



INDEPENDENT PRACTICE

Answer the questions.

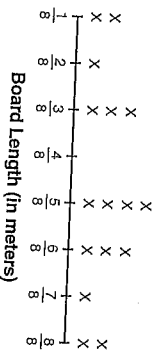
1. Gina measured the volumes of drinks in her refrigerator. She recorded her results in the line plot.



Which of the following is her data set?

- A Volume (in liters) $\frac{1}{8}$ $\frac{2}{8}$ $\frac{3}{8}$ $\frac{4}{8}$ $\frac{5}{8}$ $\frac{6}{8}$ $\frac{7}{8}$ $\frac{8}{8}$
- B Volume (in liters) $\frac{1}{4}$ $\frac{3}{4}$ $\frac{1}{2}$ 1 $\frac{3}{4}$ $\frac{5}{8}$ $\frac{1}{4}$
- C Volume (in liters) $\frac{1}{4}$ $\frac{2}{4}$ $\frac{1}{2}$ $\frac{1}{8}$ $\frac{3}{4}$ $\frac{5}{8}$ $\frac{1}{4}$
- D Volume (in liters) $\frac{1}{4}$ $\frac{2}{4}$ $\frac{1}{2}$ 1 $\frac{3}{8}$ $\frac{5}{8}$ $\frac{1}{4}$

2. Tia measured the lengths of the boards she has in her garage. She recorded the lengths in the line plot.



What is the total length of the 3 longest boards?
Write your answer in the box.

$\frac{2}{8}$ meters

TIPS AND TRICKS

On a computer-based test, you will have to type your answer using the keyboard.

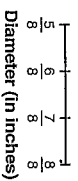
HINT, HINT
Remember to convert fractions in the data set to those used on the line plot.

3. Part A

Camell and his friends each measured the diameters of a group of coins. They put their measurements in the table.

Diameter (in inches)	$\frac{7}{8}$	$\frac{6}{8}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	$\frac{7}{8}$	$\frac{3}{4}$	$\frac{8}{8}$	1	$\frac{6}{8}$
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When they put their measurements onto the line plot, which diameter will have the most Xs?



Write your answer in the box.

$\frac{6}{8}$

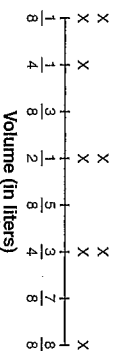
Part B

What is the total diameter in inches of the coins with the most Xs?

- ☐ A $\frac{4}{8}$
☐ B $\frac{1}{2}$
☒ C 3
☐ D 4

4. Part A

Sonya measured the volumes of liquids in 8 beakers in her science lab. She recorded her results in the line plot.



What is the total volume of all the beakers she measured?

Write your answer in the box.

4

 liters

HINT, HINT
Write the answer, and then explain how you found it.

Part B

If the liquid is combined and redistributed equally, how much liquid would be in each beaker? Explain your answer.

Sample answer: Each beaker would have $\frac{1}{2}$, or $\frac{4}{8}$.

To get the answer, I took the total volume of all of the beakers, 4, and divided it by the number of beakers, 8. So, $4 \div 8 = \frac{4}{8} \times \frac{1}{1} = \frac{4}{8} = \frac{1}{2}$.

5. Part A

Damian measured the length of pebbles he found in his yard to the nearest $\frac{1}{8}$ of an inch. He put his measurements into the table below.

Length (in inches)	$\frac{8}{8}$	$\frac{4}{8}$	$\frac{6}{8}$	$\frac{7}{8}$	$\frac{8}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{4}$	$\frac{2}{8}$	$\frac{6}{8}$	$\frac{3}{8}$	$\frac{1}{8}$	$\frac{2}{8}$	$\frac{1}{8}$	1
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He wants to put the measurements into a line plot with increments of $\frac{1}{8}$ of an inch. Select THREE values on the line plot that will have the same number of Xs.

- ☐ A $\frac{1}{8}$
☐ B $\frac{2}{8}$
☒ C $\frac{3}{8}$
☐ D $\frac{4}{8}$
☐ E $\frac{5}{8}$
☒ F $\frac{6}{8}$
☒ G $\frac{7}{8}$
☐ H $\frac{8}{8}$

WORK SPACE

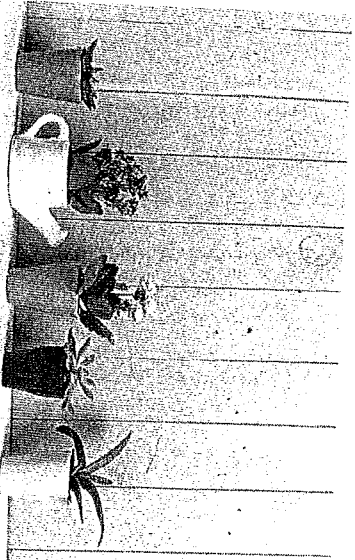
Part B

What is the total length of all the data points from the three values that would have the most Xs on the line plot? Write your answer in the box.

$6\frac{3}{8}$ inches

6. When John waters his plants each day, he keeps track of how many liters he uses. He measures in $\frac{1}{8}$ liter amounts and never uses more than 1 liter. The amount he uses each day varies, but he figures that if all the amounts were evened out, he uses $\frac{1}{2}$ liter a day. How did John decide this?

Sample answer: John could have added all the water together, and then divided by the number of days to redistribute the water evenly. He probably used $\frac{1}{8}$ liter some days, but 1 liter other days. He probably used around $\frac{1}{2}$ liter each day, sometimes more, sometimes less.



EXIT TICKET

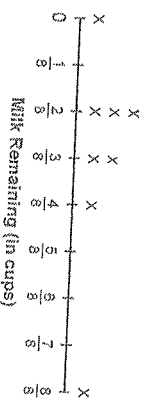
Now that you have mastered interpreting a line plot with fractions, let's solve the problem in the Real-World Connection.

A group of students are learning about measuring liquid volume. After lunch, each student measures the volume of milk left in his or her carton to the nearest $\frac{1}{8}$ cup. The measurements in cups are $\frac{1}{8}$, $\frac{2}{8}$, 0 , $\frac{2}{8}$, $\frac{4}{8}$, $\frac{3}{8}$, and $\frac{2}{8}$.

The students want to find out the amount of milk that would be in each carton if all the remaining milk were combined and then redistributed equally. How much milk would be in each carton?

Each carton would have $\frac{3}{8}$ of a cup of milk.

Make a line plot of the data to see how the amounts of milk are distributed.



Most of the data surrounds $\frac{3}{8}$ of a cup, so that amount should be close to the answer.

Add the data: $0 + \frac{2}{8} + \frac{2}{8} + \frac{2}{8} + \frac{3}{8} + \frac{3}{8} + \frac{4}{8} + \frac{3}{8} + \frac{2}{8} = \frac{24}{8} = 3$

Divide by the number of data points: $3 \div 8 = \frac{3}{8}$

Each carton would have $\frac{3}{8}$ of a cup of milk.

PRACTICE TEST

PRACTICE TEST

Chapter 3

Answer the questions.

- Find the difference.

$$2\frac{4}{5} - 1\frac{7}{10}$$

Write your answer in the box. Use simplest form.

$$\boxed{1\frac{1}{10}}$$

- Part A

Find the missing fraction. Write your answer in the box.

$$\frac{1}{4} + \boxed{\frac{3}{8}} = \frac{5}{8}$$

Part B

Explain how you solved the problem.

Sample answer: I saw that 8 is a multiple of 4. I know that $\frac{1}{4} = \frac{2}{8}$. I know that if I add $\frac{3}{8}$ to $\frac{2}{8}$, I will get $\frac{5}{8}$, so $\frac{3}{8}$ is the missing fraction.

-
-
-

Denise and Walter both drive their cars to work. Denise uses $\frac{3}{4}$ of a gallon of gas, and Walter uses $\frac{5}{6}$ of a gallon of gas. How much more gas does Walter use than Denise? Write your answer in the box.

$$\boxed{\frac{1}{12}} \text{ gallon}$$

-
-
-
-

Use the numbers in the box to compare each fraction to an appropriate benchmark. The numbers can be used more than once. Write each number in the appropriate box.

$$\frac{11}{12} = \boxed{1} \quad \frac{3}{7} = \boxed{\frac{1}{2}} \quad \frac{9}{10} = \boxed{1} \quad \frac{2}{15} = \boxed{0}$$

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5 friends are running a race as a team. Each friend runs the same distance. The total distance for the team is 12 km. How far does each friend run? Write and solve a division equation in the box.

$$12 \div 5 = \frac{12}{5} = 2\frac{2}{5} \text{ km}$$

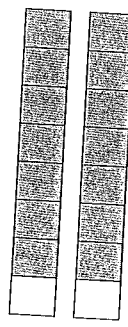
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6. For a party, 2 gallons of punch are made. If there are 12 people at the party and each person is given an equal amount of punch, how much punch does each person receive? Write your answer in the each box.

$$\boxed{2} \div \boxed{12} = \boxed{\frac{2}{12}}$$

-
-
-
-
-
-
-

7. What multiplication equation does the model show? Explain how you know your answer is correct.



Sample answer: $\frac{7}{8} \times 2 = 1\frac{7}{4}$. There are two wholes that are divided into 8 equal parts, with 7 of the parts shaded. So, the model shows $\frac{7}{8}$ of 2.

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8. Which number completes the statement below when 11×14 is compared to 11×28 ?
 11×14 is _____ times smaller than 11×28 .

(A) 1
 (B) 2
 (C) 4
 (D) 11

9. Use the numbers in the box to write the equation that the area model shows.



The numbers can be used more than once. Write each number in the appropriate box.

2	3	4	6	7	8	10	12	14	16
---	---	---	---	---	---	----	----	----	----

$$\begin{array}{r} 3 \\ \times 4 \\ \hline 12 \end{array}$$

10. Select THREE equations that are true.

(A) $\frac{1}{4} \times \frac{1}{3} = \frac{1}{6}$
 (B) $\frac{4}{10} \times \frac{1}{5} = \frac{4}{50}$
 (C) $\frac{2}{3} \times \frac{4}{6} = \frac{8}{18}$
 (D) $\frac{2}{5} \times \frac{2}{3} = \frac{4}{5}$
 (E) $\frac{7}{10} \times \frac{1}{2} = \frac{7}{20}$
 (F) $\frac{2}{7} \times \frac{2}{6} = \frac{5}{13}$

11. What is $\frac{1}{2} \div 2$?
 Write your answer in the box.

$\frac{1}{4}$

12. $6 \div \frac{1}{3} = ?$

Write your answer in the box.

18

13. Which equation is correct?

(A) $8 \div \frac{1}{2} = 4$
 (B) $2 \div \frac{1}{8} = 16$
 (C) $4 \div \frac{1}{7} = 24$
 (D) $7 \div \frac{1}{7} = 1$

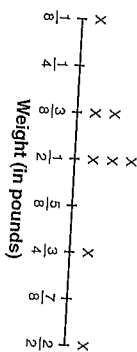
14. Carita and Thomas are making crafts to sell at the craft show. Carita uses $5\frac{1}{2}$ times as much wood as Thomas. Thomas uses $\frac{2}{3}$ foot of wood. How many feet does Carita use?
 Write your answer as a whole number or mixed number in simplest form in the box.

