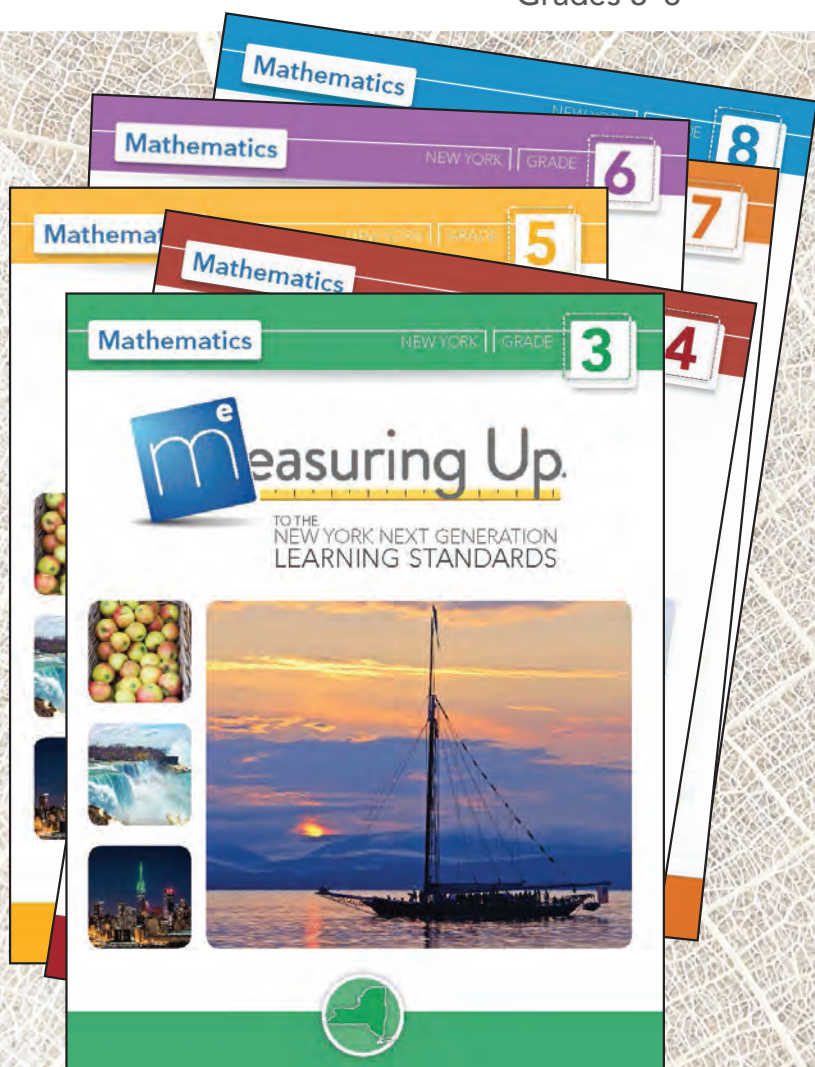




## to the New York NEXT GENERATION LEARNING STANDARDS

available for  
English Language Arts and Mathematics  
Grades 3–8



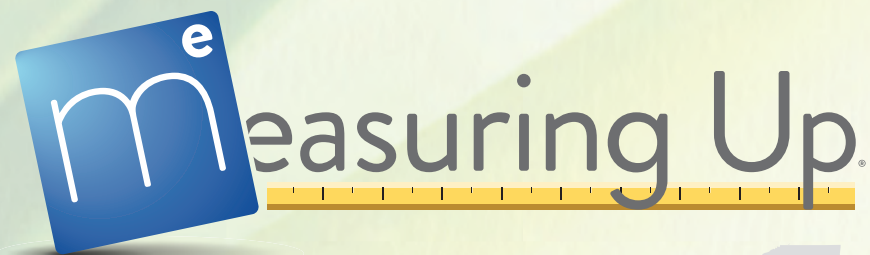
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**NEW! Lesson Feature — Share It!**  
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# Engage. Inspire. Empower.





NEW!

**Lesson pedagogy** invites students to explore math standards with a goal to build foundation for mastery. Each grade addresses all of the NY Next Generation Learning Standards. Each grade level builds on the content covered in the previous grade level. Within each chapter, each lesson builds on content in the previous lesson.

## Mathematics

Grades 3-8

Based on feedback from NY educators, powerful changes have been made to the new *Measuring Up* books written to the NY Next Generation Learning Standards which includes the change in grade level standards to improve the focus of major content and skills for each grade. The lesson pedagogy invites students to explore math standards with a goal to build foundation for mastery. Activities support the need to balance conceptual understanding, procedural skill and application while incorporating the mathematical practices into the skills lessons.

### Grade 3, Math

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[ii]

### Grade 8, Math

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### What's New?

#### Academic Language Supports Learning Complex Content and Abstract Ideas

- **Words to Know**—lists the academic vocabulary related to the lesson
- **Vocabulary In Action**—provides the academic vocabulary in context

#### Grade 3, Lesson 7

**WORDS TO KNOW**  
place value  
expanded form

### Lesson 7

#### UNDERSTAND FOUR-DIGIT NUMBERS

NY.3.NBT.4a, NY.3.NBT.4b

#### INTRODUCTION

##### Real-World Connection

Fatima and her family are on a whale-watching outing. They see two whales right away! The guide says one is a Hector's whale that weighs about two thousand, twenty pounds. The other is a strap-toothed whale that weighs about three thousand, three hundred pounds. Fatima wants to jot down the weights of those whales using numbers instead of words. How does she do that? Let's practice the skills in the **Instruction and Independent Practice** and, at the end of the lesson, see how Fatima writes the numbers!

