

Chapter 2

EXPONENTS AND SCIENTIFIC NOTATION

Lesson 2.1 Day 1

INTEGER EXPONENTS

What Do I Need Today?

- ▶ My Interactive Notebook
- ▶ 1 Piece of Paper
- ▶ Exponents Chart
- ▶ Colors



What is an Exponent?

What is an Exponent?

- ▶ Exponents show repeated multiplication
- ▶ Exponents represent how many times a number (BASE) is multiplied by itself

$$5^3$$

Base

Exponent

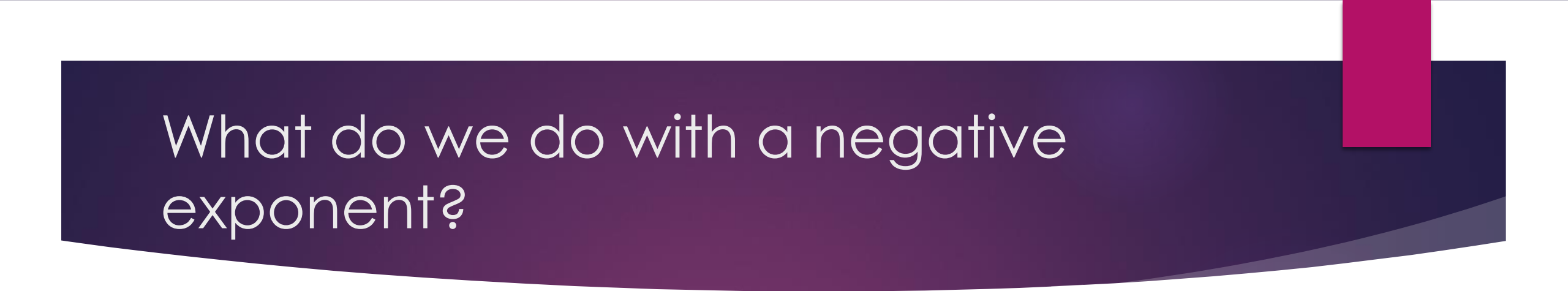
What is an Exponent?

$$5^3$$

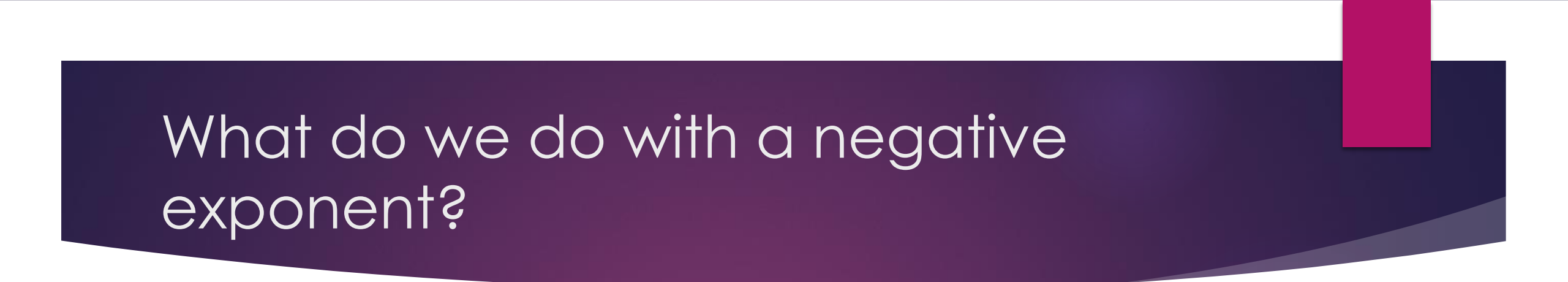
$$5 \cdot 5 \cdot 5 =$$

$$25 \cdot 5 =$$

$$125$$



What do we do with a negative exponent?



What do we do with a negative exponent?

- ▶ A negative exponent causes the number to be re-written as the reciprocal of the original number and the exponent to be positive

What is an Exponent?

$$5^{-3} = \frac{1}{5^3}$$

What is an Exponent?

$$5^{-3} =$$

$$\frac{1}{5^3} = \frac{1}{5 \cdot 5 \cdot 5} = \frac{1}{125}$$

What is an Exponent?

$$\frac{1^{-2}}{2} = \frac{2^2}{1}$$

What is an Exponent?

$$\left(\frac{1}{2}\right)^{-2} = \frac{2^2}{1^2} = 2^2 = 4$$

What is anything to the power of 0?

