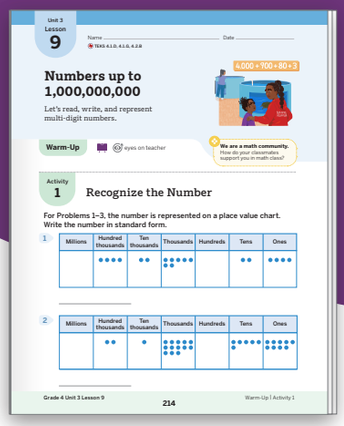
Unit 3
Lesson
9

Student Edition pages and Presentation Screens support learning in this lesson.



Numbers up to 1,000,000,000

Representing Numbers in Standard Form, Expanded Form, and Expanded Notation

Let's read, write, and represent multi-digit numbers.

Key Concepts

Today's Goals

1. **Goal:** Represent the values of numbers through 1,000,000,000 using standard form, expanded form, and expanded notation.
2. **Language Goal:** Describe how to represent the value of digits in a multi-digit number. **(Listening and Speaking)** ELPS 1.B, 2.B, 2.E

Connections and Coherence

Students continue to build their understanding of multi-digit numbers as they represent numbers up to 1,000,000,000 using place value charts, standard form, expanded form, and expanded notation. First, they examine numbers represented in place value charts and word form and write them in standard form. Students explain why, in some cases, a unit needs to be composed to accurately write the number in standard form. Then students write numbers that are represented in standard form in expanded form and expanded notation. They explain the implications of representing 0 in each form. **(TEKS 4.1.D, 4.1.G)**

Prior Learning

In Grade 3, students represented numbers up to 100,000 in standard form, expanded form, and expanded notation.

Future Learning

In Lesson 10, students will use their understanding of place value to determine the product of a number and 10 or 100.

Integrating Rigor in Student Thinking

- Students build their **conceptual understanding** of multi-digit whole numbers beyond 100,000 by identifying the values of digits to write numbers in standard form, expanded form, and expanded notation.

Vocabulary

New Vocabulary

billion	million
hundred million	ten million

Review Vocabulary

expanded form	*standard form*
expanded notation	*ten thousand*
hundred thousand	*word form*

TEKS

Addressing

4.2.B

Represent the value of the digit in whole numbers through 1,000,000,000 and decimals to the hundredths **using expanded notation and numerals.**

Math Process Standards: 4.1.D, 4.1.G

ELPS: 1.B, 1.E, 2.B, 2.C, 2.D, 2.E, 2.F, 3.E

Building On	Building Toward
3.2.A	**5.2.A**

Building Math Identity

We are a math community.
How do your classmates support you in math class?

Invite students to reflect on this question as they complete this lesson.

Lesson at a Glance

60 min

TEKS: 4.1.D, 4.1.G, 4.2.B

Warm-Up

Whole Class | 10 min

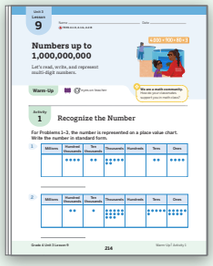
Students use the **What Do You Know About ___?** routine to recall prior knowledge about the number one **million**. They are introduced to the formal definition of one million.

Activity 1

Pairs | 15 min

Students examine numbers represented in place value mats and write each number in standard form. They represent the value of numbers using expanded form and expanded notation and discuss the importance of using 0 as a placeholder when writing numbers in standard form.

Materials: Activity 1 PDF



Activity 2

Pairs | 20 min

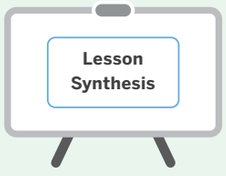
Students write numbers represented in standard form in expanded form and expanded notation and vice versa. They discuss how to represent each digit in expanded form and expanded notation, including why the digit 0 does not need to be represented. Students are introduced to the formal definitions of **ten million**, **hundred million**, and **billion**.

Materials: Activity 2 PDF

Synthesis

Whole Class | 10 min

Students review and reflect on representing the values of multi-digit numbers.



Show What You Know

Independent | 5 min

Students demonstrate their understanding of multi-digit numbers by writing numbers in expanded form and expanded notation.

Materials: *Show What You Know* PDF

Math Language Development

Emergent Bilinguals

Consider using the *Math Language Development Resources* with the **Activity 2, Monitor** to support math language acquisition.