##### What I Am Going to Learn

- How to read and write four-digit numbers in different ways.
- How to represent four-digit numbers using hundreds, tens, and ones.

##### What I May Already Know

- I know how to read and write three-digit numbers in different ways.
- I know that a two- and three-digit number represents amounts of hundreds, tens, and ones.

##### Vocabulary in Action

**Place value** is the value of each digit in a number. Understanding place value helps you read and write large numbers.

- A place-value chart shows the value of each digit in a number.


[ 72 ] masteryeducation.com | Mathematics | Level C


UNDERSTAND FOUR-DIGIT NUMBERS Lesson 7


The places in a four-digit number are ones, tens, hundreds, and thousands.


Thousands	Hundreds	Tens	Ones

- A place-value model using base-ten blocks can be used to describe the parts of a four-digit number.

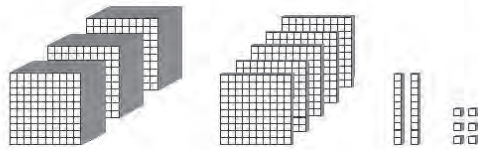
 = 1,000, or thousands place

 = 100, hundreds place

 = 10, tens place

 = 1, or ones place

If you were asked to show the number 3,526, you would use 3 thousands place cubes, 5 hundreds place flats, 2 tens place rods, and 6 ones place blocks.



**TIPS AND HINTS**  
The thousands place cubes are like 10 of the hundreds place flats stacked up.

- Place value helps you write numbers in **expanded form**. Expanded form shows the value of each digit in a large number. It is written as a sum of its parts.

Think of the number 1,251. In expanded form, it looks like this:

$$1,000 + 200 + 50 + 1$$

When you write it in words, it looks like this:

One thousand, two hundred fifty-one

Chapter 2 | Number and Operations | masteryeducation.com

#### Grade 8, Lesson 4

### Lesson 4

#### UNDERSTAND AND EVALUATE SQUARE ROOTS AND CUBE ROOTS

NY.8.EE.2

#### INTRODUCTION

##### Real-World Connection

Marco is making a square pen for his puppy. He wants the puppy to have 36 square feet of space to play. He can use square roots to determine the length of one side of the square section so that he can be sure to purchase enough fencing for the pen. Let's practice the skills in **Guided Instruction and Independent Practice** to see how Marco purchases enough fencing!

##### What I Am Going to Learn

- How to understand and evaluate square roots and cube roots
- How to classify square roots and cube roots as rational or irrational numbers

##### What I May Already Know

- I know that numbers that are not rational are irrational.
- I know how to find, position, and order rational numbers on a number line.

##### Vocabulary in Action

- The symbol  $\sqrt{\quad}$  is called a radical.
- If there is no small number in front of the radical, it represents a square root. Finding the square root of a number is the opposite or inverse of squaring a number.
- Every number has a positive and a negative square root. For example,  $8^2 = 64$  and  $(-8)^2 = 64$ , so the square root of 64 is equal to 8 or -8.
- The positive square root of a number is called the **principal square root**. For example, the value of  $\sqrt{64}$  is 8, the principal square root, because 8 times 8 equals 64.

**WORDS TO KNOW**  
radical  
square root  
principal square root  
perfect square  
cube root  
perfect cube

**THINK ABOUT IT**  
How can a square root be the inverse of an exponent?

**TURN AND TALK**  
The square roots of perfect squares, like 64, are rational. Are square roots of non-perfect squares, like 65, rational or irrational? Show your partner a number between 10 and 20 that answers this question.

Chapter 1 | Number and Operations | masteryeducation.com [ 33 ]




Specific opportunities for collaborative learning with examples to model, Turn and Talk and Learning Together.

USE THE PYTHAGOREAN THEOREM TO SOLVE RIGHT TRIANGLES Lesson 29

**Learning Together**

Working in a small group, match up in pairs to take an arm wrestling position with right hands clasped, but try to form a right triangle rather than arm wrestling. When forming pairs, consider the different arm lengths. In each pair, remember to keep one arm at a right angle to the table. Take a photo of each right triangle you are able to form as well as each effort that does not work because the hypotenuse is too short, such as shown in the image.



**How Am I Doing?**

What questions do you have?

How can you tell if a triangle with side lengths of 3, 5, and 6 inches is a right triangle?

How can you find the length of a ramp if you know the height and the horizontal distance of the ramp?

Circle the sign that shows how you are doing with the skill.

**STOP**  
I am stuck.

**YIELD**  
I almost have it.

**Lightbulb**  
I understand the skill.

Chapter 5 | Geometry | masteryeducation.com [375]

Grade 8, Lesson 29

USE THE PYTHAGOREAN THEOREM TO SOLVE RIGHT TRIANGLES Lesson 29

**Step Two** Solve the equation.

$$64 + 36 = c^2$$

$$100 = c^2$$

$$10 = c$$

**Step Three** What is the length of the hypotenuse?

The hypotenuse is 10 inches long.

**GUIDED INSTRUCTION**

1. The length of one leg of a right triangle is 12 inches. The hypotenuse is 13 inches. Find the length of the other leg.

