Topic 1 focuses on deepening the understanding of place value in both whole numbers and decimals.

**UNDERSTAND PLACE VALUE IN WHOLE NUMBERS**

- **Exponents and Powers of 10** In Lesson 1-1, students use patterns and positive exponents to write and interpret products involving powers of 10. They see that the number of zeros in the product is the same as the exponent in the power of 10. (5.NBT.A.2)

  \[
  5 \times 10^1 = 5 \times 10 = 50 \\
  5 \times 10^2 = 5 \times 10 \times 10 = 500 \\
  5 \times 10^3 = 5 \times 10 \times 10 \times 10 = 5,000
  \]

- **Place-Value Relationships** Lesson 1-2 highlights the following base-10 place-value relationships: In a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and \( \frac{1}{10} \) of what it represents in the place to its left. (5.NBT.A.1)

- **Use Place Value to Read and Write Whole Numbers** In Lesson 1-2, students use their understanding of place value to read and write whole numbers using words, standard form, and expanded form with exponents. (5.NBT.A.1, 5.NBT.A.2)
UNDERSTAND PLACE VALUE IN DECIMALS

- **Place-Value Relationships in Decimals** In Lesson 1-3, students are introduced to decimals to thousandths. It is important for students to understand that the place-value relationships apply to decimals as well as whole numbers. That is, a digit in one place represents 10 times as much as it represents in the place to its right and \( \frac{1}{10} \) of what it represents in the place to its left. (5.NBT.A.1, 5.NBT.A.3a)

- **Use Place Value to Read and Write Decimals** In Lesson 1-4, students use their understanding of place value to read and write decimals using words, standard form, and expanded form with fractions (\( \frac{1}{10}, \frac{1}{100}, \text{and} \frac{1}{1000} \)). (5.NBT.A.1, 5.NBT.A.3a)

  **Standard Form:** 0.440

  **Expanded Form:** \[ (2 \times \frac{1}{10}) + (4 \times \frac{1}{100}) + (5 \times \frac{1}{1,000}) \]

  **Number Name:** two hundred forty-five thousandths

- **Compare and Round Decimals** In Lessons 1-5 and 1-6, students compare and round decimals using procedures that are based on place value. These procedures are similar to those for whole numbers. One difference, however, is that when rounding decimals, the digit to the right of the rounding digit’s place is dropped after the rounding is completed, whereas with whole numbers, it is changed to a zero. (5.NBT.A.3b, 5.NBT.A.4)

  Round 2.36 to the nearest tenth.

| Find the rounding place. Look at the digit to the right of the rounding place. | 2.36 |
| If the digit is 5 or greater, add 1 to the rounding digit. If the digit is less than 5, leave the rounding digit alone. Since 6 > 5, add 1 to the 3. | 2.36 \uparrow \downarrow 2.4 |
| Drop the digits to the right of the rounding digit. | 2.36 rounds to 2.4 |

**Professional Development Videos** Topic Overview Videos and Listen and Look for Lesson Videos present additional important information about the content of this cluster.
Students learn best when ideas are connected in a coherent curriculum. This coherence is achieved through various types of connections including connections within clusters, across clusters, across domains, and across grades.

**BIG IDEAS IN GRADES K–6**

Big Ideas are the conceptual underpinnings of enVisionmath2.0 and provide conceptual cohesion of the content. Big Ideas connect Essential Understandings throughout the program.

A Big Idea that connects most of the work in this cluster is that the base-10 numeration system is a scheme for recording numbers using digits 0–9, groups of 10, and place value.

\[ 26,537 = (2 \times 10) + (6 \times 1) + (5 \times \frac{1}{10}) + (3 \times \frac{1}{100}) + (7 \times \frac{1}{1,000}) \]

For a complete list of Big Ideas, see pages 110–111 in the Teacher’s Edition Program Overview.

**LOOK BACK**

How does Topic 1 connect to what students learned earlier?

**GRADE 4**

- **Whole-Number Place Value** In Topic 1, students strengthened their understanding of place value for whole numbers through one million. They read and wrote multi-digit whole numbers using base-10 numerals, number names, and expanded form. They compared and rounded two multi-digit numbers. (4.NBT.A)

\[
625,087 = 600,000 + 20,000 + 5,000 + 80 + 7
\]

- **Decimal Place Value** In Topic 12, students learned how to use decimal notation, and compared decimals to hundredths by reasoning about their size. (4.NF.C)

\[
\frac{30}{100} = 0.30
\]

\[
\frac{3}{10} = 0.3
\]
TOPIC 1

How is content connected within Topic 1?

- Exponents and Expanded Form  In Lesson 1-1, students learn to use exponents to write powers of 10. They draw on this understanding in Lesson 1-2 to write multi-digit whole numbers in expanded form with exponents. (5.NBT.A.2)

\[ 2,604,037 = (2 \times 10^6) + (6 \times 10^5) + (4 \times 10^3) + (3 \times 10^0) + (7 \times 10^0) \]

- Place-Value Relationships in Whole Numbers and Decimals In Lesson 1-2, students see that for whole numbers, a digit in one place represents 10 times as much as it represents in the place to its right and \( \frac{1}{10} \) of what it represents in the place to its left. In Lesson 1-3, they see that this relationship applies to decimals, as well. They also see that writing decimals in expanded form is an extension of writing whole numbers in expanded form. (5.NBT.A.1, 5.NBT.A.3a)

- Compare and Order Decimals In Lesson 1-5, students learn to compare and order decimals by drawing on their knowledge about comparing and ordering whole numbers from earlier grades as well as their knowledge about decimal place value from Lessons 1-3 and 1-4. (5.NBT.A.3a, 5.NBT.A.3b)

<table>
<thead>
<tr>
<th>Line up the decimal points.</th>
<th>3.576</th>
<th>3.432</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start at the left.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compare digits of the same place value.</td>
<td>3.576</td>
<td>3.432</td>
</tr>
<tr>
<td>Find the first place where the digits are different.</td>
<td>3.576</td>
<td>3.432</td>
</tr>
<tr>
<td>Compare.</td>
<td>Since 5 &gt; 4, 0.5 &gt; 0.4</td>
<td>So, 3.576 &gt; 3.432</td>
</tr>
</tbody>
</table>

- Round Whole Numbers and Decimals In Lesson 1-6, students round decimals by drawing on their knowledge about rounding whole numbers from earlier grades and decimal place value from earlier lessons in the topic. (5.NBT.A.3a, 5.NBT.A.4)

LOOK AHEAD

How does Topic 1 connect to what students will learn later?

LATER IN GRADE 5

- Operations with Whole Numbers and Decimals In Topics 2, 3, 4, 5, and 6, students will add, subtract, multiply, and divide multi-digit whole numbers and decimals. This work includes multiplying and dividing by powers of 10. The standard algorithms and procedures for these computations are grounded in place-value understanding. (5.NBT.A.2, 5.NBT.B)

\[ \frac{16}{10} \]

\[ \begin{array}{c}
18.50 \\
-7.82 \\
10.68 \\
\end{array} \]

- Convert Measurements In Topic 11, students will use exponents and decimal place value to represent relationships among metric units. They will multiply and divide by powers of 10 to convert metric measurements. (5.NBT.A.2, 5.MD.A)

<table>
<thead>
<tr>
<th>DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 kilometer</td>
</tr>
<tr>
<td>(10^3) m</td>
</tr>
</tbody>
</table>

\[ \begin{array}{c}
3 \text{ km} \\
\times 0.001 \\
\end{array} \]

\[ \begin{array}{c}
3 \times 10^3 = 3,000 \\
\text{So, 3 km = 3,000 m.} \\
\end{array} \]

GRADE 6

- Exponents In Topic 1, students will write and evaluate numerical expressions involving whole-number exponents. Students will use exponents that have bases other than 10. (6.EE.A.1)

- Whole-Number and Decimal Computation In Topics 6 and 7, students will fluently add, subtract, multiply, and divide whole numbers and decimals. Again, students will use standard algorithms that are grounded in place-value understanding. (6.NS.B.2, 6.NS.B.3)
A rigorous curriculum emphasizes conceptual understanding, procedural skill and fluency, and applications.

