

Vertical Progression:

<p>2nd Grade</p>	<p>2.OA.A Represent and solve problems involving addition and subtraction.</p> <ul style="list-style-type: none"> ○ 2.OA.A.1 Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem. <p>2.NBT.B Use place value understanding and properties of operations to add and subtract.</p> <ul style="list-style-type: none"> ○ 2.NBT.B.7 Add and subtract within 1000, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method. Understand that in adding or subtracting three-digit numbers, one adds or subtracts hundreds and hundreds, tens and tens, ones and ones; and sometimes it is necessary to compose or decompose tens or hundreds.
<p>3rd Grade</p>	<p>3.OA.B Understand properties of multiplication and the relationship between multiplication and division.</p> <ul style="list-style-type: none"> ○ 3.OA.B.5: Apply properties of operations as strategies to multiply and divide. <p>3.OA.C Multiply and divide within 100.</p> <ul style="list-style-type: none"> ○ 3.OA.C.7: Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division. <p>3.NBT.A Use place value understanding and properties of operations to perform multi-digit arithmetic.</p> <ul style="list-style-type: none"> ○ 3.NBT.A.2 Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction. ○ 3.NBT.A.3 Multiply one-digit whole numbers by multiples of 10 in the range 10-90 (e.g., 9×80, 5×60) using strategies based on place value and properties of operations.
<p>4th Grade</p>	<p>4.NBT.B Use place value understanding and properties of operations to perform multi-digit arithmetic.</p> <ul style="list-style-type: none"> ○ 4.NBT.B.4 Fluently add and subtract multi-digit whole numbers using the standard algorithm. ○ 4.NBT.B.5 Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models. ○ 4.NBT.B.6 Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.
<p>5th Grade</p>	<p>5.NBT.B Perform operations with multi-digit whole numbers and with decimals to hundredths.</p> <ul style="list-style-type: none"> ○ 5.NBT.B.5 Fluently multiply multi-digit whole numbers using the standard algorithm. ○ 5.NBT.B.6 Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models. ○ 5.NBT.B.7 Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

Students will demonstrate command of the ELG by:

- Fluently adding and subtracting multi-digit whole numbers.
- Multiplying whole numbers of up to four digits by one-digit whole numbers and multiply two, two-digit numbers using strategies based on place value and properties of operations.
- Illustrating and explaining multiplication using equations, rectangular arrays, and area models.
- Recognizing that each digit's value is multiplied by ten as you move to the left.
- Applying strategies based on place value to solve division problems.
- Applying properties of operations, such as multiplication, to solve division problems.
- Explaining how to use place value, rectangular arrays, and area models to solve multiplication problems.
- Calculating the sums and differences of multi-digit numbers using the standard algorithm up to 1 million.

Vocabulary:

- addition
- algorithm
- area models
- equation
- fluently
- place value
- subtraction

Sample Instructional/Assessment Tasks:

1) Standard: 4.NBT.B.5

Source: Illustrative Mathematics

<https://www.illustrativemathematics.org/content-standards/4/NBT/B/5/tasks/1808>

Item Prompt:

There are almost 40 thousand fourth graders in Mississippi and almost 400 thousand fourth graders in Texas. There are almost 4 million fourth graders in the United States.

We write 4 million as 4,000,000. How many times more fourth graders are there in Texas than in Mississippi? How many times more fourth graders are there in the United States than in Texas? Use the approximate populations listed above to solve.

There are about 4 thousand fourth graders in Washington, D.C. How many times more fourth graders are there in the United States than in Washington, D.C.?

Correct Answer:

Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones	
		4	0	0	0	0	Wash., D.C.
	4	0	0	0	0	0	Mississippi
4	0	0	0	0	0	0	Texas
							United States

Note: Blue arrows and 'x10' labels indicate the relationship between rows: 40,000 (Wash., D.C.) is 10 times 4,000 (Mississippi); 400,000 (Texas) is 10 times 40,000 (Wash., D.C.); 4,000,000 (United States) is 10 times 400,000 (Texas).

40,000 is 10 times 4,000

400,000 is 10 times 40,000.

4,000,000 is 10 times 400,000.

Thus, $400,000 = 10 \times 40,000$, and there are about 10 times as many fourth graders in Texas as there are in Mississippi.

Also, $4,000,000 = 10 \times 400,000$, and there are about 10 times as many fourth graders in the US as there are in Texas.

Finally, to go from 4,000 to 4,000,000, we have to multiply by 10 three times. We see that

$$10 \times 10 \times 10 = 10 \times 100 = 1000$$

So there are about 1,000 times as many fourth graders in the US as there are in Washington DC.

2) Standard: 4.NBT.B.6

Source: Illustrative Mathematics

<https://www.illustrativemathematics.org/content-standards/4/NBT/B/6/tasks/1774>

Task Prompt:

Jillian says, "I know that 20 times 7 is 140 and if I take away 2 sevens that leaves 126. So $126 \div 7 = 18$."

1. Is Jillian's calculation correct? Explain.
2. Draw a picture showing Jillian's reasoning.
3. Use Jillian's method to find $222 \div 6$.

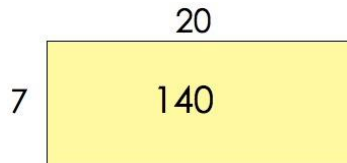
Correct Answer:

1. Jillian's reasoning is correct. She has found $20 \times 7 = 140$ and $2 \times 7 = 14$. This means that

$$18 \times 7 = (20 - 2) \times 7 = (20 \times 7) - (2 \times 7) = 140 - 14 = 126.$$

The second equality uses the distributive property. These equations tell us that $126 \div 7 = 18$.

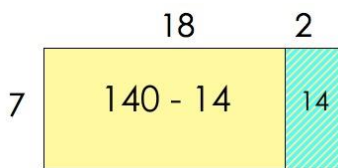
2. Jillian's initial idea of dividing 140 by 7 is represented here:



From there, Jillian decomposes the 20 sevens into 18 sevens and 2 sevens:



Lastly, Jillian recognizes that if the area of both rectangles combined would be 140, then she must subtract off the 2 extra sevens she used to get 140:



3. We have $40 \times 6 = 240$ and $3 \times 6 = 18$. So

$$37 \times 6 = (40 - 3) \times 6 = (40 \times 6) - (3 \times 6) = 240 - 18 = 222.$$

The second line uses the distributive property of multiplication.