$3\frac{2}{3}$ feet

Chapter 3 PRACTICE TEST

15. Part A

Serena weighed the bulk items she bought from the grocery store. She measured the following weights, in pounds: $\frac{4}{8}$, 1 , $\frac{2}{8}$, $\frac{3}{8}$, 1 , $\frac{6}{8}$, $\frac{2}{8}$, $\frac{4}{8}$, $\frac{4}{8}$, $\frac{3}{8}$, 1 . She recorded the weights in the line plot.



Select TWO values that are missing Xs in the line plot.

- (A) $\frac{1}{8}$
- (B) $\frac{1}{4}$
- (C) $\frac{3}{8}$
- (D) $\frac{1}{2}$
- (E) $\frac{5}{8}$
- (F) $\frac{3}{4}$
- (G) $\frac{7}{8}$
- (H) 1

Part B

How much total weight, in pounds, is missing from the line plot? Explain your answer.

Sample answer: There are $1\frac{1}{2}$ total pounds missing from the line plot.

There are three missing data points on the line plot: $\frac{2}{8}$, $\frac{6}{8}$, and 1 . So,

$$\frac{2}{8} + \frac{6}{8} + 1 = 1\frac{4}{8} = 1\frac{1}{2}$$

- The measurement system most of the world uses is the metric system.

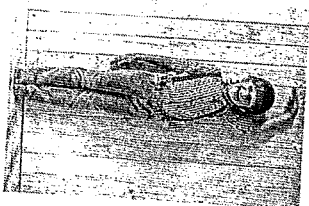
Important Metric Conversions

Length	Capacity	Weight
100 cm = 1 m	1 L = 1,000 mL	1,000 mg = 1 g
1,000 m = 1 km		1,000 g = 1 kg

- To convert measurements in either system, do the following:
 - To convert from a larger unit to a smaller unit, multiply by the number of smaller units that make the larger unit: for feet to inches, multiply by 12.
 - To convert from a smaller unit to a larger unit, multiply by 1 over the number of smaller units that make the larger unit: inches to feet, multiply by $\frac{1}{12}$.

THINK ABOUT IT

Height is often measured in inches. If you are 60 inches tall, how many feet tall are you?



TURN AND TALK

Remember, to multiply or divide by powers of 10, move the decimal point.
How do you know which direction to move the decimal point and how many places?

EXAMPLE

Find the number of feet in 18 inches.

$$12 \text{ inches} = 1 \text{ foot}$$

We are converting from a smaller unit (inches) to a larger unit (feet).

So, multiply 18 inches by $\frac{1}{12}$.

$$18 \times \frac{1}{12} = \frac{18}{12} = 1\frac{6}{12} = 1\frac{1}{2}$$

$$18 \text{ inches} = 1\frac{1}{2} \text{ feet}$$

Metric conversions are done in the same way as customary conversions: you just use different numbers.

EXAMPLE

Convert 600 centimeters to meters.

$$100 \text{ centimeters} = 1 \text{ meter}$$

We are converting from a smaller unit (centimeters) to a larger unit (meters).

So, multiply 600 centimeters by $\frac{1}{100}$.

$$600 \times \frac{1}{100} = \frac{600}{100} = 6$$

$$600 \text{ centimeters} = 6 \text{ meters}$$

EXAMPLE

Convert 4 kilometers to meters.

$$1,000 \text{ meters} = 1 \text{ kilometer}$$

We are converting from a larger unit (kilometers) to a smaller unit (meters).

So, multiply 4 kilometers by 1,000.

$$4 \text{ kilometers} \times 1,000 = 4,000$$

$$4 \text{ kilometers} = 4,000 \text{ meters}$$

GUIDED INSTRUCTION

- At Wendy's party, she will use 8-ounce cups to serve juice. If Wendy has 2 gallons of juice, how many cups can she fill?

Step One Find how many 8-ounce cups are in a quart.

$$8 \text{ ounces} = 1 \text{ cup}$$

$$2 \text{ cups} = 1 \text{ pint}$$

$$2 \text{ pints} = 1 \text{ quart}$$

$$\text{So, there are 4 cups in 1 quart (} 2 \times 2 \text{).}$$

Step Two Convert from quarts to gallons.

$$4 \text{ quarts} = 1 \text{ gallon}$$

$$\text{So, there are 16 cups (} 4 \times 4 \text{) in one gallon.}$$

Step Three Solve the problem.

$$16 \text{ cups in 1 gallon, } 32 \text{ cups in 2 gallons}$$

$$\text{Wendy can fill 32 cups.}$$

TIPS AND TRICKS

Customary liquid measurements seem confusing, but they are all powers of 2.
2 cups = 1 pint
4 qt = 1 gal
8 oz = 1 cup
16 cups = 1 gal
16 oz = 1 pint
128 oz = 1 gal

2. Tom and Scott want to compare the distance they are from school. Tom lives $\frac{3}{4}$ kilometers from school and Scott lives 800 meters from school. Who lives farther away?

To solve this problem, one measure should be converted to the other. Which measure is easier to convert?

Step One To compare the measures, convert to the same unit.
Convert $\frac{3}{4}$ kilometers to meters.

1 kilometer = 1,000 meters

So, $\frac{3}{4}$ kilometers = $\frac{3}{4} \times 1,000 = 750$ meters

Step Two Now the distances can be compared

750 meters < 800 meters

So, Scott lives farther away.

Consider comparing two

measurements at a time. Which is farther, 50 feet or 500 inches? Remember 1 foot = 12 inches.

3. Which of the measures listed below represents the farthest distance?

- Ⓐ 50 feet
Ⓑ $\frac{1}{100}$ mile
Ⓒ 500 inches
Ⓓ 16 yards

To solve the problem, convert

2 liters to milliliters, and multiply 300 mL by each answer choice.

1 L = 1,000 mL, so 2 L = 2,000 mL

4. Sara has a 2-liter bottle of water. She wants to fill glasses that each hold 300 milliliters. What is the greatest number of glasses can she fill?

- Ⓐ 4 glasses
Ⓑ 5 glasses
Ⓒ 6 glasses
Ⓓ 7 glasses

How Am I Doing?

What questions do you have?

Describe how to convert from a larger unit to a smaller unit.

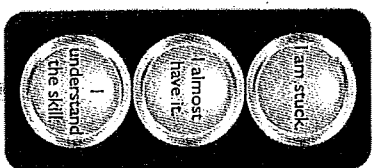
Describe how to convert from a smaller unit to a larger unit.

Describe a situation in which units would need to be converted

▶ TURN AND TALK

With a partner, use what you learned in this lesson to solve the following: Mrs. Brown wants to give each student 150 mL of ocean water for a science investigation. There are 24 students in her class. If she has 4.0 L of ocean water, how many liters of ocean water will she have left over? Explain how you found the answer.

Color in the traffic signal that shows how you are doing with the skill.



INDEPENDENT PRACTICE

Answer the questions.

1. Ariel has a half-gallon container. Which of the following volumes would fill Ariel's container? Select all of the correct answers.

- ☐ A 64 ounces
- ☐ B 4 pints
- ☐ C 6 cups
- ☐ D 2.75 quarts

TIPS AND TRICKS

Because the metric system is a decimal system, converting metric measures is as easy as multiplying and dividing by powers of 10: move the decimal point to convert!

2. Order these measures from least to greatest.

4 L, 3,500 mL, 2.67 L, 4,200 mL

Write your answers in the boxes.

2.67 L	<	3,500 mL	<	4 L	<	4,200 mL
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3. Mrs. Keyes is making a stew for a weekend party and she needs 8 quarts of broth. Her quart measure is broken, so she must measure the liquid in cups. How many cups are there in 8 quarts?

- ☐ A 64
- ☐ B 32
- ☐ C 16
- ☐ D 8

HINT, HINT

When converting from a larger unit to a smaller one, the number of units will go up. Since the unit is smaller, it takes more to measure the same amount.

4. Complete the conversions. Write your answers in the boxes.

280,000 cm	=	2,800	m	=	2.8	km
------------	---	-------	---	---	-----	----

5. Which of the following measures is equivalent to 4 yards?

- ☐ A 2 feet
- ☐ B 96 inches
- ☐ C 144 inches
- ☐ D 8 feet

6. Part A

Which of the following measures is equivalent to 16 tons?

- ☐ A 8,000 pounds
- ☐ B 32,000 ounces
- ☐ C 160,000 pounds
- ☐ D 512,000 ounces

Part B

Explain how you found the answer to Part A.

Sample answer: First I multiplied by 2,000 to change tons to pounds. Then I multiplied by 16 to change pounds to ounces.

16 tons \times 2,000 lb/1 ton \times 16 oz/1 lb = 512,000 oz

THINK ABOUT IT

Find real-world items to help estimate measures. When you have benchmark measures, it is easier to tell when your answers are reasonable.

WORK SPACE

7. Select THREE of the following that are true statements.

- ☐ A To convert from centimeters to meters, multiply by $\frac{1}{100}$.
- ☐ B To convert from meters to centimeters, multiply by 100.
- ☐ C To convert from kilometers to meters, multiply by 100.
- ☐ D To convert from meters to kilometers, multiply by $\frac{1}{1,000}$.
- ☐ E To convert from grams to kilograms, multiply by 1,000.

8. In the metric system, 1 milliliter of iced tea weighs 1 gram and has a volume of 1 cubic centimeter. In fact, the metric system is based on this relationship.

How much would a 2-liter bottle of iced tea weigh (not including the bottle itself) in kilograms? Explain your answer.

Sample answer: $1,000 \text{ mL} = 1 \text{ L}$, so $2,000 \text{ mL} = 2 \text{ L}$.

If each $\text{mL} = 1 \text{ g}$, then $2,000 \text{ mL} = 2,000 \text{ g}$. $1,000$

$\text{g} = 1 \text{ kg}$, so $2,000 \text{ g} = 2 \text{ kg}$. So, a 2-liter bottle of

water weighs 2 kilograms.

EXIT TICKET

Now that you have mastered solving problems with measurement conversions, let's solve the problem in the Real-World Connection.

Olivia earns money making and selling hair bows. She buys ribbon for the bows in 5-yard rolls. It takes 26 inches of ribbon to make one bow. How many bows can Olivia make from one roll of ribbon?

Olivia can make 6 bows.

Since the ribbons are measured in inches and the rolls are measured in yards, Olivia needs to know how many inches are in 5 yards.

1 yard = 3 feet, so 5 yards = 15 feet

1 foot = 12 inches, so 15 feet = 12 inches \times 15 = 180 inches

Each bow is 26 inches long, so Olivia can divide 180 inches by 26 inches:

$180 \div 26 = 6$, with 24 left over

So, Olivia can make 6 bows, but not quite 7.

If Olivia used 30 inches for each bow, she would have no wasted ribbon:

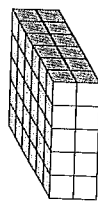
$180 \div 30 = 6$

TURN AND TALK

How big would this rectangular prism be in real life? Base 10 blocks have a volume of 1 cm³.

GUIDED INSTRUCTION

- Find the volume of the rectangular prism. Each cube measures 1 cubic centimeter.



Step One Count the number of cubes in the bottom layer.

The bottom layer is 5 cubes long and 6 cubes wide: $5 \times 6 = 30$.
So the first layer has 30 cubes.

Step Two Count the number of layers.

