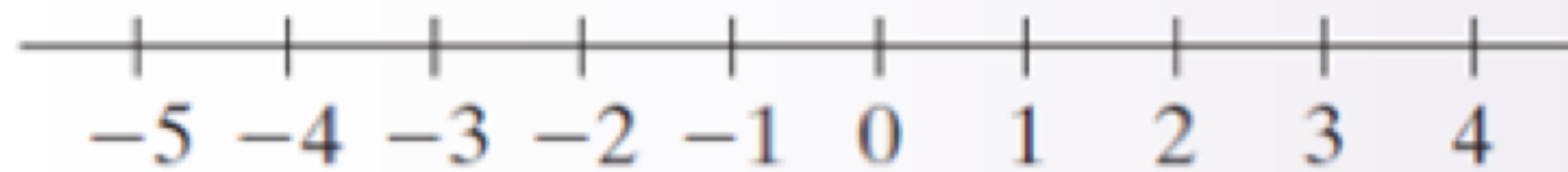


Day 4



The Number Line

- The number line is an evenly divided line used for displaying numbers and operations, like addition and subtraction, on them.
- The origin of the number line is 0.



Examples of Using the Number Line to Add and Subtract

$$3+2$$

$$-4.5+5.5$$

$$-9-1$$

$$10-5$$

Absolute Value

- The “absolute value” of a number is it’s distance from the origin.
- We use $| |$ to show we are taking the absolute power of a number.

Examples

- $|6|=6$
- $|-3|=3$
- $|-4.325|$
- $|(4+5)|=9$

- Use the number line to find the absolute values of the following numbers:

-2

4.5

-5.25

$-(2^3)$

$(-3)^2$

Addition of Real Numbers

- To add numbers of the same “sign,” add their absolute values and reapply their sign.

$$-12 + (-14)$$

$$-8.8 + (-3.7)$$

$$-\frac{4}{3} + \left(-\frac{6}{7}\right)$$

$$-\frac{1}{4} + \left(-\frac{3}{2}\right) + 2$$

$$-47.36 + 24.28$$

- To add values with different signs, subtract the smaller absolute value from the larger absolute value. Then apply the sign of the number having the larger absolute value.

a. $-10.6 + 20.4$

b. $\frac{2}{15} + \left(-\frac{4}{5}\right)$

Lingo

Operation	Symbols	Translation
Addition	$a + b$	sum of a and b a plus b b added to a b more than a a increased by b the total of a and b
Subtraction	$a - b$	difference of a and b a minus b b subtracted from a a decreased by b b less than a a less b
Multiplication	$a \times b$, $a \cdot b$, $a(b)$, $(a)b$, $(a)(b)$, ab (Note: From this point forward we will seldom use the notation $a \times b$ because the symbol, \times , might be confused with the variable, x .)	product of a and b a times b a multiplied by b
Division	$a \div b$, $\frac{a}{b}$, a/b , $b \overline{)a}$	quotient of a and b a divided by b b divided into a ratio of a and b a over b a per b

Translating Problems

Write each English phrase as an algebraic expression. Then simplify the result.

- a. The sum of -12 , -8 , 9 , and -1
- b. Negative three-tenths added to $-\frac{7}{8}$
- c. The sum of -12 and its opposite

11. The sum of -10 , 4 , and -6

12. Negative 2 added to $-\frac{1}{2}$

13. -60 added to its opposite

A student has \$120 in her checking account. After depositing her paycheck of \$215, she writes a check for \$255 to cover her portion of the rent and another check for \$294 to cover her car payment. Write a mathematical expression to describe this situation and then simplify the result.

Inequalities

Mathematical Expression	Translation	Example
$a < b$	a is less than b .	$2 < 3$
$a > b$	a is greater than b .	$5 > 1$
$a \leq b$	a is less than or equal to b .	$4 \leq 4$
$a \geq b$	a is greater than or equal to b .	$10 \geq 9$
$a = b$	a is equal to b .	$6 = 6$
$a \neq b$	a is not equal to b .	$7 \neq 0$
$a \approx b$	a is approximately equal to b .	$2.3 \approx 2$

Examples

$$3 \square 4$$

$$\frac{3}{4} \square \frac{9}{12}$$

$$6 \square 3.3$$

Subtracting Real Numbers

Subtracting Real Numbers

If a and b are real numbers, then $a - b = a + (-b)$.