✓ Cognates ✓ Sentence frames and word bank

ELPS 1.B, 1.E, 2.B, 2.C, 2.D, 2.E, 2.F

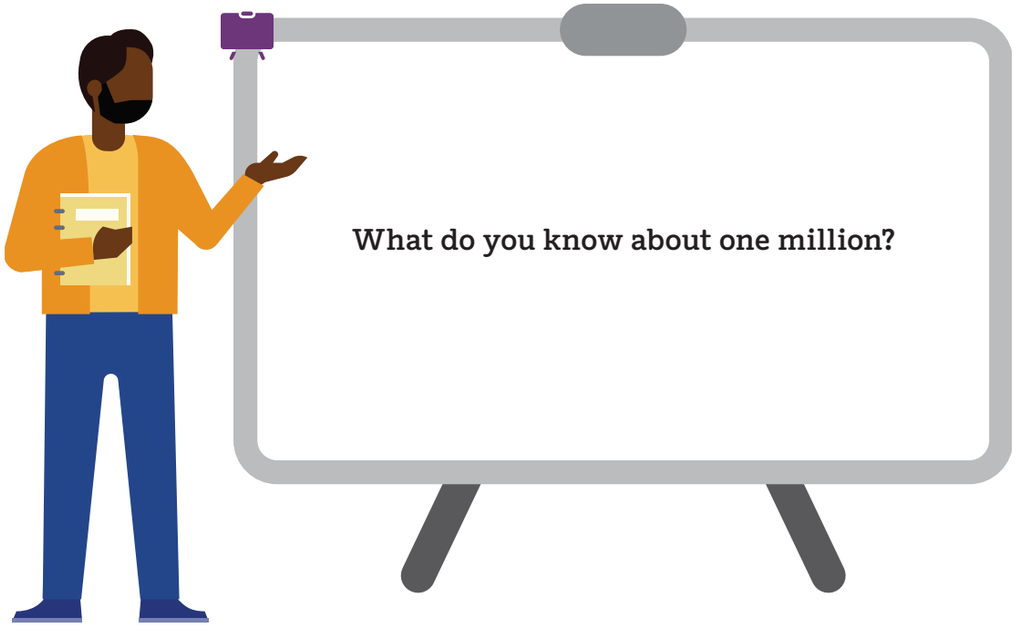
Pre-Production	Beginning	Intermediate	High Intermediate	Advanced
Students **listen** to spoken English and **respond** using their primary languages and gestures.	Students **listen** to spoken English and **speak** using their primary languages, gestures, and single words or short phrases.	Students **listen** to spoken English and **speak** using short phrases or simple sentences.	Students **listen** to spoken English and **speak** using a variety of sentence types.	Students **listen** to spoken English and **speak** using longer sentences. Exemplar responses are provided.

Whole Class | 10 min

Presentation Screen

Warm-Up What Do You Know About _?

Purpose: Students share ideas about one million to prepare for learning more about place value through one billion.



1 Launch

Display the question.

Use the What Do You Know About __? routine.

Ask, "What do you know about one million?"

Invite students to share their responses.

2 Connect

Record students' responses as they share.

Say, "One **million** is the base-10 place value unit composed of 10 hundred thousands. One million is written as 1,000,000."

Students might say . . . ELPS 1.E, 2.C, 2.D, 2.F

It is a really big number.

I know it is bigger than one thousand.

It has a lot of zeros.

It is used for money.

I know it is bigger than I can count.

Pairs | 15 min

Activity 1 Recognize the Number

Purpose: Students continue to build conceptual understanding of the values of digits by representing multi-digit numbers using standard form, expanded form, and expanded notation.

Presentation Screens

Materials

Lesson Resources:

- Distribute Activity 1 PDF to each student.

Short on time? Consider omitting Problems 3 and 5.

1 Launch

Display the number 154,132 in a place value mat, word form, expanded notation, and standard form.

Use the Think-Pair-Share routine. Ask, "What do you know about the expanded notation and standard form of numbers?"

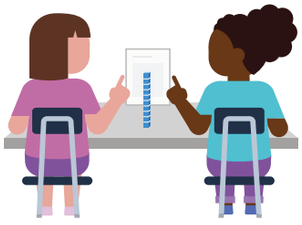
Say, "Expanded notation and standard forms are different ways to represent numbers. Expanded notation shows each digit multiplied by its place value."

Distribute the Activity 1 PDF.

Say, "Work with your partner to complete Problems 1–6."

A **Accessibility: Memory and attention** Chunk this task into more manageable parts and check in to provide feedback and encouragement after each chunk. Have students complete Problems 1–3 and then Problems 4–6.

