MATH 1010 ~ Intermediate Algebra Chapter 1 Fundamentals of Algebra

Section 1.2: Operations with Real Numbers

Objectives:

- Add, subtract, multiply and divide real numbers.
- Evaluate exponential expressions
- Use order of operations to evaluate expressions.

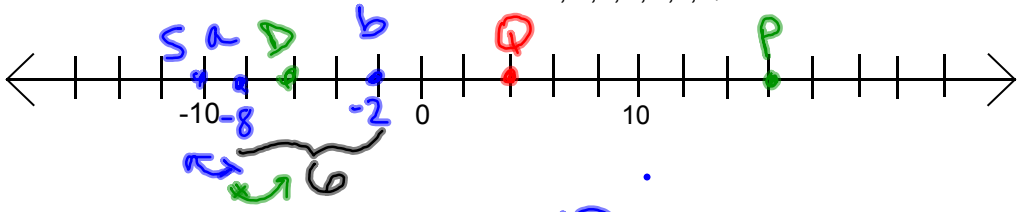
$$4 - 3^2(5+^-6)^3 + 8 = ?$$

OPERATIONS ON REAL NUMBERS

① EXAMPLE:

Find the sum, difference, product and quotient of these two integers: a = -8 and b = -2

Place all values on this number line, a,b,S,D,P,Q .



Sum: a+b $= -8 + -2 = -10$

Difference: a-b $= -8 - (-2) = -6$

Product: a×b or a∗b or ab $= (-8)(-2) = 16$

least used — most used

Quotient: a÷b or a/b or $\frac{a}{b}$ $= \frac{-8}{-2} = 4$

Distance between a and b on the number line.

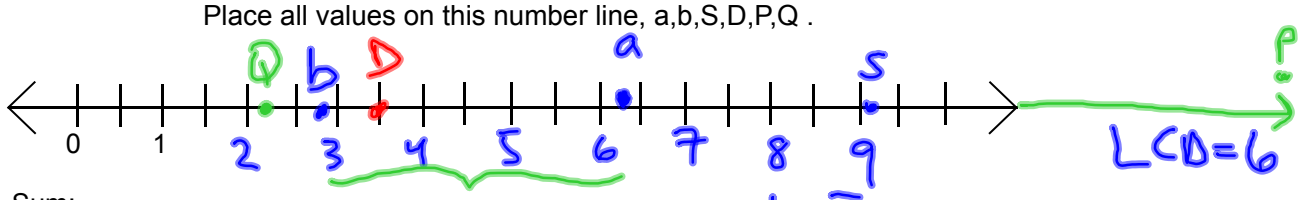
$$|a-b| = |b-a| = |-6| = 6$$

② EXAMPLE:

Find the sum, difference, product and quotient of these two mixed numbers : a = $6\frac{1}{3}$

and b = $2\frac{5}{6}$

Place all values on this number line, a,b,S,D,P,Q .



Sum:

$6\frac{1}{3}+2\frac{5}{6}=6+\frac{1}{3}+2+\frac{5}{6}=8+\frac{1}{3}+\frac{5}{6}$

$=8+\frac{1}{3}\left(\frac{2}{2}\right)+\frac{5}{6}$

Difference:

$6\frac{1}{3}-2\frac{5}{6}=6+\frac{1}{3}-\left(2+\frac{5}{6}\right)$

$=6+\frac{1}{3}-2-\frac{5}{6}$

$=4+\frac{2}{6}-\frac{5}{6}$

$=4-\frac{3}{6}=4-\frac{1}{2}=3\frac{1}{2}=D$

$=8+\frac{2}{6}+\frac{5}{6}=8+\frac{7}{6}$

$=8+1\frac{1}{6}=9\frac{1}{6}$ S

Product:

$(6\frac{1}{3})(2\frac{5}{6})=\left(\frac{19}{3}\right)\left(\frac{17}{6}\right)=\frac{19(17)}{3(6)}$

$=\frac{323}{18}=17\frac{17}{18}$

Quotient:

$\frac{6\frac{1}{3}}{2\frac{5}{6}}=\frac{\frac{19}{3}}{\frac{17}{6}}=\frac{19}{3}\div\frac{17}{6}=\frac{19}{3}\cdot\frac{6^{2}}{17}$

$=\frac{19(2)}{17}=\frac{38}{17}$

$=2\frac{4}{17}$

Distance between a and b on the number line.

$\left|6\frac{1}{3}-2\frac{5}{6}\right|=\left|3\frac{1}{2}\right|=3\frac{1}{2}$

EXPONENT NOTATION

a^n means "a multiplied by itself n times"

③ Examples:

$(-5)^3 = (-5)(-5)(-5)$
$= -125$

but $-3^4 = -(3 \cdot 3 \cdot 3 \cdot 3)$
$= -81$

$\left(\frac{2}{3}\right)^2 = \left(\frac{2}{3}\right)\left(\frac{2}{3}\right) = \frac{4}{9}$

ORDER OF OPERATIONS

"Please excuse my dear Aunt Sally."

exponents

P E MD AS addition/subtraction

parantheses multiplication/division

④ Examples:

$8 \cdot 3^2 - 4(12+3)$ $= 8 \cdot 3^2 - 4(15)$

$= 8 \cdot 9 - 4(15) = 72 - 60$

$= 12$

$2(6) + 12 \div 3(2) - 7$

$= 12 + 4(2) - 7$

$= 12 + 8 - 7 = 20 - 7 = 13$

$3 + 2 * 5 - 2^3$ $= 3 + 2 \cdot 5 - 8$

$= 3 + 10 - 8$

$= 13 - 8 = 5$

Finally:

$4 - 3^2(5+^-6)^3 + 8 = ?$

$= 4 - 3^2(-1)^3 + 8$

$= 4 - 9(-1) + 8$

$= 4 - (-9) + 8$

$= 4 + 9 + 8 = 21$