

## Measurements / Matching

1. Distance between the sun and the earth in miles.
2. The population of New York City.
3. The length of a marathon in inches.
4. The number of square miles in Pennsylvania.
5. Number of atoms in 1 gram of hydrogen.

- a. 1,650,000
- b. 93,000,000
- c. 46,000
- d. 8,300,000
- e. 602,000,000,000,000,000,000,000

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## Scientific Notation

1. Move decimal place behind 1st significant digit.
2. Count # of places it moved.
3. Moves left? (large #) The exponent of 10 is +.  
Moves right? (small #) The exponent of 10 is -.

Examples (# → SN)

Examples (SN → #)

1,650,000

$3.68 \times 10^4$

0.0032

$1.6 \times 10^{-1}$

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## How Science Differs from Math

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### Science vs. Math

- Math involves EXACT numbers.
- Science involves MEASUREMENTS which are uncertain.

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Consider the number “5”

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5 Pencils



Exactly 5! Can be written 5.0000000000.

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### 5 Apples



Exactly 5! Can be written 5.0000000000.

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### 5 grams of salt?



Measuring devices (scales, rulers, etc.) do not take exact measurements.

The salt has a mass of APPROXIMATELY 5 grams. It could be 5.001 or 5.03 etc.

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### To summarize...

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|----------|-----------------------|
| • Math   | • Science             |
| Counting | Measurements          |
| Exact    | Not exact (uncertain) |

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We need a new way to do calculations in Science.

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**Significant Figures**

- Deal with uncertainties in measurements.

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**Rules for Counting Sig. Figs.**

1. Nonzero integers are always significant.
2. Zeros:
  - a. Leading zeros - never significant
  - b. Captive zeros - always significant
  - c. Trailing zeros - only significant if there is a decimal point (anywhere).

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**Multiplication/Division Rules**

1. Identify the term with the smallest # of significant figures - this is limiting.
2. Solve for the answer and round it so it has as many significant figures as the limiting term.

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**Addition/Subtraction Rules**

1. Identify the term with the smallest # of decimal places - this is limiting.
2. Solve for the answer and round it so it has as many decimal places as the limiting term.

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