Understanding Place Value

Ten Symbols, Infinite Numbers

With just 10 symbols, we can write any number known to humankind. We can write large numbers, small numbers and numbers somewhere in between.

0 1 2 3 4 5 6 7 8 9

Ten digits

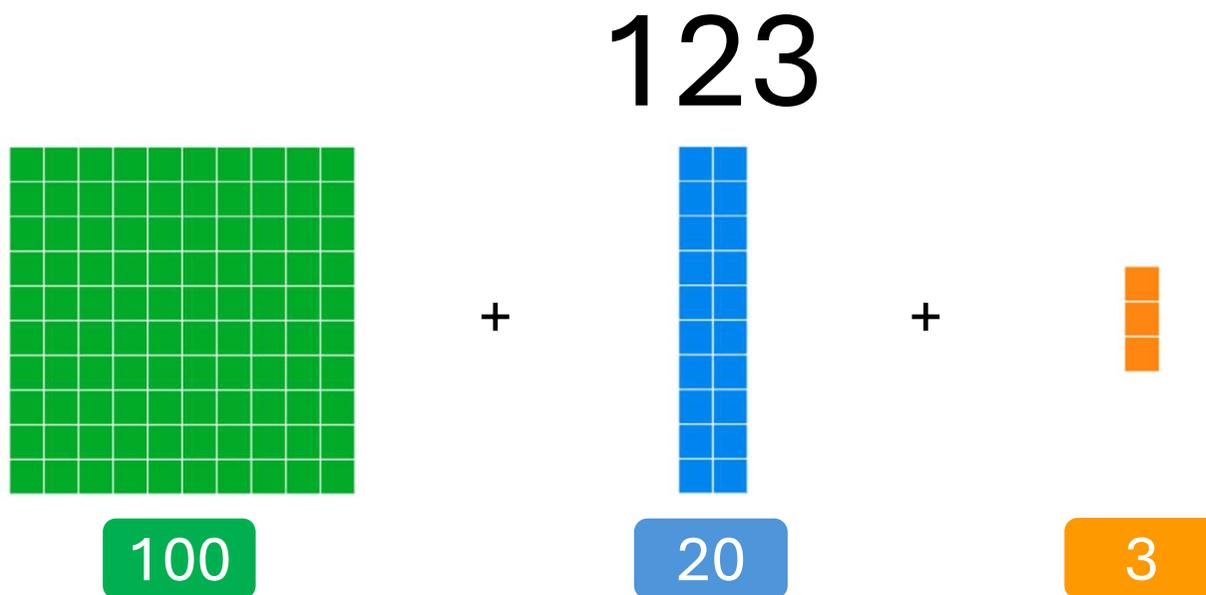Radius of a
hydrogen atom:
0.000000000025m

Your age

Circumference of Earth:
40,075,017 m

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What is Place Value?

Place value means the value of a digit depends on its position in a number.

123

100 + 20 + 3

For example, in the number **123**:
- The **1** is in the hundreds place, so it means **100**
- The **2** is in the tens place, so it means **20**
- The **3** is in the units place, so it means **3**

Understanding the Place Value Chart

A **place value chart** is a visual tool that helps you understand the value of each digit in a number based on its position.

- This is a place value chart.

- The headings of the columns are hundreds, tens and units.

- This is often abbreviated to H, T, U.

- The columns represent hundreds, tens and units of one.

- Units are often referred to as ones.

- Each place is worth 10 times more than the one to its right.