2 Monitor



After students have completed **Problem 2**, refer to the D **Differentiation | Teacher Moves** table on the following page.

If students need help getting started . . .

- Ask, "How can you represent what is shown in the place value mat using a digit in each place value?"
- Ask, "How many hundred thousands are represented in the place value mat? How can you represent that with a digit?"

3 Connect

Invite pairs to share their responses for Problem 2, explaining how they know which digit belongs in each place value.

Ask:

- "When do you need to compose a larger unit before writing a number in standard form?"
- "Why is it important to represent 0 units in a place value when writing a number in standard form?"

Key Takeaway: Say, "When writing a number in standard form, if there are 10 or more units in any place value, you have to group them to compose a larger unit. You also have to include a digit for each place value in order, including a 0 when there are no units in that place value."

Student Edition

Unit 3 Lesson 9

Name _____ Date _____

TEKS 4.1.D, 4.1.G, 4.2.B

Numbers up to 1,000,000,000

Let's read, write, and represent multi-digit numbers.

Warm-Up eyes on teacher

We are a math community. How do your classmates support you in math class?

Activity 1 Recognize the Number

For Problems 1–3, the number is represented on a place value chart. Write the number in standard form.

1

Millions	Hundred thousands	Ten thousands	Thousands	Hundreds	Tens	Ones
	●●●●	●●	●●●●● ●●		●●	●●●●

427,024

2

Millions	Hundred thousands	Ten thousands	Thousands	Hundreds	Tens	Ones
	●●	●	●●●●● ●●●●● ●●		●●●●●	●●●●●

223,069

Activity 1

Name _____ Date _____

Recognize the Number (continued)

3

Millions	Hundred thousands	Ten thousands	Thousands	Hundreds	Tens	Ones
●●●●	●	●●●●●	●●		●●●	●●●●●

4,152,035

For Problems 4 and 5, the number is represented in word form. Write the number in standard form. Use a place value chart if it is helpful.

4 one million, seven hundred fifty-one thousand, six hundred four

1,751,604

5 one million, four hundred thirty-eight thousand, nine hundred twenty

1,438,920

6 Represent 703,458 in expanded form and expanded notation.

expanded form: 700,000 + 3,000 + 400 + 50 + 8

expanded notation: (7 × 100,000) + (3 × 1,000) + (4 × 100) + (5 × 10) + (8 × 1)

Presentation Screens

D Differentiation | Teacher Moves

Look for students who . . .	For example . . .	Provide support . . .
Almost there Write the number of units in each place value.	2,113,069	**Support** Ask, "What do you notice about the number of thousands shown in the place value mat?"
Write a digit to represent each place value that has a number of units other than 0.	22,369	**Support** Ask, "What do you notice about the digit you wrote in the hundreds place and the number of hundreds represented in the place value mat?"
Write the number in standard form.	223,069	**Strengthen** Ask, "How did you know to write a 0 in the hundreds place?"

Pairs | 20 min

Activity 2 Different Forms

Purpose: Students apply their understanding of place value to represent numbers in a place value chart, expanded form, expanded notation and standard form.

Presentation Screens

Materials

Lesson Resources:

- Distribute Activity 2 PDF to each student.

1 Launch

Display the number 31,154,132 in standard form and expanded form.

Use the Think-Pair-Share routine. Ask, "What do you know about the expanded form of numbers?"

Say, "Expanded form shows a number as a sum of the value of the digits."

Distribute the Activity 2 PDF.

Say, "This place value mat shows ones, tens, hundreds, thousands, ten thousands, hundred thousands, millions, **ten millions**, **hundred millions**, and **billions**."

Say, "Work with your partner on Problems 7–10."

EB **Emergent Bilinguals** To support students in orally responding to Problem 9 using the new vocabulary terms, ask, "Which place value positions did you use? Which ones did you not use? Why?" ELPS 1.E, 2.B, 2.C, 2.D

2 Monitor

After students have completed **Problem 10**, refer to the D Differentiation | Teacher Moves table on the following page.

If students need help getting started . . .

- Ask, "What place value is the digit 4 in? How can you represent that on the place value chart?"
- For Problem 8, ask, "What is the value of the 4?"

3 Connect

Display Row 5 of the table in Problem 10.

Invite a pair to share their response, explaining how they determined the value of each digit.

Use the Think-Pair-Share routine. Ask,

- "Do you need to represent the digit 0 in expanded form? Why or why not?"
- "How would you write this in expanded notation?"