What is anything to the power of 0?

- ▶ Any number raised to the power of 0 is equal to 1

What is an Exponent?

$$5^0 = 1$$



Chart

Practice using
these rules and fill
out the chart

General Rules

$$a^0 = 1$$

$$a^{-n} = \frac{1}{a^n}$$

Practice

Work on “Guided
Practice” Page 36
Numbers 1-9



Homework

Work on Homework
2.1 Worksheet Page
24 and Handout

Lesson 2.1 Day 2

INTEGER EXPONENTS

What Do I Need Today?

- ▶ My Interactive Notebook
- ▶ 1 Piece of Paper
- ▶ Scissors
- ▶ Tape/Glue
- ▶ Exponents Rules Flip Book
- ▶ Colors

Product Rule

- ▶ When multiplying exponents with the same base, keep the base and add the powers

Product Rule

$$3^3 \cdot 3^2 = 3^5$$

Product Rule

$$3^3 \cdot 3^2 =$$

$$3^5$$

Same level = add

Quotient Rule

- ▶ When dividing exponents with the same base, keep the base and subtract the powers

Quotient Rule

$$\frac{4^9}{4^6} = 4^3$$

Quotient Rule

Keep where the bigger power is!

$$\frac{4^6}{4^9} = \frac{1}{4^3}$$



Practice

Work on “Guided
Practice” Page 36
Numbers 10-15

Power of a Power Rule

- ▶ To raise a power to a power, multiply the exponents

Power of a Power Rule

$$5^{3^2} = 5^6$$

Power of a Power Rule

$$5^{\cancel{3^2}} = 5^6$$

Different level = multiply

Power of a Product

- ▶ Each base is raised to a power

Power of a Product Rule

$$(4 \cdot 5)^3$$

$$4^3 \cdot 5^3$$

Practice

Work on “Guided
Practice” Page 36
Numbers 16-19

Homework

Work on Homework 2.1
Worksheet Page 20
and 2.1 Independent
Practice #s 21-27

Lesson 2.2

SCIENTIFIC NOTATION WITH POSITIVE POWERS OF 10

What Do I Need Today?

- ▶ My Interactive Notebook
- ▶ Scissors
- ▶ Tape/Glue
- ▶ Scientific Notation Flip Book
- ▶ Colors

What is Scientific Notation?

- ▶ A way of expressing a very large or very small number as a product of a number greater than or equal to 1 or less than 10 and a power of 10

Standard Notation to Scientific Notation

- ▶ Move decimal to the left so your number is...

$$1 < \text{number} < 10$$

Standard Notation to Scientific Notation

$$26,400,000 =$$

$$2.64 \times 10^7$$

Standard Notation to Scientific Notation

$$41,200 =$$

$$4.12 \times 10^4$$

Scientific Notation to Standard Notation

- ▶ Move the decimal the number of times as exponent

Scientific Notation to Standard Notation

$$2.36 \times 10^5 =$$

236,000

Scientific Notation to Standard Notation

$$7.034 \times 10^9 =$$

7,034,000,000

Practice

Work on “Guided
Practice” Page 42
Numbers 1-14

Homework

Work on Homework 2.2
Independent Practice
#s 16-22 & 25-27 & 2.2
Worksheet Page 26

Lesson 2.3

SCIENTIFIC NOTATION WITH NEGATIVE POWERS OF 10

What Do I Need Today?

- ▶ My Interactive Notebook
- ▶ 1 Piece of Paper
- ▶ Scissors
- ▶ Tape/Glue
- ▶ Other Half of Scientific Notation Flip Book
- ▶ Colors

Standard Notation to Scientific Notation

- ▶ Move decimal to the right so your number is...

$$1 < \text{number} < 10$$

Standard Notation to Scientific Notation

$$0.0783 =$$

$$7.83 \times 10^{-2}$$

The exponent becomes negative when moving to the right!

Standard Notation to Scientific Notation

$$0.00000152 =$$

$$1.52 \times 10^{-6}$$

The exponent becomes negative when moving to the right!