One		
Hundreds	Tens	Units

x 10   x 10

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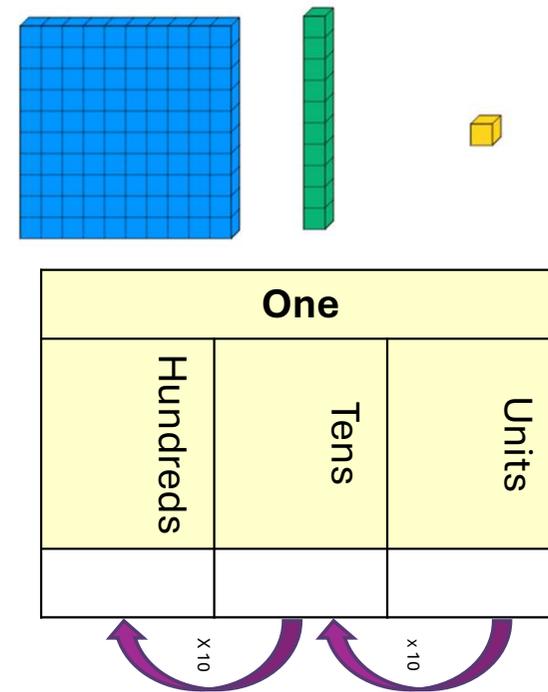
# Identifying the Place Value of 3-Digit Numbers

Place value is the value of a digit depending on its position in a number. We can **identify the place value of a digit** using a place value chart.

To identify the place value of a digit:

- **Use a place value chart.** Line up the digits under the headings.

- **Make the number with base-10 blocks.** Use blocks if you have them, if not sketch or imagine them.

- **Identify the digit.** What digit do you want to explore?

- **Check the column.** What place is the digit in? (E.g., units, tens or hundreds?)

- **State the final answer.** What is the place value of the digit?

Example: What is the place value of the 4 in the number 452?

Ones		
Hundreds	Tens	Units
4	5	2
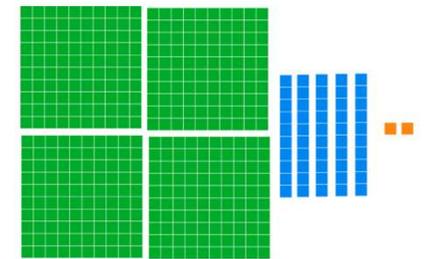
Answer: 4 hundreds or 400

Common mistake: Hundred **X**

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Comparing 3-Digit Numbers

To **compare numbers**, we need to understand their place value. One way to do this is to use a place value chart.

To compare the size of numbers:

- **Write each number in a place value chart.** Line up digits under hundreds, tens, and units. Make sure they're aligned correctly.

- **Use base-10 blocks to build each number.** If you don't have blocks, sketch or imagine.

- **Start with the hundreds ↑ column.** Compare the digits in the hundreds place. Bigger digit = bigger number.

- **Move to the tens ↑ column.** If the hundreds digits are the same, compare the tens digits. Still the same? Keep going.

- **Move to the units ↑ column.** If the tens digits are the same, compare the units digits.

- **State the final answer.**

Example: Compare the numbers:
245 and 145
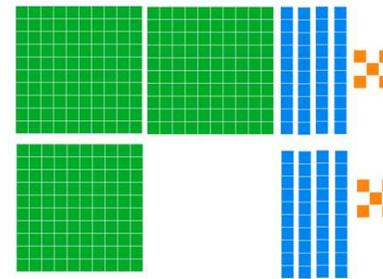
	Ones	
Hundreds	Tens	Units
2	4	5
1	4	5

Answer:
245 is greater than 145
245 > 145

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Ordering 3-Digit Numbers

To **put numbers in order of size,** we need to understand their place value. One way to do this is using a place value chart.

To put numbers in order of increasing (small to large) size:

- **Write each number in a place value chart.** Make sure the digits are aligned correctly. You may find base-10 blocks useful for comparing the size of numbers.

- **Start with the hundreds ⬆ digit first.** The number with the smallest digit in this column will be the smallest. The number with the next smallest digit will be the second smallest. Continue until all numbers have been placed in order of increasing size.

- **Move to the tens ⬆column.** If two or more numbers have the same digit in the hundreds column, move right to the tens column and compare the digits from the same number.