MLR **MLR8: Discussion Supports — Active Listening** ELPS 1.E, 2.F

To support listening comprehension, invite students to begin partner interactions by restating their partner's explanation, in their own words, before adding their own ideas to the discussion.

Record the expanded notation and expanded form.

Key Takeaway: Say, "When you write a number in expanded form or expanded notation, you only need to write the values of the digits that are greater than 0 because adding 0 does not change the sum."

Activity 2

Name _____ Date _____

Different Forms

7 Write the digits in the number 420,764,129 in the place value chart.

Billions	Hundred millions	Ten millions	Millions	Hundred thousands	Ten thousands	Thousands	Hundreds	Tens	Ones
	4	2	0	7	6	4	1	2	9

8 Represent 420,764,129 in expanded form and expanded notation.

expanded form: 400,000,000 + 20,000,000 + 700,000 + 60,000 + 4,000 + 100 + 20 + 9

expanded notation: (4 × 100,000,000) + (2 × 10,000,000) + (7 × 100,000) + (6 × 10,000) + (4 × 1,000) + (1 × 100) + (2 × 10) + (9 × 1)

9 Discuss

How did you represent each digit in expanded form and expanded notation?

Oral activity: No writing expected. Sample response shown.

I represented the value of each digit by thinking about its place in the number. I didn't represent the digit in the millions place because 0 doesn't need to be represented in expanded form or expanded notation.

Activity 2

Name _____ Date _____

Different Forms (continued)

10 Complete the table. Use a place value mat if it is helpful.

Standard form	Expanded form
901,334	900,000 + 1,000 + 300 + 30 + 4
1,970,588,212	1,000,000,000 + 900,000,000 + 70,000,000 + 500,000 + 80,000 + 8,000 + 200 + 10 + 2
52,500,602	50,000,000 + 2,000,000 + 500,000 + 600 + 2
678,122	600,000 + 70,000 + 8,000 + 100 + 20 + 2
2,554,003	2,000,000 + 500,000 + 50,000 + 4,000 + 3
1,821,542,001	1,000,000,000 + 800,000,000 + 20,000,000 + 1,000,000 + 500,000 + 40,000 + 2,000 + 1

Presentation Screens

D Differentiation | Teacher Moves

Look for students who . . .	For example . . .	Provide support . . .
Almost there Write each digit as an addend.	2 + 5 + 5 + 4 + 0 + 0 + 3	**Support** Ask, "What is the value of each digit? How can you use that to help you write the number in expanded form?"
Write the value of each digit as an addition expression.	2,000,000 + 500,000 + 50,000 + 4,000 + 0 + 0 + 3	**Strengthen** Ask, "Would the value of the number change if you didn't include a 0 in the expanded form? How do you know?"
Write the value of each digit greater than 0 as an addition expression.	2,000,000 + 500,000 + 50,000 + 4,000 + 3	**Stretch** Ask, "Can you write the values in a different order? Why or why not?"

Whole Class | 10 min

Presentation Screen

Synthesis

Lesson Takeaway: Multi-digit numbers written in expanded form and expanded notation show the value of each non-zero digit in the number.

Use the Think-Pair-Share routine. Say, "Tell your partner how to read each number."

Say:

- In standard form, the digits are organized in groups of 3. A comma separates the groups, which combines the value of each digit.
- "The first number is read as *fifty-seven million, eight hundred thousand, two hundred seventy-four.* The second number is read as *four hundred sixty-two million, nine hundred fifty-one thousand, nine hundred three*."
- "Just like when reading a number, when you write a multi-digit number in expanded form or expanded notation, you only need to show the values of the non-zero digits."

Formalize vocabulary: billion, hundred million, million, ten million

(optional) **Consider using the Word Connections: Prior Knowledge routine** with the terms *ten million* and *hundred million*. Consider asking, "How can you use your understanding of the terms *ten* and *million* to help you understand the term *ten million*?" Repeat for the term *hundred million*. ELPS 3.E

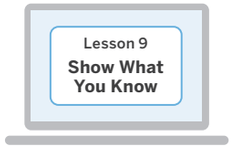
Refer to the *Math Language Development Resources* for a description of this routine and for more vocabulary support.

Invite students to refer to the **Summary** during Practice or anytime during the year.

