# Model Place Value Relationships

A hundred grid can help you understand place-value relationships.

• One small square has been shaded to represent 1.

• Shade the rest of the first column. Count the number of small squares. There are 10 small squares. The model for 10 has 10 times as many squares as the model for 1.

• Shade the remaining 9 columns. Count the number of small squares. There are 100 small squares. The model for 100 has 10 times as many squares as the model for 10.

• If you shade ten hundred grids, you will have shaded 1,000 squares. So, the model for 1,000 has 10 times as many squares as the model for 100.
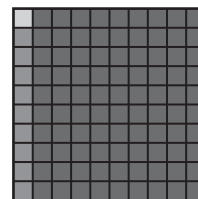
A place-value chart helps you find the value of each digit in a number.

THOUSANDS			ONES		
Hundreds	Tens	Ones	Hundreds	Tens	Ones
		8,	5	1	6

In the number 8,516:

The value of the digit 8 is 8 thousands, or 8,000.

The value of the digit 5 is 5 hundreds, or 500.

The value of the digit 1 is 1 ten, or 10.

The value of the digit 6 is 6 ones, or 6.

Find the value of the underlined digit.

1. 756

2. 1,025

3. 4,279

4. 35,703

_____   _____   _____   _____

Compare the values of the underlined digits.

5. 700 and 70

The value of 7 in _____ is _____

times the value of 7 in _____.

6. 5,000 and 500

The value of 5 in _____ is _____

times the value of 5 in _____.

Comparing Values

Compare the values of the underlined digits.

1. 3,<u>4</u>92 and 70<u>4</u>

The value of 4 in _____

is _____ times

the value of 4 in _____ .

2. <u>8</u>,596 and 9<u>8</u>5

The value of 8 in _____

is _____ times

the value of 8 in _____ .

3. <u>2</u>,481 and 5,07<u>2</u>

The value of 2 in _____

is _____ times

the value of 2 in _____ .

4. 4<u>3</u>,158 and 71,4<u>3</u>5

The value of 3 in _____

is _____ times

the value of 3 in _____ .

5. 4<u>9</u>5,123 and 63,12<u>9</u>

The value of 9 in _____

is _____ times

the value of 9 in _____ .

6. <u>5</u>06,712 and 324,8<u>5</u>9

The value of 5 in _____

is _____ times

the value of 5 in _____ .

7. <u>8</u>37,164 and 4,50<u>8</u>

The value of 8 in _____

is _____ times

the value of 8 in _____ .

8. <u>6</u>31,485 and <u>6</u>82

The value of 6 in _____

is _____ times

the value of 6 in _____ .

9. Stretch Your Thinking Write a pair of numbers such that
the value of the 7 in the first number is 1,000 times the value
of the 7 in the second number, and the value of the 3 in the first
number is 100 times the value of the 3 in the second number.

_____

Name _____

Read and Write Numbers

Look at the digit 6 in the place-value chart below. It is in the hundred thousands place. So, its value is <u>6 hundred thousands</u> .

In **word form**, the value of this digit is six hundred thousand.

In **standard form**, the value of the digit 6 is 600,000.

PERIOD

THOUSANDS			ONES		
Hundreds	Tens	Ones	Hundreds	Tens	Ones
6	5	9,	0	5	8

Read the number shown in the place-value chart. In word form, this number is written as six hundred fifty-nine thousand, fifty-eight.

Note that when writing a number in words, a comma separates periods.

You can also write the number in **expanded form**:
600,000 + 50,000 + 9,000 + 50 + 8

Read and write each number in two other forms.

1. 40,000 + 1,000 + 300 + 70 + 8

_____

2. twenty-one thousand, four hundred

_____

3. 391,032

_____

Period Posers

Solve each riddle.

1. **Fred:** My number has two periods. One period contains the digits 3, 0, and 6 in that order. The other contains the digits 0, 9, and 5 in that order.

   Ned: My number has two periods also. One contains the digits 4, 8, and 6 in that order. The other period contains the digits 1, 2, and 7 in that order.

   Fred: Yes, but my number is greater than your number.

   What are Fred's and Ned's numbers?

   _____

   _____

2. **Ann:** My number has two periods. One contains the digits 4, 1, and 8 in that order. The other contains the digit 9.

   Jan: My number has two periods. One period contains only 0s. The other has the digits 1 and 0 in that order.

   Ann: Too bad, my number must be greater than your number.

   Jan: Nope—my number is greater!