Add the number of cubes for each layer (or multiply the number of layers by the number of cubes in each layer).

There are 2 layers:

$$30 + 30 = 60$$

$$\text{or: } 2 \times 30 = 60$$

Step Three Write the volume of the prism.

$$\text{Volume (V)} = 60 \text{ cm}^3$$

- Kenyon's baby sister is playing with toy blocks and she makes this shape. Each toy block has a volume of 1 in.³ What is the volume of the shape?



Step One Count the number of blocks.

There are 8 blocks.

Each block is 1 in.³ in volume.

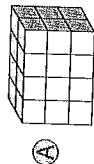
Step Two Write the volume.

$$V = 8 \text{ in.}^3$$

HINT, HINT

Remember, there are unit cubes that you can't see in the figure. Count how many unit cubes it takes to make one layer of the prism, then count the number of layers.

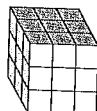
- Select THREE rectangular prisms that have a volume of 24 cubic units.



A



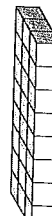
B



C



D



E



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SKETCH IT

In the margin below, draw a solid figure that has a volume of 18 cubic inches. Explain how you chose the shape you did.



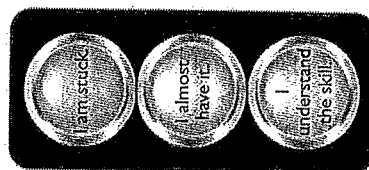
How Am I Doing?

What questions do you have?

How can you find the volume of a rectangular prism?

There are rectangular prisms all around you. Your bedroom is probably a rectangular prism. What are some other rectangular prisms with which you could find the volume?

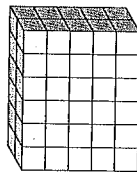
Color in the traffic signal that shows how you are doing with the skill.



INDEPENDENT PRACTICE

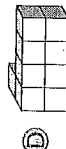
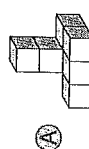
Answer the questions.

1. Each cube in the figure has an edge length of 1 unit. What could be the volume of this solid?



- (A) 60 inches
- (B) 30 square inches
- (C) 50 cubic inches
- (D) 60 cubic inches

2. Select FOUR figures that have a volume greater than 6 cubic units.

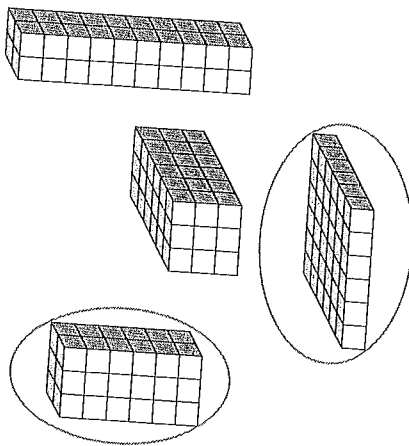


HINT, HINT

Find out how many unit cubes are needed to build each layer of the figure shown. Assume that any block on an upper layer has a block underneath it.

WORK SPACE

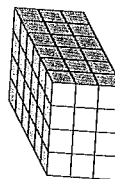
3. Each unit cube has a volume of 1 cm^3 . Circle TWO figures that have a volume of 36 cubic centimeters.



4. Select THREE of the following that are measures of volume.

(A) 8 square units
(B) 12 cubic units
(C) 15 in.^2
(D) 20 cm^3
(E) 24 inches
(F) 30 cubic inches

5. What is the volume of this rectangular prism?
Each cube is 1 cubic centimeter.



Write your answer in the box.

72 cm^3

WORK SPACE

6. What is the volume of the rectangular prism shown?



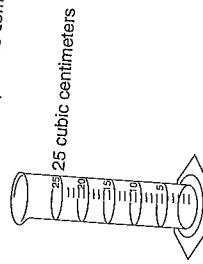
Complete the statements. Write your answer in each box.

There are 12 cubes in the bottom layer.

There are 2 layers.

The rectangular prism has a volume of 24 cubes.

7. When water is poured from the graduated cylinder below into a rectangular prism, the rectangular prism is completely filled.



How many 1 cm unit cubes can be packed into the rectangular prism with no gaps or overlaps? Explain your answer.

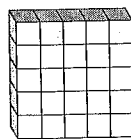
Sample answer: 25. The graduated cylinder holds 25 cubic centimeters of water, so the volume of the rectangular prism is 25 cubic centimeters. Each unit cube has a volume of 1 cubic centimeter, so exactly 25 cubes can be packed into the prism.

THINK ABOUT IT

Are there any hidden cubes in the shape?

WORK SPACE

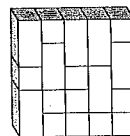
8. Part A
Kyra builds the shape shown below with unit cubes.



Kyra's figure has a volume of how many cubic units?

- Ⓐ 10
Ⓑ 15
Ⓒ 20
Ⓓ 25

Part B
Jaden builds the shape shown. He says the volume of the figure is 17 cubic units because he used 17 blocks. Explain why Jaden is wrong.



Sample answer: The volume is not 17 cubic units. The blocks that he used to make his figure are not all the same size, so the volume is not equal to the number of blocks.

EXIT TICKET

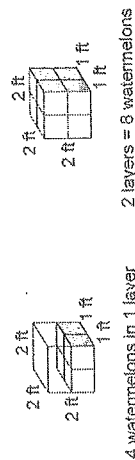
Now that you have mastered finding volume, let's solve the problem in the Real-World Connection.

Japanese gardeners have developed a new way to grow watermelons shaped like cubes! They are much easier to pack in boxes than regular watermelons. If each watermelon is 1 foot long, 1 foot wide, and 1 foot high, how many can be packed in a box that measures 2 feet on each side?

The box can fit 8 watermelons.

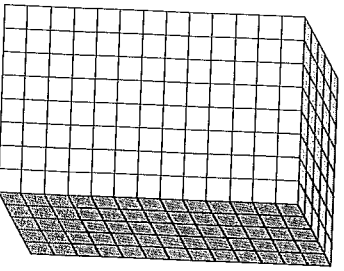
Compare the volume of the watermelons to the volume of the box. Since the watermelons are 1 foot on each side, two will fit side by side, and two rows will fit in the box. So, the bottom layer has 4 watermelons.

Two layers will fit since the box is 2 feet tall. $2 \times 4 = 8$, so 8 watermelons will fit in the box.



TURN AND TALK

Think about Kyle's problem from the beginning of the lesson. What equation might solve the problem?

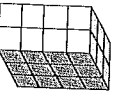


TURN AND TALK

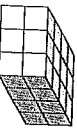
What if the prism was 13 cm long, 8 cm wide and 5 cm tall? Would the prism hold more, less, or the same number of cubes? How do you know?

EXAMPLE

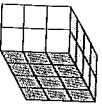
The same prism is shown below from three different viewpoints. The volume is the same in each case.



$$\begin{aligned} V &= (l \times w) \times h \\ &= (2 \times 3) \times 4 \\ &= 6 \times 4 \\ &= 24 \end{aligned}$$



$$\begin{aligned} V &= (l \times w) \times h \\ &= (3 \times 4) \times 2 \\ &= 12 \times 2 \\ &= 24 \end{aligned}$$



$$\begin{aligned} V &= (l \times w) \times h \\ &= (2 \times 4) \times 3 \\ &= 8 \times 3 \\ &= 24 \end{aligned}$$

GUIDED INSTRUCTION

1. The prism to the right has been filled with centimeter cubes.

Find the volume of the prism.

Step One Find the dimensions of the prism.

The front of the prism is 8 cubes long.

so the length is 8 cm.

The side of the prism is 5 cubes wide.

so the width is 5 cm.

The prism is 13 cubes tall.

so the height is 13 cm.

Step Two Write the formula for the volume of a prism.

$V = \text{length} \times \text{width} \times \text{height}$

$V = l \times w \times h$

Step Three Multiply to find the volume.

$$V = 8 \times 5 \times 13$$

$$= 40 \times 13$$

$$= 520 \text{ cm}^3$$

2. Find the volume of a rectangular prism with a base area of 18 square inches and a height of 10 inches.

Step One Write the formula for the volume of a prism.

$$V = \text{base} \times \text{height}$$

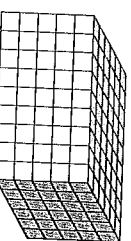
$$V = b \times h$$

Step Two Multiply to find the volume.

$$V = 18 \times 10$$

$$= 180 \text{ in.}^3$$

3. Select THREE expressions that can be used to calculate the volume of the prism.



HINT, HINT

Find one expression for the volume. Then, use what you know about multiplication to find equivalent expressions.

- (A) $(9 \times 6) \times 5$
- (B) $(6 + 5) + 9$
- (C) $(9 + 6) + 5$
- (D) $9 \times (5 \times 6)$
- (E) $(9 \times 5) \times 6$
- (F) $(9 + 5) \times 6$
- (G) $6 \times (9 + 5)$

SKETCH IT

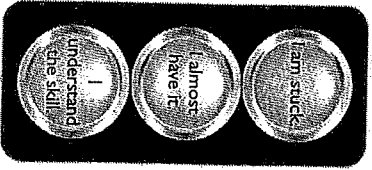
Use the margin below to sketch an item you see in the room right now that you could find the volume of.

How Am I Doing?

What questions do you have?

Describe how to find the volume of an item you see in the room right now.

Color in the traffic signal that shows how you are doing with the skill.



INDEPENDENT PRACTICE

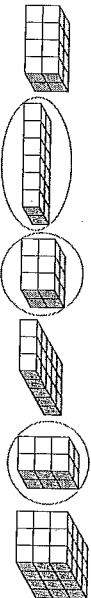
WORK SPACE

Answer the questions.

- What is the volume of a rectangular prism with edge lengths of 2 inches, 4 inches, and 6 inches?

- (A) 60 cubic inches
- (B) 48 cubic inches
- (C) 30 cubic inches
- (D) 24 cubic inches

- Circle THREE rectangular prisms that have a volume of 12 units.



- A cube is a rectangular prism with equal length, width, and height. What is the volume of a cube that is 5 cm high?

Write your answer in the box.

125 cm³

- A rectangular prism has a base with an area of 15 square feet. The prism is 3 feet high. What is the volume of the prism?

- (A) 5 cubic feet
- (B) 18 cubic feet
- (C) 45 cubic feet
- (D) 135 cubic feet

HINT, HINT

Volume = (length X width) X height = area of base X height

WORK SPACE

5. Which rectangular prism described has a volume of 32 cubic units?
- (A) Base area = 8 square units, height = 16 units
 - (B) Length = 2 units, width = 4 units, height = 6 units
 - (C) Base area = 12 square units, height = 20 units
 - (D) Length = 4 units, width = 4 units, height = 2 units

6. The volume of a rectangular box is 756 cubic inches. Which set of dimensions below could NOT be the dimensions of the box in inches?

- (A) 6, 9, 14
- (B) 3, 7, 36
- (C) 2, 18, 28
- (D) 3, 6, 42

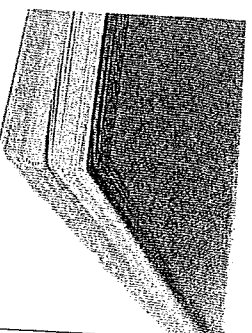
7. A construction worker is making a container to hold 30 cubic meters of gravel. The width of the container must be 2 meters, and its height must be 3 meters. What must be the length of the container in order for it to hold exactly 30 cubic meters?