$$\left. \begin{array}{l} 10 - 4 = 10 + (-4) = 6 \\ -10 - 4 = -10 + (-4) = -14 \end{array} \right\}$$

Subtracting 4 is the same as adding -4 .

$$\left. \begin{array}{l} 10 - (-4) = 10 + (4) = 14 \\ -10 - (-4) = -10 + (4) = -6 \end{array} \right\}$$

Subtracting -4 is the same as adding 4.

$$\frac{3}{20} - \left(-\frac{4}{15}\right)$$

$$= 2.3 - 6.04$$

Skill Practice Write an algebraic expression for each phrase and then simplify.

7. 8 less than -10

Answer

8. -7.2 subtracted from -8.2

Answer

9. 10 more than the difference of -2 and 3

Answer

10. Two-fifths decreased by four-thirds

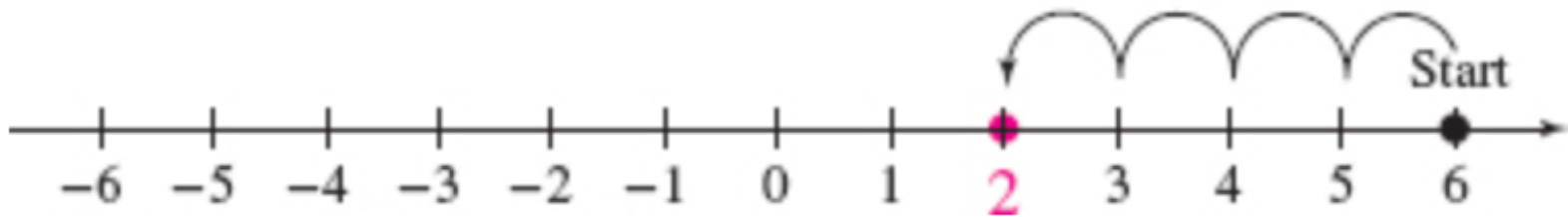
Answer

Skill Practice

- 12.** The record high temperature for the state of Montana occurred in 1937 and was 117°F . The record low occurred in 1954 and was -70°F . Find the difference between the highest and lowest temperatures.

Example of Subtraction Using the Number Line

$$6 - 4 = 2 \Leftrightarrow 6 + (-4) = 2$$



Multiplication of Real Numbers

- Multiplication can be interpreted as repeated addition, or adding groups of the same term together.

$$3(4) = 4 + 4 + 4 = 12$$

Add 3 groups of 4.

$$3(-4) = -4 + (-4) + (-4) = -12$$

Add 3 groups of -4 .

Multiplying Real Numbers

- The product of two real numbers with the *same* sign is positive.

Examples: $(5)(6) = 30$

$$(-4)(-10) = 40$$

- The product of two real numbers with *different* signs is negative.

