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

Objective

*Add and subtract numbers in scientific notation

*Introduce the prefix system

- **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/presevere 6. Attend to precision.

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

Quick Write-

What questions should you ask yourself when you are adding or subtracting very large numbers in scientific notation?

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

Quick Write-

What questions should you ask yourself when you are adding or subtracting very large numbers in scientific notation?

Ask yourself....
What operation is the problem asking me to complete?

What do I notice about the bases?

Can I factor out the same base and exponent using parenthesis?

Is my answer written in scientific notation?
If not, then rewrite!!!!

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 1 Adding and Subtracting Numbers in Scientific Notation *very small numbers*

Example 1 Adding and Subtracting Numbers in Scientific Notation with the Same Power (Very Small)

The approximate thickness of a standard CD is $1.2 \cdot 10^{-3}$ meter.

A slim jewel case is about $5.3 \cdot 10^{-3}$ meter thick.

a) The CD is placed on top of the jewel case. What is the total thickness of the CD and jewel case?

Ask yourself....
What operation is the problem asking me to complete?

What do I notice about the bases?

Can I factor out the same base and exponent using parenthesis?

Is my answer written in scientific notation?
If not, then rewrite!!!!

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

Example 1 Adding and Subtracting Numbers in Scientific Notation *very small numbers*

Solution

Approximate thickness of the CD and jewel case

$= \text{Thickness of CD} + \text{Thickness of jewel case}$

$= 1.2 \cdot 10^{-3} + 5.3 \cdot 10^{-3}$ Substitute.

$= (1.2 + 5.3) \cdot 10^{-3}$ Factor 10^{-3} from each term.

$= 6.5 \cdot 10^{-3}$ m Add within parentheses.

The total thickness of the CD and jewel case is about $6.5 \cdot 10^{-3}$ meter.

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

Example 1 Adding and Subtracting Numbers in Scientific Notation *very small numbers*

b) How much thicker is the jewel case than the CD?	What operation is the problem asking me to complete? What do I notice about the bases? Can I factor out the same base and exponent using parenthesis? Is my answer written in scientific notation? If not, then rewrite!!!!

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

Example 1 Adding and Subtracting Numbers in Scientific Notation *very small numbers*

b) How much thicker is the jewel case than the CD?

Solution

Difference in thickness between the jewel case and CD

$= \text{Thickness of jewel case} - \text{Thickness of CD}$

$= 5.3 \cdot 10^{-3} - 1.2 \cdot 10^{-3}$ Substitute.

$= (5.3 - 1.2) \cdot 10^{-3}$ Factor 10^{-3} from each term.

$= 4.1 \cdot 10^{-3}$ m Subtract within parentheses.

The jewel case is about $4.1 \cdot 10^{-3}$ meter thicker than the CD.

What operation is the problem asking me to complete?

What do I notice about the bases?

Can I factor out the same base and exponent using parenthesis?

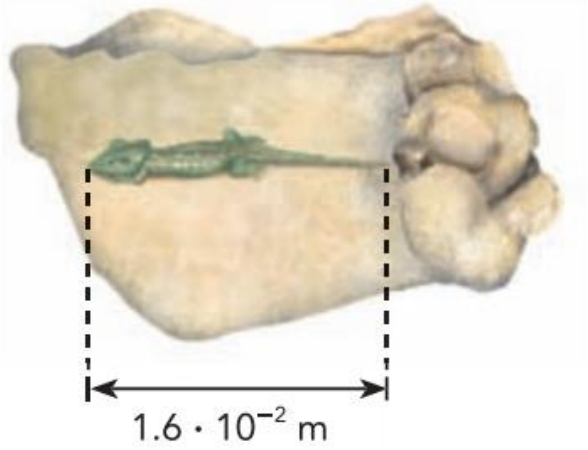
Is my answer written in scientific notation?
If not, then rewrite!!!!

