
Scientific Paper Folding

ID: 11497

Time Required
45 minutes

Activity Overview

This activity gives students an opportunity to see where large and small numbers are used and how scientific notation offers a convenient method of writing such numbers.

Topic: Numbers and Operations

- *Understand numbers, ways of representing numbers, relationships among numbers, and number systems*
 - *Develop an understanding of large numbers and recognize and appropriately use exponential, scientific, and calculator notation*
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Teacher Preparation and Notes

- *TI-Navigator is not required for this activity, but an extension is given for those teachers that would like to use it.*
- ***To download the student worksheet and navigator files, go to education.ti.com/exchange and enter “11497” in the quick search box.***

Associated Materials

- *MGAct06_Scientific_worksheet_TI73.doc*
- *MGAct06_Scientific_LrnChk.edc*
- *L_1_.73I (list L1)*

Suggested Related Activities

To download any activity listed, go to education.ti.com/exchange and enter the number in the quick search box.

- *The Large and Small Number Game (TI-73 Explorer with TI-Navigator) — 6673*
- *Light Years Away (TI-30xa, TI-30xIIB, TI-30X IIS, TI-34 II Explorer Plus) — 5253*
- *So Many Zeros (TI-30XS MultiView) — 8351*

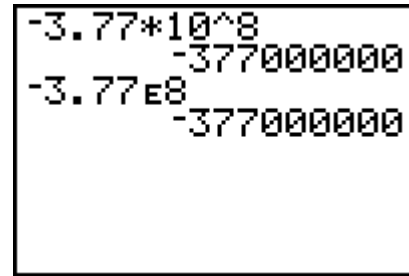
Problem 1 – Writing Scientific Notation in Expanded Form

Help students understand the form for scientific notation.

To check -3.77×10^8 , enter their answers and see if it matches the original.

Students can enter scientific notation numbers two different ways, using 10 or E.

1. (-) 3 . 7 7 × 1 0 ^ 8
2. (-) 3 . 7 7 2nd ^ 8



Problem 2 – Writing Numbers in Scientific Notation

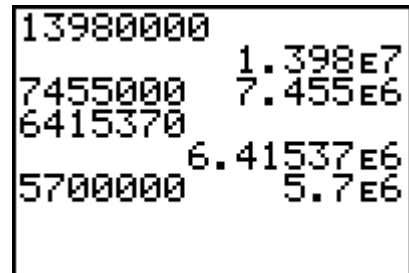
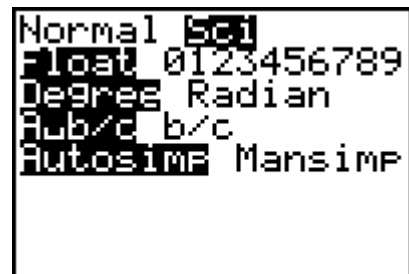
Questions 5 & 6

Students can change the TI-73 mode to “Sci” to convert numbers to scientific notation. To change the mode, press [MODE] and ▸ to move to **Sci**, then press [ENTER].

The answer will appear with an E. Explain to students that this represents $\times 10$ and the number that follows the E is the exponent.

Students should not enter the commas into the calculator when converting the salaries.

Discuss with students how to compare numbers with the exponent. What is different between Carson’s salary and Stacy’s?



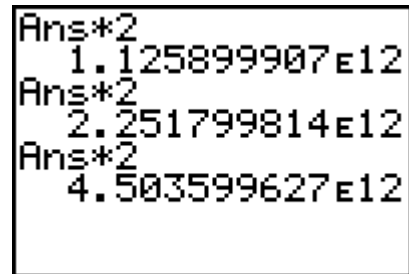
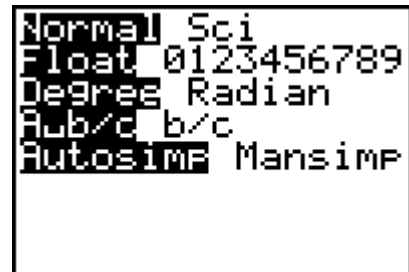
Questions 7 & 8

Students need to change the calculator mode to **Normal** by pressing [MODE] [ENTER] 2nd [MODE].

Students can fold a piece of paper in half to understand how the thickness doubles. Ensure students understand that the $\times 2$ represents the doubled thickness.

The key presses for the screen to the right are 0 . 0 0 4 [ENTER] × 2 [ENTER] [ENTER] [ENTER]. Continue pressing [ENTER] to solve the problem. They will need to count how many times they press enter.

They do not count the first entry as a paper fold.



Extension – TI-Navigator™

1. Open the LearningCheck™ file **MCAct06_Scientific_Nav_TI-73.edc** on the computer. Drag the window divider so the questions in the right column cannot be seen by the students. Highlight the first question and click File, Send, Item as Quick Poll. This will reveal the LearningCheck™ question in the Poll Prompt window of Quick Poll.

Tell students to read the question, agree on an answer, and submit the answer as quickly as possible. When all answers have been received, click Poll Details and Show Student Names. Use the Time Stamp feature to decide which team submitted the correct answer first and award that group 1 point. Repeat this procedure for each question and tally points at the end to determine a winning group.

2. For Questions 7 and 8, use **Quick Poll** or **Screen Capture** to gather student guesses of what the answers may be.

3. Send L1 to students and have them place the numbers in order from least to greatest. The list is a categorical list so the calculator treats the numbers as text. Make sure students understand that some of the numbers may be converted between scientific notation and expanded form.

| L1 | c | L2 | L3 | 1 |
|--------------|---|-------|-------|---|
| 3744 | | ----- | ----- | |
| -5.2E3 | | | | |
| 4.8E-1 | | | | |
| .0541 | | | | |
| 8.6E7 | | | | |
| ----- | | | | |
| L1(1)=2 E -6 | | | | |

To create additional lists or change L1, use "" around the first element. This will ensure the numbers are treated as text. The quotation can be found by pressing

2nd **MATH**. Use the arrows to move over " and press **ENTER**.

