Created by Mr. Lischwe

Warmup 1/ (2.3×10^{1})

Put the values in order from least to greatest. Show at least a little work for each value.

A: $\frac{17}{4}$ **B.** $(-3)^2$ **C.** $\pi+4$ **D.** $\frac{2}{3}\cdot 6$ **E.** $\sqrt{24}$

Changing Enrichments…

Plan:

Rest of this week: Scientific notation

Next week: Calculations & Story Problems using Scientific notation

Test at the end of next week

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Scientific Notation

Objectives:

- Review scientific notation
- Understand mathematically WHY scientific notation works the way it does

POP QUIZ (not graded)

1. 4 x 10
2. 68 x 100
3. 3.2 x 10
4. 3.2 x 100
5. 9.251 x 10
6. 97 ÷ 10
7. 3 ÷ 10
8. 0.2 ÷ 10
9. 52.5 ÷ 10
10. 7 ÷ 100

Answers

1.	4 x 10	**40**
2.	68 x 100	**6800**
3.	3.2 x 10	**32**
4.	3.2 x 100	**320**
5.	9.251 x 10	**92.51**
6.	97 ÷ 10	**9.7**
7.	3 ÷ 10	**.3**
8.	0.2 ÷ 10	**.02**
9.	52.5 ÷ 10	**5.25**
10.	7 ÷ 100	**.07**

"Moving the decimal" tricks

- **When you multiply anything by ten, you can move the decimal 1 to the right, or just add a zero.**
- **When you divide anything by ten, you can move the decimal 1 to the left, or just take away a zero.**
- **<u>These tricks work because our number system is based off of tens!</u>**

What is the weight of the earth?

- Let's google "Weight of the earth"

Some really big numbers…

Distance from Earth to Pluto (miles)

2,660,000,000

Number of cells in your body (estimate)

37,200,000,000,000

Mass of the earth (kilograms)

5,972,000,000,000,000,000,000,000

A googol

10,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000

- We don't want to have to always write these big numbers out.
- Shorter way of writing 2,660,000,000?

Scientific Notation

$a \times 10^b$

- **"a" MUST be a number between 1 and 10**
- **"b" must be an integer (non-decimal)**

Have you ever done a really big problem in a calculator and it gave you something like this?

- **9.25E30**
  - This is the calculator's shorthand for scientific notation!
  - 9.25E30 means 9.25×10^{30}

Converting from Scientific to Standard Notation

Scientific Notation → Standard Notation

1. 9×10^4 **90,000**
2. 3.45×10^6 **3,450,000**
3. 9.1234×10^2 **912.34**
4. (leave 2 more blanks for later)
5. _____

Writing Numbers in Scientific Notation

Standard Notation → Scientific Notation:

1. 8,000,000 — 8×10^6
2. 75,000 — 7.5×10^4
3. 14005 — 1.4005×10^4
4. (leave 2 more blanks for later)
5. _____

COPY:

WHY SCIENTIFIC NOTATION WORKS

- 8.2×10^4 means to take 8.2 and multiply it by 10 four times.
- When you multiply anything by ten, you can move the decimal to the right.

ADVICE FOR UNDERSTANDING THIS:

- Scientific notation is ALL about multiplying and dividing by 10. “Moving the decimal” is only a trick.

COMMON MISTAKE ALERT:

- **"1.27×10^6" does <u>not</u> mean to put 6 zeroes.**

- **How many zeroes will it have?**

Some really small numbers…

- **Smallest size object your eye can see (meters)**

  0.0001

- **Diameter of a human hair (meters)**

  0.000025

- **Size of 1 water molecule (meters)**

  0.000000000275

Another way of writing this?

- 6×10^{-4}

$$\frac{6}{10^4}$$

You don't have to write it this way. I just showed you this to help you see **WHY** it works the way it does!!!

Negative Exponents in Scientific Notation

- 6×10^{-4} is like *dividing by ten* 4 times.
- When you divide anything by ten, you can move the decimal to the left.

DO NOT do this:

$$6^{-4}$$

$$6.$$

$$.0006$$

Why doesn't this work?

Converting from Scientific to Standard Notation

Scientific Notation → Standard Notation

1. 9×10^{4} — **90,000**
2. 3.45×10^{6} — **3,450,000**
3. 9.1234×10^{2} — **912.34**
4. **6.04×10^{-4}** — **.000604**
5. **8×10^{-3}** — **.008**

Writing Numbers in Scientific Notation

Standard Notation → Scientific Notation:

1. 8,000,000 — 8×10^{6}
2. 75,000 — 7.5×10^{4}
3. 1405 — 1.405×10^{3}
4. **.0000054** — 5.4×10^{-6}
5. **0.07** — 7×10^{-2}

"But Mr. Lischwe, they already are…aren't they?"

WRITE IN SCIENTIFIC NOTATION:

- 42×10^{3}
  - ↓
- 42000
  - ↓
- 4.2×10^{4}

- 0.875×10^{6}
  - ↓
- 875000
  - ↓
- 8.75×10^{5}

WRITE IN SCIENTIFIC NOTATION:

- 500×10^{-4}

- 0.05

- 5×10^{-2}

Homework

- **p. 55 (1 – 7, 10, 11, 13)**

- Look for examples of scientific notation in the world. If you see one, report it to the class!