**Step One** Substitute the known values into the equation.

$$b^2 = c^2 - a^2$$

$$b^2 = 13^2 - 12^2$$

**Step Two** Solve the equation.

$$b^2 = 169 - 144$$

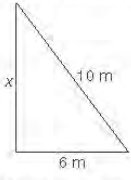
$$b^2 = 25$$

$$b = 5$$

**Step Three** Find the length of the leg.

The length of the leg is 5 inches.

2. Find the perimeter of the right triangle.



**Step One** Substitute the known values into the equation.

$$a^2 + b^2 = c^2$$

$$x^2 + 6^2 = 10^2$$

**TURN AND TALK**

If side c had been 11 inches, what would the length of side b be? Would it be a whole number?

Chapter 5 | Geometry | masteryeducation.com [373]



Activities support the need to balance conceptual understanding, procedural skill and application.

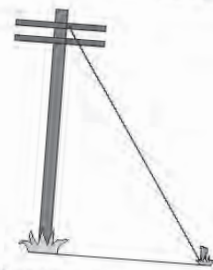
The questions in the activities encompass a variety of levels.

In both **Independent Practice I** and **II**, you will find multiple choice questions that ask for basic application (DOK 1 and DOK 2), as well as procedural skill questions (DOK 2 and DOK 3), and conceptual understanding questions (DOK 3).

### Independent Practice I

Includes questions at a mix of levels that include question supports. Items includes multiple choice and constructed response items.

3 The diagram below shows a telephone pole outside of Roger's house.



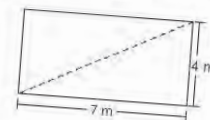
#### SKETCH IT

Visualize or draw the triangles on grid paper in small-to-scale form. If some numbers are not possible, then some choices are eliminated.

The pole is 20 feet high and the cable between the pole and the ground is 25 feet. What is the distance, in feet, between the stake, which is holding the cable in the ground, and the base of the pole?

- A 5  
B 15  
C 30  
D 45

4 A dance teacher separated her studio in half by painting a dashed line across the studio floor as shown below.



#### THINK ABOUT IT

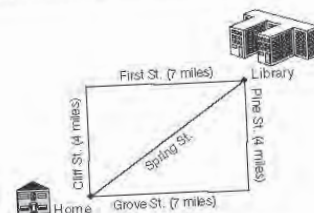
Why does placing a dashed line from corner to corner automatically create right triangles?

Between which two consecutive integers is the length, in meters, of the dashed line?  
The length is between \_\_\_\_\_ and \_\_\_\_\_ meters.

Explain your answer:

### INDEPENDENT PRACTICE 1

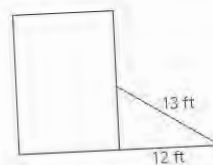
1 The map below shows an area where Ms. Guzman often walks.



Ms. Guzman usually takes Grove Street to Pine Street, or Cliff Street to First Street, to get to the library. Now there is a new road that might be a more direct route. Which is closest, in miles, to the length of Spring Street?

- A 3  
B 8  
C 11  
D 65

2 The image below shows the layout of Kyra's house and the triangular garden she is planning.



Kyra has two lengths of fencing to make her flower garden. She will use the fence to make a triangle. Part of her home will make up the third side of the garden. What length of her home, in feet, will be needed to form the third side of the garden?

- A 5  
B 7  
C 14  
D 25

### INDEPENDENT PRACTICE 1

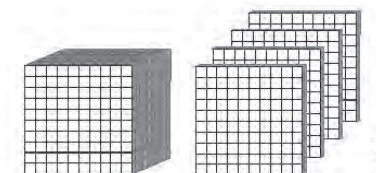
1 Arturo lives in New York City and his grandfather lives in Austin, TX. Arturo travels 1,572 miles to visit his grandfather. Which shows 1,572?

- A  $1,000 + 700 + 50 + 2$   
B  $1,000 + 500 + 50 + 20 + 2$   
C  $1,000 + 500 + 7 + 2$   
D  $1,000 + 500 + 40 + 20 + 2$

#### TIPS AND HINTS

In your head, picture a place-value chart with the four digits of 1,572 in order across the chart.

2 Flora made a model below to show how many students go to her school.



Which could be the number of students in her school?

- A 1,042  
B 1,402

#### THINK ABOUT IT

How are thousands, hundreds, and tens blocks alike and different?

3 Joseph's lucky number has a 5 in the thousands place and a 1 in the tens place. Which could be his lucky number?

- A 1,574  
B 2,517  
C 5,013  
D 5,108

#### TIPS AND HINTS

Create a quick place-value chart by writing Th, H, T, and O at the top of the first answer and drawing column lines from the first answer through the last answer.

4 Nina's older sister was born in 2002. Nina adds 50 to this year to find out when her sister will be 50 years old. In what year will Nina's sister be 50 years old? Write the year in expanded form.

Explain your answer:

#### TIPS AND HINTS

Write the numbers vertically with the ones lined up so you make sure to keep all numbers in the proper place value.







## Independent Practice II

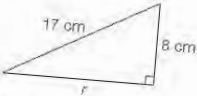
Includes questions at a mix of levels (mostly at DOK 2 and 3) and include no question supports. Items includes multiple choice and constructed response items.