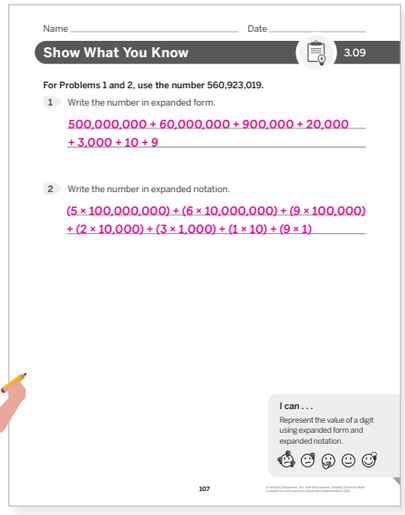
Show What You Know

Independent | 5 min

Students using digital



Show What You Know PDF


Name _____ Date _____

Show What You Know 3.09

For Problems 1 and 2, use the number 560,923,019.

1 Write the number in expanded form.

500,000,000 + 60,000,000 + 900,000 + 20,000 + 3,000 + 10 + 9

2 Write the number in expanded notation.

(5 × 100,000,000) + (6 × 10,000,000) + (9 × 100,000) + (2 × 10,000) + (3 × 1,000) + (1 × 10) + (9 × 1)

I can . . .

Represent the value of a digit using expanded form and expanded notation.

107

Today's Goals

1. **Goal:** Represent the values of numbers through 1,000,000,000 using standard form, expanded form, and expanded notation.
   - In Problem 1 in the *Show What You Know*, students represented the values of numbers using expanded form.
   - In Problem 2 in the *Show What You Know*, students represented the values of numbers using expanded notation.
2. **Language Goal:** Describe how to represent the value of digits in a multi-digit number. **(Listening and Speaking)** ELPS 1.B, 2.B, 2.E

Differentiation See the last page of the lesson for differentiation and Math Language Development support.

Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Lesson 9
Practice

Students using digital

Students using print

Summary 3.09

The expanded form and expanded notation of numbers shows the value of each non-zero digit in the number when written in standard form.

Billion	Hundred million	Ten million	Million							
1,	3	0	2,	8	0	0,	7	0	0	

Expanded Form: 1,000,000,000 + 300,000,000 + 2,000,000 + 800,000 + 700

Expanded Notation: (1 × 1,000,000,000) + (3 × 100,000,000) + (2 × 1,000,000) + (8 × 100,000) + (7 × 100)

billion The base-ten place value unit composed of 10 hundred millions. One billion is written as 1,000,000,000.

Practice 3.09

1 What is the value of the digit 3 in the number 539,004,298?

30,000,000

2 The amount of plastic that washes into the ocean each year is represented in expanded notation.

(1 × 10,000,000) + (6 × 1,000,000) + (5 × 100,000)

What is this number written in standard form?

16,500,000

Practice 3.09

Name _____ Date _____

3 In which of these numbers does the digit 4 have a value of (4 × 100,000)?

Select **TWO** correct answers.

Number
○ 5,644,010
○ 198,340,877
○ 1,234,056,202
● 32,418,009
● 442,012

4 Which expression represents the value of the number 390,060,028 in expanded form?

Ⓐ 390 + 60 + 28

Ⓑ 300,000,000 + 90,000,000 + 60,000 + 20 + 8

Ⓒ 300,000 + 90,000 + 60,000 + 20 + 8

Ⓓ 300,000,000 + 90,000 + 6,000 + 28

5 Here are clues about a number. **Sample response shown.**

- The digit 7 has a value of (7 × 10).
- The digit 3 has a value of (3 × 10,000,000).
- The digit 2 has a value of (2 × 10,000).

Write a number that could fit these clues.

30,020,070

6 Here are clues about a number.

- The digit 6 has a value of (6 × 10,000).
- The digit 1 has a value of (1 × 1,000,000,000).
- The digit 8 has a value of (8 × 100,000).

Which number fits these clues?

Ⓐ 1,060,800

Ⓑ 618,000,000

Ⓒ 1,000,860,000

Ⓓ 1,557,012,823

Practice 3.09

Name _____ Date _____

7 Write 4,000 + 20,000 + 9 + 600 + 50 + 8,000,000 in standard form. 8,024,659

8 Write 1 + 9,000 + 700,000 + 800 + 60,000,000 in standard form. 60,709,801

9 Write 24,851,032 in expanded notation.

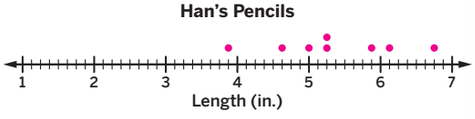
(2 × 10,000,000) + (4 × 1,000,000) + (8 × 100,000) + (5 × 10,000) + (1 × 1,000) + (3 × 10) + (2 × 1)

Spiral Review

10 Han measured a set of pencils to the nearest $\frac{1}{8}$ inch. Here is a list of the measurements.

5 $5\frac{2}{8}$ $6\frac{6}{8}$ $3\frac{7}{8}$ $5\frac{2}{8}$ $6\frac{1}{8}$ $5\frac{7}{8}$ $4\frac{5}{8}$

Plot the measurement data on the dot plot.