   What are Ann's and Jan's numbers?

   _____

   _____

3. **Mo:** My number has two periods. One period has a 7 in the hundreds place. The other has an 8 in the tens place.

   Bo: My number also has two periods. One has a 1 in the hundreds place. The other has a 2 in the tens place.

   Mo: All other digits in our numbers are zeros. So how can it be that your number is greater than my number?

   What are Mo's and Bo's numbers?

   _____

4. **Stretch Your Thinking** Write your own period poser. Then exchange it with a classmate and solve each other's posers.

   _____

   _____

Name _____

Compare and Order Numbers

Compare 31,072 and 34,318. Write <, >, or =.

Step 1 Align the numbers by place value using grid paper.

Step 2 Compare the digits in each place value. Start at the greatest place.

Are the digits in the ten thousands place the same?
__Yes.__ Move to the thousands place.
Are the digits in the thousands place the same?
__No.__ 1 thousand is less than 4 thousands.

start here

| | | 3 | 1 | 0 | 7 | 2 |
| | | 3 | 4 | 3 | 1 | 8 |

3 = 3

| | | 3 | 1 | 0 | 7 | 2 |
| | | 3 | 4 | 3 | 1 | 8 |

1 < 4

Step 3 Use the symbols <, >, or = to compare the numbers.

< means *is less than.*   > means *is greater than.*   = means *is equal to.*

There are two ways to write the comparison.

31,072 $<$ 34,318   or   34,318 $>$ 31,072

---

1. Use the grid paper to compare 21,409 and 20,891.
   Write <, >, or =.
   21,409 ◯ 20,891

Compare. Write <, >, or =.

2. $53,621 ◯ $53,760

3. 82,550 ◯ 80,711

Order from greatest to least.

4. 16,451; 16,250; 17,014

5. 561,028; 582,073; 549,006

Name _____

Place-Value Puzzle

Fill in each blank with a digit that will make the number sentence true. The digits to choose from are listed in the box under each number sentence. Use each digit only once.

1. 1 __ 5,120 > 125, __ 20 > 125,1 __ 0

   | 1, 2, 3 |

2. 4 __ 3,900 < 42 __ ,900 = 423, __ 00 < 42 __ ,900

   | 1, 3, 4, 9 |

3. 27 __ ,010 < 2 __ 8,010 < 29 __ ,010

   | 7, 8, 9 |

4. 3 __ ,788 > 35,7 __ 8 = 35, __ 88 > 35, __ 88

   | 5, 6, 7, 8 |

5. 6 __ 8,138 > 6 __ 7,294 < 63 __ ,705

   | 3, 4, 9 |

6. 4 __ 6,047 > __ 63,941 = 463, __ 41 > __ 86, __ 42

   | 3, 4, 5, 7, 9 |

7. 101,5 __ 2 > 1 __ 1,508 > 101, __ 62 > 101,3 __ 7

   | 0, 3, 5, 8 |

8. **Write Math** ▶ If you know A is greater than B and B is greater than C, do you have to compare A to C to know which is greater? Use an example to explain.

Round Numbers

When you round a number, you replace it with a number that is easier to work with but not as exact. You can round numbers to different place values.

Round 4̲78,456 to the place value of the underlined digit.

Step 1 Identify the underlined digit.
The underlined digit, 4, is in the **hundred thousands place**.

Step 2 Look at the number to the right of the underlined digit.

If that number is 0–4, the underlined digit stays the same.

If that number is 5–9, the underlined digit is increased by 1.

The number to the right of the underlined digit is <u>7</u>, so the underlined digit, 4, will be increased by one; 4 + 1 = <u>5</u>.

Step 3 Change all the digits to the right of the hundred thousands place to zeros.

So, 478,456 rounded to the nearest hundred thousand is <u>500,000</u>.

1. In 2010, the population of North Dakota was 672,591 people. Use the number line to round this number to the nearest hundred thousand.

600,000   650,000   700,000
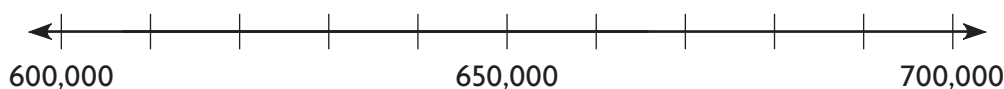
672,591 is closer to _____ than _____,

so it rounds to _____.

Round to the place value of the underlined digit.