Grade 8, Lesson 29

Lesson 29 USE THE PYTHAGOREAN THEOREM TO SOLVE RIGHT TRIANGLES

### INDEPENDENT PRACTICE 2

1 The right triangle below shows the lengths of two sides.



What is the length, in centimeters, of side  $r$ ?

A 9  
B 15  
C 25  
D 64

2 The leg lengths of right triangles are given. Which triangle has a hypotenuse with a length less than 12 units?

A 4, 3  
B 5, 12  
C 15, 8  
D 16, 12

3 Three friends are playing catch. Zoe is in a straight path 12 feet to the west of Alex. Jin is in a straight path 9 feet to the north of Alex. How far apart, in feet, are Jin and Zoe?

A 3  
B 15  
C 21  
D 225

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Lesson 29 USE THE PYTHAGOREAN THEOREM TO SOLVE RIGHT TRIANGLES

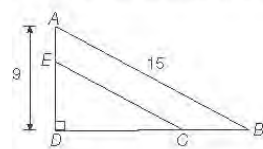
4 How many units long is the hypotenuse of a right triangle with leg lengths of 3 units and 4 units?

A 6  
B 5  
C 4  
D 3

5 Two side lengths of right triangles are given. Which is missing a hypotenuse length greater than 10?

A 8, 15  
B 7, 6  
C 4, 2  
D 2, 8

6 The figure below shows two right triangles where  $ED = (2)(AE)$  and  $DC = (2)(CB)$ .



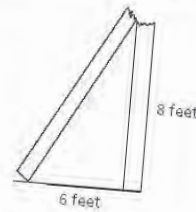
What is the length of  $DC$ ?

A 12  
B 8  
C 6  
D 4

Chapter 5 | Geometry | masteryeducation.com

Lesson 29 USE THE PYTHAGOREAN THEOREM TO SOLVE RIGHT TRIANGLES

7 A sign broke during a storm. The diagram below shows how it fell.



What was the original height, in feet, of the sign?

A 10  
B 14  
C 18  
D 24

8 Lisa drew two legs of a right triangle. One leg measured 16 centimeters and the other measured 12 centimeters. She says the hypotenuse length should be 20 centimeters. Is she correct?

Answer \_\_\_\_\_ yes or no

Explain your answer:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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## Independent Practice II

Includes questions at a mix of levels (mostly at DOK 2 and 3) and include no question supports. Items includes multiple choice and constructed response items.

UNDERSTAND FOUR-DIGIT NUMBERS Lesson 7

### INDEPENDENT PRACTICE 2

1 Yolanda used a place-value chart to write a number:

Thousands	Hundreds	Tens	Ones
3	5	1	2

Which is another way to write this number?

A  $300 + 50 + 10 + 2$   
B  $2,000 + 1,000 + 500 + 10 + 2$   
C  $3,000 + 400 + 100 + 2$   
D  $3,000 + 500 + 20 + 1$

2 A coffee shop sold one thousand three cups of tea during May. What is this number in expanded form?

A  $1,000 + 30$   
B  $1,000 + 3$   
C  $100 + 3$   
D  $1,000 + 30 + 3$

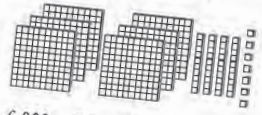
3 Which of the following means 4 thousands, 3 hundreds, and 2 ones?

A 432  
B 4,032  
C 4,302  
D 40,302

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Lesson 7 UNDERSTAND FOUR-DIGIT NUMBERS

4 Which does **not** show the same as 6 thousands, 4 tens, and 7 ones?

A 6,047  
B  $4,000 + 2,000 + 40 + 7$   
C   
D  $6,000 + 30 + 10 + 7$

5 Emma ran 5,000 feet. Jose ran 907 feet. Emma writes the total number of feet the two ran in a place-value chart. Which shows the number Emma writes?

A  $5,000 + 90 + 7$   
B  $5,000 + 900 + 7$   
C  $5,000 + 900 + 70$   
D  $9,000 + 500 + 7$

6 Li-mei tried to write the number 4,802 in expanded form.

$4,000 + 80 + 2$

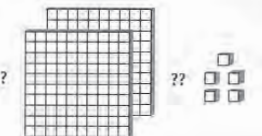
Which change would make Li-mei's answer correct?

A Change 4,000 to 400.  
B Change 80 to 8,000.  
C Change 80 to 800.  
D Change 2 to 20.

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UNDERSTAND FOUR-DIGIT NUMBERS Lesson 7

7 The model below shows how many people went to a concert. The thousands and tens are missing.



Which could be the number of people?

A 4,325  
B 6,592  
C 8,245  
D 9,260

8 In science class, Ana puts 1,000 milliliters (mL) of water in a bottle. Next, she adds 200 mL of water. Then she adds 50 mL of water. How many milliliters of water will be in the bottle if she adds 100 more milliliters? Draw a model in the space provided.

**Show your work.**

**Answer** \_\_\_\_\_ milliliters

9 Marcelo and his friends collect pennies. Marcelo has four thousand pennies. Vinato has one thousand, nine hundred pennies. Sabina has six pennies. What is the total number of pennies the friends have? Use the place-value chart to help.

Thousands	Hundreds	Tens	Ones

**Explain how you found the answer:**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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## Exit Ticket


Use this writing activity as a check for understanding asking students to apply skill to a real-world question.

