Lesson - Place value to 1 000 000

Year: Year 5

Hello, I am Otto! Big numbers are all around us. A football stadium holds tens of thousands of fans, a big city has hundreds of thousands of people, and a very tall mountain is measured in thousands of metres. In Year 5 we read, write, compare and round numbers up to one million. We also count in big steps and meet negative numbers and Roman numerals.

Starter activity

A cup final is watched by **63,482** fans. Say the number out loud: "sixty-three thousand, four hundred and eighty-two". Now imagine the crowd grows by 10,000. Which digit changes? Then imagine it grows by 100. Which digit changes this time? Keep these questions in mind as you read.

Reading and writing numbers up to 1,000,000

Definition: place value

The **place value** of a digit is the value it has because of where it sits in the number. In 345,678 the digit 5 is in the ten-thousands place, so it is worth 50,000. The same digit in 5,678 is worth 5,000.

Key fact: the columns

Moving one place to the left makes a digit **ten times bigger**. Moving one place to the right makes it ten times smaller. The six columns of a number below one million are hundred thousands (HTh), ten thousands (TTh), thousands (Th), hundreds (H), tens (T) and ones (O). One million is ten hundred thousands, so it needs a seventh column.

HTh	TTh	Th	H	T	O
3	4	5	6	7	8

The chart shows 345,678. We read it as **three hundred and forty-five thousand, six hundred and seventy-eight**.

Method: reading a big number

1. Put the digits into a place value chart, or look for the commas. Commas split a number into groups of three digits.
2. Read the group before the first comma as a number and then say the word "thousand".
3. Read the last group of three digits as an ordinary number.
4. Say "and" before the tens and ones, for example "six hundred and seventy-

eight".

Example 1

Write 207,059 in words.

The groups are 207 and 059. The first group is "two hundred and seven" thousand. The last group is "fifty-nine". So the number is **two hundred and seven thousand and fifty-nine**. The zero in the hundreds column of the last group is simply not read out.

Watch out

A zero is a place holder. 400,005 and 45 are very different numbers! Never leave out a zero when you write a number in figures. "Four hundred thousand and five" has zeros in the ten-thousands, thousands, hundreds and tens places.

Partitioning and the value of a digit

Definition: partitioning

To **partition** a number means to split it into parts according to place value. For example 482,359 = 400,000 + 80,000 + 2,000 + 300 + 50 + 9. The **value** of a digit is the digit multiplied by its place.

Example 2

What is the value of the 7 in 372,614? Write the number as a sum.

The 7 is in the ten-thousands column, so its value is 70,000. The number is 300,000 + 70,000 + 2,000 + 600 + 10 + 4.

Rule: adding and subtracting powers of ten

To make a number 10, 100, 1,000, 10,000 or 100,000 more or less, change only the digit in that column. Look for a carry. For example 10,000 more than 396,215 is 406,215 because the ten-thousands digit 9 becomes 10, so one is carried into the hundred thousands.

Comparing and ordering

Method: comparing numbers

1. Count the digits. The number with more digits is bigger (if there is no leading zero).

2. If they have the same number of digits, compare the digits one column at a time from the left.
3. The first column where the digits differ decides which number is bigger.
4. Use the symbols < (less than), > (greater than) and = (equal to). The open mouth faces the bigger number.

Example 3

Put in order, smallest first: 438,205, 438,025, 84,382, 438,250.

84,382 has only five digits, so it is the smallest. The other three all start 438, so compare the thousands, hundreds, tens: 438,025 < 438,205 < 438,250. The order is **84,382; 438,025; 438,205; 438,250**.

Rounding

Definition: rounding

Rounding means replacing a number by a nearby, simpler number. We round to the nearest 10, 100, 1,000, 10,000 or 100,000. The rounded number is an **estimate**, so we use the sign ≈ (is approximately equal to).

Method: rounding to the nearest 1,000

1. Underline the digit in the thousands column.
2. Look at the digit to its right, in the hundreds column.
3. If that digit is 5 or more, round up: add one to the thousands digit.
4. If it is 4 or less, round down: keep the thousands digit.
5. Replace all digits to the right with zeros.

Example 4

Round 68,572 to the nearest 10, 100, 1,000 and 10,000.

Nearest 10: the ones digit is 2, so round down to **68,570**. Nearest 100: the tens digit is 7, so round up to **68,600**. Nearest 1,000: the hundreds digit is 5, so round up to **69,000**. Nearest 10,000: the thousands digit is 8, so round up to **70,000**.

Watch out

A number halfway between two multiples rounds up. So 2,500 rounds to 3,000 to the nearest 1,000. Also remember that rounding can change several digits at once, as in 69,999 rounded to the nearest 10 which is 70,000.

Note

When we round to the nearest 10,000, every number from 65,000 up to 74,999 becomes 70,000. The smallest whole number that rounds to 70,000 is 65,000 and the largest is 74,999.

Counting in steps, negative numbers and Roman numerals

Rule: counting in steps of powers of ten

When you count in steps of 10,000, only the ten-thousands digit changes (apart from carries). For example 235,000; 245,000; 255,000; 265,000. When you count backwards through zero you meet **negative numbers**, which are numbers below zero such as −3 or −12.

Example 5

The temperature at night is −4°C. By midday it has risen by 9 degrees. What is the temperature at midday?

Start at −4 on a number line and count up 9: 4 steps reach 0, and 5 more steps reach 5. The temperature is **5°C**.

Definition: Roman numerals

Roman numerals use letters for numbers: I = 1, V = 5, X = 10, L = 50, C = 100, D = 500 and M = 1,000. When a smaller letter comes before a larger one, subtract it, so IV = 4 and IX = 9. Otherwise add the values.

Example 6

Write 1,994 in Roman numerals.

1,994 = 1,000 + 900 + 90 + 4. That is M + CM + XC + IV, so the answer is **MCMXCIV**.

Did you know?

The Romans had no symbol for zero, so they could not write a place value chart. Our digits 0 to 9 came to Europe from India through the Arab world more than 800 years ago. The zero made place value, and every big number in this lesson, possible.

Otto's tip

Always say the number out loud as you write it. If you cannot say "three hundred and forty-five thousand" you may have put a digit in the wrong column. Use the commas to help you.