2. 3,4̲52   3. 1̲80   4. $7̲2,471   5. 5̲72,000

_____   _____   _____   _____

6. 9̲50   7. 6̲,495   8. 83̲5,834   9. 96,6̲25

_____   _____   _____   _____

Rounding Ranges

Solve each riddle. Give your answer as a range of numbers.

1. When rounded to the nearest hundred, I become 500. What numbers could I be?

_____

2. When rounded to the nearest ten, I become 500. What numbers could I be?

_____

3. When rounded to the nearest thousand, I become 3,000. What numbers could I be?

_____

4. When rounded to the nearest hundred, I become 3,000. What numbers could I be?

_____

5. When rounded to the nearest hundred thousand, I become 600,000. What numbers could I be?

_____

6. When rounded to the nearest ten thousand, I become 600,000. What numbers could I be?

_____

7. Write Math ▸ Compare the ranges of your answers to Exercises 2, 4, and 6 to the ranges in Exercises 1, 3, and 5. What do you notice? Give a reason for your observation.

_____

_____

_____

_____

Rename Numbers

You can use place value to rename whole numbers.
Here are different ways to name the number 1,400.

- **As thousands and hundreds**
  Think: 1,400 = __1__ thousand __4__ hundreds.
  You can draw a quick picture to help.

  | T | | | | |

- **As hundreds**
  Think: 1,400 = __14__ hundreds.
  You can draw a quick picture to help.
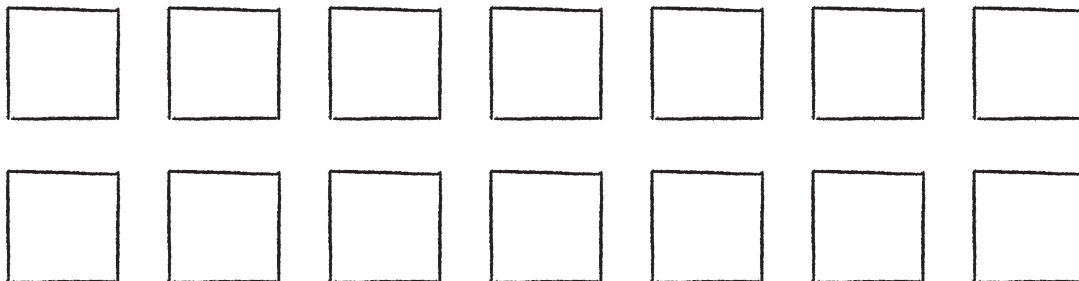
- **As tens**
  Think: 1,400 = __140__ tens.

- **As ones**
  Think: 1,400 = __1,400__ ones.

Rename the number. Draw a quick picture to help.

1. 180 = _____ tens

2. 1,600 = _____ hundreds

3. 6,000 = _____ thousands

4. 2,700 = 27 _____

5. 2 hundreds 6 tens = _____ tens

6. 71 thousands = _____

Name _____

Number Comparisons

Compare the numbers. Write <, >, or =.

1. 400 tens ◯ 48 hundreds

2. 7 thousands, 8 hundreds ◯ 2,500 tens

3. 715 thousands, 34 tens ◯ 715,034

4. 10 thousands, 5 hundreds ◯ 1,050 tens

5. 34 ten thousands, 85 hundreds ◯ 348,500

6. 6 hundred thousands, 47 tens ◯ 60 ten thousands, 4 hundreds

7. 2 ten thousands, 45 hundreds ◯ 308 hundreds

8. 25 thousands, 56 ones ◯ 3 ten thousands, 17 hundreds

9. 476 thousands ◯ 4 hundred thousands, 76 hundreds

10. 35 ten thousands, 8 hundreds ◯ 3 hundred thousands 50 thousands, 80 tens

11. **Write Math** ▶ Look back at Exercise 5. **Explain** how you found the answer.

_____

_____

_____

_____

Add Whole Numbers

Find the sum. 63,821 + 34,765

Step 1 Round each addend to estimate.
60,000 + 30,000 = **90,000**

Step 2 Use a place-value chart
to line up the digits by
place value.

	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
			¹			
	6	3,	8	2	1
+	3	4,	7	6	5
	9	8,	5	8	6

Step 3 Start with the ones place.
Add from right to left.
Regroup as needed.

The sum is **98,586** . Since 98,586 is close
to the estimate 90,000, the answer is reasonable.

Estimate. Then find the sum.