**CONCEPTUAL UNDERSTANDING**

- **Understand Exponents** In Lesson 1-1, students are introduced to exponents. They learn that the exponent in a power of 10 tells the number of times 10 is used as a factor. When multiplying by a power of 10, they recognize the connection between the exponent in the power of 10 and the number of zeros in the product. (5.NBT.A.2)

- **Understand the Relationship Between Adjacent Place-Value Positions** Throughout Topic 1, students extend their previous understanding of place value. They use base-10 blocks, place-value charts, and patterns to recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and \( \frac{1}{10} \) of what it represents in the place to its left. (5.NBT.A.1)

- **Make Sense of Comparing Numbers** In Lesson 1-5, students use place-value concepts and representations, such as number lines, to understand decimal comparison. It is important for students to realize that the number of digits in a decimal cannot be used to determine its size. While whole numbers with more digits are greater because the values of the places increase to the left, decimals with more digits may be smaller because the values of the places decrease to the right. (5.NBT.A.3b)

\[ 325,408 > 822 \quad 325.4 > 325.048 \]

- **Make Sense of Round Numbers** In Lesson 1-6, students round decimals by extending their understanding of how to use place value to round whole numbers. The procedure for rounding whole numbers is based on knowing the halfway point between the nearest multiples of 10, 100, 1,000, and so on. The procedure for rounding decimals is similar. It is based on knowing the halfway point between the nearest multiples of 0.1, 0.01, and 0.001, and so on. (5.NBT.A.4)

\[ 8.273 \quad 8.291 \quad \text{Since } 0.07 < 0.09, 8.273 < 8.291. \]

**PROCEDURAL SKILL AND FLUENCY**

There are no standards in this cluster that call for fluency.

- **Use Conceptual Understanding to Write Whole Numbers in Expanded Form** In Lesson 1-1, students learn to use exponents to represent powers of 10. They then use exponents to represent multi-digit whole numbers in expanded form. (5.NBT.A.1)

**APPLICATIONS**

- **Situations Involving Whole Numbers and Decimals** Throughout Topic 1, there are a variety of real-world situations that require students to apply their understanding of place value. These situations require students to read and write whole numbers and decimals as well as compare and round decimals. (5.NBT.A)
Connecting Math Practices and Content Standards in enVisionmath2.0

Math practices and content standards are connected within all lessons including the lessons that focus on math practices.

**MATH PRACTICES WITHIN LESSONS**

**MP.1** Make sense of problems and persevere in solving them.
Students persevere as they try to understand problems involving place value, plan how to solve them, and determine if their solution makes sense. (e.g., p. 26, Item 14)

**MP.2** Reason abstractly and quantitatively.
Students use reasoning to analyze relationships between place-value positions. (e.g., p. 12, Convince Me!)

**MP.3** Construct viable arguments and critique the reasoning of others.
Students construct and critique arguments to justify the values of digits in whole numbers and decimals. (e.g., p. 22, Item 23)

**MP.4** Model with mathematics.
Students model with math when they use equations to represent place value in whole numbers and decimals. (e.g., p. 8, Item 21)

**MP.5** Use appropriate tools strategically.
Students use tools such as place-value blocks to represent numbers and solve problems. (e.g., p. 5, Solve and Share)

**MP.6** Attend to precision.
Students attend to precision when they use and explain place value. (e.g., p. 19, Item 1)

**MP.7** Look for and make use of structure.
Students use structure when they apply place-value relationships to read and write numbers. (e.g., p. 20, Item 29)

**MP.8** Look for and express regularity in repeated reasoning.
Students use repeated reasoning when they generalize about decimal place value based on their understanding of whole number place value. (e.g., p. 23, Solve and Share)

**LESSON THAT FOCUSES ON MATH PRACTICES**

**Lesson 1-7** This lesson focuses on MP.7. Students use the structure of the decimal place-value system to solve problems involving patterns. Students use what they know about place-value relationships to compare decimals, then find and explain patterns and make predictions.

**Thinking Habits**

*Be a good thinker! These questions can help you.*
- What patterns can I see and describe?
- How can I use the patterns to solve the problem?
- Can I see expressions and objects in different ways?
- What equivalent expressions can I use?

Revisit the information about MP.7 in these other resources:
- **Math Practices Posters** to display in your classroom.
### MAJOR CLUSTER 5.NBT.A

#### DIFFERENTIATED INSTRUCTION

<table>
<thead>
<tr>
<th>Ongoing Intervention</th>
<th>Strategic Intervention</th>
<th>Intensive Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>During the core lesson, monitor progress, reteach as needed, and extend students’ thinking.</td>
<td>At the end of the lesson, assess to identify students’ strengths and needs and then provide appropriate support.</td>
<td>As needed, provide more instruction that is on or below grade level for students who are struggling.</td>
</tr>
</tbody>
</table>

#### Guiding Questions
- **In the Teacher’s Edition** Guiding questions are used to monitor understanding during instruction.

#### Online Guiding Questions
Guiding questions are also in the online Visual Learning Animation Plus.

#### Prevent Misconceptions
This feature in the Teacher’s Edition is embedded in the guiding questions.

#### Error Intervention: If... then...
This feature in the Teacher’s Edition is provided during Guided Practice. It spotlights common errors and gives suggestions for addressing them.

#### Reteaching
Reteaching sets are at the end of the topic in the Student’s Edition. They provide additional examples, reminders, and practice. Use these sets as needed before students do the Independent Practice.

#### Higher Order Thinking
These problems require students to think more deeply about the rich, conceptual knowledge developed in the lesson.

#### Practice Buddy Online
Online auto-scored practice is provided for each lesson. On-screen learning aids include Help Me Solve This and View an Example.

#### Quick Check
- **In the Student’s Edition** Assess the lesson using 3 items checked in the Teacher’s Edition.
- **Online Quick Check** You can also assess the lesson using 5 online, machine-scored, multiple-choice items.

#### Intervention Activity
Teachers work with struggling students.

#### Reteach to Build Understanding
This is a page of guided reteaching.

#### Technology Center
- **Digital Math Tools Activities** Reinforce the lesson content or previously taught content using a suite of digital math tools.
- **Online Games** provide practice on the lesson content or previously taught content.

#### Homework and Practice
Use the leveled assignment to provide differentiated homework and practice.

Additional resources to support differentiated instruction for on-level and advanced students include:

- **On-Level and Advanced Activity Centers**
  - **Center Games** are provided in on-level and advanced versions.
  - **Math and Science Activity** is related to the topic science theme introduced at the start of the topic.
  - **Problem-Solving Reading Mat** is used with a lesson-specific activity.

#### Math Diagnosis and Intervention System 2.0
- **Diagnosis** Use the diagnostic tests in the system. Also, use the item analysis charts given with program assessments at the start of a grade or topic, or at the end of a topic, group of topics, or the year.
- **Intervention Lessons** These two-page lessons include guided instruction followed by practice. The system includes lessons below, on, and above grade level.
- **Teacher Support** Teacher Notes provide the support needed to conduct a short lesson. The lesson focuses on vocabulary, concept development, and practice. The Teacher’s Guide contains individual and class record forms and correlations to Student’s Edition lessons.

#### Resources for Fluency Success
- A variety of print and digital resources are provided to ensure success on Common Core fluency standards. See Steps to Fluency Success on pages 109E–109H.
**English Language Learners**

**Provide ELL support** through visual learning throughout the program, ELL instruction in every lesson, and additional ideas in an ELL Toolkit.

