Lesson 2.2 Adding and Subtracting in Scientific Notation (Day 2)

Objective

*Add and subtract numbers in scientific notation

- **Common Core State Standards** *8.EE.4*

Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size…Interpret scientific notation that has been generated by technology.

- **Mathematical Practices** 1.Solve problems/persevere 6. Attend to precision.

Lesson 2.2 Adding and Subtracting in Scientific Notation (Day 2)

Warm Up

*Take out homework

*Begin Practice 2-10 Scientific Notation

NAME _____ DATE _____ PERIOD ____

2-10 Study Guide and Intervention

Scientific Notation

A number in scientific notation is written as the product of a factor that is at least one but less than ten and a power of ten.

Example 1 Write 8.65×10^7 in standard form.

$8.65 \times 10^7 = 8.65 \times 10{,}000{,}000$ $10^7 = 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10$ or 10,000,000

$= 86{,}500{,}000$ Move the decimal point 7 places to the right.

Example 2 Write 9.2×10^{-3} in standard form.

$9.2 \times 10^{-3} = 9.2 \times \frac{1}{10^3}$ $10^{-3} = \frac{1}{10^3}$

$= 9.2 \times 0.001$ $\frac{1}{10^3} = \frac{1}{1{,}000}$ or 0.001

$= 0.0092$ Move the decimal point 3 places to the left.

Example 3 Write 76,250 in scientific notation.

$76{,}250 = 7.625 \times 10{,}000$ The decimal point moves 4 places.

$= 7.625 \times 10^4$ The exponent is positive.

Example 4 Write 0.00157 in scientific notation.

$0.00157 = 1.57 \times 0.001$ The decimal point moves 3 places.

$= 1.57 \times 10^{-3}$ The exponent is negative.

Exercises

Write each number in standard form.

1. 5.3×10^1
2. 9.4×10^3
3. 7.07×10^5
4. 2.6×10^{-3}
5. 8.651×10^{-2}
6. 6.7×10^{-6}

Write each number in scientific notation.

7. 561
8. 14
9. 56,400,000
10. 0.752
11. 0.0064
12. 0.000581

NAME _____ DATE _____ PERIOD ____

2-10 Practice

Scientific Notation

Write each number in standard form.

1. 9.03×10^2
2. 7.89×10^3
3. 4.115×10^5
4. 3.201×10^6
5. 5.1×10^{-2}
6. 7.7×10^{-5}
7. 3.85×10^{-4}
8. 1.04×10^{-8}

Write each number in scientific notation.

9. 4,400
10. 75,000
11. 69,900,000
12. 575,000,000
13. 0.084
14. 0.0099
15. 0.000000515
16. 0.0000307

17. Which number is greater: 3.5×10^4 or 2.1×10^6?

18. Which number is less: 7.2×10^7 or 9.9×10^5?

19. **POPULATION** The table lists the populations of five countries. List the countries from least to greatest population.

Country	Population
Australia	2.0×10^7
Brazil	1.9×10^8
Egypt	7.7×10^7
Luxembourg	4.7×10^5
Singapore	4.4×10^6

Source: *The World Factbook*

20. **SOLAR SYSTEM** Pluto is 3.67×10^9 miles from the Sun. Write this number in standard form.

21. **MEASUREMENT** One centimeter is equal to about 0.0000062 mile. Write this number in scientific notation.

22. **DISASTERS** In 2005, Hurricane Katrina caused over $125 billion in damage in the southern United States. Write $125 billion in scientific notation.

Lesson 2.2 Adding and Subtracting in Scientific Notation (Day 2)

Exercises

Write each number in standard form.

1. 5.3×10^{1}

2. 9.4×10^{3}

3. 7.07×10^{5}

4. 2.6×10^{-3}

5. 8.651×10^{-2}

6. 6.7×10^{-6}

Write each number in scientific notation.

7. 561

8. 14

9. 56,400,000

10. 0.752

11. 0.0064

12. 0.000581

Lesson 2.2 Adding and Subtracting in Scientific Notation (Day 2)

Exercises

Write each number in standard form.

1. 5.3×10^1 53

2. 9.4×10^3 9,400

3. 7.07×10^5 707,000

4. 2.6×10^{-3} .0026

5. 8.651×10^{-2} .08561

6. 6.7×10^{-6} .0000067

Write each number in scientific notation.

