Chapter 2: Numeration

Lesson 1 - Representing Numbers in the Millions
Learning Goals: Represent and describe numbers in the millions using a place value chart.

Question:

The chart below shows the value of Canadian retail sales in a month.

Canadian Retail Sales

Products	Sales ($)
Home electronics, computers, and cameras	507 036 000
Toys, games, and hobby supplies (includes electronic games)	105 199 000
Telephones and home office electronics	33 668 000

a) How do you know that the value of home electronics, computers, and cameras is more than $100 million but that the amount for telephones and home office electronics is less than $100 million?
b) Which number is about five times the value of another number in the chart? How do you know?
c) How do you know that the value for retail sales for toys, games, and hobby supplies is more than twice the value for telephones and home office electronics?

Answer:

a) For example, I wrote these values in a place value chart. I estimated that the value of home electronics, computers, and cameras is about $500 million and that the value of telephones and home office electronics is about $30 million. $500 million is more than $100 million, and $30 million is less than $100 million.

Millions			Thousands			Ones		
H	T	O	H	T	O	H	T	O
5	0	7	0	3	6	0	0	0
	3	3	6	6	8	0	0	0

b) The value of home electronics, computers and cameras is about five times the value of toys, games, and hobby supplies. For example, I used a place value chart and estimated the value for home electronics, computers, and cameras to be $500 million and the value for toys, games, and hobby supplies to be about $100 million.

5 × $100 million = $500 million

c) For example, 2 times 34 million is 68 million, and 105 million is a lot more than 68 million.

**Lesson 3 - ** Solving Problems That Involve Large Numbers
Learning Goals: Represent and describe numbers in the millions using a place value chart.

Question:

About 615 000 households in Canada use only a cellphone. Suppose each household pays $573 each year for a cellphone plan.

a) Estimate the amount spent in total on cellphones by these households. Explain your thinking.

b) Calculate the amount spent. Compare the calculated amount with your estimate.

Answer:

a) For example, $573 is close to $600 and 615 000 is close to 600 000. I can multiply 600 × 6 hundred thousand to get 3600 hundred thousands. I can write 3600 in a place value chart and then move over two spaces for the hundred and a period for the thousand. I get 360 000 000.

Millions			Thousands			Ones		
H	T	O	H	T	O	H	T	O
					3	6	0	0
3	6	0	0	0	0	0	0	0

b) $352 395 000; the answer is reasonable because it's close to 360 000 000.

Lesson 4 - Renaming Number

<mark>**Learning Goals:**</mark> Represent and describe numbers in the millions using a place value chart.

Question:

In a recent census, the population of the Philippines was 88 574 614, the population of Thailand was 63 038 247, and the population of Malaysia was 27 452 527.

a) Write an estimate for each population using decimal millions with one decimal place.

b) Write an estimate for each population using decimal millions with two decimal places.

c) Why might these numbers be written in standard form instead of as decimal millions?

Answer:

a) Philippines: 88.6 million; Thailand: 63.0 million; Malaysia: 27.5 million

b) Philippines: 88.57 million; Thailand: 63.04 million; Malaysia: 27.45 million

c) For example, we might want to track the population growth for each country over the next few months, and that growth might be in the ten thousands instead of the millions. Writing the population in decimals might make it harder to compare the monthly growth.

At-Home Help

You can represent numbers greater than 1 million using estimates with decimals.

For example,

• 1 237 928 is about
  1.2 million or 1.24 million

• 7 381 290 is about
  7.4 million or 7.38 million

• 4 973 472 is about
  5.0 million or 4.97 million

Lesson 5 - Communicating about Large Numbers
Learning Goals: Represent and describe numbers in the millions using a place value chart.

Question:

a) Use magazines, newspapers, or the Internet to find some facts or measurements that include large numbers. Create a multiplication or division problem.

b) Write a solution to your problem. Explain your thinking for each step.

Answer:

a) For example, the book *Harry Potter and the Half-Blood Prince* has 168 923 words. Approximately how many words are in the whole series of seven Harry Potter books?

b) For example, the books are of different lengths, but I am assuming that the seven books each have about the same number of words. To estimate, I will say that the number of words in *Harry Potter and the Half-Blood Prince* is about 170 000. Then I will multiply 170 000 by 7. $170\,000 \times 7 = 1\,190\,000$. There are about 1 million 190 thousand words in the seven-book series.

Lesson 6 - Representing Millionths
<mark>**Learning Goals:**</mark> Represent and describe numbers in the millions using a place value chart.

Question:

The chart to the left shows the amount of PCBs found in every million parts of marine life.

PCBs in Marine Life

Animal or fish	PCBs in one million parts
beluga whales	79
ringed seals	77
catfish	2
salmon	1

a) Write each number the way you would read it.
b) Write each number using decimals.
c) How do you know that the total amount of PCBs in these four animals or fish is about twice the amount in beluga whales?

Answer:

a) For example, beluga whales: 79 millionths; ringed seals: 77 millionths; catfish: 2 millionths; salmon: 1 millionth

b) beluga whales: 0.000079; ringed seals: 0.000077; catfish: 0.000 002; salmon: 0.000001

c) For example, if I add 77 millionths to 2 millionths, I get 79 millionths, which is the same amount as beluga whales. So the amount of PCBs in ringed seals, catfish, and beluga whales is twice that of beluga whales. If I add 1 millionth to the total of the ringed seals, catfish, and beluga whales, it will be a small amount more than twice that of beluga whales.

Lesson 8 - Using Decimals
Learning Goals: Represent and describe numbers in the millions using a place value chart.

Question:
Order these decimal numbers from greatest to least.
0.000 24, 0.000 050, 0.000 243, 0.000 35

Answer:
0.000 35, 0.000 243, 0.000 24, 0.000 050

At-Home Help

Here are two ways to compare decimals less than one thousandth:
- Write the decimals in a place value chart. Then compare the value of the digits.
- Rewrite the decimals as you would say them. For example, 0.000 02 becomes 20 millionths, and 0.000 012 becomes 12 millionths. Then compare the values.