**Visual Learning**
The visual learning that is infused in enVisionmath2.0 provides support for English language learners. This support includes a Visual Learning Animation Plus and a Visual Learning Bridge for each lesson.

**English Language Learners Instruction**
Lessons provide instruction for English language learners at Beginning, Intermediate, and Advanced levels of English proficiency.

**English Language Learners Toolkit**
This resource provides professional development and resources for supporting English language learners.

**Math Vocabulary**

**Build math vocabulary** using the vocabulary cards, vocabulary activities, vocabulary review, and glossary plus the online glossary and vocabulary game.

**My Word Cards**
Vocabulary cards for a topic are provided in the Student's Edition. Students use the example on the front of the card to complete the definition on the back.

**Vocabulary Activities**
The Teacher’s Edition provides vocabulary activities at the start of topics. These include activities for vocabulary in My Word Cards and/or activities for vocabulary in Review What You Know.

**Vocabulary Review**
A page of vocabulary review is provided at the end of each topic. It reviews vocabulary used in the topic.

**Glossary**
A glossary is provided at the back of the Student’s Edition.

**Animated Glossary**
An online, bilingual, animated glossary uses motion and sound to build understanding of math vocabulary.

**Online Vocabulary Game**
An online vocabulary game is available in the Game Center.

**Math and Reading**

**Connect reading and math** using a data-filled reading mat for the topic with accompanying activity masters and guide.

**Problem-Solving Reading Mats**
There is a large, beautiful mat for each topic. At the start of the topic, help students become familiar with the mat and the vocabulary used by reading the mat aloud as students follow along. Use the Problem-Solving Reading Activity Guide for suggestions about how to use the mat.

**Problem-Solving Reading Activity**
At the end of some lessons, a Problem-Solving Reading Activity provides a page of math problems to solve by using the data on the mat.
### Lesson 1-1

**PATTERNS WITH EXPONENTS AND POWERS OF 10** pp. 5–10

- **Content Standard**: 5.NBT.A.2
- **Mathematical Practices**: MP.1, MP.2, MP.4, MP.5, MP.6, MP.7

**Objective**: Use exponents to write powers of 10 and calculate products.

**Essential Understanding**: Basic facts and place-value patterns can be used to find products when one factor is a multiple of 10, 100, or 1,000; an exponent with 10 as the base can be used to represent powers of 10.

**Vocabulary**: Exponent, Power, Base

**ELL Speaking**: Speak using content area vocabulary in context.

**Materials**: Place-value blocks (or TT 4 and TT 5), Index cards

**On-Level and Advanced Activity Centers**
- Math and Science Activity

### Lesson 1-2

**UNDERSTAND WHOLE-NUMBER PLACE VALUE** pp. 11–16

- **Content Standard**: 5.NBT.A.1
- **Mathematical Practices**: MP.2, MP.3, MP.4, MP.6, MP.7

**Objective**: Read and write whole numbers using standard form, expanded form, and number names.

**Essential Understanding**: Understanding each digit’s place value in a number provides a way to understand the number’s value.

**Vocabulary**: Value, Expanded form

**ELL Strategies**: Use prior knowledge to understand meanings.

**Materials**: Place-value chart (TT 3), Colored pencils

**On-Level and Advanced Activity Centers**
- Center Games

### Lesson 1-3

**DECIMALS TO THOUSANDTHS** pp. 17–22

- **Content Standards**: 5.NBT.A.1, 5.NBT.A.3a
- **Mathematical Practices**: MP.2, MP.3, MP.4, MP.6, MP.7

**Objective**: Represent decimals to thousandths as fractions and fractions with denominators of 1,000 as decimals.

**Essential Understanding**: Our number system is based on powers of 10. Whenever we get 10 in one place value, we move to the next greater place value.

**Vocabulary**: Thousandths

**ELL Strategies**: Use reading supports to enhance comprehension of written text.

**Materials**: Place-value blocks (or TT 4 and TT 5), Decimal place-value chart (TT 6), Index cards

**On-Level and Advanced Activity Centers**
- Center Games
### Lesson 1-4
**UNDERSTAND DECIMAL PLACE VALUE pp. 23–28**

- **Content Standard**: 5.NBT.A.3a
- **Mathematical Practices**: MP.1, MP.2, MP.3, MP.4, MP.7, MP.8

**Objective**: Read and write decimals through thousandths in different ways.

**Essential Understanding**: Each digit within a decimal number has place value that helps determine the value of the number.

**Vocabulary**: Equivalent decimals

**Materials**: Decimal place-value chart (TT 6), Decimal grids (TT 8), Markers

**On-Level and Advanced Activity Centers**
- Problem-Solving Reading Mat

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### Lesson 1-5
**COMPARE DECIMALS pp. 29–34**

- **Content Standard**: 5.NBT.A.3b
- **Mathematical Practices**: MP.1, MP.3, MP.4, MP.6, MP.7

**Objective**: Use place value to compare decimals through thousandths.

**Essential Understanding**: Place value can be used to compare and order whole numbers and decimals.

**Vocabulary**: None

**Materials**: Decimal place-value chart (TT 6), Number lines (TT 12), Index cards, Markers

**On-Level and Advanced Activity Centers**
- Math and Science Activity

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### Lesson 1-6
**ROUND DECIMALS pp. 35–40**

- **Content Standard**: 5.NBT.A.4
- **Mathematical Practices**: MP.1, MP.2, MP.3, MP.4, MP.6, MP.7

**Objective**: Round decimals to different places.

**Essential Understanding**: Rounding is a process for finding the multiple of 10, 100, and so on, or of 0.1, 0.01, and so on, closest to a given number.

**Vocabulary**: None

**Materials**: Decimal place-value chart (TT 6), Number Lines (TT 12), Markers

**On-Level and Advanced Activity Centers**
- Problem-Solving Reading Mat

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### TOPIC RESOURCES

**Start of Topic**
- Math and Science Project
- Home-School Connection
- Review What You Know
- My Word Cards

**End of Topic**
- Fluency Practice Activity
- Vocabulary Review
- Reteaching
- Topic Assessment
- Topic Performance Assessment
- Placement Test
- Basic-Facts Timed Tests

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**Start of Topic**
- Topic Overview PD Video

**End of Topic**
- Math Practices Animations
- Online Topic Assessment
- ExamView® Test Generator
- Practice Buddy Fluency Practice/Assessment
Lesson 1-7

Math Practices and Problem Solving: Look for and Use Structure pp. 41–46

**Mathematical Practices** MP.7, Also MP.1, MP.6, MP.8

**Content Standards** 5.NBT.A.3a, 5.NBT.A.3b

**Objective** Use the structure of the decimal place-value system to solve problems involving patterns.

**Essential Understanding** Good math thinkers look for relationships in math to help solve problems.

**Vocabulary** None

**ELL Reading** Use support from peers/teachers to enhance/confirm understanding.

**Materials** Decimal place-value chart (TT 6), Centimeter grid paper (TT 9)

**On-Level and Advanced Activity Centers**
- Center Games

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Notes

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TOPIC ESSENTIAL QUESTION

How are whole numbers and decimals written, compared, and ordered?

Revisit the Topic Essential Question throughout the topic, and see a note about answering the question in the Teacher’s Edition for the Topic Assessment.

MATH AND SCIENCE PROJECT  STEM

Science Theme: The science theme for this topic is Pollinating Insects, including crops and flowering plants that depend on them in order to produce the foods that we eat. This theme will be revisited in the Math and Science Activities in Lessons 1-1 and 1-5.

Have students estimate the number of insects there are for all the people in their household, for the class, and for the entire school. Help students organize and record their data in a chart.

Remind students that flowering plants and trees bear fruit and vegetables. Many flowering plants rely on insect pollination. Discuss the variety and number of foods and beverages we consume that rely on pollinating insects.

Project-Based Learning: Have students work on the Math and Science Project over the course of several days.