- (A) 4
- (B) 5
- (C) 6
- (D) 7

8.

Jenna has a package of construction paper. Each sheet of paper measures 8 inches by 12 inches. There are 500 sheets of paper in the package. Does Jenna have enough information to find the volume of the package? Explain why or why not.

Sample answer: Jenna does not have enough information. The package is a rectangular prism. She needs the length, width, and height of the package, or the base area and the height. She knows the length and width of the package, but she doesn't know the height of the package.



9. Part A

The volume of a rectangular prism is 200 cm³, and its height is 2 cm. The base of the prism is a square. What is the length of one side of the base?

Write your answer in the box.

10 cm

Part B

Explain how you found your answer to Part A.

Sample answer: I know that volume = area of base × height, so area of base × 2 = 200. The base must have an area equal to 100 square cm. The base is a square, so the two sides are the same length. 10 × 10 = 100. Therefore, one side of the base is 10 cm long.

THINK ABOUT IT

Use division to find the number that equals 200 when multiplied by 2.

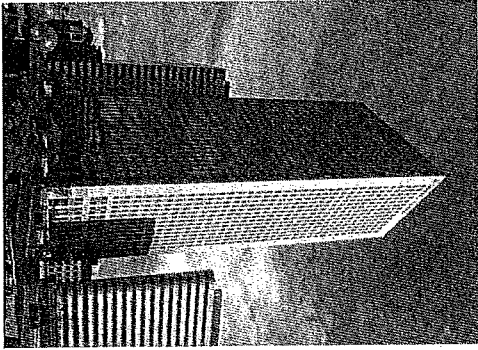
EXIT TICKET

5.MD.3.5.MD.3.5.MD.3

Now that you have mastered finding volume of rectangular prisms using multiplication, let's solve the problem in the Real-World Connection.

Kyle's mother is an architect. He is visiting a new office building that her company designed. The building is 40 feet long and 25 feet wide. It stands 135 feet tall. How much space does the building occupy?

Show your work.



The building occupies 135,000 cubic feet of space.

$$\begin{aligned} V &= \text{length} \times \text{width} \times \text{height} \\ &= 40 \text{ ft} \times 25 \text{ ft} \times 135 \text{ ft} \\ &= 1,000 \text{ ft}^2 \times 135 \text{ ft} \\ &= 135,000 \text{ ft}^3 \end{aligned}$$

What I May Already Know

4.MD.3, 5.MD.3, 5.NBT.5

- I know how to find area and perimeter of rectangles in real-world and mathematical problems.
- I know that volume is an attribute of three-dimensional figures.
- I know that volume of a rectangular prism can be found by multiplying the length, width, and height, or by multiplying the area of the base and the height.
- I know how to perform operations with multi-digit whole numbers.

Vocabulary in Action

- Volume is a measure of how much space an object occupies.
- A rectangular prism is a solid figure made up of two rectangular bases joined by rectangular sides, or faces.
- A rectangular prism has three dimensions: length, width, and height.
- You can find the volume of a prism by multiplying its dimensions.
- The formula for the volume of a rectangular prism is $V = l \times w \times h$, where l is length, w is width, and h is height. You can find the volume of a more complex solid by breaking it into pieces. Find the volume of each piece and then add to find the volume of the complex solid.

EXAMPLE

This solid figure is made up of two rectangular prisms. Use the volume formula to find the volume of each prism.

$$V = l \times w \times h$$

$$= 3 \times 2 \times 2$$

$$= 12$$

The volume of the smaller prism is 12 in.³

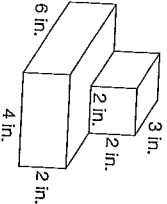
$$V = l \times w \times h$$

$$= 6 \times 4 \times 2$$

$$= 48$$

The volume of the larger prism is 48 in.³

Add the volumes of the prisms to find the volume of the solid figure. The solid figure has a volume of 60 in.³

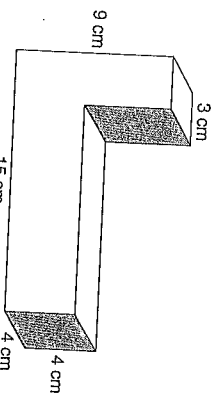


TURN AND TALK

What if a solid figure is made up of more than two rectangular prisms? How does this change how you find the total volume?

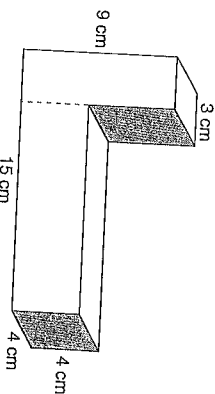
GUIDED INSTRUCTION

1. Look at this solid figure from a wooden puzzle.

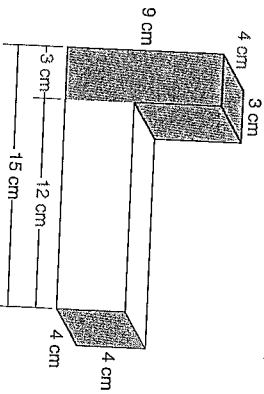


Find the volume of the solid figure.

Step One Break the solid into two rectangular prisms.



Step Two Find the length, width, and height of each prism.



TURN AND TALK

Is there more than one way to break apart the solid figure? If so, is one way better than another?

The dimensions of the shaded prism are 3 cm, 4 cm and 9 cm.

The dimensions of the unshaded prism are 4 cm, 4 cm, and 12 cm.

Step Three Use the formula to find the volume of the shaded prism.

$$V = 3 \times 4 \times 9 = \boxed{108} \text{ cm}^3$$

Step Four Use the formula to find the volume of the unshaded prism.

$$V = 4 \times 4 \times 12 = \boxed{192} \text{ cm}^3$$

Step Five Add to find the total volume of the solid figure.

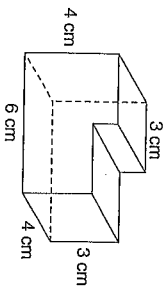
$$V = \boxed{108} + \boxed{192} = \boxed{300} \text{ cm}^3$$

HINT, HINT

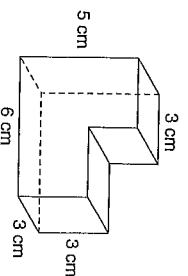
To find the volume of a complex solid, break it down into smaller pieces. Find the volume of each piece and then add the volumes.

2. Select TWO solid figures that have a volume of 72 cm³.

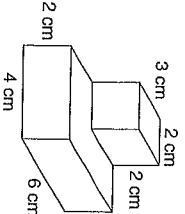
(A)



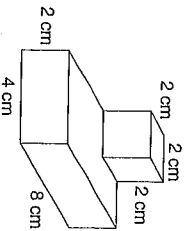
(B)



(C)



(D)



How Am I Doing?

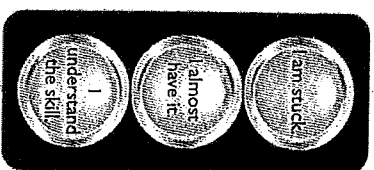
What questions do you have?

Are there any items you see in the room right now that are composed of two or more rectangular prisms? Describe how you would find the volume of these items.

SKETCH IT

Think about building a sandbox or a garden box using two or more rectangular prisms. In the margin below or on a separate sheet of paper, draw an outline of your box. How can you use what you know about volume of complex figures to help you determine the amount of sand or soil your box could hold?

Color in the traffic signal that shows how you are doing with the skill.

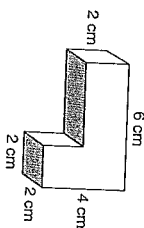


INDEPENDENT PRACTICE

Answer the questions.

1. What is the volume of the solid figure?

Write your answer in the box.

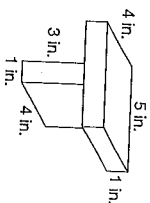


32 cm³

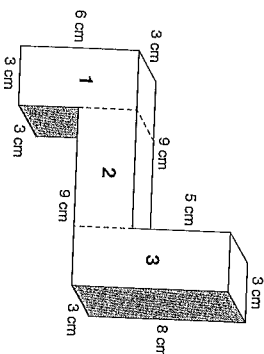
2. Which is the volume of the solid figure?

A 12 in.³
B 32 in.³

C 20 in.³
D 80 in.³



3. Find the volume of the solid. Write your answer in each box.



The volume of Prism 1 is 54 cm³.

The volume of Prism 2 is 54 cm³.

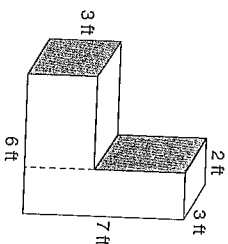
The volume of Prism 3 is 72 cm³.

The volume of the solid is 180 cm³.

4. Part A

Mary found the volume of the solid figure. She divided the solid into two rectangular prisms.

WORK SPACE



Write your answers in the boxes.

The prism on the left has a volume of 36 ft³.

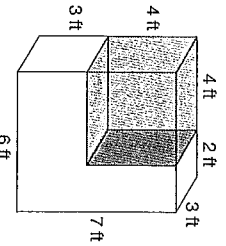
The prism on the right has a volume of 42 ft³.

The volume of the solid is 78 ft³.

WORK SPACE

Part B

Sam used a different method to find the volume of the solid in Part A. His drawing is below. Sam used subtraction to find the volume.



Describe how Sam found the volume. Use expressions and equations to show Sam's method.

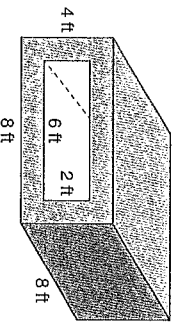
Sample answer: Sam made one large prism,

$6 \times 7 \times 3 = 126 \text{ ft}^3$. He found the volume of the cut-out part of the solid, $4 \times 4 \times 3 = 48 \text{ ft}^3$. Then he subtracted to find the volume of the solid figure.
 $126 - 48 = 78 \text{ ft}^3$



Part A

Tori says the volume of this solid is 256 ft^3 . What mistake did she make?



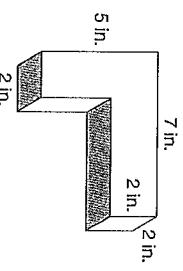
Sample answer: She found the volume of the entire rectangular prism. She did not subtract the cut-out prism.

Part B

Find the volume of the solid in Part A.
 Write your answer in the box.

ft^3

6. Which expression can be used to find the volume of the solid figure?



- (A) $(7 \times 5 \times 2) + (3 \times 2 \times 2)$
- (B) $(2 \times 5 \times 2) + (5 \times 2 \times 2)$
- (C) $(5 \times 7 \times 2) + (2 \times 2 \times 2)$
- (D) $(7 \times 7 \times 2) - (5 \times 2 \times 2)$

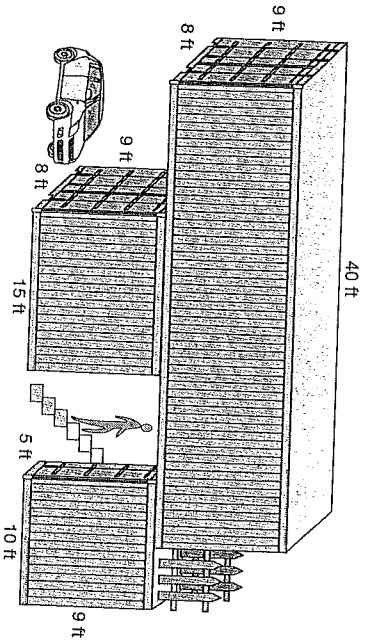
THINK ABOUT IT

Every expression for the volume of the solid will have the same result. You should not get different answers by solving the problem in different ways.