Lesson 7
UNDERSTAND FOUR-DIGIT NUMBERS

EXIT TICKET
NY.3.NBT.4a, NY.3.NBT.4b

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

Fatima and her family are on a whale-watching outing. They see two whales right away! The guide says one is a Hector's beaked whale that weighs about two-thousand twenty pounds and the other is a strap-toothed whale that weighs about three thousand three hundred pounds. How can Fatima write these weights using numbers instead of words?



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Grade 3, Lesson 7

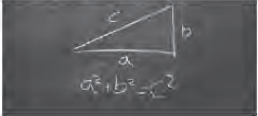
Lesson 29
USE THE PYTHAGOREAN THEOREM TO SOLVE RIGHT TRIANGLES

EXIT TICKET
NY.8.G.7

Now that you have mastered applying the Pythagorean theorem, let's solve the problem in the Real-World Connection.

Sayid rides his bike from school to a bookstore, and then from the bookstore to a computer shop. The bookstore is on a straight path 4 miles east of the school. The computer shop is on a straight path 3 miles north of the bookstore. Use the Pythagorean theorem to find the straight-path distance directly from school to the computer shop.

**Pythagorean Theorem**



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[ 382 ]
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Grade 8, Lesson 29



The 8 Mathematical Practices are incorporated into the lessons.

1

**Make sense of problems and persevere in solving them.**

Guided Instruction as well as the tips within the **Independent Practice I** provide students with examples and tools that allow them to understand how to begin solving a problem, how to progress through a problem, and how to monitor and evaluate their responses.

Students practice these solution techniques on their own in **Independent Practice II** and **Exit Ticket**.

2

**Reason abstractly and quantitatively.**

Within each lesson, there are 3 constructed response questions. Most of these require students to both provide quantitative answers and to explain the reasoning behind their answers.

Grade 5, Lesson 5

Lesson 5 READ, WRITE, AND COMPARE DECIMALS

## GUIDED INSTRUCTION

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

1. 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 it is in the hundredths place. There is no digit in the thousandths place.

**Step Three** Write 86.03 in words.  
eighty-six and    hundredths

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
0	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.  
 $27.304 = 2 \times \text{  } + 7 \times 1 + 3 \times \text{  } + 4 \times \frac{1}{1,000}$

Lesson 5 READ, WRITE, AND COMPARE DECIMALS

## INDEPENDENT PRACTICE 1

1. What is 10.802 expressed in word form?

A ten and eight hundred two thousandths  
B one hundred eight and two thousandths  
C ten and eighty-two hundredths  
D one hundred and eighty-two hundredths

**TIPS AND HINTS**  
When reading a number in word form, write out each number next to the words.

2. Which number is greater than 34.16?

A 3.516  
B 3.518  
C 34.21  
D 34.06

**TIPS AND HINTS**  
Compare the digits one at a time, using place value and starting at the left.

3. The number below is in expanded form.  
 $(6 \times 100) + (2 \times 10) + (8 \times 1) + (3 \times \frac{1}{10}) + (4 \times \frac{1}{100}) + (2 \times \frac{1}{1,000})$   
Which is the number in standard form?

A 628,342  
B 62,834.2  
C 6,283.42  
D 628.342

**THINK ABOUT IT**  
How would you write this number in a place-value table?

Lesson 5 UNDERSTANDING SCIENTIFIC NOTATION

8. The table below shows four expressions in random-size order.

Order	Expression
?	$1 \times 10^{-7}$
?	$1.13 \times 10^{-6}$
?	$1.01 \times 10^{-6}$
?	$1.2 \times 10^{-2}$

With 1 being the least and 4 being the greatest, number the four expressions from least to greatest.

**Answer** 1. \_\_\_\_\_, 2. \_\_\_\_\_, 3. \_\_\_\_\_, 4. \_\_\_\_\_

**Explain your answer:**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

9. Mary stated that  $2.01 \times 10^6$  is less than  $4.8 \times 10^4$  because 2.01 is less than 4.8. What was Mary's mistake? Use what you know about scientific notation.

**Explain your answer:**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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Grade 8, Lesson 5