EXTENSION

Have students gather information about locally grown produce: When is local produce available? How much local produce does their family consume? What sort of produce is shipped to local supermarkets from elsewhere? How does the variety of available produce vary from season to season?

Sample Student Work for Math and Science Project

<table>
<thead>
<tr>
<th>Pollinator</th>
<th>Types of Plants</th>
<th>Number of Plants</th>
</tr>
</thead>
<tbody>
<tr>
<td>ants</td>
<td>black-eyed peas, cucumber, squash, peonies</td>
<td>over 500,000</td>
</tr>
<tr>
<td>moths</td>
<td>lavender, orchids, yuca</td>
<td>10,000 to 100,000</td>
</tr>
</tbody>
</table>

Do Research: Use the Internet or other sources to find out more about pollinating insects in the United States. What types of insects are they? How many are there of each type? How many crops and flowering plants depend on pollinating insects in order to produce the foods we eat?

Journal: Write a Report

Include what you found. Also in your report:

- Choose two of the pollinating insects. Estimate how many crop plants each type of insect pollinates.
- Estimate how many of your favorite foods and beverages come from pollinated plants.
- Make up and solve ways to compare and order your data.

Home-School Connection

Send this page home at the start of Topic 1 to give families an overview of the content in the topic.
Comparing

Compare. Use <, >, or = for each.

4. 869 < 912
5. 9,033 < 9,133
6. 1,338 < 1,388
7. 417,986 = 417,986
8. 0.25 = 0.3
9. 0.5 = 0.5

10. Kamal has 7,325 songs on his computer. Benito has 7,321 songs on his computer. Who has more songs?

Adding Whole Numbers

Find each sum.

11. 10,000 + 2,000 + 60 + 1
12. 20,000 + 5,000 + 400 + 3
13. 900,000 + 8,000 + 200 + 70 + 6
14. 7,000,000 + 50,000 + 900 + 4
15. 908,276
16. 7,050,904

Place Value

15. The largest playing card structure was made of 218,792 cards. What is the value of the digit 8 in 218,792?

16. MP.3 Construct Arguments In the number 767, does the first 7 have the same value as the final 7? Why or why not?

No. The first 7 is 7 hundreds. The final 7 is 7 ones.

My Word Cards

Use the examples for each word on the front of the card to help complete the definition on the back.

- **exponent**: The number that tells how many times a base number is used as a factor.
- **base**: The number that is used as a factor.
- **power**: The product that results from multiplying the same number over and over.
- **equivalent decimals**: Decimals that name the same part of a whole are called.
- **expanded form**: A way to write a number that shows the sum of each digit multiplied by its place value.
- **thousandth**: A thousandth is one out of 1,000 equal parts of a whole.
- **value**: The place of a digit in a number tells you its value.
- **digit**: The symbols used to show numbers.
- **period**: A group of 3 digits in a number is a period.
- **place value**: The position of a digit in a number that is used to determine the value of the digit.

**Vocabulary**

Choose the best term from the box. Write it on the blank.

1. Digits are the symbols used to show numbers.
2. A group of 3 digits in a number is a period.
3. Place value is the position of a digit in a number that is used to determine the value of the digit.

**Item Analysis for Diagnosis and Intervention**

<table>
<thead>
<tr>
<th>Item</th>
<th>Standard</th>
<th>MDIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1–3</td>
<td>4.NBT.A.1</td>
<td>F9</td>
</tr>
<tr>
<td>4–7,10</td>
<td>4.NBT.A.2</td>
<td>F14</td>
</tr>
<tr>
<td>8–9</td>
<td>4.NF.C.7</td>
<td>H30</td>
</tr>
<tr>
<td>11–14</td>
<td>4.NBT.B.4</td>
<td>G18</td>
</tr>
<tr>
<td>15–16</td>
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**Topic 1 Vocabulary Words Activity**

Use the Topic 11 activity on p. 632 with the Topic 1 words at the right.
LESSON 1-1

PATTERNS WITH EXPONENTS AND POWERS OF 10

**ENGLISH LANGUAGE LEARNERS**

**Speaking**
Speak using content area vocabulary in context.

Use with the Visual Learning Bridge on Student’s Edition p. 6.

Have students define previously learned vocabulary: factor. Read Box A. Have them tell partners the horse’s weight. We will determine the horse’s weight using exponents and a base. Read Box B.

**Beginning**
Reread Box B to students. Write: $1,000 = 10 \times 10 \times 10 = 10^3$. Underline 1,000. Remind students that 1,000 is the horse’s weight. Circle $10 \times 10 \times 10$. These 10s are the factors. Write factors. Ask students to read factors. Put a square around $10^3$. Point to the 10. This number is the base. Write base. Ask students to read base. Point to 3. This is the exponent. Write exponent. Ask students to read exponent. Have them identify the factor, base, and exponent in the expression.

**Intermediate**
Reread Box B with students. Write: $1,000 = 10 \times 10 \times 10 = 10^3$. Point to the circled 10s. These 10s are the factors. Point to $10^3$. 10 is the base and 3 is the exponent. Ask students to work with partners to identify the factor, base, and exponent in the expression.

**Advanced**
Ask students to reread Box B with partners: $1,000 = 10 \times 10 \times 10 = 10^3$. Have them work with partners to identify the factor, base, and exponent in the expression using complete sentences.

**Summarize**
What are factors, bases, and exponents?
1. Pose the Solve-and-Share Problem
   **MP.5 Use Appropriate Tools Strategically** Look for students who use place-value blocks (or Teaching Tools 4 and 5) or another tool to find products of powers of 10.

2. Build Understanding
   **What is the problem asking you to do?** [Find the product of 10 and 10 and the product of 10 and 100.] **What tools could you use?** [Sample answer: Place-value blocks or paper and pencil]

3. Ask Guiding Questions As Needed
   **What place-value block could you use to represent 10? To represent 100?** [Ten blocks; 100s blocks] **How can you find 10 tens? 10 hundreds?** [Sample answer: Multiply 10 by 10; multiply 100 by 10.]

4. Share and Discuss Solutions
   Start with students’ solutions. Have them share the strategies used to solve the problems. If needed, project and analyze Victor’s work to discuss how to find each product.

5. Transition to the Visual Learning Bridge
   When multiplying by powers of 10, the number of zeros in the product is the same as the total number of zeros in the factors.

6. Extension for Early Finishers
   **What is the product of 4 tens? 5 tens?** What do you notice about the number of zeros in each product? [Sample answer: 10,000; 100,000; The number of zeros in the product is the same as the number of 10s that I multiplied.]

---

**Solve**

A store sells AA batteries. There are 10 batteries in a package. How many batteries are in 10 packages? 100 packages? Solve these problems any way you choose.

**I can ...** write numbers using exponents.

**Content Standard** 5.NBT.A.2

**Mathematical Practices** MP.1, MP.2, MP.4, MP.5, MP.6, MP.7

---

**Victor’s Work**

100 batteries in 10 packages
1,000 batteries in 100 packages

Victor finds the values using place-value blocks.

**Gabrielle’s work**

10 × 10 = 100
10 × 100 = 1,000

100 batteries in 10 packages
1,000 batteries in 100 packages

Gabrielle writes equations to find the products.
What is the weight of the horse? [1,000 pounds] Is the weight of the horse a power of 10? Explain. [Yes; Sample explanation: 1,000 is a power of 10 because it can be formed by multiplying 10 by itself 3 times.]

**MP.3 Construct Arguments**
Why would you use exponents to write the product when multiplying by a power of 10? [Sample answer: Using exponents is a simpler and shorter way to show multiplication by powers of 10.]

**Prevent Misconceptions**
Some students may have difficulty recognizing a number in its exponential form and may think that 10³ means 10 x 3 or 30. Remind students that the exponent represents the number of times that the base number is multiplied. Have students write the factors for the exponential form, 10 x 10 x 10, in order to find the standard form, 1,000.