EXIT TICKET

5.MD.A.3.MD.3C

Now that you have mastered finding volume of solid figures composed of two or more rectangular prisms, let's solve the problem in the Real-World Connection. This house is made from recycled shipping containers. What is the volume of the house?



The house is made up of three rectangular prisms. Find the volume of each prism. Then find the total volume of the house. Show your work.

Volume of large prism:

$$\text{Volume} = 40 \text{ ft} \times 8 \text{ ft} \times 9 \text{ ft} = 2,880 \text{ ft}^3$$

Volume of medium prism:

$$\text{Volume} = 15 \text{ ft} \times 8 \text{ ft} \times 9 \text{ ft} = 1,080 \text{ ft}^3$$

Volume of small prism:

$$\text{Volume} = 10 \text{ ft} \times 5 \text{ ft} \times 9 \text{ ft} = 450 \text{ ft}^3$$

Volume of the house:

$$\text{Volume} = 2,880 + 1,080 + 450 = 4,410 \text{ ft}^3$$

PRACTICE TEST

Answer the questions.

1. Order the measures shown from least to greatest.

14,000 inches	1,500 feet	400 yards	$\frac{1}{4}$ mile
---------------	------------	-----------	--------------------

Write each measure in the appropriate box.

14,000 inches	<	400 yards	<	$\frac{1}{4}$ mile	<	1,500 feet
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2. How many grams does 4,000 milligrams equal?

- ☐ A 40,000
☐ B 400
☐ C 40
☐ D 4

3. Order these measures from least to greatest.

5 L, 4,500 mL, 4.37 L, 5,100 mL

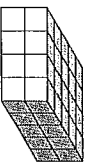
Write your answers in the boxes.

4.37 L	<	4,500 mL	<	5 L	<	5,100 mL
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4. Complete the conversions. Write your answers in the boxes.

450,000 cm =	4,500	m =	4.5	km
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5. Each cube in the figure has an edge length of 1 unit. Which could be the volume of this solid?



- ☐ A 28 cubic inches
- ☐ B 40 cubic centimeters
- ☐ C 28 square inches
- ☐ D 40 inches

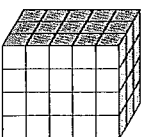
6. Can two solids with different shapes have the same volume? Explain your answer and give an example.

Sample answer: Yes, because volume is the amount of space a solid figure takes up. Two solids with different shapes can take up the same amount of space. For example, I can use 4 unit cubes to make a tower 4 cubes high, or I can make two rows of 2 cubes. Both solids will have the same volume of 4 cubic units, even though they have different shapes.

7. Select THREE of the following that are measures of volume.

- ☐ A 15 square units
- ☐ B 12 in.²
- ☐ C 14 inches
- ☐ D 10 cm³
- ☐ E 36 cubic inches
- ☐ F 14 cubic units

8. Tyree builds the shape shown below with unit cubes. Circle the number that correctly completes the statement.



What is the volume of Tyree's figure?

- ☐ A 4 cubic units
- ☐ B 12 cubic units
- ☐ C 20 cubic units
- ☐ D 60 cubic units

9. Which rectangular prism described does not have a volume of 24 cubic units?

- ☐ A Base area = 6 units, height = 4 units
- ☐ B length = 2 units, width = 4 units, height = 3 units
- ☐ C Base area = 12 units, height = 20 units
- ☐ D length = 4 units, width = 3 units, height = 2 units

Chapter 4 PRACTICE TEST

10. Select TWO of the following expressions that can be used to find the volume of a rectangular prism that measures 5 feet long, 8 feet wide, and 12 feet tall.

- Ⓐ $(5 + 8) \times 12$
 Ⓑ $(8 \times 5) \times 12$
 Ⓒ $(8 \times 5) + 12$
 Ⓓ $8 \times (12 + 5)$
 Ⓔ $5 \times (8 \times 12)$
 Ⓕ $(5 \times 12) \div 8$

11. Li is mailing a package that measures 5 inches long, 7 inches wide, and 3 inches tall. What is the volume of the package?

Write your answer in the box.

105 cubic inches

12. Part A

The volume of a rectangular prism is 720 cm^3 and its height is 5 cm. The base of the prism is a square. What is the length of one side of the base?

Write your answer in the box.

12 cm

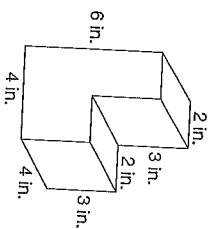
Part B

Explain how you found your answer to Part A.

Sample answer: I know that volume = area of base \times height, so area of base $\times 5 = 720$. The base must have an area equal to 144 square cm. The base is a square, so the two sides are the same length. $12 \times 12 = 144$. Therefore, one side of the base is 12 cm long.

PRACTICE TEST Chapter 4

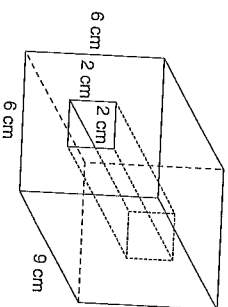
13. What is the volume of the solid figure?



Write your answer in the box.

72 in^3

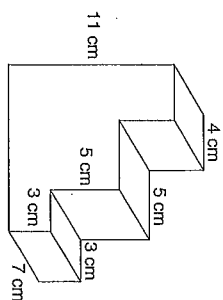
14. Which expression can be used to find the volume of the solid figure?



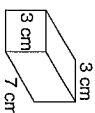
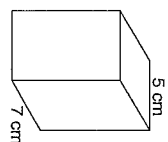
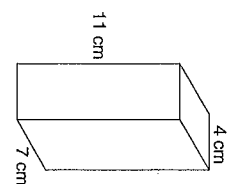
- Ⓐ $(6 \times 6 \times 9) - (2 \times 2 \times 6)$
 Ⓑ $(9 \times 6 \times 6) - (9 \times 2 \times 2)$
 Ⓒ $(9 \times 6 \times 2) + (2 \times 2 \times 2)$
 Ⓓ $(6 \times 6 \times 2) - (9 \times 2 \times 2)$

15. Part A

Layton wants to find the volume of this solid figure.



He breaks the solid into three rectangular prisms.



Which is the volume of the solid figure?

- (A) 308 cm³
- (B) 651 cm³
- (C) 756 cm³
- (D) 924 cm³

Part B

What is a different way to find the volume of the solid in Part A?

Explain your answer.

Sample answer: I can draw lines across the solid instead of up and down.

The bottom prism is $12 \times 7 \times 3 = 252$. The middle prism is $9 \times 7 \times 5 = 315$.

The top prism is $3 \times 7 \times 4 = 84$. The volume is $252 + 315 + 84 = 651$ cm³.

Lesson 24

CLASSIFY TWO-DIMENSIONAL FIGURES

5.G.3, 5.G.4

INTRODUCTION

Real-World Connection

Frida is entering a poster contest at school. The poster needs to be in the shape of a quadrilateral that has two sides that are parallel and two sides that are not parallel. How can you use what you know about the classification of shapes to help Frida design her poster? Let's practice the skills in the Guided Instruction and Independent Practice and see how to help Frida design her poster at the end of the lesson!

What I Am Going to Learn

- How to identify attributes of two-dimensional figures
- How to classify two-dimensional figures based on properties
- How to categorize and subcategorize two-dimensional figures

What I May Already Know

4.G.1, 4.G.2, 3.G.1

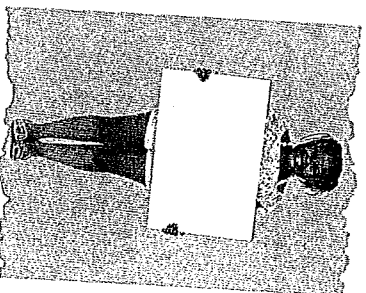
- I know how to draw parallel and perpendicular lines and identify them in two-dimensional figures.
- I know how to identify right, acute, and obtuse angles.
- I know how to classify shapes, using properties of their lines and angles.

Vocabulary in Action

- Shapes are identified and categorized based on their attributes.
- An attribute is a trait.
- Parallel lines can be an attribute of a shape. Parallel lines are pairs of lines that never intersect.

WORDS TO KNOW

attribute
parallel
polygon
quadrilateral
trapezoid
parallelogram
rectangle
rhombus
hexagon
octagon



TURN AND TALK

What is the difference between a rhombus and a square? Are all squares rhombuses? Are all rhombuses squares?

- A polygon is a closed figure with 3 or more straight sides.
- One type of polygon is a quadrilateral, which has four sides. Here are some types of quadrilaterals.
- A trapezoid has only one pair of parallel sides.
- A parallelogram has two pairs of parallel sides.
- A rectangle has four right angles.
- A rhombus has all four sides of the same length.
- A square has all four sides of the same length and four right angles.
- A hexagon is a polygon with six sides.
- An octagon is a polygon with eight sides.

EXAMPLE



This is a polygon. It has 12 sides.



This is **not** a polygon. It is made up of two curved lines and two straight lines.

Some shape names describe many different shapes that all share similar attributes.

EXAMPLE

Sometimes, you can use more than one name to describe a shape. Both the shapes below are quadrilaterals because they have four straight sides.



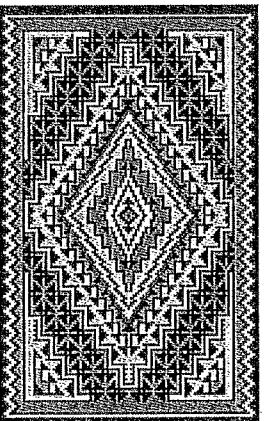
This quadrilateral has only one pair of parallel sides. This shape is a trapezoid.



This quadrilateral has two pairs of parallel lines. All four sides are the same length, and it has four right angles. This shape can also be classified as a parallelogram, a rectangle, a rhombus, or a square.

GUIDED INSTRUCTION

Shapes can be seen in home décor, such as carpets and wallpaper. Look at the shape within the design of this rug.



1. Circle all the names that describe the shape.

As you look at each term, think about the attributes.

If you answer yes to the question, the name can be used to describe the shape.

Is the shape a closed figure with three or more straight sides?

Polygon

Does the shape have four straight sides?

Quadrilateral

Does the shape have only one pair of parallel sides?

Trapezoid

Does the shape have two pairs of parallel sides?

Parallelogram

Does the shape have two pairs of parallel sides and all sides the same length?

Rhombus

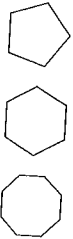
HINT, HINT

Sometimes shapes do not look the way we expect. Remember shapes are categorized by their attributes.

THINK ABOUT IT

Count the number of sides to determine the name of a polygon.

2. Name each of the polygons.



A/an **pentagon** has 5 sides.



A/an **hexagon** has 6 sides.



A/an **octagon** has 8 sides.

HINT, HINT

Remember shapes are categorized by their attributes, such as number of sides, parallel lines, and right angles. There may be more than one name for the shape.