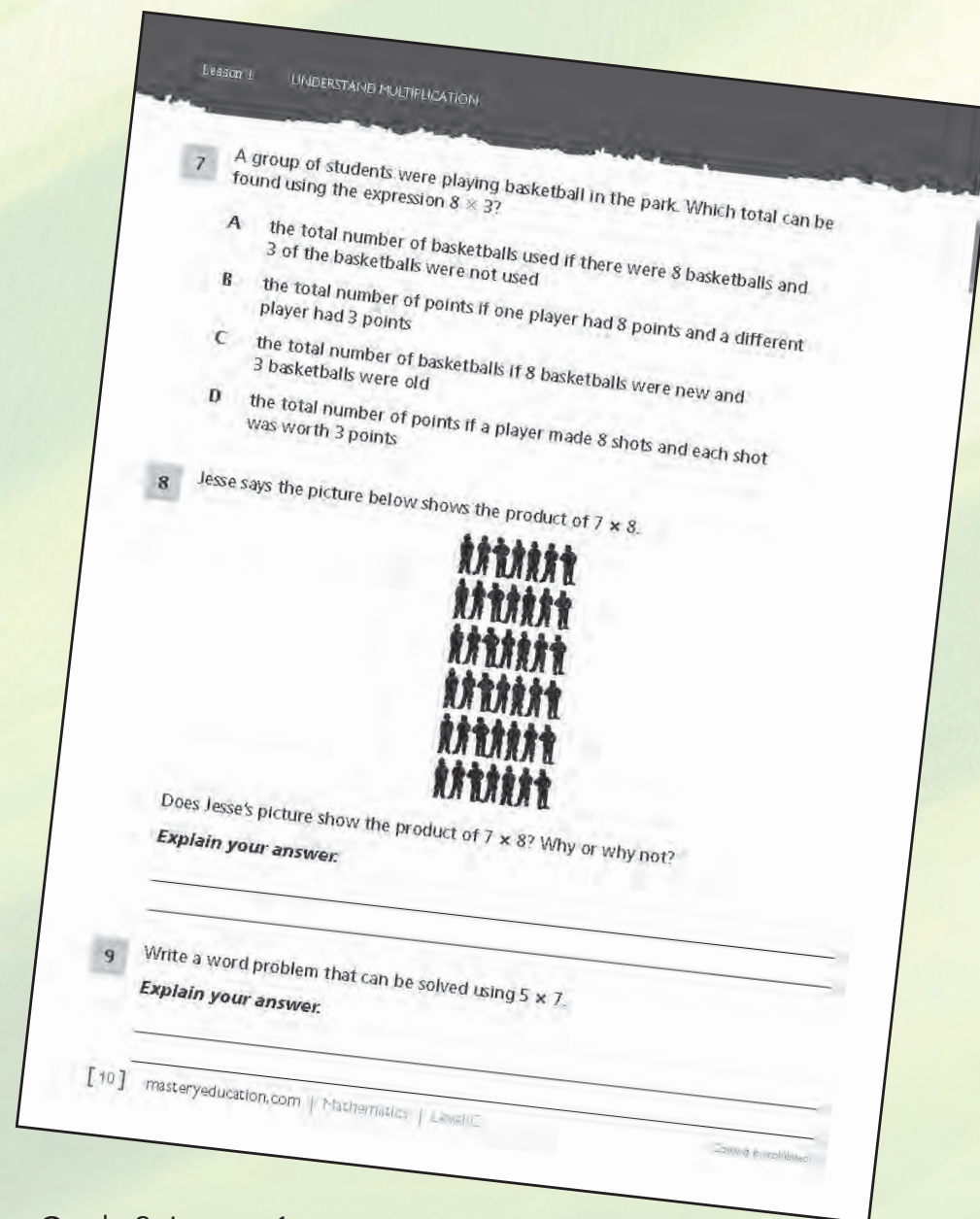


3

### Construct viable arguments and critique the reasoning of others.

Many lessons include questions where students have to determine what, if any, error a person has made when solving a math problem.

Lessons include partner or group activities where students naturally critique and discuss each other's reasoning as they work together.