**Convince Me!**
**MP.7 Look for Relationships**
What patterns do you notice? [Sample answer: The number of zeros in the factors is the same as the exponent. The number of zeros in 5,000 is the same as the exponent when 5,000 is written as 5 times a power of 10.]

**Coherence**
In this problem, students apply their knowledge of multiplying by 10 to identify a pattern in the products of a number multiplied by different powers of 10. They discover that the number of zeros in the product increases by 1 each time 5 is multiplied by another 10. As they extend their understanding of the symbolic notation of the powers of 10 to exponents, they identify that the exponent is equal to the number of zeros in the product.

Revisit the Essential Question. When multiplying a number by a power of 10 written with exponents, the exponent is the same as the number of zeros in the product.
Guided Practice

**Do You Understand?**

1. **MP.2 Reasoning** Why are there three zeros in the product of $6 \times 10^3$? Since the exponent on the power of 10 is 3, there are 3 zeros in the product.

2. Susan said that $10^3$ is 50. What mistake did Susan make? What is the correct answer?
   - Sample answer: She multiplied 10 by 5 rather than multiplying 10 five times; 100,000.

**Do You Know How?**

In 3 and 4, complete the pattern.

1. 
   - $10^3 = 10$
   - $10^4 = 100$
   - $10^5 = 1,000$
   - $10^6 = 10,000$

2. 
   - $7 \times 10^1 = 70$
   - $7 \times 10^2 = 700$
   - $7 \times 10^3 = 7,000$
   - $7 \times 10^4 = 70,000$

Independent Practice

**In 5–15, find each product. Use patterns to help.**

5. $3 \times 10^3 = 30$
   - $3 \times 10^4 = 300$
   - $3 \times 10^5 = 3,000$
   - $3 \times 10^6 = 30,000$

6. $2 \times 10^2 = 20$
   - $2 \times 10^3 = 200$
   - $2 \times 10^4 = 2,000$
   - $2 \times 10^5 = 20,000$

7. $9 \times 10^3 = 90$
   - $9 \times 10^4 = 900$
   - $9 \times 10^5 = 9,000$
   - $9 \times 10^6 = 90,000$

8. $8 \times 10^4 = 80,000$

9. $4 \times 10^3 = 4,000$

10. $5 \times 10^5 = 500$

11. $6 \times 10^6 = 60,000$

12. $4 \times 10^2 = 40$

13. $100 \times 9 = 900$

14. $10^3 \times 6 = 6,000$

15. $8 \times 10^4 = 80,000$

16. Write $10 \times 10 \times 10 \times 10 \times 10 \times 10$ with an exponent.
   - Sample explanation: Since 10 is multiplied 6 times, the exponent is 6.

Reteaching Assign Reteaching Set A on p. 49.

**Error Intervention:** Item 7

If students have difficulty writing the standard form for each product, then have them write out the factors for the exponential form for each power of 10; for example, $9 \times 10^2 = 9 \times 10 \times 10 = 900$.

Math Practices and Problem Solving

**MP.1 Make Sense and Persevere** Remind students that the shape of the field is a rectangle. How many sides of the rectangle are 42 feet long? [2] How many posts are needed for these two sides? Explain. [Sample answer: $42 \div 6 = 7$, so 7 posts for each side.] How many sides of the rectangle are 36 feet wide? [2] How many posts are needed for these two sides? Explain. [Sample answer: $36 \div 6 = 6$, so 6 posts for each side.]

**Items 8 and 23 are worth 1 point. Item 22 is worth 3 points.**

**Error Intervention:** Item 7

If students have difficulty writing the standard form for each product, then have them write out the factors for the exponential form for each power of 10; for example, $9 \times 10^2 = 9 \times 10 \times 10 = 900$.

**Reteaching** Assign Reteaching Set A on p. 49.

**Item 18 MP.1 Make Sense and Persevere** Remind students that the shape of the field is a rectangle. How many sides of the rectangle are 42 feet long? [2] How many posts are needed for these two sides? Explain. [Sample answer: $42 \div 6 = 7$, so 7 posts for each side.] How many sides of the rectangle are 36 feet wide? [2] How many posts are needed for these two sides? Explain. [Sample answer: $36 \div 6 = 6$, so 6 posts for each side.]

**Item 19 Number Sense** Ask students to write the product $9 \times 10^6$ ($9,000,000$) and then check that the number of zeros in their answer is the same as the exponent.

**Item 21 MP.4 Model with Math** What expression models the time it takes Isaac to ride his bike up the hill? [Sample answer: $5 \times 10$.] What expression models the time it takes Isaac to ride his bike up the hill? [Sample answer: $10 \times 10$.] What expression can you write to model your work? [Sample answer: $5 \times 10 + (10 \times 10) = 50 + 100 = 150$.]

**Item 22 Higher Order Thinking** If students have difficulty thinking of all the numbers that round to 12,000 when rounded to the nearest hundred, ask them to give one number that does. If the number is less than 12,000, ask them if that is the least number that will round to 12,000 when rounded to the nearest hundred. Repeat for a number greater than 12,000.

Multi-Step Problems Page 8 Items 17, 18, and 21; Page 10 Items 16, 19, and 20
The Power of Tens

Materials
Index cards

• Distribute 18 index cards to each pair of students.

• Have pairs create the following groups of index cards: Group 1: $10^1$, $10^2$, $10^3$, $10^4$, $10^5$, $10^6$; Group 2: $10$, $100$, $1,000$, $10,000$, $100,000$, $1,000,000$; Group 3: $10$, $10 \times 10$, $10 \times 10 \times 10$, $10 \times 10 \times 10 \times 10$, $10 \times 10 \times 10 \times 10 \times 10$

• The first partner draws a card from Group 1 showing a number written in standard form and as a product of factors.

• The second partner finds the cards in Groups 2 and 3 that show the same number written in standard form and as a product of factors.

• The first partner verifies that the second partner’s answers are correct.

• Partners switch roles and repeat the activity.

Intervention Activity

On-Level and Advanced Activity Centers

Math and Science Activity

Sample Student Work

1. Since 198,000 has 3 zeros, the exponent for 10 will be 3.
   $198,000 = 198 \times 10^3$

4. Since a trillion has 12 zeros, $4$ trillion $= 4 \times 10^{12}$
**Math Tools and Math Games**

A link to a specific math tools activity or math game to use with this lesson is provided at PearsonRealize.com.

**Leveled Assignment**

- Items 1-10, 22-23: Items 1-10, 22-23
- Items 2-3, 5-6, 11-17-18, 21-23
- Items 3, 5-6, 14-17, 19-23

**Another Look!**

Patterns can help you multiply by powers of 10.

1. Write $10 \times 10 \times 10 \times 10 \times 10 \times 10$ with an exponent. $10^6$

2. Write $6 \times 10 \times 10 \times 10$ with an exponent. $6 \times 10^3$

3. How many zeros are in the standard form of $10^7$? Write this number in standard form.

- 7 zeros; 10,000,000

**In 4-14, find each product. Use patterns to help.**

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Lesson 1-2

Understand Whole-Number Place Value

Focus
Domain 5.NBT Number and Operations in Base Ten
Cluster 5.NBT.A Understand the place value system.
Content Standard 5.NBT.A.1 Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in another place to its right, and develop the idea that the value of a digit is ten times what it represents in the place to its right (Standard 4.NBT.A.1) extended to hundred millions.
Mathematical Practices MP.2, MP.3, MP.4, MP.7
Objective Read and write whole numbers using standard form, expanded form, and number names.
Essential Understanding Understanding each digit’s place value in a number provides a way to understand the number’s value.
Vocabulary Value, Expanded form
Materials Place-Value Charts (Teaching Tool 3)

Coherence
In this lesson, students will learn to extend their prior knowledge of place value for numbers through hundred thousands in order to read and write numbers through hundred millions. The ideas that the value of a digit depends on its place, or position, in a number and that each place has a value equal to 10 times the value of the place to its right (Standard 4.NBT.A.1) are extended to hundred millions.