1. Find 238,503 + 341,978. Use the grid to help.

Estimate: _____

2. Estimate: _____

$$\begin{array}{r} 52,851 \\ + 65,601 \\ \hline \end{array}$$

3. Estimate: _____

$$\begin{array}{r} 54,980 \\ + 24,611 \\ \hline \end{array}$$

4. Estimate: _____

$$\begin{array}{r} 604,542 \\ + \quad 87,106 \\ \hline \end{array}$$

5. Estimate: _____

$$\begin{array}{r} 147,026 \\ + 106,792 \\ \hline \end{array}$$

6. Estimate: _____

$$\begin{array}{r} 278,309 \\ + 422,182 \\ \hline \end{array}$$

7. Estimate: _____

$$\begin{array}{r} 540,721 \\ + 375,899 \\ \hline \end{array}$$

Name _____

3-Foot Path

Find the path with the addends that correctly leads from the START box to the FIRST SUM box, and from there to the sum in the FINISH box. Then write the letters of the 5 boxes on your path in order to answer the riddle.

START

A
20,165

(+)   (+)   (+)

N	M	Y
13,942	14,574	14,292

(=)   (=)   (=)

FIRST SUM
A
34,457

(+)   (+)   (+)

T	R	S
116,348	128,615	121,905

(=)   (=)   (=)

D
163,072

FINISH
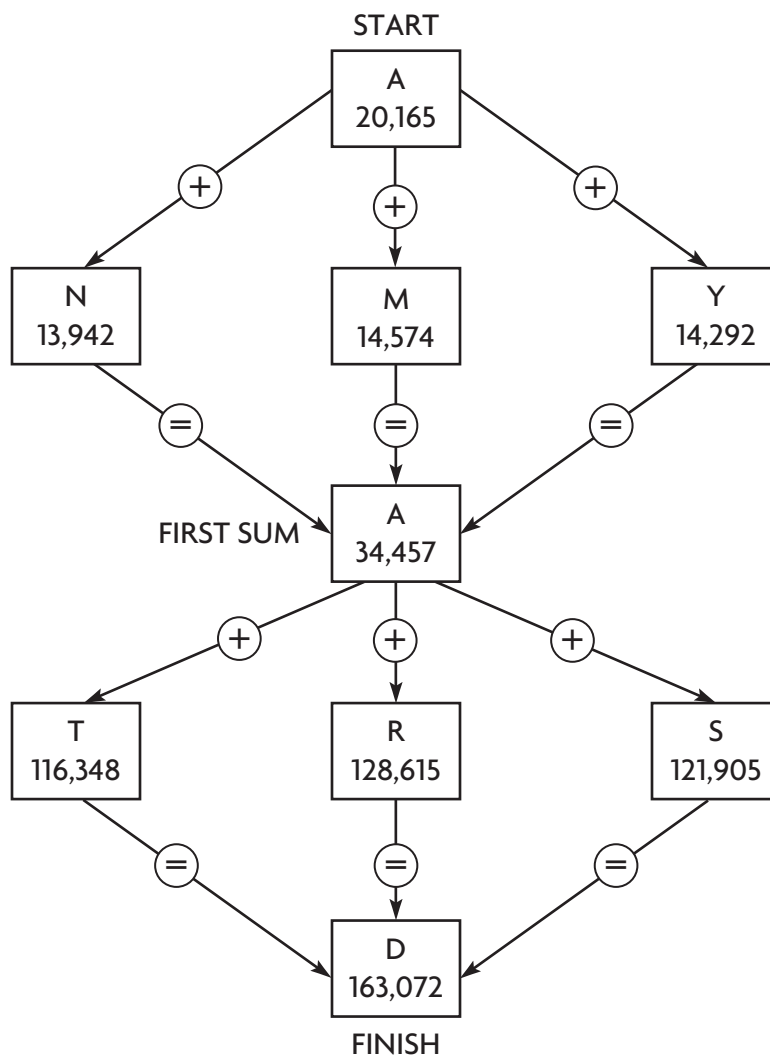
Where can you buy a ruler that is 3 feet long?

AT __ __ __ __ __ SALE

Name _____

Subtract Whole Numbers

Find the difference. 5,128 − 3,956

Estimate first.
Think: 5,128 is close to 5,000. 3,956 is close to 4,000.
So, an estimate is 5,000 − 4,000 = 1,000.

Write the problem vertically. Use grid paper to align digits by place value.

Step 1 Subtract the ones.