Examples: $(-2)(5) = -10$

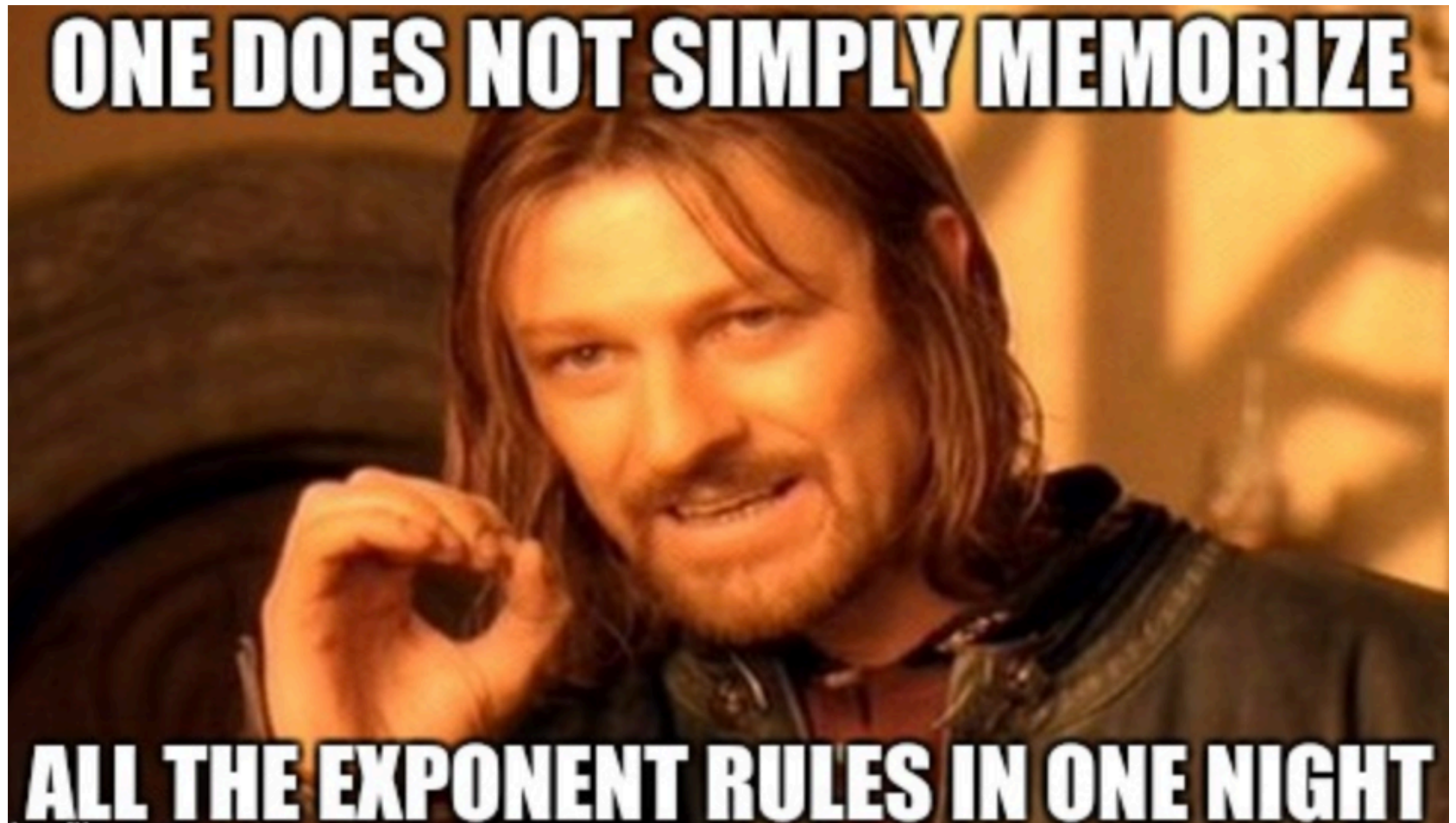
$$(4)(-9) = -36$$

- The product of any real number and zero is zero.

Examples: $(8)(0) = 0$

$$(0)(-6) = 0$$

Exponent Review



Exponents

An exponent, or power, is denoted as a superscript (raised number) to the right of another number, the base. It means, to multiply the base by its self, that many times.

b^p

b , is the base

p , is the power

Examples:

$$x^2 = x * x$$

$$3^3 = 3 * 3 * 3$$

Rules of Exponents

$$a^{-b}=1/(a^b)$$

$$a^b a^c = a^{b+c}$$

$$a^b/a^c = a^{b-c}$$

Rules of Exponents(cont.)

$$(a^b)^c = a^{bc}$$

$$a^{1/b} = \sqrt[b]{a} = c$$

(Why is this special? Because $a = c^b$)

$$(a/b)^c = a^c / b^c$$

Avoiding Mistakes

The negative sign is not part of the base unless it is in parentheses with the base. Thus, in the expression -5^2 , the exponent applies only to 5 and not to the negative sign.

$$(-0.4)^3 = (-0.4)(-0.4)(-0.4) = -0.064$$

Multiply three factors of -0.4 .

$$-0.4^3 = -1(0.4)(0.4)(0.4) = -0.064$$

Multiply -1 by three factors of 0.4 .

$$\left(-\frac{1}{2}\right)^3 = \left(-\frac{1}{2}\right)\left(-\frac{1}{2}\right)\left(-\frac{1}{2}\right) = -\frac{1}{8}$$

Multiply three factors of $-\frac{1}{2}$.

Review Topics

What do y'all feel like you need to review?