Rigor
This lesson emphasizes conceptual understanding of place value. Students deepen their knowledge about place value through hundred millions as they extend the idea that the value of a digit depends on its place in a number. They extend their understanding that each place has a value equal to 10 times the value of the place to its right, and develop the understanding that each place has a value equal to 10 of what it represents in the place to its left (Standard 5.NBT.A.1).

Today’s Challenge
Use the Topic 1 problems any time during this topic.

ENGLISH LANGUAGE LEARNERS

Strategies Use prior knowledge to understand meanings.
Use the Visual Learning Bridge on Student Edition p. 12.

To introduce the new vocabulary, write the word(s)’s value and expanded form on note cards. Display the cards and have students repeat the word(s). Review the word digits before learning the word value. Write a three-digit number on the board. Point to the number. What number is this? Ask the students how many digits the number has. Make sure that they understand the difference between digits and number. Next, introduce the word value and the place-value chart. Explain that the value of a digit depends on its place, or position, in the number.

Beginning Point to the ones period in the place-value chart. Then point to the ones digit. This digit is in the ones place. What digit is this? [0]. Point to the digit in the tens place and have students complete the sentence: This digit is in the ____ place.

Intermediate Have students work in pairs to read numbers on the place-value chart. They will point to and identify the value of digits in the thousands place.

Advanced Have students read numbers on the place-value chart. Ask them to say the value of digit 1 on the chart.

Summarize How can you find the value of a digit?
1. **Pose the Solve-and-Share Problem**  
   **MP.7 Use Structure** Listen and look for students who use the structure of a place-value chart to determine the relationship between two digits in a number in the millions.

2. **Build Understanding**  
   *With which period of numbers are you already familiar?*  
   [Ones and thousands]  
   *What are you asked to find out?* [How the values of the two 8s in 1,880,000 are related]

3. **Ask Guiding Questions As Needed**  
   *How many place values are included in each period on your place-value chart?* [Three place values]

4. **Share and Discuss Solutions**  
   Start with students’ solutions. If needed, project Cory’s work below to show how to use a place-value chart to determine and explain how the values of the two 8s are related.

5. **Transition to the Visual Learning Bridge**  
   *A digit in any place represents 10 times as much as it would represent in the place to its right. Whole numbers are grouped into periods of three places, separated by commas. Each period has a ones, a tens, and a hundreds place.*

6. **Extension for Early Finishers**  
   *Rearrange the digits in 605,800,000 to make the greatest possible number. [865,000,000]*

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### Analyze Student Work

**Cory’s Work**

Cory uses a place-value chart to write 1,880,000. He uses the chart to determine and explain how the values of the two 8s are related.

- 8 hundred thousands × 10 = 800,000
- 8 ten thousands = 80,000
- 80,000 × 10 = 800,000

**Albert’s Work**

Albert uses a place-value chart to write 1,880,000 and find the values of the two 8s. However, he does not explain how the values are related.
MP.2 Reason Quantitatively
If the first digit of a whole number is in the millions place, how many digits are in the number? [7]

MP.3 Construct Arguments
In 1,440,000, which digit has the greatest place value? [1]
Why does the 1 have a greater value than either 4? [The 1 is in the millions place and has a greater value than the 4 in the hundred thousands place or the 4 in the ten thousands place because those two numbers have zero millions.]

According to the 2010 U.S. Census, the population of Phoenix, Arizona is about 1,440,000. What is the relationship between the value of the two 4s in this number?

Look at the expanded form of 1,440,000. The value of the 4 in the hundred thousands place is 400,000. The value of the 4 in the ten thousands place is 40,000.

400,000 is 10 times as great as 40,000.
40,000 is \( \frac{1}{10} \) of 400,000.

Writing the number in expanded form can help.

Sometimes word form is used instead of number name.

Standard form:
1,440,000
Expanded form:
\( 1 \times 1,000,000 + 4 \times 100,000 + 0 \times 10,000 \)
Using exponents, this can be written as:
\( (1 \times 10^6) + (4 \times 10^5) \)
Number names:
one million, four hundred and forty thousand

Convince Me!
MP.2 Reason Abstractly
Students use reasoning and place-value relationships to determine whether a suggested relationship between two values in a number is correct.

Coherence
The population of Phoenix problem emphasizes the fact that for the value of any digit in a number to be 10 times as great as the value of the digit to its right (or 10 times the value of the digit to its left), the two digits must be the same.

Revisit the Essential Question. Remind students that each place value represents a power of ten, so for any multi-digit number, the same digit in each place represents 10 times as much as it represents in the place to its right and one tenth as much as it represents in the place to its left.
Another Example  In 555,000, how many times as great is the 5 in the hundred thousands place compared to the 5 in the thousands place? [100 times]

Reteaching  Assign Reteaching Set B on page 49.

Error Intervention: Items 3–4
If students do not understand how to find the value of a given digit in a number,
then have them write the entire number in a place-value chart and use the labels in the chart to find the value of the given digit.

Items 8–10 Remind students that they do not need to include the value of the digit 0 when they write numbers in expanded form.

Math Practices and Problem Solving
14. Write the number name and expanded form for the number of driver ants that could be in two colonies.
   Forty-four million; 40,000,000 + 4,000,000
15. Math and Science A queen ant can produce about nine million ants in her lifetime. Write this number in standard form.
   9,000,000
16. MP.3 Critique Reasoning Paul says that in the number 6,367, one 6 is 10 times as great as the other 6. Is he correct? Explain why or why not.
   No; Sample answer: They are not next to each other. The 6 in the thousands place is 10 or 100 times as great as the 6 in the tens place.
17. Jorge drew a square that had a side length of 8 inches. What is the perimeter of Jorge’s square?
   32 inches
18. Higher Order Thinking Dan wrote $\frac{2}{10}$, $\frac{3}{10}$, and $\frac{4}{10}$ for the expanded form of two million, three hundred fifty thousand, four.
   No; The error he made in the expanded form was multiplying 3 by 10 instead of 100. For the expanded form he wrote 20,000,000 + 3,000 + 4.
   No; Sample answer: They are not next to each other. The 6 in the thousands place is 10 or 100 times as great as the 6 in the tens place.
19. Colette says she is thinking of a 4-digit number in which all the digits are the same. The value of the digit in the hundreds place is 200.
   Part A  What is the number? Explain.
   Sample answer: Each digit has a value 10 times the value of the digit to its right and $\frac{1}{10}$ of the value of the digit to its left.
   Part B Describe the relationship between the values of the digits in the number.
   Sample answer: Each digit has a value 10 times the value of the digit to its right and $\frac{1}{10}$ of the value of the digit to its left.

Item 16 MP.3 Critique Reasoning  If students have difficulty analyzing Paul’s reasoning, suggest that they write 6,367 in expanded form. Then have them compare the two terms that have a 6.

Item 18 Higher Order Thinking  If students have difficulty finding Dan’s error, have them write the number in expanded form without using exponents: $2 \times 1,000,000 + 3 \times 100,000 + 5 \times 10,000$. Then they can compare each part to the expanded form with exponents that Dan wrote.

Coherence  The place-value system is structured so that a digit in one place is ten times as great as it would be in the place to its right, and one tenth as great as it would be in the place to its left. Students can learn greater numbers by building on their knowledge of numbers in the thousands and millions.
STEP 3

ASSESS AND DIFFERENTIATE

Use the QUICK CHECK on the previous page to prescribe differentiated instruction.