Scientific Notation to Standard Notation

- ▶ Move the decimal the number of times as exponent

Scientific Notation to Standard Notation

$$2.33 \times 10^{-6}$$

0.00000233

Scientific Notation to Standard Notation

$$7.032 \times 10^{-3}$$

0.007032

Practice

Work on “Guided
Practice” Page 48
Numbers 1-14

Homework

Work on Homework 2.3
Independent Practice
#s 16-22 & 28-35 & 2.3
Worksheet Page 32

Lesson 2.4 Day 1

OPERATIONS WITH SCIENTIFIC NOTATION – ADDING AND SUBTRACTING

What Do I Need Today?

- ▶ My Interactive Notebook
- ▶ 1 Piece of Paper
- ▶ Scissors
- ▶ Tape/Glue
- ▶ Table Print Out
- ▶ Colors



How can we add and subtract
scientific notation numbers?

Method 1

- ▶ Step 1: Write each number in standard form
- ▶ Step 2: Add all the numbers
- ▶ Step 3: Change back to scientific notation

Method 1

Country	United States	Canada	Mexico
Population	3.1×10^8	3.38×10^7	1.1×10^8

Method 1

$$\begin{array}{r} 310000000 \\ 33800000 \\ +110000000 \\ \hline 453800000 \end{array}$$

$$453800000. =$$

$$4.538 \times 10^8$$

Method 2

- ▶ Step 1: Re-write each number with the SAME power of 10
- ▶ Step 2: Add the multipliers for each
- ▶ Step 3: Write the final answer in scientific notation

Method 2

Country	United States	Canada	Mexico
Population	3.1×10^8	3.38×10^7	1.1×10^8

Method 2

$$\begin{array}{r} 3.1 \times 10^8 \\ .338 \times 10^8 \\ 1.1 \times 10^8 \\ \hline 4.538 \times 10^8 \end{array}$$
$$\begin{array}{r} 3.100 \\ .338 \\ +1.100 \\ \hline 4.538 \end{array}$$

Practice

Work on “Guided
Practice” Page 54
Numbers 1-4



Homework

Work on Homework
2.4 Worksheet
Handouts

Lesson 2.4 Day 2

OPERATIONS WITH SCIENTIFIC NOTATION –MULTIPLICATION AND DIVISION

What Do I Need Today?

- ▶ My Interactive Notebook
- ▶ 1 Piece of Paper
- ▶ Colors



How can we multiply and divide
scientific notation numbers?

Dividing

- ▶ Step 1: Put numbers all into scientific notation
- ▶ Step 2: Divide multipliers
- ▶ Step 3: Use exponent rules to divide exponents
- ▶ Step 4: Re-write in scientific notation

Dividing

$$\frac{2.025 \times 10^{14}}{225,000,000} = \frac{2.025 \times 10^{14}}{2.25 \times 10^8}$$

Dividing

$$\frac{2.025 \times 10^{14}}{2.25 \times 10^8}$$

Divide 2.025 by 2.25 to equal 0.9

Dividing

$$\frac{2.025 \times 10^{14}}{2.25 \times 10^8}$$

Divide 10^{14} by 10^8 to get 10^6

Dividing

$$\frac{2.025 \times 10^{14}}{2.25 \times 10^8}$$

$.9 \times 10^6$ cannot work because it has to be larger than 1

Dividing

$$\frac{2.025 \times 10^{14}}{2.25 \times 10^8} =$$

$$9 \times 10^5$$

Multiplying

- ▶ Step 1: Put all numbers into scientific notation
- ▶ Step 2: Multiply multipliers
- ▶ Step 3: Use exponent rules to multiply exponents
- ▶ Step 4: Re-write in scientific notation

Multiplying

$$(20,000,000,000)(5.23 \times 10^6) =$$

$$(2 \times 10^{10})(5.23 \times 10^6) =$$

$$2 \cdot 5.23 = 10.46$$

$$10^{10} \cdot 10^6 = 10^{16}$$

Multiplying

$$10.46 \times 10^{16}$$

Needs to be small than 10!

$$1.046 \times 10^{17}$$

Practice

Work on “Guided
Practice” Page 54
Numbers 5-8

Homework

Work on Homework 2.4
Independent Practice
#s 16-25 EVENS & 2.4
Worksheet Page 38