**Number Sense**

**Getting a Feel for “BIG” numbers**

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**Instructor Notes**

By Trey Cox

**Overview of Lesson:**

Understanding the magnitude of very small and very large numbers can be quite challenging for students to wrap their minds around. However, in today’s media numerical quantities that are both quite large (such as the size of the memory available of computers) or small (the speed of computers) confront us on a daily basis. Therefore, it is important for mathematical and practical reasons to have a solid understanding of such numbers.

This lesson includes the following documents:

* Student Activity
* Instructor Notes

**Common Core Standard(s) Addressed:**

CCSS.Math.Content.8.EE.A.3  
Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. For example, estimate the population of the United States as 3 times 108 and the population of the world as 7 times 109, and determine that the world population is more than 20 times larger.

CCSS.Math.Content.8.EE.A.4  
Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology

Good number sense is fundamental for success in estimation, approximation, and problem solving. We need to develop a sense of large numbers because newspaper and television news reports contain many references to large quantities. The federal budget is expressed in billions and trillions of dollars, space distances in millions of light years or trillions of miles, computer speeds in nanoseconds (1 nanosecond = 1 billionth of a second), computer storage memory in gigabytes (1 gigabyte = 1 billion bytes), world populations in millions and billions of individuals, and nuclear weapons in millions of tons of TNT. Clearly the average citizen needs a well-developed sense of large numbers to understand many of the news items that invade our homes. Large-number concepts are appropriate for development in upper elementary, secondary school, and college.

Understanding the numbering system and the naming convention is a prerequisite for understanding large numbers. Once students are familiar with the numbering system and naming convention, period names of larger numbers can be explored. Students often ask questions such as: What (number) comes after that? What is the largest number (name) you know? How can I get my mind around how BIG that number really is?

1. **$787,000,000,000 – How much is that?**

Signing Stimulus, Obama Doesn’t Rule Out More



Ruth Fremson/The New York Times

President Obama, with Vice President Joseph R. Biden Jr., signed the $787 billion stimulus bill at the Denver Museum of Nature and Science on Tuesday.

* + [Linkedin](http://www.nytimes.com/2009/02/18/us/politics/18web-stim.html?_r=1)
  + [Digg](http://www.nytimes.com/2009/02/18/us/politics/18web-stim.html?_r=1)
  + [Facebook](http://www.nytimes.com/2009/02/18/us/politics/18web-stim.html?_r=1)
  + [Mixx](http://www.nytimes.com/2009/02/18/us/politics/18web-stim.html?_r=1)
  + [My Space](http://www.nytimes.com/2009/02/18/us/politics/18web-stim.html?_r=1)
  + [Yahoo! Buzz](http://www.nytimes.com/2009/02/18/us/politics/18web-stim.html?_r=1)
  + [Permalink](http://www.nytimes.com/2009/02/18/us/politics/18web-stim.html?_r=1)

By [SHERYL GAY STOLBERG](http://topics.nytimes.com/top/reference/timestopics/people/s/sheryl_gay_stolberg/index.html?inline=nyt-per) New York Times Published: February 17, 2009

DENVER — President Obama has not ruled out a second stimulus package, his press secretary, Robert Gibbs, said on Tuesday, just before Mr. Obama signed his ***$787 billion*** recovery package into law with a statement that it would “set our economy on a firmer foundation.” [Skip to next paragraph](http://www.nytimes.com/2009/02/18/us/politics/18web-stim.html?_r=1#secondParagraph) The president said he would not pretend “that today marks the end of our economic problems.”

“Nor does it constitute all of what we have to do to turn our economy around,” Mr. Obama said at the signing ceremony in the Denver Museum of Nature and Science. “But today does mark the beginning of the end, the beginning of what we need to do to create jobs for Americans scrambling in the way of layoffs.”

Mr. Gibbs, speaking to reporters aboard Air Force One on the way to Denver, said, “I think the president is going to do what’s necessary to grow this economy.” While “there are no particular plans at this point for a second stimulus package,” he added, “I wouldn’t foreclose it.”

Mr. Obama began the first leg of a two-day trip, using the museum ceremony to spotlight the bill’s clean-energy provisions. The president will also visit Phoenix, where he will unveil his new housing plan on Wednesday.

After a bruising legislative battle on the stimulus bill, which drew only three supporting votes from Republicans in the Senate and none in the House, the White House is trying to recapture the debate over the economy. Mr. Obama’s message is that the bill will create or save 3.5 million jobs over the next two years.

While the bill has been criticized by conservatives as bloated with pork-barrel spending, it has also been criticized by the left as too tepid and not bold enough to jumpstart the economy. Mr. Gibbs’s remarks on the plane seemed to echo that concern.

The Denver-Phoenix swing is meant to put the spotlight on the difficulties faced by ordinary Americans around the country. In Denver, the unemployment rate jumped to 6.3 percent at the end of last year from 5.8 percent in November. The city has been hard-hit by foreclosures — in December, metropolitan Denver had more foreclosures than regular home sales — and so has Phoenix.

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Let’s get our mind around this figure:

* How many days (and years) ago would America have had to begin spending $1,000,000 per day to equal the amount of the stimulus package of $787,000,000,000?

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* If you had $787,000,000,000 how many of your friends, neighbors, acquaintances, and random strangers could you make millionaires?

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* There are approximately 305,000,000 people living in the United States. If every person paid the same amount, how much money would every person (man, woman, and child) have to pay to cover the $787,000,000,000?

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* If you were to count the $787,000,000,000 of the stimulus package one dollar at a time at a rate of $1 per second, how long would it take you to count it all? How many days? years?

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**II. Wow! That’s a lot of ants!**



**Here are some very interesting ant facts found at www.helpinganimals.com**

1. ***With their combined weight greater than the combined weight of all humans*, ants are the most numerous type of animal.**
2. **Strong in relation to their size, ants can carry 10 to 20 times their body weight.   They work in teams to move extremely heavy things.**
3. **Ant brains are largest amongst insects.  Mushroom shaped brain appendages have function similar to the gray-matter of human brains.**
4. **It has been estimated that an ant's brain may have the same processing power as a Macintosh II computer.**



***Your mission…***

**is to explore the validity of the first fact (that the *combined weight of ants is greater than the combined weight of all humans*). To do this, you will work to answer the following questions:**

**1. Assuming, initially, that the combined weight of ants is equal to the combined weight of all humans, how many ants are there on Earth? How many times larger is the ant population than the human population?**

***We assume the weight of one ant is 0.003 grams, the average person weighs 62 kg, and there are 7,195,095,270 people living as of 10/2014. (Information found from online resources) Total weight would be:* *. To find out how many ants we divide by the weight of one ant 0.003 grams:* *ants. The ant population would be* *times larger than the human population.***

**2. Imagine that you could take all of the ants on Earth and stack them up, head to rear. How high would the stack be in feet? In miles?**

***There are* *ants and if each ant is 5 mm long (found from online resource) then the height would be:*  *tall. This would be* **

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**You will present your findings in 30 minutes. You must state all assumptions and all assumptions must be backed up by logical reasoning and facts. That is, if need to know how much one ant weighs, you cannot just “make it up”. You must conduct some research and base this assumption on logical reasoning and facts.**