3. Select THREE names that can be used to describe the figure.



- ☐ A polygon
- ☐ B trapezoid
- ☐ C parallelogram
- ☐ D rhombus
- ☐ E quadrilateral

How Am I Doing?

What questions do you have?

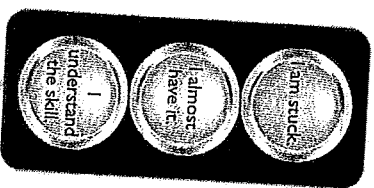
Look around the room. Find something that is in the shape of a quadrilateral. Describe the item based on its lines and angles.

What is an example of a trapezoid or parallelogram you see or use every day? What other shapes do you see or encounter in the world around you?

SKETCH IT

In the margin below or on a separate sheet of paper, draw a Venn diagram that shows the relationships among quadrilaterals. Include parallelograms, rectangles, squares, rhombuses, and trapezoids.

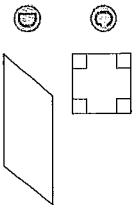
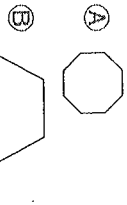
Color in the traffic signal that shows how you are doing with the skill.



INDEPENDENT PRACTICE

Answer the questions.

1. Select TWO figures that are parallelograms.



WORK SPACE

2. Which word can be used to describe a quadrilateral with only one pair of parallel sides?

- ☐ A rectangle
☐ B parallelogram
☐ C trapezoid
☐ D rhombus

3. Which sign is NOT a polygon?

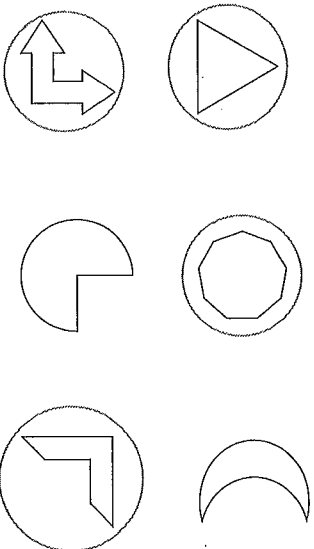


WORK SPACE

4. Which statement is true about all rectangles?

- ☐ A four equal sides
☐ B exactly two pairs of parallel sides
☐ C exactly one pair of parallel sides

5. Circle FOUR figures that are polygons.



6. Draw a pentagon with two right angles.

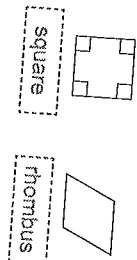
Sample answer:



7. Part A

Name each of the figures using one term that defines all of its attributes. Write your answers in the boxes.

Sample answer:



TIPS AND TRICKS

This question is asking you to give two different answers. First, you have to explain how the two figures are alike. Then you need to explain what makes the figures different.

Part B

Explain which attributes the two figures in Part A have in common and which attribute(s) make them different.

Sample answer: Both figures have two pairs of parallel sides and four sides that are all the same length. The square has four right angles and the rhombus does not.

8. Is the figure below a triangle? Explain why or why not.



Sample answer: It is not a triangle. Although the figure has three sides, it is an open figure. A triangle is a polygon and polygons are closed figures.

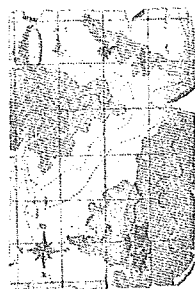
EXIT TICKET

Now that you have mastered describing shapes and classifying two-dimensional shapes, let's solve the problem in the Real-World Connection. Frida is entering a poster contest at school. The poster needs to be in the shape of a quadrilateral that has two sides that are parallel and two sides that are not parallel. How can you use what you know about the classification of shapes to help Frida design her poster?

Sample answer: The only quadrilateral with two sides that are parallel and two sides that are not parallel is a trapezoid. Therefore, Frida's poster should be in the shape of a trapezoid.

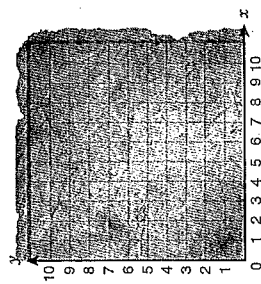
Handwriting practice lines for the exit ticket answer.

GUIDED INSTRUCTION

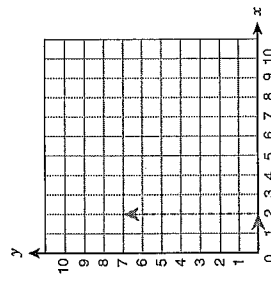


Have you ever used a map to find the location of a place? If you have, you may have noticed that each point is identified by coordinates.

- Here is the beginning of a treasure map. The coordinates (2, 7) tell the location of the treasure. Plot the point (2, 7) on the map.



Step One Locate the x-coordinate.



The x-coordinate is 2.

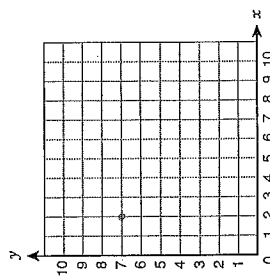
Start at the origin (0, 0) and move 2 units to the right along the x-axis.

Step Two Locate the y-coordinate.

The y-coordinate is 7.

Move 7 units up from the x-coordinate.

Step Three Plot the point.



- Which point is located on the y-axis?

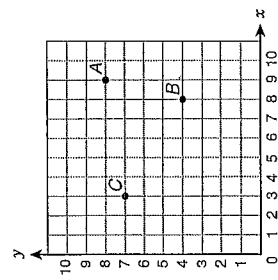
- ☐ A (0, 5)
- ☐ B (4, 0)
- ☐ C (2, 0)
- ☐ D (1, 1)

SKETCH IT

Sometimes drawing a picture or model can be helpful. In the margin below, draw a coordinate plane to help you identify which points would be on the y-axis.

- Name the coordinates for point B.

Write your answer in the box.



(8, 4)

How Am I Doing?

TURN AND TALK

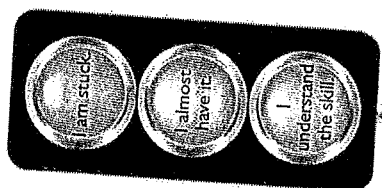
With a partner, solve the following. Vanessa plotted (2, 1) and (2, 5) on a coordinate plane. Give the coordinates for two other points that would form a rectangle. Explain how you found your answer.

What questions do you have?

How can you use a coordinate plane to show the location of your seat in the classroom?

What are some examples of how coordinate planes are used in everyday life? Can you think of some careers that use coordinate planes?

Color in the traffic signal that shows how you are doing with the skill.

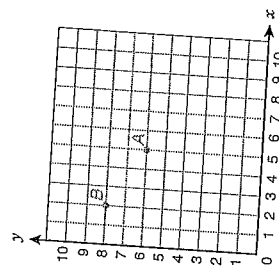


INDEPENDENT PRACTICE

Answer the questions.

1. Select TWO sets of steps you could use to plot the point (5, 9).
A Starting at (0, 0), move 5 units to the right of the origin on the x-axis and 9 units up.
B Starting at (1, 1), move 5 units to the right on the x-axis and 9 units up.
C Starting at (0, 0), move 9 units up on the y-axis and 5 units to the right.
D Starting at (1, 1), move 9 units up on the y-axis and 5 units to the right.
E Starting at (0, 0), move 5 units up on the y-axis and 9 units to the right.
F Starting at (0, 0), move 9 units to the right on the x-axis and 5 units up.

2. Plot points A and B on the coordinate plane. Point A should be located at (5, 6) and point B should be located at (2, 8). Label the points A and B.



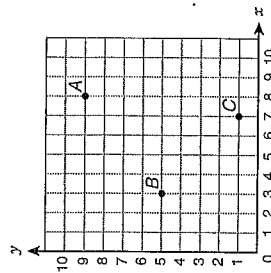
TIPS AND TRICKS

A computer-based test will provide tools for plotting points. Be sure to choose the correct tool for placing points and check to make sure each point shows up in the correct place.

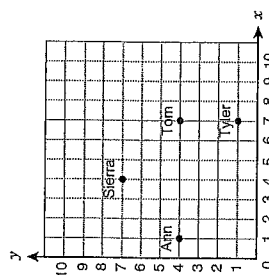
TIPS AND TRICKS

For a question like this, the parentheses and comma may or may not be provided. If only a blank answer box is provided, you will be expected to add the parentheses and comma along with the numbers.

3. What are the coordinates of point C?
Write your answer in the box.



(7, 1)



4. Part A
Sierra, Tom, Ann, and Tyler are playing a game. They created a coordinate plane on the gym floor. Each of them is at a different location on the floor. The rest of the students have their backs turned away from the grid. They guess coordinates and if a student is located at the point he or she is "out."
Maria guesses (7, 4) and gets one of the students out. Who is located at (7, 4)?

- (A) Sierra
(B) Tom
(C) Ann
(D) Tyler

Part B

Brian joins the game and hides at the same x-coordinate as Sierra and the same y-coordinate as Tyler. What is Brian's location?

Write your answer in the box.

(4, 1)

5. What are the coordinates of the origin?

- (A) (1, 1)
(B) (0, 1)
(C) (1, 0)
(D) (0, 0)

6. Part A

Write the coordinates of the point that is located on the x-axis 9 units to the right of the origin in the appropriate boxes.

(9 , 0)

Part B

Explain how you know that your answer to Part A is correct.

Sample answer: The x-coordinate is to the right of the origin, so it is 9. The y-coordinate is 0 because the point is on the x-axis.

7.

Explain how you would plot the point (6, 1) on the coordinate plane.

Sample answer: The x-coordinate is to the right of the origin, so I would move 6 units to the right.

The y-coordinate moves up from the x-axis. While on the 6 on the x-axis, I would move up 1 unit and plot the point.

TIPS AND TRICKS

When asked to explain your answer, be as specific as possible and use the correct mathematical terms.

EXIT TICKET

504

Now that you have mastered identifying and graphing points on the coordinate plane, let's solve the problem in the Real-World Connection. Khalid is making a map of his town. How can he use a coordinate plane to show locations of important places and how close or far away they are to his home? Khalid's home is represented by the origin, the point (0,0). Each unit on the grid is one city block.

Which axis represents going east from Khalid's house? x-axis

Which axis represents going north from Khalid's house? y-axis

The fire department is one block east and two blocks north from Khalid's house.

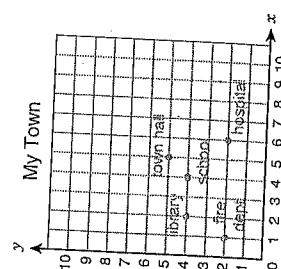
Plot and label this point on the grid. What are the coordinates? (1, 2)

Plot each location. Label the points.

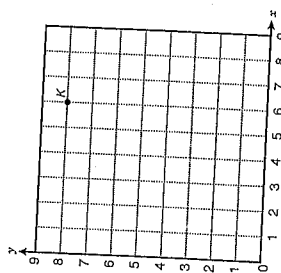
Hospital (6, 2)	Library (2, 4)	School (4, 4)	Town Hall (5, 5)
-----------------	----------------	---------------	------------------

Explain how you located each point.

Sample answer: I start at the origin. The first coordinate tells me how far to move to the right along the x-axis, and the second coordinate tells me how far to move up on the y-axis. I plot the point where the two intersect.