**Intervention**
0–3 points on the Quick Check

**On-Level**
4 points on the Quick Check

**Advanced**
5 points on the Quick Check

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### Place Value

**Materials**
Lined paper, colored pencils

- Guide students to turn the paper sideways and draw nine horizontal lines to create a grid with eight rows.
- Then have them draw a colored line to mark every third vertical column so that the ones, thousands, and millions periods are separated.
- Tell students you will name some numbers that are between 1 and 999,999,999. Call out the following numbers and have students write them on the grid: 1; 10; 100; 1,000; 10,000; 100,000; 1,000,000; 10,000,000; 100,000,000.

- You may pause after each number as needed and guide students to write the number and count its zeros.
- Ask volunteers to read their numbers.

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### Center Games

Students work in pairs or small groups to read values for different periods and match them to their standard forms. Have students write the expanded form for some of their tosses.

#### On-Level and Advanced Activity Centers

**On-Level**

- **Toss and Talk**
  - Get 10 squares in one color and 10 in another color.
  - Get two number cubes. Take turns with another player or team.
  - Talk about math as you play!
  - Toss two number cubes. Add the dots. Find your toss below.
  - Follow the directions. Explain your thinking. Cover the answer.
  - Write 30,400,000 in expanded form, using powers of 10 with exponents.

**Advanced**

- **Toss and Talk**
  - Get 10 squares in one color and 10 in another color.
  - Get two number cubes. Take turns with another player or team.
  - Talk about math as you play!
  - Toss two number cubes. Add the dots. Find your toss below.
  - Follow the directions. Explain your thinking. Cover the answer.
  - Write 30,400,000 in expanded form, using powers of 10 with exponents.
TIMING
The time allocated to Step 3 will depend on the teacher’s instructional decisions and differentiation routines.

Technology Center

Math Tools and Math Games
A link to a specific math tools activity or math game to use with this lesson is provided at PearsonRealize.com.

Leveled Assignment

Another Look!
A place-value chart can help you write larger numbers. What are the various ways to write 92,888,100?

- Expanded form: \((9 \times 10^7) + (2 \times 10^5) + (8 \times 10^4) + (8 \times 10^3) + (1 \times 10^2)\)
- Standard form: 92,888,100
- Number name: ninety-two million, eighty-eight thousand, one hundred

1. Write 720,080 in expanded form with exponents.

2. Write the number name for 43,080,700.

In 3–5, write the values of the given digits.

3. the 2s in 42,256
4. the 9s in 9,905,482
5. the 4s in 305,444

6. Write 12,430,000 in expanded form.

7. Write 337,060 in expanded form using exponents.

8. Write the number name for 3,152,308.

What is the value of the underlined digit?

- Three million, one hundred fifty-two thousand, three hundred eighty

- What is the value of the underlined digit?

- What is the value of the underlined digit?

- What is the value of the underlined digit?

9. MP.7 Use Structure Sue and Jonah chose numbers for a place-value game. Sue chose the number one hundred fifty-two thousand. Jonah chose five million for his number. Who chose the greater number? Explain.

   Joseph: Sample answer: Jonah’s number has 5 millions and Sue’s number has no millions.

   No; Sample answer: Although the digits are all the same, each digit has a different value.

10. Higher Order Thinking One day, the state fair total attendance was 126,945. Round 126,945 to the nearest hundred thousand, nearest ten thousand, and nearest thousand. Which of these rounded amounts is closest to the actual attendance?

   - 120,000
   - 130,000
   - 127,000
   - 127,000

   Sample answer: Each digit has a value 10 times the value of the digit to its right and \(\frac{1}{10}\) of the value of the digit to its left.

   Yes; Sample explanation: Although the digits are all the same, each digit has a different value.

   Sample answer: Each digit has a value 10 times the value of the digit to its right and \(\frac{1}{10}\) of the value of the digit to its left.

   Sample answer: Each digit has a value 10 times the value of the digit to its right and \(\frac{1}{10}\) of the value of the digit to its left.

   Sample answer: Each digit has a value 10 times the value of the digit to its right and \(\frac{1}{10}\) of the value of the digit to its left.

   Sample answer: Each digit has a value 10 times the value of the digit to its right and \(\frac{1}{10}\) of the value of the digit to its left.
FOCUS

Domain 5.NBT
Cluster 5.NBT.A Understand the place value system.

Content Standard 5.NBT.A.1 Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it does in another place value position, in the number.

Objective Represent decimals to thousandths as fractions with denominators of 1,000 and extend understanding of the place-value system to include decimals.

Essential Understanding Our number system is based on powers of 10. Whenever we get 10 in one place value, we move to the next greater place value.

Mathematical Practices MP.2, MP.3, MP.4, MP.5, MP.6, MP.7

Vocabulary Thousandths
Materials Decimal Place-Value Charts (Teaching Tool 6)

COHERENCE

In this lesson, students will learn to extend their understanding of the place-value system (Cluster 5.NBT.A) from whole numbers to decimals through thousandths. They apply their previous knowledge of fractions as they learn that fractions with denominators of 10, 100, and 1,000 can be expressed as decimals, and that the denominator of the fraction determines the place values used for the decimal. They also use decimal place value to write decimals as fractions.

RIGOR

This lesson emphasizes conceptual understanding. Students deepen their knowledge of place value through thousandths as they extend the idea that the value of a digit depends on its place in a number. They also extend their understanding of the relationships between decimal place values—that each place has a value equal to 10 times the value of the place to its right, and a value equal to \( \frac{1}{10} \) of what it represents in the place to its left (Standard 5.NBT.A.1).

ENGLISH LANGUAGE LEARNERS

Strategies Use reading supports, such as charts, to enhance comprehension of written text.

Use with the Visual Learning Bridge on Student’s Edition p. 18.

Display the place-value charts from the student page. What do these decimal place-value charts help you do? [Represent decimals to thousandths.] How do the charts help you represent decimals to thousandths? [On the place-value charts, the thousands place is three places to the right of the decimal point. 6,100 is represented by the decimal 0.005.] Write 0.785 on the board. Five is in the thousandths place. Remind students that the value of a digit depends on its place, or position, in the number.

Beginning How would you represent the following fractions as decimals on a place-value chart? \( \frac{692}{1000} \), \( \frac{8}{1000} \), \( \frac{75}{1000} \) [0.692, 0.008, 0.075]

Intermediate Marcos has a hose that measures \( \frac{5}{10} \times \frac{1}{100} \) + \( \frac{7}{10} \times \frac{1}{100} \) + \( \frac{6}{10} \times \frac{1}{1000} \) meters. How would you represent this measurement as a decimal on a place-value chart? [0.576]

Advanced Have students work in pairs to describe the value of the digit 9 on a place-value chart where the fraction \( \frac{999}{1000} \) is represented by the decimal 0.999. [The value of the digit 9 in the hundredths place has 10 times the value of the digit 9 in the thousandths place and \( \frac{1}{10} \) the value of the digit 9 in the tenths place.]

Summarize: How do you use place-value charts to represent decimals to thousandths?
Before: Pose the Solve-and-Share Problem
You may wish to provide decimal place-value charts to students (Teaching Tool 6).

MP.7 Use Structure Listen and look for students who use the structure of decimals to the hundredths to explain the meaning of a decimal to the thousandths.

During:
3. Ask Guiding Questions As Needed
How many places to the right of the decimal point is the tenths place? [1] The hundredths place? [2] What place do you think is 3 places to the right of the decimal point? [Thousandths] How many cubes would you use to model \( \frac{305}{1000} \) cubes? [305]

After:
4. Share and Discuss Solutions
Start with students’ solutions. Have them share the strategies used to solve the problem. If needed, project and analyze Billy’s work to facilitate a discussion of the meaning of 0.305.

5. Transition to the Visual Learning Bridge
When reading and writing decimals, the thousandths place is three places to the right of the decimal point.

6. Extension for Early Finishers
How would you represent \( \frac{472}{1000} \) as a decimal? [0.472]

Analyze Student Work
Billy’s Work

“\( \frac{305}{1000} \) is 0.305 Second”

Billy explains the meaning of 0.305 by connecting it to a fraction.

