SELECTED SOLUTIONS AND COMMENTS FOR TASKS

Grade 8 – Number Sense, Exponents

Tasks are intended to serve different purposes. When appropriate, students are encouraged to make choices, think strategically, and explain their reasoning. This document contains answers to selected problems. When answers vary, we try to offer an example when possible. When not possible, we describe what a student response could look like. The solutions in this document are not meant to represent an exhaustive list of suitable answers.

Problem of 4s (number sense)	
	Solutions to this problem are widely accessible on the internet. This provides a good opportunity to discuss appropriate use of tools in the class. http://www.mathsisfun.com/puzzles/four-fours-solution.html

How Much is a Million? A Billion? A Trillion? (number sense - exponents)	
1	(There is a typo in some versions of this task. There are 60 minutes in an hour, not 60 days.) Be sure students predict before answering questions. Answers may vary.
2	31,500,000
3	Thirty-one million, five hundred thousand
4	3.15×10^7
5	1×10^6
6	1×10^9
7	1×10^{12}
8	11.7 days is about $\frac{3}{100}$ of a year.
9	31.7 years
10	31,700 years
11	Answers will vary
12	1 million seconds ago → 12 days ago. → Answers will vary. 1 billion seconds → 32 years ago. → Answers will vary. 1 trillion seconds ago → 31,000 years ago → prehistoric times. Students may find it interesting to research on the internet events that occurred during these times.

The National Debt (number sense - exponents)	
1	About 17 trillion dollars (see national debt clock). All figures from 2013.
2	$17,000,000,000,000
3	Seventeen trillion dollars
4	1.7×10^{13}
5	Population of the US is about 317,000,000 people.
6	320,000,000
7	Three hundred twenty million people.
8	3.2×10^8
9	$53,000
10	Answers will vary.

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Digital Memory (number sense - exponents)	
1	1×10^{3}
2	1×10^{-9}
3	1×10^{6}
4	1×10^{-12}
5	2000 songs
6	Terabyte hard drive holds 2 times more data.
7	About 2.5 megabytes per photo.

Hit the Jackpot with a Catch (number sense / estimation)	
	To help scaffold this task, consider the following series of questions. ***250 sheets of paper in a ream of paper are about 2 inches. This is one place to start when estimating. Is this a good estimate for thickness? overestimate? underestimate?*** Here is a followup question to ask. Students may want to generate their own followup questions to explore as well. The suitcase question: ***If a carry-on airline suitcase cannot exceed 22 in x 14 in x 9 in, will $1M in $100 bills fit in the suitcase?*** Yes. If a bill is a little more than 2.5 in x 6 in, one stack of 8 inches tall will be 1000 bills. 1000 * $100 = $100,000. 10 stacks will easily fit in a suitcase. However, if you got the money in $10 bills, it would require 50 stacks. You will have to check your luggage and hope that TSA does not open it up! Read more about this task at: http://wiki.answers.com/Q/How_tall_is_1_million_dollars_in_100_dollar_bills#ixzz25RoHh6fr

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Sea Floor Spreading (number sense / estimation)	
1	1 meter = 1000 millimeters, so # years = mm/(mm/yr) = 1000/25 = 40. Or argue that 25 mm is one 40^{th} of a meter, so each year the plates move one 40^{th} of a meter apart, and it will take 40 years for the plates to move one meter apart.
2	One inch is approximately 2.54 cm = 25.4 mm. Thus the rate of spreading is about one inch per year.
3	Answers may vary. The diagonal is just barely less than 14 in., so the student would have to be under 14 years old.
4	The plates move apart about 100 years x 25 millimeters = 2500 mm = 2.5 meters. Since each meter is a little less than 40 inches, this comes out to a little less than 100 inches, or approximately 8 feet.
5	Since the plates move a meter in 40 years, they move 1600 meters (about a mile) in about 64,000 years. Thus they would move apart another 4,500 miles in approximately (64,000)(4500) = 300,000,000 years. (That's a long time.) Or 4500 mi ≈ 7,200,000,000 meters and 25mm = 0.025 m, so 7,200,000,000 meters / 0.025 meters per year = 288,000,000 years.