GUIDED INSTRUCTION



- Each square on the coordinate plane represents 1 square block. Kayla's house is at point K. Leah lives 4 blocks west and 2 blocks south of Kayla. What is the location of Leah's house?

Step One Find the starting location.

Kayla's house is at $(6, 8)$.

Step Two Add or subtract to find the new x-coordinate.

West is to the left. Move 4 blocks to the left, so subtract.

$$6 - 4 = 2$$

The new x-coordinate is 2 .

Step Three Add or subtract to find the new y-coordinate.

South is down. Move 2 blocks down, so subtract.

$$8 - 2 = 6$$

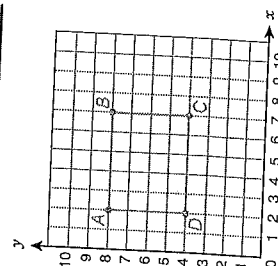
The new y-coordinate is 6 .

Step Four Write the ordered pair that represents the end location.

The ordered pair that represents the location of Leah's house is $(2, 6)$.

THINK ABOUT IT

The definition of a rectangle tells you about opposite sides and the angles of a rectangle. How does that help you find point that is the fourth corner?



- Three corners of a rectangle are at $(2, 8)$, $(7, 8)$, and $(2, 4)$. What is the ordered pair for the point at the fourth corner of the rectangle?

Plot the ordered pairs for the first three corners.

Draw a point for the fourth corner of the rectangle. It should be on the same vertical line as $(7, 8)$ and the same horizontal line as $(2, 4)$.

Write the coordinates of the new point in the box.

$(7, 4)$

How Am I Doing?

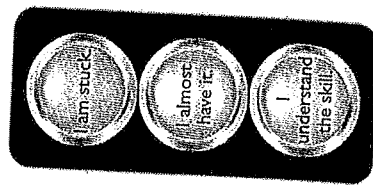
What questions do you have?

TURN AND TALK

With a partner, solve this problem: The attractions at a water park are plotted on a coordinate plane. The Frantic Fountain is at $(3, 2)$. The Wacky Water Slide is up 4 units and right 8 units from the Frantic Fountain. What are the coordinates of the water slide?

An ordered pair can be used to show the cost of one item. How can you use the cost per item to plot points on a coordinate plane and find how many of the same item you can buy with a given amount of money?

Color in the traffic signal that shows how you are doing with the skill.



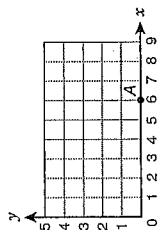
Create a coordinate plane in your classroom. Write an ordered pair to represent the location of something in your classroom on the coordinate plane. Explain what your ordered pair represents.

INDEPENDENT PRACTICE

WORK SPACE

Answer the questions.

1. What is the location of point A?

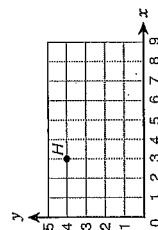


- (A) (0, 6)
- (B) (1, 6)
- (C) (6, 0)
- (D) (6, 1)

2. Hilary's house is represented by point H on the coordinate plane. Jenna lives 3 units east and 2 units south of Hilary. Write the ordered pair that represents the location of Jenna's house.

Write your answer in the box.

(6, 2)

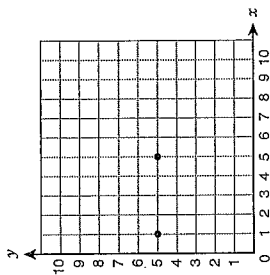


THINK ABOUT IT

How many different points can complete this right triangle with two sides that are the same length? What are the ordered pairs for those points?

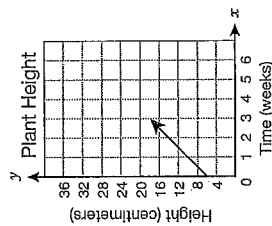
WORK SPACE

3. Two vertices of a right triangle are plotted on a coordinate plane. Which ordered pair can complete a right triangle?



- (A) (2, 1)
- (B) (4, 9)
- (C) (5, 8)
- (D) (7, 5)

4. Look at the graph. What is the height of the plant after 6 weeks?



- (A) 24
- (B) 28
- (C) 30
- (D) 32

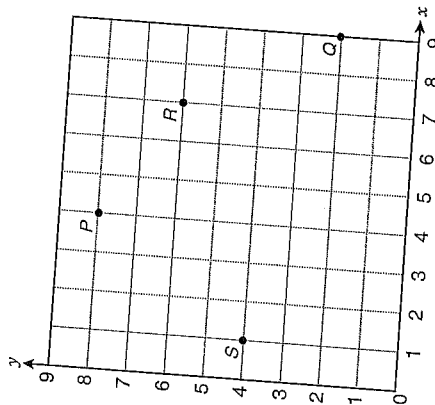
SKETCH IT

Even if you are not asked to plot the points, it may help you to sketch them in the margin below.

5. Three of the vertices of a parallelogram are located at (2, 4), (6, 4), and (7, 1). Which ordered pair completes the parallelogram?

(A) (1, 1)
(B) (3, 1)
(C) (3, 7)
(D) (7, 4)

6. Points P, Q, R, and S are shown on the coordinate plane. Select THREE statements that are true.



- (A) To go from P to Q, move 5 units right and 6 units down.
(B) To go from Q to R, move 2 units left and 4 units down.
(C) To go from R to S, move 6 units left and 2 units down.
(D) To go from Q to S, move 8 units right and 2 units up.
(E) To go from P to R, move 3 units right and 2 units down.

7. Part A

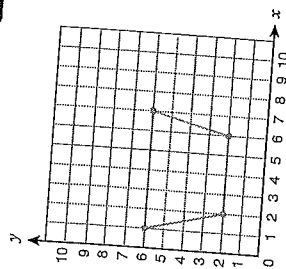
Use the coordinate plane to draw a quadrilateral with the following coordinates.

(1, 6), (7, 6), (6, 2), (2, 2)

Part B

Describe the quadrilateral that you drew. Explain your answer.

Sample answer: I drew a trapezoid because the quadrilateral has exactly one pair of parallel sides.

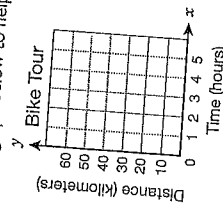


HINT, HINT

Quadrilaterals can be classified based on how many congruent angles, congruent sides, and parallel sides they have.

8. Part A

Tim biked 5 kilometers before starting a bike tour. Then he biked 10 kilometers each hour for 5 hours. Which ordered pairs are on the graph representing the total distance Tim biked? Select TWO correct answers. Use the Bike Tour graph below to help you.



- (A) (0, 5)
(B) (2, 20)
(C) (3, 30)
(D) (4, 45)
(E) (5, 50)

A.

Part B

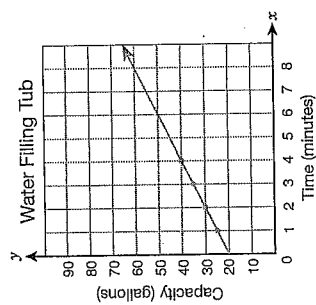
Explain how you got your answer.

Sample answer: I drew a line on the graph. The first point was (0, 5), where he started the bike tour. I calculated that 10 kilometers per hour for 5 hours is $10 \times 5 = 50$ kilometers. I added that to the 5 kilometers he had already biked, and got the point (5, 55). I drew the line through those two points.

EXIT TICKET

Now that you have mastered representing real-world situations on the coordinate plane, let's solve the problem in the Real-World Connection. Melanie's bathtub can hold 40 gallons of water. She has already put 20 gallons of water in the tub. Water is entering the tub at a rate of 5 gallons per minute. How long can Melanie continue to fill the tub before it overflows?

Plot points on the coordinate plane to show the amount of water in the bathtub at different times. At 0 minutes, the tub contains 20 gallons of water, so start at (0, 20).



As the time increases by 1 minute, the amount of water in the tub increases by 5 gallons. Use this rate to list the points when the x-coordinate is 1, 2, 3, and 4.

(1, 25), (2, 30), (3, 35), and (4, 40)

How long can Melanie continue to fill the tub? Explain how you found your answer.

Sample answer: The ordered pair (4, 40) shows that there will be

40 gallons of water in the tub after 4 minutes. The capacity of the tub is

40 gallons. So, Melanie can continue to fill the tub for 4 more minutes.

After that, the tub would overflow.

- Two patterns can be created using two rules.
- The two patterns can be written as ordered pairs.
- The term from the first pattern is the x -coordinate and the term from the second pattern is the y -coordinate.
- The numbers at the same position (e.g., first, second, third, and so on) in the patterns are called corresponding terms.

EXAMPLE

The pattern 0, 3, 6, 9, ... follows the rule "Add 3."

What are the next four terms in the pattern?

Add 3 to the last number in the pattern to continue the pattern.

$9 + 3 = 12$ $12 + 3 = 15$ $15 + 3 = 18$ $18 + 3 = 21$

So, the next four numbers in the pattern would be 12, 15, 18, and 21.

EXAMPLE

One pattern starts with 2 and follows the rule "Add 2."

Another pattern starts with 6 and follows the rule "Add 6."

What are the first four terms in each pattern?

Pattern 1 2, 4, 6, 8, ...

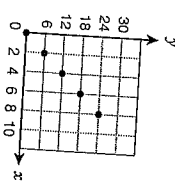
Pattern 2 6, 12, 18, 24, ...

The first corresponding terms are 2 and 6, so the first ordered pair is (2, 6).

The next ordered pairs are (4, 12), (6, 18), and (8, 24).

In each ordered pair, the y -coordinate is 3 times the x -coordinate. Therefore, each term in Pattern 2 is 3 times the corresponding value in Pattern 1.

You can plot the ordered pairs on a coordinate plane.



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GUIDED INSTRUCTION

Do you have a bank account or a place you put money you are saving? You can use a pattern to save money. You could add the same amount to the account each week or each month.

1. Two sisters start at \$0 in their savings accounts. Isabel saves money using the rule "Add 3 each week." Maya saves money using the rule "Add 6 each week."

What is the relationship between the corresponding terms of the two accounts?

Step One Make a table of values.

Write the starting values.

	Isabel	Maya
0	0	0
3	6	
6	12	
9	18	
12	24	

Step Two Use the rules to find each term.

For Isabel's account, add 3.

For Maya's account, add 6.

Step Three Write the terms as ordered pairs.

(0, 0), (3, 6), (6, 12), (9, 18), (12, 24)

Step Four Look for the relationship between corresponding terms. Explain the relationship.

Each term in Maya's pattern is two times the corresponding term in Isabel's pattern.

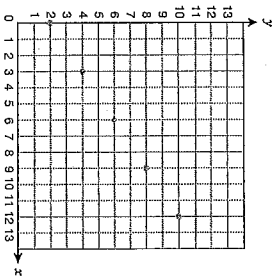
So, Maya's account has twice as much money as Isabel's account.



Copying is prohibited.

2. Pattern 1 starts at 0 and its rule is "Add 3." Pattern 2 starts at 2 and its rule is "Add 2." Graph the ordered pairs formed by corresponding terms in the patterns.