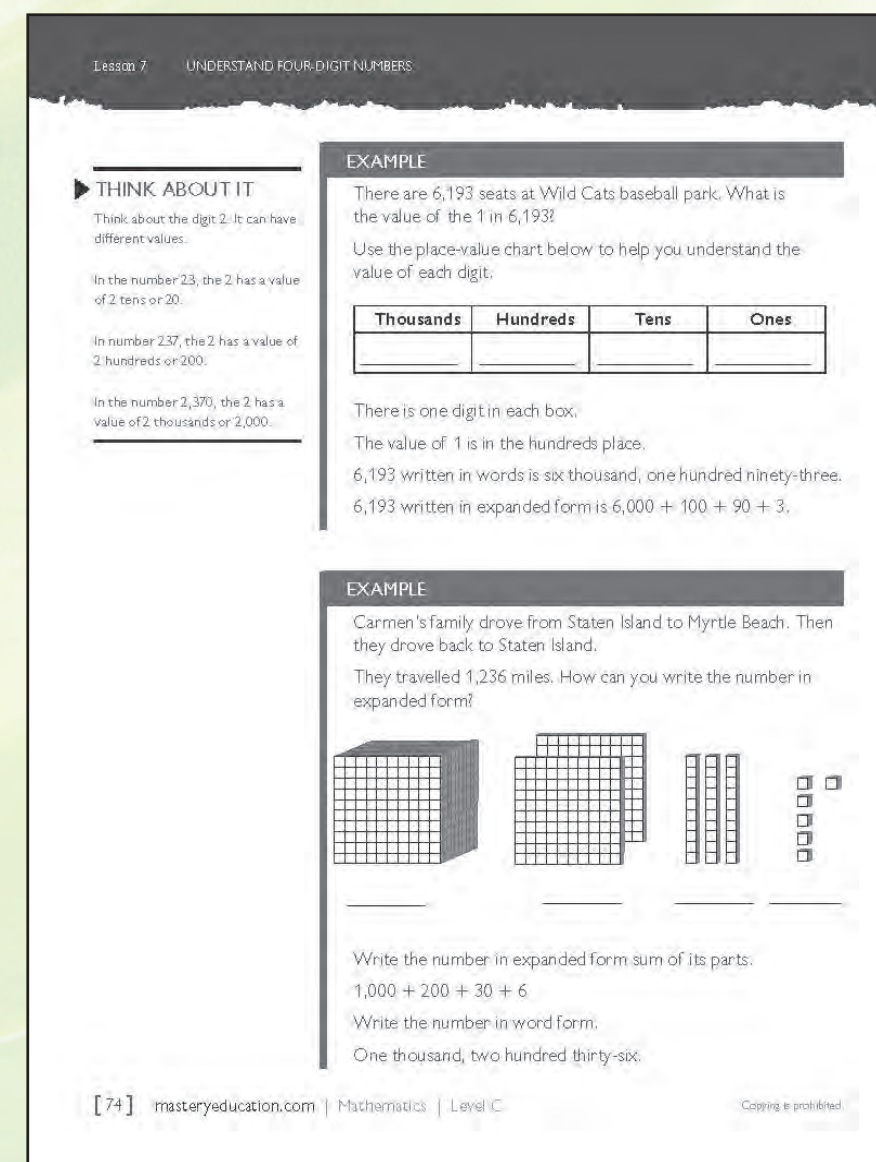


Grade 3, Lesson 1

4

### Model with mathematics.

The lessons are full of visual models that will help students understand the mathematical concepts.



Grade 3, Lesson 7



5

## Use appropriate tools strategically.

Where appropriate, the lessons incorporate mathematical tools that students can use to make the problems easier to understand and work. Examples include:

- the Properties of Operation
- math manipulatives
- sketches
- relating to real life
- working together

### SKETCH IT

Write the integer format of  $\frac{a}{b}$  and then cross out the  $a$  and replace it with an integer for this problem. Then cross out the  $b$  and replace it with an integer for this problem.

COMPARE AND ESTIMATE IRRATIONAL NUMBERS Lesson 2

## EXIT TICKET

NY-8.NS.2

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

Ludiano's company is building a wildlife sanctuary on a plot of land. The plot is square-shaped and has an area of 3 square miles. He must estimate the side lengths of the plot so he can purchase fencing. He will receive a discount on fencing if he buys more than 8 miles of fencing. To find the length of each side, he must estimate the value of  $\sqrt{3}$ . What is an estimate for the value of  $\sqrt{3}$ ? Approximately how long is each side?

IDENTIFY RATIONAL AND IRRATIONAL NUMBERS Lesson 1

## Learning Together

Nikita makes the statement "All non-terminal decimals are irrational numbers." Discuss with a partner: Is Nikita correct? Explain your answer.

Include these ideas in your discussion:

- What are the two types of non-terminal decimals?
- Which type of non-terminal decimal can be represented as  $\frac{a}{b}$ ?
- How are the decimals  $4.\bar{3}$  and 4.3564207 alike and different?
- Was Nikita correct?

Grade 8, Lesson 1

6

## Attend to precision.

Every lesson provides content-related vocabulary and thorough explanations for using the vocabulary. Inclusion of this vocabulary content encourages students to incorporate the vocabulary into their mathematical thinking and discussing.

## WORDS TO KNOW

property

Commutative Property of Multiplication

Associative Property of Multiplication

Distributive Property of Mathematics

## Vocabulary in Action

There are many strategies to help you multiply and divide. Remember, multiplication and division are related and understanding fact families can help.

A **property** is a set of rules used in operations. You can use more than property to solve a multiplication problem.

Grade 3, Lesson 4

## THINK ABOUT IT

As you learn your multiplication facts, think of ways you can use these properties to help you.



7

### Look for and make use of structure.

The lessons provide extensive instruction in the use of the Properties of Operation as well as Order of Operations so that students are constantly focusing on and using these structures as well as reasoning about them.

8

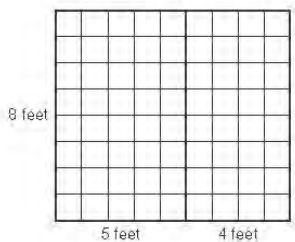
### Look for and express regularity in repeated reasoning.

The lessons provide ample Guided Instruction as well as ample Independent Practice to allow students to experience and recognize both patterns and shortcuts that they can use to simplify the math with which they are working.

Lesson 4 USE MULTIPLICATION AND DIVISION STRATEGIES

## GUIDED INSTRUCTION

There are two rectangular rooms with floors that need to be covered with tiles. The tiles are 1 foot long and 1 foot wide. One room is 8 feet wide and 5 feet long, and the other room is 8 feet wide and 4 feet long.



8 feet

5 feet 4 feet

How could you find the number of tiles?

- You could find  $8 \times 9$ , or you could use the Distributive Property and break the length of 9 feet into 5 feet and 4 feet.
 

**Step One** Find the product of 8 and 5.  
 $8 \times 5 = 40$

**Step Two** Find the product of 8 and 4.  
 $8 \times 4 = 32$

**Step Three** Add the products.  
 $40 + 32 = 72$

The floors will need 72 tiles.

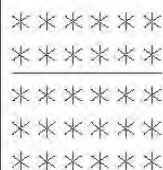
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Lesson 4 USE MULTIPLICATION AND DIVISION STRATEGIES

### TURN AND TALK

How can using the Commutative Property of Multiplication help you learn your multiplication facts?

- The **Commutative Property of Multiplication** says that you can multiply two factors in any order.  
 The product is the same:  $a \times b = b \times a$   
 These numbers are from the same fact family:  
 $6 \times 4 = 24$   
 $4 \times 6 = 24$   
 $6 \times 4 = 4 \times 6$
- The **Associative Property of Multiplication** says you can group factors in different ways.  
 The product is the same:  $(a \times b) \times c = a \times (b \times c)$   
 $(2 \times 4) \times 3 = 2 \times (4 \times 3)$   
 $8 \times 3 = 2 \times 12$   
 $24 = 24$
- The **Distributive Property of Mathematics** says you can break apart factors to get to the facts you know.