7. 561 5.61×10^2

8. 14 1.4×10^1

9. 56,400,000 5.64×10^7

10. 0.752 7.52×10^{-1}

11. 0.0064 $6.4 \cdot 10^{-3}$

12. 0.000581 5.81×10^{-4}

Lesson 2.2 Adding and Subtracting in Scientific Notation (Day 2)

NAME _____ DATE _____ PERIOD ____

2-10 Practice

Scientific Notation

Write each number in standard form.

1. 9.03×10^{2}
2. 7.89×10^{3}
3. 4.115×10^{5}
4. 3.201×10^{6}
5. 5.1×10^{-2}
6. 7.7×10^{-5}
7. 3.85×10^{-4}
8. 1.04×10^{-3}

Write each number in scientific notation.

9. 4,400
10. 75,000
11. 69,900,000
12. 575,000,000
13. 0.084
14. 0.0099
15. 0.000000515
16. 0.0000307

Lesson 2.2 Adding and Subtracting in Scientific Notation (Day 2)

Write each number in standard form.

1. 9.03×10^2 — 903
2. 7.89×10^3 — 7,890
3. 4.115×10^5 — 411,500
4. 3.201×10^6 — 3,201,000
5. 5.1×10^{-2} — .051
6. 7.7×10^{-5} — .000077
7. 3.85×10^{-4} — .000385
8. 1.04×10^{-3} — .00104

Write each number in scientific notation.

9. 4,400. — $4.4 \cdot 10^3$
10. 75,000 — $7.5 \cdot 10^4$
11. 69,900,000 — 6.99×10^7
12. 575,000,000 — 5.75×10^8
13. 0.084 — $8.4 \cdot 10^{-2}$
14. 0.0099 — 9.9×10^{-3}
15. 0.000000515 — $5.15 \cdot 10^{-7}$
16. 0.0000307 — 3.07×10^{-5}

Lesson 2.2 Adding and Subtracting in Scientific Notation (Day 2)

17. Which number is greater: 3.5×10^4 or 2.1×10^6?

18. Which number is less: 7.2×10^7 or 9.9×10^5?

19. **POPULATION** The table lists the populations of five countries. List the countries from least to greatest population.

Country	Population
Australia	2.0×10^7
Brazil	1.9×10^8
Egypt	7.7×10^7
Luxembourg	4.7×10^5
Singapore	4.4×10^6

Source: *The World Factbook*

20. **SOLAR SYSTEM** Pluto is 3.67×10^9 miles from the Sun. Write this number in standard form.

21. **MEASUREMENT** One centimeter is equal to about 0.0000062 mile. Write this number in scientific notation.

22. **DISASTERS** In 2005, Hurricane Katrina caused over $125 billion in damage in the southern United States. Write $125 billion in scientific notation.

Lesson 2.2 Adding and Subtracting in Scientific Notation (Day 2)

Quick Write-

Write and answer the following statement:

To add or subtract number in scientific notation, the powers of 10 must be the _____.

Quick Write-

To add or subtract number in scientific notation, the powers of 10 must be the ____SAME_____.

To add or subtract numbers in scientific notation, the powers of 10 must be the same.

Lesson 2.2 Adding and Subtracting in Scientific Notation (Day 2)

Example 3- Small Numbers

Example 3 (Very Small Numbers)	Ask yourself ….
A standard CD is about $1.2 \cdot 10^{-3}$ meter thick. A thin coating on the CD is approximately $7.0 \cdot 10^{-8}$ meter thick. a) How thick is the CD with the coating added? b) How much thicker is the CD than the coating?	*Can I rewrite the problem so the bases have the SAME power of ten?

Lesson 2.2 Adding and Subtracting in Scientific Notation (Day 2)

Example 3- Small Numbers

Example 3 (Very Small Numbers)

A standard CD is about $1.2 \cdot 10^{-3}$ meter thick. A thin coating on the CD is approximately $7.0 \cdot 10^{-8}$ meter thick.

a) How thick is the CD with the coating added?

Ask yourself ....

*Can I rewrite the problem so the bases have the SAME power of ten?

Approximate thickness of the CD and coating

= Thickness of CD + Thickness of coating

$= 1.2 \cdot 10^{-3} + 7.0 \cdot 10^{-8}$ Substitute.

$= 1.2 \cdot 10^{-3} + 0.00007 \cdot 10^{-3}$ Rewrite $7.0 \cdot 10^{-8}$ as $0.00007 \cdot 10^{-3}$.

