 Scientific Notation

& Approximating Square Roots

### express numbers in scientific notation, including negative exponents, in appropriate problem situations

Numbers written in scientific notation have two factors. The first factor is a number between 1 and 10. The second factor is a power of 10.

***change from standard form to scientific notation***

**Step 1**: Move the decimal point so there is one non-zero digit to the left of the decimal point (*a number* ***greater*** *than* ***1*** *and* ***less*** *than* ***10****).*

Example: Given:  4,750,000 use: 4.75

**Step 2:** Count the number of decimal places the decimal has "moved" from the original number.  This will be the exponent of the 10.

Example: 4,750,000 to 4.75 *(moved* ***6*** *decimal places)*

 answer:  **4.75 X 106**

***The original number was greater than 1 so the exponent is positive.***

\*\*\*If the original number was ***less than 1***, the exponent is ***negative.***

Example: Given:  0.000789 use: 7.89

0.000789 to 7.89 (moved 4 decimal places)

answer:  **7.89 x 10-4**

***The original number was less than 1 so the exponent is negative.***

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| --- | --- |
| Planet | Average distance from the sun (km) |
| Earth | 150 million |
| Jupiter | 779 million |
| Mars | 228 million |
| Mercury | 57 million |
| Neptune | 4500 million |
| Saturn | 1430 million |
| Uranus | 2880 million |
| Venus | 108 million |

**STAAR Practice**

In science class, Misty was learning about the solar system. She wanted to write a report about the distance of each planet from the Sun. She found a table that displays this information.

Write the distance of the planet furthest from the Sun in scientific notation.

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***change from scientific notation to standard form***

Move the decimal point to the ***right*** for a ***positive*** exponent of **10**.

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| --- |
| Example: Given:  5.024 x 103 |
| **answer:**  **5,024** (**3** places to the **right**) | Positive exponent - move the decimal to the **right**. |

**\*\*\*Hint: A positive exponent tells you the standard form will be greater than 1.**

Move decimal point to ***left*** for ***negative*** exponent of **10**.

|  |
| --- |
| Example: Given:  1.015 x 10-8 |
| **answer:** **0.00000001015** (**8** places to the **left**) | Negative exponent - move the decimal to the **left**. |

**\*\*\*Hint: A negative exponent tells you the standard form will be less than 1.**

**STAAR Practice**

The unit price of 1 ounce of Biff creamy peanut butter is $0.094. How would this value be written in scientific notation?

A. $0.94 × 10^{-1}$

B. $9.4 × 10^{2}$

C. $9.4 × 10^{1}$

D. $9.4 ×10^{-2}$

The equatorial diameter or the Earth is 7,926.6 miles. How would this distance be represented in scientific notation?

A. $7.9 × 10^{3}$

B. $7.9266 × 10^{3}$

C. $7.999999266 × 10^{-3}$

D. $7.9266 × 10^{-3}$

**Approximating Square Roots**

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Sixteen tiles make a square with four tiles on a side.

* The square of 4 is 16.

4 units



* The square root of 16 is 4 because $4^{2}=16.$

$\sqrt{16}=4$

4 units

Numbers that can form squares are perfect squares.

Their square roots are whole numbers.

 $1^{2}=1$ $2^{2}=4$ $3^{2}=9$

 $\sqrt{1}=1$ $\sqrt{4}=2$ $\sqrt{9}=3$

Whole numbers that are not perfect squares still have square roots.  However, their square roots are not whole numbers; they are decimals or fractional parts of whole numbers. The non-terminating, non repeating decimals are called **irrational numbers**.



You can estimate square roots for numbers that are not perfect squares by using the calculator.

Estimate  Estimate $\sqrt{97}$

Graph these numbers on the number line.



**STAAR Practice**







6.

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