Ginny’s Work

305 thousandths of a second

Ginny explains the meaning of 0.305 using place value.
**DEVELOP: VISUAL LEARNING**

The Visual Learning Bridge connects students' thinking in Solve & Share to important math ideas in the lesson. Use the Visual Learning Bridge to make these ideas explicit. Also available as a Visual Learning Animation Plus at PearsonRealize.com

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**MP.3 Construct Arguments**

Remind students to include a zero in the ones place when writing a decimal less than 1. Emphasize the importance of placing zeros in the correct place. Is 0.04 equal to 0.004? Explain. [No; 0.04 is equal to 0.040. So, 0.04 is not equal to 0.004.]

**Prevent Misconceptions**

Some students may have difficulty determining which zeros can be omitted and which zeros must be written in decimal numbers. Emphasize that students should find the non-zero digit that is farthest to the right in a decimal. Only the zeros to the right of this digit can be dropped.

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**Convince Me! MP.2 Reason Quantitatively**

Although both decimals have a 4 in the thousandths place, students should notice that there are 0 tenths and 0 hundredths in 0.004, but 4 tenths and 4 hundredths in 0.444.

**Coherence**

Choosing cubes from a box filled with 1,000 cubes stresses the idea that the value of any digit in a number is dependent on its place in the number, and that the same digit in a different place will have a different value. This concept has been extended from whole numbers to decimals. For example, 4,000 = 4 thousands; 40 = 4 tens, 0.4 = 4 tenths; and 0.004 = 4 thousandths.

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**Revisit the Essential Question**

Our number system is based on powers of ten. Whenever we get 10 in one place value, we move to the next greater place value. A digit in one place value represents 10 times as much as the same digit represents in the place to its right, and \( \frac{1}{10} \) of what the same digit represents in the place to its left.
Item 19 Students may have difficulty working with a fraction with a large denominator. Remind them to be precise (MP.6) and that a fraction with a denominator of 1,000 can always be converted to a decimal with three digits to the right of the decimal point (although some digits may be 0).

Error Intervention: Item 1
If students have difficulty identifying from which place they should subtract 4,
then remind them that the thousandths place is \( \frac{1}{10} \) as great as the hundredths place, and that the hundredths place is \( \frac{1}{10} \) as great as the tenths place.

Reteaching Assign Reteaching Set C on p. 49.

Item 31 Higher Order Thinking If needed, provide students with a place-value chart and have them write 0.97 in the chart to determine whether it is equal to \( \frac{97}{100} \).

Item 33 MP.3 Construct Arguments Students should recognize that the label under the box gives important information. What information does the label under the box provide? [Possible answers: The box contains 1,000 cubes, the denominator of the fraction. How many cubes are to the right of the box? 7 cubes. What fraction of the entire box do the 7 cubes represent?] Explain your answer.

Coherence Students have worked with tenths and hundredths previously. Thousandths are just an extension of the decimal place-value system.
For students who need review with tenths and hundredths, remind them that a dime is \( \frac{1}{10} \) (0.1) of a dollar and a penny is \( \frac{1}{100} \) (0.01) of a dollar. Ask: 
- What is the value of a dime compared to a penny? [ten times as great]
- What is the value of a penny compared to a dime? [one tenth as great]

Multi-Step Problems Page 20 Item 30; Page 22 Item 28
**Thousandths**

**Materials**
- Index cards

- Have students create 6 cards in a group, from 0.1, 0.01, 0.001, \( \frac{1}{10} \), \( \frac{1}{100} \), and \( \frac{1}{1000} \) through 0.9, 0.09, 0.009, \( \frac{9}{10} \), \( \frac{9}{100} \), and \( \frac{9}{1000} \).

- Shuffle the cards and lay them all face down. Have students take turns drawing matches using these guidelines:
  1. Each decimal can be matched with one fraction.
  2. When a match is found, say the decimal number aloud.
  3. Keep matches as points, and turn non-matches upside down.

**Center Games**

Students work in pairs or small groups to answer questions about equivalent values for fractions and decimals. In the Advanced version, ask students to explain why they answered YES or NO for different questions.

**On-Level**

**Toss and Talk**

Get 10 squares in one color and 10 in another color.

- Get two number cards. Take turns with another player or team. Talk aloud math as you play!
- Toss two number cards. Add the dots. Find your turn below.
- Follow the directions. Explain your thinking. Cover the answer.
- If the answer is taken, lose your turn. Have fun!

- What is \( \frac{0.03}{10} \) as a fraction?
- What is \( \frac{3}{100} \) as a fraction?
- What is \( \frac{2}{100} \) as a fraction?
- What is \( \frac{1}{1000} \) as a fraction?
- What is \( \frac{8}{1000} \) as a fraction?
- What is \( \frac{0.08}{100} \) as a fraction?

**On-Level and Advanced Activity Centers**

**Advanced**

**Toss and Talk**

Get 10 squares in one color and 10 in another color.

- Get two number cards. Take turns with another player or team. Talk aloud math as you play!
- Toss two number cards. Add the dots. Find your turn below.
- Follow the directions. Explain your thinking. Cover the answer.
- If the answer is taken, lose your turn. Have fun!

- What is \( \frac{0.25}{100} \) as a fraction?
- What is \( \frac{0.05}{100} \) as a fraction?
- What is \( \frac{0.05}{1\,000} \) as a fraction?
- What is \( \frac{0.05\,006}{1\,000} \) as a fraction?

**Assess and Differentiate**

Use the QUICK CHECK on the previous page to prescribe differentiated instruction.

- **Intervention**
  - 0–3 points on the Quick Check
- **On-Level**
  - 4 points on the Quick Check
- **Advanced**
  - 5 points on the Quick Check

**On-Level Activity Centers**

- Have students create 6 cards in a group, from 0.1, 0.01, 0.001, \( \frac{1}{10} \), \( \frac{1}{100} \), and \( \frac{1}{1000} \) through 0.9, 0.09, 0.009, \( \frac{9}{10} \), \( \frac{9}{100} \), and \( \frac{9}{1000} \).

- Shuffle the cards and lay them all face down. Have students take turns drawing matches using these guidelines:
  1. Each decimal can be matched with one fraction.
  2. When a match is found, say the decimal number aloud.
  3. Keep matches as points, and turn non-matches upside down.

**Quick Check**

- **On-Level**
  - 0–3 points on the Quick Check
- **Advanced**
  - 5 points on the Quick Check

**On-Level**

1. Write six thousandths in standard form.
2. A decimal place-value chart can help you write a decimal as a fraction.
   - The place farthest to the right that contains a digit tells you the denominator of the fraction.
   - The number written in the decimal place-value chart tells you the numerator of the fraction.

**Advanced**

1. Write six thousandths in standard form.
2. A decimal place-value chart can help you write a decimal as a fraction.
   - The place farthest to the right that contains a digit tells you the denominator of the fraction.
   - The number written in the decimal place-value chart tells you the numerator of the fraction.

**Reteach**

**Name**

**Vocabulary**

- Thousandths is one part of 1,000 equal parts of a whole.

1. Write six thousandths in standard form.
2. A decimal place-value chart can help you write a decimal as a fraction.
   - The place farthest to the right that contains a digit tells you the denominator of the fraction.
   - The number written in the decimal place-value chart tells you the numerator of the fraction.

**On the Back**

- Write the decimal that is 10 times as great as 0.09.
TIMING
The time allocated to Step 3 will depend on the teacher’s instructional decisions and differentiation routines.

Math Tools and Math Games
A link to a specific math tools activity or math game to use with this lesson is provided at PearsonRealize.com.

Leveled Assignment

I Items 1–8, 13–16, 21–22, 25–27, 29–30
O Items 9–12, 17–20, 22–30
A Items 3–4, 10–12, 18–30