4. Use **Screen Capture** regularly to assess student progress and understanding.

Solutions to Student Worksheet

Problem 1

1. -377,000,000
2. 0.000004224
3. 120,200
4. -0.00000000000524

Problem 2

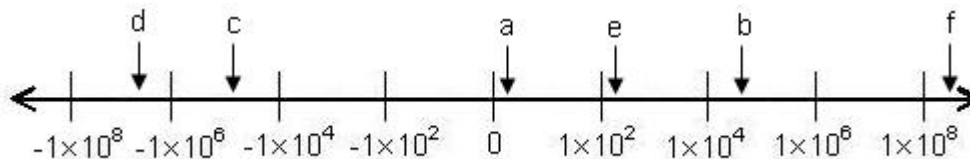
5.

| Player | Salary | Scientific Notation |
|---------------|--------------|------------------------|
| Carson Palmer | \$13,980,000 | 1.398×10^7 |
| Stacy Andrews | \$7,455,000 | 7.455×10^6 |
| Chad Johnson | \$6,415,370 | 6.41537×10^6 |
| Antwan Odom | \$5,700,000 | 5.7×10^6 |
| Levi Jones | \$5,266,666 | 5.266666×10^6 |

6. Students should notice that the exponents have a difference of 2. The football salaries are more than 100 times the median income.

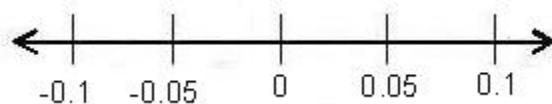
7. 4.504×10^{10}
8. 45,040,000,000,000
9. 9.095×10^{-13}
10. 0.0000000000009095

Problem 3



11.

12. All the numbers are between -1 and 1. The larger the negative exponent, the closer the number is to zero. A possible number line is given.





Problem 1 – Writing Scientific Notation in Expanded Form

Scientific notation is a way of writing very large and very small numbers. Numbers in scientific notation include two parts, a number greater than or equal to 1 and less than 10, and a power of 10. Examples include:

$$5.6 \times 10^5 = 5,600,000 \quad \text{and} \quad 2.3 \times 10^{-8} = 0.00000023$$

Write each of the following numbers in expanded notation. Check your answer with a calculator.

1. -3.77×10^8

Write the answer. _____

3. 4.224×10^{-6}

Write the answer. _____

2. 1.202×10^5

Write the answer. _____

4. -5.24×10^{-12}

Write the answer. _____

Problem 2 – Writing Numbers in Scientific Notation

To write numbers in scientific notation, place a decimal point so there is one non-zero digit to the left. Count the number of decimal places the decimal point moved. The number of places the decimal point moves to the left is the positive exponent power of 10. The number of places the decimal point moves to the right is the negative exponent power of 10.

$$156,000,000 = 1.56 \times 10^8 \quad \text{and} \quad 0.0000045 = 4.5 \times 10^{-6}$$

5. The following are salaries for the 5 top paid players of the Cincinnati Bengals. Write each salary in scientific notation.

| Player | Salary | Scientific Notation |
|---------------|--------------|---------------------|
| Carson Palmer | \$13,980,000 | |
| Stacy Andrews | \$7,455,000 | |
| Chad Johnson | \$6,415,370 | |
| Antwan Odom | \$5,700,000 | |
| Levi Jones | \$5,266,666 | |

6. The 2007 median American household income was $\$5.0233 \times 10^4$. How does this compare to the salaries above? _____

7. Imagine you could fold a piece of paper 0.004 inches thick 50 times. About how many inches thick would the resulting paper be after the 50th fold?

```
0.004      .004
Ans*2      .008
Ans*2      .016
Ans*2      .032
```

To solve, type 0.004 on the home screen and press **ENTER**. Then, type **2** **ENTER**. Each time **ENTER** is pressed, the previous value is doubled.

8. What is the answer in expanded form? _____

9. What is the percent chance of flipping a coin 40 times and having it come up heads each time?

```
0.5        .5
Ans*.5     .25
Ans*.5     .125
Ans*.5     .0625
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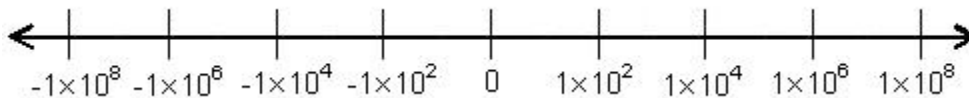
To solve, type 0.5 on the home screen and press **0.5** **ENTER**. Each time **ENTER** is pressed, the previous value is multiplied by 0.5. This shows the probability of heads three times in a row, four times in a row, etc.

10. What is the answer in expanded form? _____

Problem 3 – Ordering Numbers in Scientific Notation

11. Place the following numbers on the number line. After placing them on the number line, switch with a partner to check answers.

- | | | |
|--------------------------|------------------------|-----------------------|
| a. 1.25×10^{-3} | c. -4.45×10^4 | e. 1.8×10^2 |
| b. 5.5×10^4 | d. -3.11×10^6 | f. 7.79×10^8 |



12. Draw an appropriate number line for the following numbers. Explain your choice.

- | | | |
|-----------------------|------------------------|------------------------|
| 2.25×10^{-3} | -1.05×10^{-4} | 5.603×10^{-2} |
|-----------------------|------------------------|------------------------|