- **Move to the units ⬆ column.** If two or more numbers have the same digit in the tens column, move right to the units column and compare the digits from the same number.

- **State the final answer.**

**Example:** Put these numbers in order of increasing size: 794, 927, 618, 772, 792.

Ones		
Hundreds	Tens	Units
7	9	4
9	2	7
6	1	8
7	7	2
7	9	2

Answer: 618, 772, 792, 794, 927

Ordering 3-Digit Numbers

To **put numbers in order of size,** we need to understand their place value. One way to do this is using a place value chart.

To put numbers in order of decreasing (large to small) size:

- **Write each number in a place value chart.** Make sure the digits are aligned correctly. You may find base-10 blocks useful for comparing the size of numbers.

- **Start with the hundreds ⬆ digit first.** The number with the **largest** digit in this column will be the largest. The number with the next largest digit will be the second largest. Continue until all numbers have been placed in order of increasing size.

- **Move to the tens ⬆column.** If two or more numbers have the same digit in the hundreds column, move right to the tens column and compare the digits from the same number.

- **Move to the units ⬆ column.** If two or more numbers have the same digit in the tens column, move right to the units column and compare the digits from the same number.

- **State the final answer.**

Ones		
Hundreds	Tens	Units
1	2	3
3	2	1
1	2	4
9	0	9
4	5	6

Answer: 909, 456, 321, 124, 123

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Understanding the Place Value of Zero

On a **place value chart,** zero does not have a value but it holds the place value of the other digits.
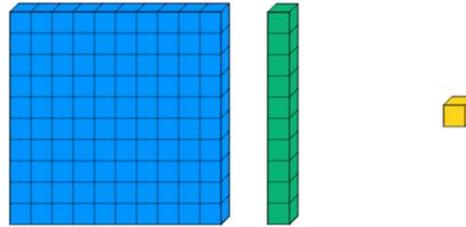
| One		
Hundreds	Tens	Units
	2	0

This is 20.
There are no units in 20.
We put a 2 in the tens column and a zero in the units column.
This zero tells us there are no units in the units column. It keeps the place of the 2 in the tens column.
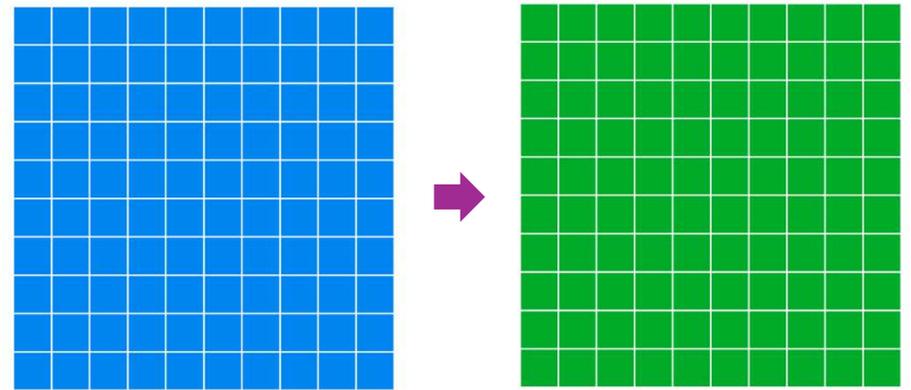This is why it is called a place value holder.

