Essential Questions: How do we perform operations with rational numbers? How do we evaluate algebraic expressions with rational numbers?

Do Now: Perform the indicated operation.

a.
$$-9 - 8$$

b.
$$-10 + 5$$

c.
$$-14 - (-3)$$

d.
$$6-8+3-4-6$$

h.
$$|-2-5|$$

Operations with Integers

Reading Variables

-N is read as "the inverse of N" or "the opposite of N"

-N means take the opposite of N or multiply N by -1

a. Evaluate
$$-N$$
 when $N = 5$

b. Evaluate
$$-N$$
 when $N = -5$

$$-(5) \rightarrow -5$$

$$-(-5) \rightarrow 5$$

Raising Integers to a Power



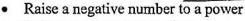
What is the difference between -6^2 and $(-6)^2$?

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Evaluating Algebraic Expressions with Integers

-Always follow the order of operations (PEMorDAOrS)

-When evaluating algebraic expressions, parentheses must be used to...



• Subtract a negative number

Show multiplication between signed numbers

Evaluate each expression when x = -3, y = -2 and z = 6. Show all work!

1.
$$\frac{z}{y} - xy$$

$$\frac{6}{-2}$$
 - $(-3)(-2)$

[-9]

2. $x - y^2$

$$-3 - (-2)^2$$

-3 - 4



3. -z|x-y|

- -6 |-3+2|
- -6 |-1|
- -6.1

4.
$$x\left(\frac{y-z}{4y}\right)^{4}$$

$$-3\left(\frac{-2-6}{4(-2)}\right)^{4}$$

$$-3\left(\frac{-8}{-8}\right)^{4}$$

$$-3\left(1\right)^{4}$$

$$-3\left(1\right)$$

5. T/F If $x = \text{any integer and } x \neq 0$, then $-x^4$ is always negative.

$$-2^{4}$$
 $-(-2)$ -16

Operations with Rational Numbers

All rules that apply for integers apply for fractions, decimals and signed numbers!

a.
$$-\frac{1}{4} - \frac{2}{3}$$

$$\frac{-3}{12} - \frac{8}{12}$$

b.
$$\frac{-240}{-1.2}$$

c.
$$-\frac{5}{8} + \frac{1}{3}$$

Fractions and Powers



What is the difference between $\frac{4^2}{9}$ and $\left(\frac{4}{9}\right)^2$?

Order of Operations with Rational Numbers

1.
$$\frac{(-0.9)^2}{-5+4.7}$$

2.
$$\frac{1}{2} - \frac{1}{2} \div \frac{1}{4}$$

$$\frac{1}{2} - \frac{1}{2} \cdot \frac{4}{1}$$

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

$$\frac{1}{2} - \frac{2}{2}$$
 $\frac{-3}{2}$ or $-\frac{1}{2}$

3.
$$\left(\frac{4}{7} - \frac{5}{7}\right)^2 \div \frac{1}{49}$$

$$\left(\frac{-1}{7}\right)^2 \div \frac{1}{49}$$



Evaluating Algebraic Expressions with Rational Numbers

Evaluate when $a = \frac{1}{4}$, b = 9 and c = -0.5.

4.
$$a-b+c$$

$$\begin{bmatrix} -9.25 \\ or \\ -9\frac{1}{4} \end{bmatrix}$$

5.
$$-a^2 + c \div -\frac{1}{8}$$

$$-\left(\frac{1}{4}\right)^{2}+\left(-0.5\right)\div\frac{1}{5}$$

$$6 bc^2 - a$$

$$9(-0.5)^2 - .25$$

 $9(.25) - .25$

7.
$$-2a^2 \div \frac{1}{3}b - c^3$$

$$-2(\frac{1}{4})^2 \div \frac{1}{3}(9) - (-0.5)$$

$$-2(\frac{1}{16}) \div \frac{1}{3}(9) - (-\frac{1}{2})$$

Evaluate when
$$a = \frac{1}{4}$$
, $b = 9$ and $c = -0.5$.

4. $a - b + c$
5. $-a^2 + c \div -\frac{1}{8}$
6. $bc^2 - a$
7. $-2a^2 \div \frac{1}{3}b - c^3$

$$\frac{1}{4} - 9 + (-0.5) - (\frac{1}{4})^2 + (-0.5) \div -\frac{1}{8}$$

$$-2(\frac{1}{4})^2 \div \frac{1}{3}(9) - (-0.5)^3$$

$$-2(\frac{1}{4})$$

$$-\frac{3}{8}(9) + \frac{1}{8}$$

$$-\frac{27}{8} + \frac{1}{8}$$