	5,	1	2	8	
−	3,	9	5	6	
				2	

8 − 6 = 2

Step 2 Subtract the tens.

			0	12	
	5,	1	2	8	
−	3,	9	5	6	
			7	2	

There are not enough tens to subtract.
Regroup 1 hundred as 10 tens.
12 tens − 5 tens = 7 tens

Step 3 Subtract the hundreds.

	4	10	12		
	5,	1	2	8	
−	3,	9	5	6	
		1	7	2	

There are not enough hundreds to subtract. Regroup 1 thousand as 10 hundreds.
10 hundreds − 9 hundreds = 1 hundred

Step 4 Subtract the thousands.

	4	10	12		
	5,	1	2	8	
−	3,	9	5	6	
	1,	1	7	2	

4 thousands − 3 thousands = 1 thousand

The difference is ___**1,172**___. Since 1,172 is close
to the estimate of 1,000, the answer is reasonable.

Estimate. Then find the difference.

1. Estimate: _____

$$\begin{array}{r} 6,253 \\ -\ 3,718 \\ \hline \end{array}$$

2. Estimate: _____

$$\begin{array}{r} 74,529 \\ -\ 38,453 \\ \hline \end{array}$$

3. Estimate: _____

$$\begin{array}{r} 232,318 \\ -\ 126,705 \\ \hline \end{array}$$

Unknown Digits

Complete each subtraction problem by finding the unknown digits.

1.
```
   4 2, □ 5 3
 − 2 □ , 3 4 □
 ─────────────
   1 5, 2 □ 6
```

2.
```
   9 0, 7 □ □
 − □ 3, □ 9 5
 ─────────────
   4 □ , 9 3 6
```

3.
```
   □ 4 1, □ 1 □
 − 1 2 8, 7 □ 1
 ───────────────
   1 □ □ , 8 9 7
```

4.
```
   6 3 □ , □ □ 2
 − □ □ 5, 6 3 □
 ───────────────
   4 5 4, 8 0 8
```

5.
```
   □ 0 □ , 3 □ 7
 −       8, 7 5 □
 ───────────────
   □ 7, □ 6 8
```

6.
```
   □ 0 0, □ □ □
 − 2 3 8, 1 7 2
 ───────────────
   4 □ □ , 8 2 8
```

7. **Write Math** ➤ Describe what strategy you used to complete the unknown-digit subtraction problems. Use an example to explain.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Problem Solving • Comparison Problems with Addition and Subtraction

For a community recycling project, a school collects aluminum cans and plastic containers. This year the fourth grade collected 5,923 cans and 4,182 containers. This is 410 more cans and 24 more containers than the fourth grade collected last year. How many cans did the fourth grade collect last year?

Read the Problem		
What do I need to find? I need to find the number of **cans the fourth grade** **collected last year.**	**What information do I need to use?** The fourth grade students collected _5,923_ cans this year. They collected _410_ more cans this year than the fourth grade collected last year.	**How will I use the information?** I can draw a _bar model_ to find the number of cans the fourth grade collected last year.

Solve the Problem

I can draw a bar model and write an equation to represent the problem.

5,923

410	

5,513

5,923 − 410 = _5,513_

So, the fourth grade collected _5,513_ aluminum cans last year.

Use the information above for 1 and 2.

1. Altogether, how many aluminum cans and plastic containers did the fourth grade collect this year?

2. This year the fifth grade collected 216 fewer plastic containers than the fourth grade. How many plastic containers did the fifth grade collect?

Take a Seat!

Use the table for 1–5.

1. Last night's game at the arena in Cleveland was 251 seats short of being filled to capacity. How many people attended the game?

_____

Basketball Arena Seating Capacities	
City	Capacity
Cleveland	20,562
Boston	18,624
Atlanta	20,300
New Orleans	18,500
Los Angeles	18,997

2. How many more people can be seated in the largest arena than can be seated in the smallest arena?

_____

3. Estimate the difference in the seating capacities of the Atlanta and Los Angeles arenas. **Explain** how you made your estimate.

_____

_____

4. There are two sold-out basketball games tonight. One is at the arena in Boston, and the other is at the arena in New Orleans. How many people are attending the two games?

_____

5. [Write Math] The biggest college basketball arena seats 33,000. Is the combined capacity of the Cleveland and Boston arenas greater than or less than the capacity of the biggest college arena? How much greater or less? **Explain**.

_____

_____

_____