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

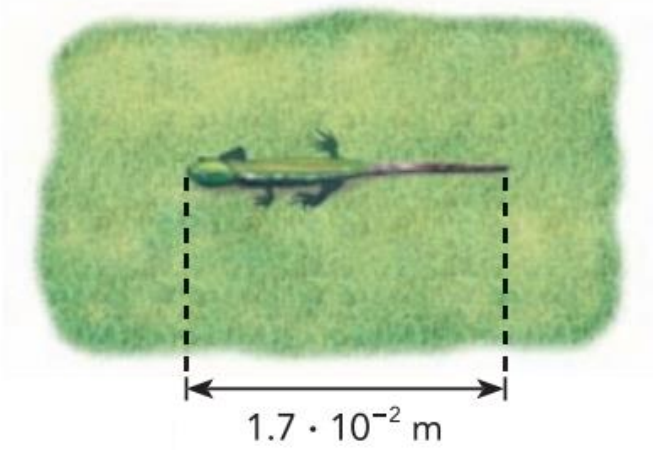
Your Turn- Open up purple math books, table of contents (Lesson 2.2)

2 The approximate length of the smallest salamander is $1.7 \cdot 10^{-2}$ meter. The smallest lizard is about $1.6 \cdot 10^{-2}$ meter long.

Lizard



Salamander



a) What is the sum of the lengths of the salamander and the lizard?

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

Your Turn- Open up purple math books, table of contents (Lesson 2.2)

a) What is the sum of the lengths of the salamander and the lizard?

Sum of the lengths of the salamander and the lizard

= Length of salamander + Length of lizard

$= 1.7 \cdot 10^{-2} + 1.6 \cdot 10^{-2}$ Substitute.

$= (\underline{?} + \underline{?}) \cdot \underline{?}$ Factor ___ from each term. $1.7;\ 1.6;\ 10^{-2};\ 10^{-2}$

$= \underline{?} \cdot \underline{?}$ m ___ within parentheses. $3.3;\ 10^{-2};$ Add

The sum of the lengths is about ___ meter. $3.3 \cdot 10^{-2}$

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

Your Turn- Open up purple math books, table of contents (Lesson 2.2)

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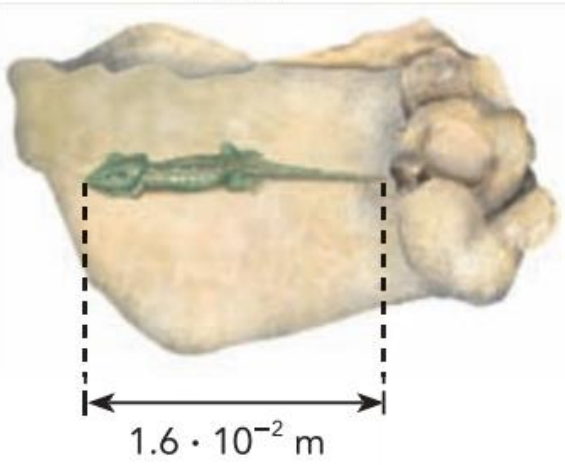
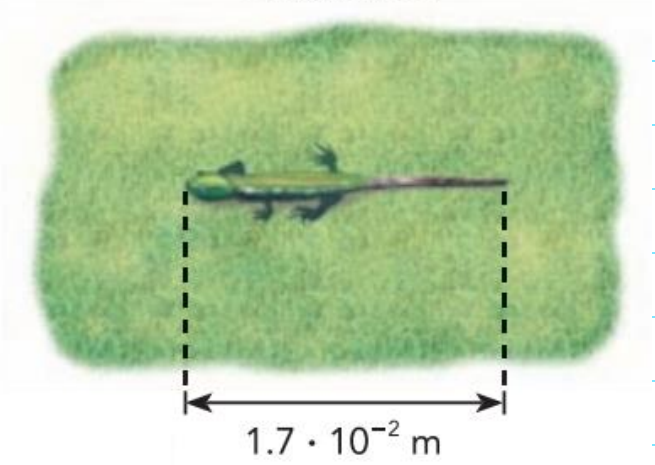


Salamander



b) What is the difference in the length of the reptiles?