 <p><math>5 \times 6 = ?</math></p>	<p>To solve: <math>5 \times 6 = ?</math>          Think: <math>5 = 2 + 3</math>, so          5 groups of 6 = 2 groups of 6 + 3 groups of 6  <math>5 \times 6 = (2 + 3) \times 6</math>  <math>= (2 \times 6) + (3 \times 6)</math>  <math>= 12 + 18</math>  <math>= 30</math></p>
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Grade 3, Lesson 4

UNDERSTAND PLACE-VALUE PATTERNS Lesson 1


When multiplying or dividing by a power of 10, the power will often be written as an exponent. It is much easier to write  $5.4 \times 10^9$  than  $5.4 \times 1,000,000,000$ .

### EXAMPLE

What is  $7.92 \times 10^4$ ?  
 $7.92 \times 10^4 = 7.92 \times 10 \times 10 \times 10 \times 10 = 79,200$   
 You are multiplying by 10 four times. The exponent tells you to shift the digits to the left four places.

### 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.



3. What is  $49.33 \div 10^2$ ?

**Step One** Change  $10^2$  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.  
 $49.33 \times \frac{1}{100} = 0.$

### TURN AND TALK

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

4. Complete the equations.  
 Write each number in the appropriate box.


$0.21 \times 100 =$

$0.21 \div 10 =$

$\times 100 = 210$

### TIPS AND HINTS

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

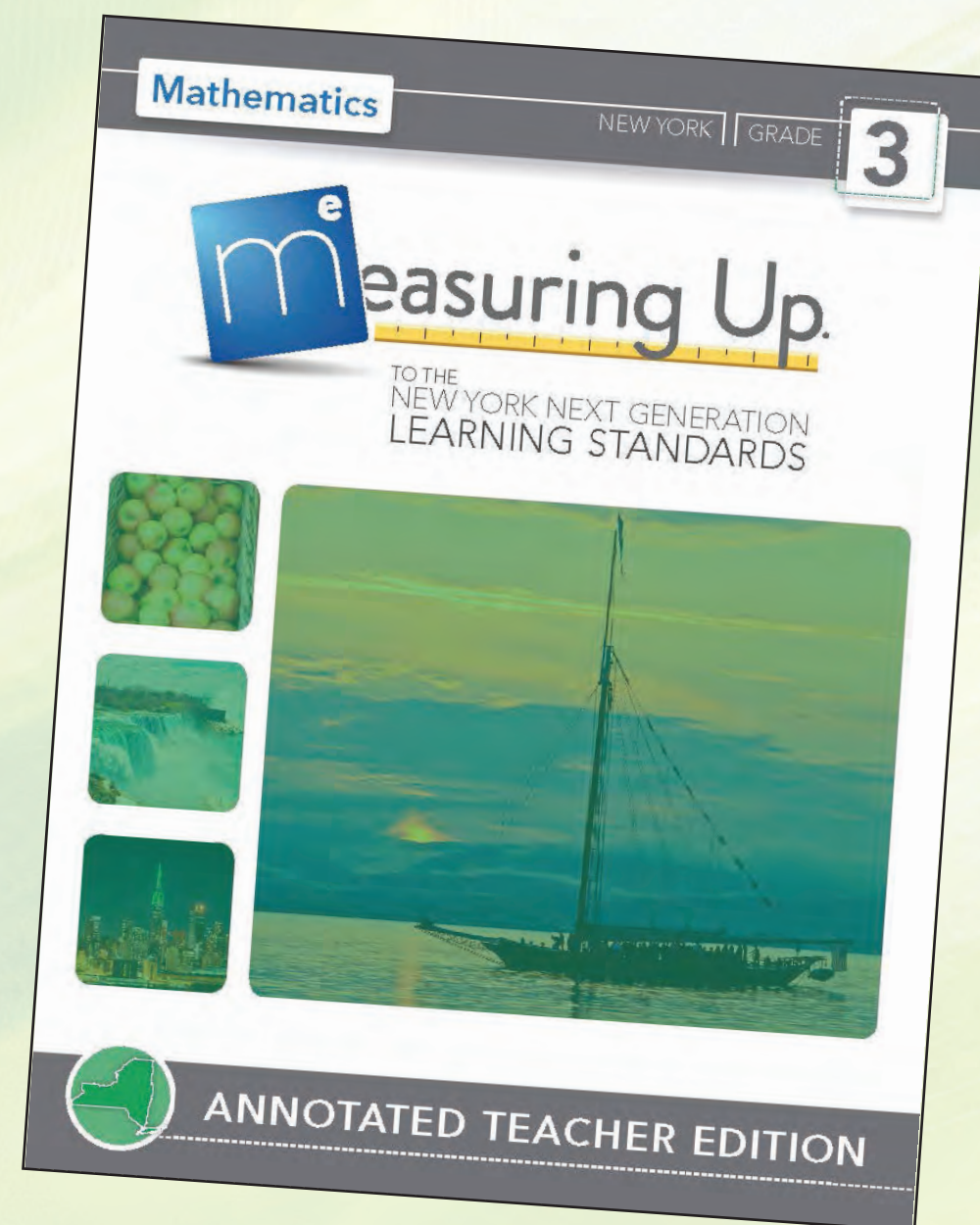


Grade 5, Lesson 1



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