Principle of Exchange

The principle of exchange means you can trade 10 of one place value for 1 of the next higher place. It's how our base-10 system works when building numbers. Understanding exchange is fundamental for written calculation methods.
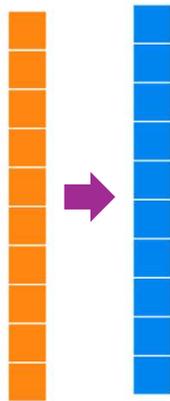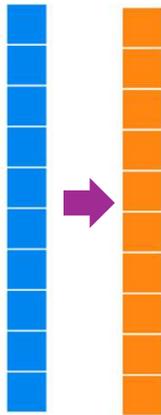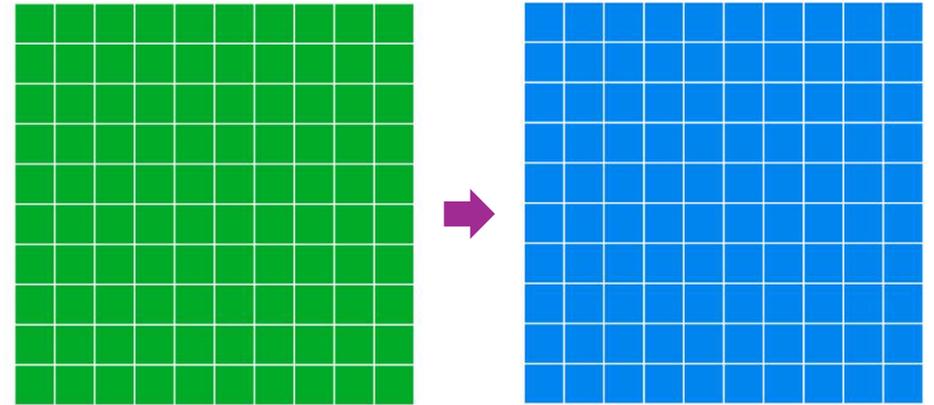
10 units can be exchanged for 1 ten

10 tens can be exchanged for 1 hundred

Principle of Decomposition

The principle of decomposition means you can trade 1 of one place value for 10 of the next lower place. It's how our base-10 system works when breaking numbers. Understanding exchange is fundamental for written calculation methods.
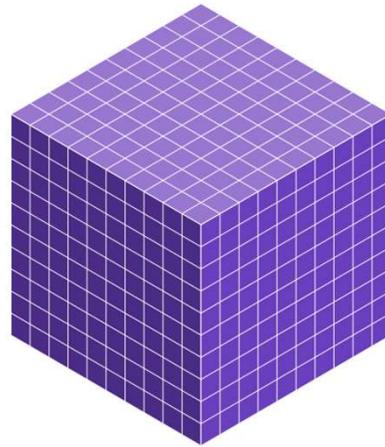
1 ten can be exchanged for 10 units

1 hundred can be exchanged for 10 tens

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Introducing the Thousands

A thousand block is a large cube made of 1000 units.

Thousand = 1000 units

Extending the Place Value Chart

A place value chart can be extended to include the thousands. You should practice drawing your own place value chart.

Thousands			Ones		
Hundreds	Tens	Units	Hundreds	Tens	Units
100 x 🧊	10 x 🧊	1 x 🧊			

Extending the Place Value Chart

A place value chart can be extended to include the millions. You should practice drawing your own place value chart.

Millions			Thousands			Ones		
Hundreds	Tens	Units	Hundreds	Tens	Units	Hundreds	Tens	Units

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Writing Numbers in Words

Writing numbers in words can be tricky, especially if they are large. However, if you can read any three-digit number, then you can read any large number provided you follow these steps.

To write a number in words:

- **Write the number in a place value chart.** Line up the digits under headings (e.g., millions, thousand, ones).
- **Insert the commas.** Break the number into groups of three digits, starting from the right.
- **Name the commas.** Each comma separates a place value group:
  - First comma = **Thousands**
  - Second comma = **Millions**
- **Read each group of three digits.** Say each group as a regular number.
- **Put it all together.** Combine the three-digit numbers words the comma names.
- **State the final answer.**

Example: What is 123456789 in words?

Millions			Thousands			Ones		
Hundreds	Tens	Units	Hundreds	Tens	Units	Hundreds	Tens	Units
1	2	3	4	5	6	7	8	9

One hundred and twenty-three

Four hundred and fifty-six

Seven hundred and eighty-nine

Millions

Thousands

One hundred and twenty-three million, four hundred and fifty-six thousand, seven hundred and eight-nine