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

Your Turn- Open up purple math books, table of contents (Lesson 2.2)

Difference in length between the salamander and lizard

= Length of salamander − Length of lizard

= ? · ? − ? · ? Substitute. $1.7; 10^{-2}; 1.6; 10^{-2}$

= (? − ?) · ? Factor ? from each term. $1.7; 1.6; 10^{-2}; 10^{-2}$

= ? · ? ? within parentheses. $0.1; 10^{-2}$; Subtract

= ? · ? · ? Write ? in scientific notation. $1; 10^{-1}; 10^{-2}; 0.1$

= ? · ? Use the product of powers property. $1; 10^{-1 + (-2)}$

= ? · ? m Write in scientific notation. $1; 10^{-3}$

The salamander is about ? meter longer than the lizard. $1 \cdot 10^{-3}$

Lesson 2.2 Adding and Subtracting in Scientific Notation (Day 2

Independent Practice #2, 6, and 8

2.2 Independent Practice

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

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

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

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	$1.67 \cdot 10^{5}$

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

Solve. Show your work.

8. A flight from Singapore to New York includes a stopover at Hawaii. The distance between Singapore and Hawaii is about $6.7 \cdot 10^{3}$ miles. The distance between New York and Hawaii is about $4.9 \cdot 10^{3}$ miles. Write each sum or difference in scientific notation.

   a) Find the total distance from Singapore to New York.

   b) Find the difference in the length of the two flights.

SCIENTIFIC NOTATION

Scientists very often deal with very small and very large numbers, which can lead to a lot of confusion when counting zeros! We have learned to express these numbers as powers of 10.

Scientific notation takes the form of $M \times 10^{n}$ where $1 \leq M < 10$ and "n" represents the number of decimal places to be moved. Positive n indicates the standard form is a large number. Negative n indicates a number between zero and one.

Example 1: Convert 1,500,000 to scientific notation.
We move the decimal point so that there is only one digit to its left, a total of 6 places.
$1{,}500{,}000 = 1.5 \times 10^{6}$

Example 2: Convert 0.000025 to scientific notation.
For this, we move the decimal point 5 places to the right.
$0.000025 = 2.5 \times 10^{-5}$
(Note that when a number starts out less than one, the exponent is always negative.)

Convert the following to scientific notation.

1. 0.005 = _____
2. 5,050 = _____
3. 0.0008 = _____
4. 1,000 = _____
5. 1,000,000 = _____
6. 0.25 = _____
7. 0.025 = _____
8. 0.0025 = _____
9. 500 = _____
10. 5,000 = _____

Convert the following to standard notation.

1. 1.5×10^{2} = _____
2. 1.5×10^{3} = _____
3. 3.75×10^{-2} = _____
4. 3.75×10^{2} = _____
5. 2.2×10^{5} = _____
6. 3.35×10^{-1} = _____
7. 1.2×10^{-4} = _____
8. 1×10^{4} = _____
9. 1×10^{-1} = _____
10. 4×10^{0} = _____

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Homework

Name _____ Date _____

Multiply Decimals by Positive Powers of 10

When you multiply a decimal by a positive power of 10, the decimal point moves to the right.

Example 1

$2.35 \cdot 10^{2} = 2.3\,5$

Multiplying by 10^{2} is the same as multiplying by 100. There are 2 zeros in 100, so move the decimal point 2 places to the right.

$2.35 \cdot 10^{2} = 235$

Example 2

$2.35 \cdot 10^{3} = 2.3\,5\,0$

Multiplying by 10^{3} is the same as multiplying by 1,000. There are 3 zeros in 1,000, so move the decimal point 3 places to the right. Write 0 as a placeholder.

$2.35 \cdot 10^{3} = 2{,}350$

Quick Check

Evaluate.

1. $8.29 \cdot 10$ _____
2. $0.76 \cdot 10^{2}$ _____
3. $1.52 \cdot 10^{3}$ _____

Practice on Your Own

Evaluate.

4. $12.8 \cdot 10$ _____
5. $4.91 \cdot 10^{2}$ _____
6. $0.154 \cdot 10^{3}$ _____
7. $5.6 \cdot 10^{2}$ _____
8. $0.64 \cdot 10$ _____
9. $37.9 \cdot 10^{2}$ _____
10. $0.86 \cdot 10$ _____
11. $0.207 \cdot 10^{2}$ _____
12. $9.5 \cdot 10^{4}$ _____
13. $5.1 \cdot 10^{2}$ _____
14. $2.86 \cdot 10$ _____
15. $0.108 \cdot 10^{4}$ _____

Lesson Check #1 & 2 (add and subtract numbers in scientific notation)