Pattern 1	Pattern 2	Ordered Pair
0	2	(0, 2)
$0 + 3 = 3$	$2 + 2 = 4$	(3, 4)
$3 + 3 = 6$	$4 + 2 = 6$	(6, 6)
$6 + 3 = 9$	$6 + 2 = 8$	(9, 8)
$9 + 3 = 12$	$8 + 2 = 10$	(12, 10)



3. One pattern starts at 2 and follows the rule "Add 1." A second pattern starts at 0 and follows the rule "Add 3." Which ordered pairs are on the graph of the relationship between the two patterns? Select TWO correct answers.

- (A) (0, 0)
(B) (3, 3)
(C) (4, 7)
(D) (5, 9)
(E) (6, 10)

How Am I Doing?

What questions do you have?

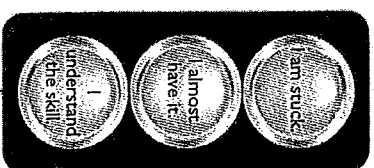
Can you think of situations in your everyday life that form a pattern? What is a rule to describe your age? What about scoring points in different sports? Give two other examples of when you can use patterns to describe the relationship between two events.

Do the graphs of all pairs of patterns form a line? Explain and give examples.

TURN AND TALK

Solve this problem with a partner. Two different patterns start with zero. One follows the rule "Add 6." The other follows the rule "Add 12." Predict if any numbers will appear in both patterns within the first five terms. Write the first five terms in both patterns. Was your prediction correct? Explain.

Color in the traffic signal that shows how you are doing with the skill.



WORK SPACE

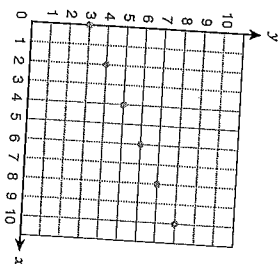
INDEPENDENT PRACTICE

Answer the questions.

- Pattern 1 starts at 1 and follows the rule "Add 2." Pattern 2 starts at 0 and follows the rule "Add 4." Which of the following ordered pairs is on the graph of the relationship between the two patterns?

- (A) (2, 3)
- (B) (4, 7)
- (C) (5, 8)
- (D) (7, 11)

- Pattern 1 starts at 0 and follows the rule "Add 2." Pattern 2 starts at 3 and follows the rule "Add 1." Use the grid to graph the first six ordered pairs for the relationship between the patterns.



- Tara has created two patterns that start at 0. Pattern 1 follows the rule "Add 6." Pattern 2 follows the rule "Add 2." The relationship between the patterns is that each term in Pattern 2 is what value of the corresponding term in Pattern 1?

- (A) $\frac{1}{6}$
- (B) $\frac{1}{3}$
- (C) 3
- (D) 6

WORK SPACE

- One pattern starts with 4 and follows the rule "Add 1." Another pattern starts with 1 and follows the rule "Add 2." Complete the ordered pairs. Write your answer in the each box.

(5, 3), (6, 5), (7, 7), (8, 9)

- Pattern 1 starts at 2 and follows the rule "Add 2." Pattern 2 starts at 9 and follows the rule "Subtract 2." Which ordered pairs are on the graph of corresponding terms? Select THREE correct answers.

- (A) (2, 9)
- (B) (4, 8)
- (C) (6, 5)
- (D) (8, 3)
- (E) (10, 2)

- Part A
Two patterns are shown.

Pattern 1: 0, 3, 6, 9, 12

Pattern 2: 0, 15, 30, 45, 60

How many times greater are the values of the terms in Pattern 2 than the values of the corresponding terms in Pattern 1?

Write your answer in the box.

5

HINT, HINT

The pattern rule tells you how much greater each term in a pattern is than the previous term.

Part B

Use the rule for each pattern to justify your answer to Part A.

Sample answer: The rule for Pattern 1 is "Add 3."

The rule for Pattern 2 is "Add 15." Since 15 is 5

times 3 and both patterns start at 0, each term in

Pattern 2 will be 5 times the corresponding term in

Pattern 1.

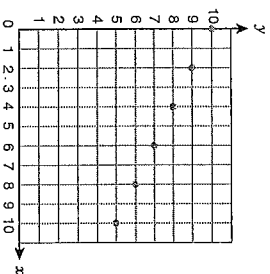
THINK ABOUT IT

How are graphs of patterns that have "Add" different from graphs that have patterns that say "Subtract"?

WORK SPACE

7. Part A

Pattern 1 starts at 0 and follows the rule "Add 2." Pattern 2 starts at 10 and follows the rule "Subtract 1." Use the grid to graph the first six ordered pairs in the relationship between the patterns.



Part B

What is the value of x when the value of y is 0? Explain how you found your answer.

Sample answer: The value of x is 20 when the

value of y is 0. I continued Pattern 1 by adding 2

to the previous term and I continued Pattern 2 by

subtracting 1 from the previous term. This resulted

in ordered pairs (12, 4), (14, 3), (16, 2), (18, 1), and

(20, 0).

EXIT TICKET

Now that you have mastered using patterns to write ordered pairs and analyze relationships, let's solve the problem in the Real-World Connection.

Chloe is biking on a path around a lake, while Matt jogs. Both Chloe and Matt plan to complete 6 laps of the path. It takes Chloe 4 minutes to bike the first lap, 8 minutes to bike 2 laps, and 12 minutes to bike 3 laps. It takes Matt 8 minutes to jog the first lap, 16 minutes to jog 2 laps and 24 minutes to jog 3 laps. How much longer will it take for Matt to finish 6 laps than Chloe?

Use a pattern to find out how long it will take Chloe and Matt to complete 6 laps each. Complete the table.

Number of Laps	Chloe's Number of Minutes	Matt's Number of Minutes
1	4	8
2	8	16
3	12	24
4	16	32
5	20	40
6	24	48

Describe the rule you used for each pattern.

Sample answer: For Chloe, the rule is "Add 4." For Matt, the rule is "Add 8."

How much longer will it take for Matt to finish 6 laps?

Sample answer: It will take Matt 24 minutes longer to finish the 6 laps.

PRACTICE TEST

PRACTICE TEST Chapter 5

Answer the questions.

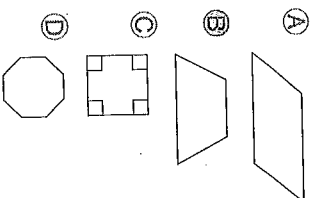
- Which term could be used to describe a closed figure that always has four sides, two sets of opposite parallel sides, and at least two right angles?

- ☐ A rectangle
- ☐ B quadrilateral
- ☐ C trapezoid
- ☐ D parallelogram

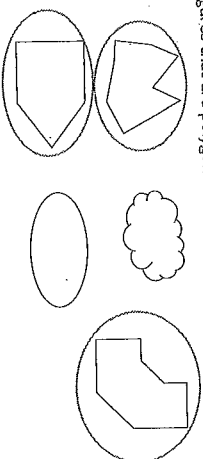
- Can a shape be both a rectangle and a rhombus? Explain.

Sample answer: Yes. A square is both a rectangle and a rhombus because it has two pairs of parallel sides that are all the same length and four right angles.

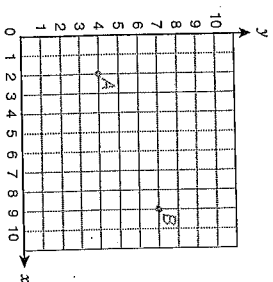
- Which figure is a trapezoid?



- Circle THREE figures that are polygons.



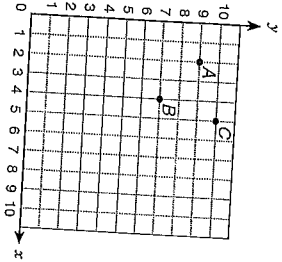
- Plot points A and B on the coordinate plane. Point A should be located at (2, 4) and point B should be located at (9, 7). Label the points.



CHAPTER 5

Chapter 5 PRACTICE TEST

6. What are the coordinates of point C?



Write your answer in the box.

(5, 10)

7. Part A

Write the coordinates of a point that would be located on the y-axis and 5 units above the origin.

(0, 5)

Part B

Explain how you know that your answer to Part A is correct.

Sample answer: The x-coordinate is 0 because it is on the y-axis. The y-coordinate is up from the origin, so it is 5.

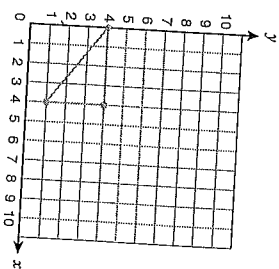
8.

Explain how you would plot the point (4, 2) on the coordinate plane.

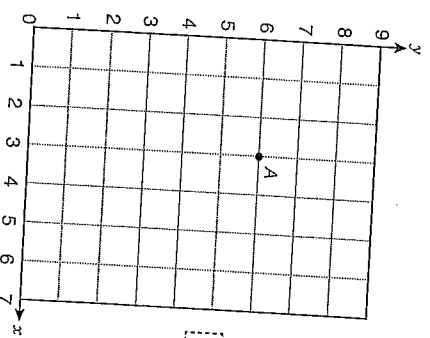
Sample answer: The x-coordinate is to the right of the origin, so I would move 4 units to the right. The y-coordinate moves up from the x-axis. While on the 4 on the x-axis, I would move up 2 units and plot the point.

PRACTICE TEST Chapter 5

9. Use the coordinate plane to draw a triangle with the following coordinates.
(0, 4), (4, 4), (4, 1)



10. Point B is located 2 units below and 4 units to the right of point A.
What ordered pair represents the location of point B?
Write your answer in the box.



(7, 4)

11. Three of the vertices of a square are located at (2, 3), (2, 5), and (5, 3). Which ordered pair completes the square?

(A) (1, 5)
(B) (5, 5)
(C) (5, 2)
(D) (3, 5)

12. Louis has created two patterns that start at 0. Pattern 1 follows the rule "Add 8." Pattern 2 follows the rule "Add 2." The relationship between the patterns is that each term in Pattern 2 is what value of the corresponding term in Pattern 1?

(A) $\frac{1}{8}$
(B) $\frac{1}{4}$
(C) 4 times
(D) 8 times

13. Two patterns are shown.

Pattern 1: 0, 1, 2, 3, 4

Pattern 2: 0, 7, 14, 21, 28

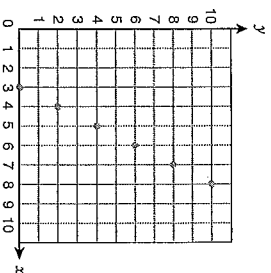
How many times greater are the values of the terms in Pattern 2 than the values of the corresponding terms in Pattern 1?

Write your answer in the box.

7

14. Part A

Pattern 1 starts at 3 and follows the rule "Add 1." Pattern 2 starts at 0 and follows the rule "Add 2." Use the grid to graph the first six ordered pairs in the relationship between the patterns.



Part B

What is the value of x when the value of y is 20? Explain how you found your answer.

The value of x is 13 when the value of y is 20. Sample answer: I continued Pattern 1 by adding 1 to the previous term and I continued Pattern 2 by adding 2 to the previous term. This resulted in ordered pairs (9, 12), (10, 14), (11, 16), (12, 18), and (13, 20).

15. Pattern 1 starts at 0 and follows the rule "Add 2." Pattern 2 starts at 0 and follows the rule "Add 12." How many times greater is each term in Pattern 2 than the corresponding term in Pattern 1?

Write your answer in the box.

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