$= (1.2 + 0.00007) \cdot 10^{-3}$ Factor 10^{-3} from each term.

$= 1.20007 \cdot 10^{-3}$ m Add within parentheses.

Lesson 2.2 Adding and Subtracting in Scientific Notation (Day 2)

Example 3 (Very Small Numbers)

b) How much thicker is the CD than the coating?

A standard CD is about $1.2 \cdot 10^{-3}$ meter thick. A thin coating on the CD is approximately $7.0 \cdot 10^{-8}$ meter thick.

Ask yourself ....

*Can I rewrite the problem so the bases have the SAME power of ten?

Solution

Difference in thickness between the CD and coating

$= \text{Thickness of CD} - \text{Thickness of coating}$

$= 1.2 \cdot 10^{-3} - 7.0 \cdot 10^{-8}$ Substitute.

$= 1.2 \cdot 10^{-3} - 0.00007 \cdot 10^{-3}$ Rewrite $7.0 \cdot 10^{-8}$ as $0.00007 \cdot 10^{-3}$.

$= (1.2 - 0.00007) \cdot 10^{-3}$ Factor 10^{-3} from each term.

$= 1.19993 \cdot 10^{-3}$ m Add within parentheses.

The CD is about $1.19993 \cdot 10^{-3}$ meter thicker than the coating.

Lesson 2.2 Adding and Subtracting in Scientific Notation (Day 2)

Your Turn

Guided Practice #4 Page 76

4 A custom-made invitation using a 10-pt card stock is about $2.54 \cdot 10^{-4}$ meter thick. It is placed inside a tissue paper insert that is approximately $6.0 \cdot 10^{-6}$ meter thick.

a) How thick is the invitation when placed in the tissue paper insert?

b) How much thicker is the invitation than the tissue paper insert?

Lesson 2.2 Adding and Subtracting in Scientific Notation (Day 2)

Your Turn

Guided Practice #4

4 A custom-made invitation using a 10-pt card stock is about $2.54 \cdot 10^{-4}$ meter thick. It is placed inside a tissue paper insert that is approximately $6.0 \cdot 10^{-6}$ meter thick.

a) How thick is the invitation when placed in the tissue paper insert? $2.6 \cdot 10^{-4}$ m

b) How much thicker is the invitation than the tissue paper insert? $2.48 \cdot 10^{-4}$ m

Lesson 2.2 Adding and Subtracting in Scientific Notation (Day 2

Independent Practice #3-5, 7, and 14-15

Homework *Back Challenge

2.2 Independent Practice

Solve. Show your work. Round the coefficient to the nearest tenth.

3. $3.8 \cdot 10^3 + 5.2 \cdot 10^4$

4. $8.1 \cdot 10^5 - 2.8 \cdot 10^4$

The table shows the amounts of energy, in Calories, contained in various foods.

Food (per 100 g)	Energy (Cal)
Chicken breast	$1.71 \cdot 10^5$
Raw potato	$7.7 \cdot 10$
Cabbage	$2.5 \cdot 10^4$
Salmon	$1.67 \cdot 10^5$

5. Find the total energy in each food combination. Write your answer in scientific notation. Round coefficients to the nearest tenth.

   a) Chicken breast and cabbage

   b) Cabbage and raw potato

7. How many more Calories are in salmon than in cabbage?

Name:_____ Period_____

Thursday Homework

Practice 2.2

Solve. Show your work. Round the coefficient to the nearest tenth.

1. $6.3 \cdot 10^{-2} + 4.9 \cdot 10^{-2}$

2. $7.2 \cdot 10^2 - 3.5 \cdot 10^2$

3. $3.8 \cdot 10^3 + 5.2 \cdot 10^4$

4. $8.1 \cdot 10^5 - 2.8 \cdot 10^4$

Use the table to answer questions 5 to 9.

The table shows the amounts of energy, in Calories, contained in various foods.

Food (per 100 g)	Energy (Cal)
Chicken breast	$1.71 \cdot 10^5$
Raw potato	$7.7 \cdot 10$
Cabbage	$2.5 \cdot 10^4$
Salmon	$1.67 \cdot 10^5$

5. Find the total energy in each food combination. Write your answer in scientific notation. Round coefficients to the nearest tenth.

   a) Chicken breast and cabbage

   b) Cabbage and raw potato

6. How many more Calories are in chicken breast than in salmon?

7. How many more Calories are in salmon than in cabbage?

Lesson Check –Explain how to use scientific notation when calculating problems