For Problems 11–14, determine the value of the expression.

11 7 × 7 49

12 3 × 8 24

13 64 ÷ 8 8

14 16 ÷ 4 4

Practice Problem Item Analysis

	Problem(s)	DOK	TEKS
On-Lesson			
	1, 2, 4–9	1	4.2.B
Test Practice	3	1	4.2.B
Spiral Review			
	10	1	4.9.A
Fluency	11–14	1	3.4.F

Need more Practice?

Additional practice can be found in the **Practice Resources, Intervention and Extension Resources,** and online resources (item banks, Boost Personalized Learning, and Fluency Practice).

Differentiation Use after Lesson 9

Lesson Goal: Represent the values of numbers through 1,000,000,000 using standard form, expanded form, and expanded notation.

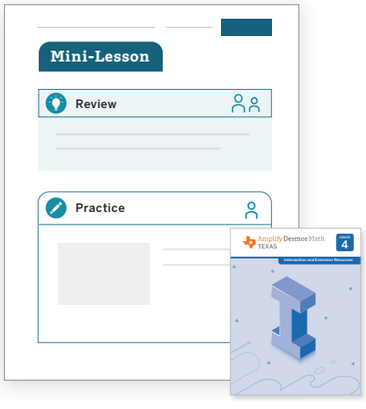
Support

Provide targeted intervention for students by using these resources.

If students represent the digits of a number without paying attention to their values:

Respond:

- Assign the *Writing Numbers in Standard and Expanded Form* Mini-Lesson. | 15 min
- Review the value of each digit in each place value, encouraging students to use the place value chart to the billions.



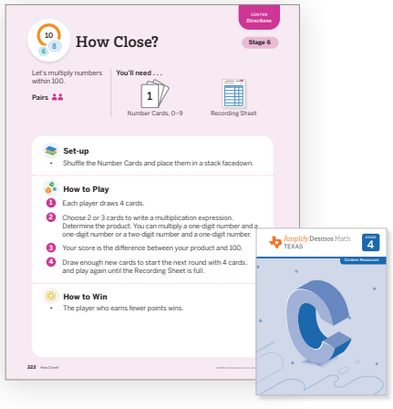
Strengthen

Reinforce students' understanding of the concepts assessed by using these resources.

If students represent the digits of a number paying attention to their values:

Respond:

- Invite students to play these **Centers**. | 15 min
  How Close?: Multiply to 100
  Mystery Number: Six-digit Numbers
- Have students complete **Lesson 9 Practice**. | 15 min
- **Item Bank**



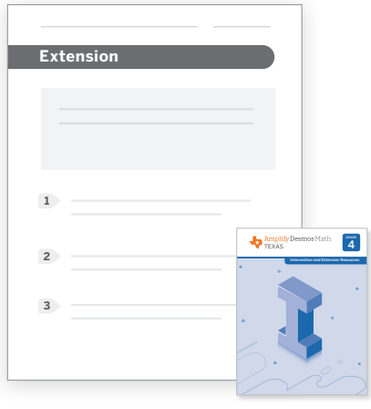
Stretch

Challenge students and extend their learning with these resources.

If students represent the digits of a number, including a 0, when there is not a digit in a certain place:

Respond:

- Invite students to explore the **Sub-Unit 2 Extension Activities.** | 15 min
- Revisit Activity 1 and invite students to respond to the **Stretch** question from the *Differentiation: Teacher Moves* table. | 5 min



Support, *Strengthen*, and *Stretch* learning by assigning these digital resources that adjust to each student's current level of skill and understanding.
• **Boost Personalized Learning** • **Fluency Practice** • **Math Adventures**

Math Language Development

EB Use the **Math Language Development Resources** for further language support with all your students, including those building English proficiency.

- English/Spanish cognates, e.g., **million/millón**
- Frayer Model templates
- Vocabulary routines

Professional Learning

What did you see or hear that surprised you about students' sense of multi-digit whole numbers? What question do you wish you had asked that would have provided some insight into students' thinking?