MATH 100
REAL NUMBERS

GOALS

- CLASSIFY NUMBERS AS NATURAL, INTEGER, RATIONAL IRRATIONAL, REAL.
- UNDERSTAND HOW ORDER OF OPERATIONS RELATES TO NUMBER TYPES
- PERFORM OPERATIONS USING PEMDAS
- EVALUATE + SIMPLIFY ALGEBRAIC OPERATIONS/EXPRESSIONS

CONSTRUCTING NUMBER SYSTEMS

NATURAL NUMBERS: THE NUMBERS WE USE TO COUNT AND ORDER THINGS

$\mathbb{N} =$

WHOLE NUMBERS: NATURALS AND ZERO (NON-NEGATIVE INTEGERS)

$\mathbb{W} =$

OPERATIONS ON NATURAL/WHOLE NUMBERS

- WE CAN **ADD** ANY TWO WHOLE NUMBERS AND GET ANOTHER WHOLE NUMBER

  e.g. $3 + 7 =$, $0 + 41 =$; $101 + 2002 =$

- WE CAN **MULTIPLY** ANY TWO WHOLE NUMBERS AND GET ANOTHER WHOLE NUMBER

  e.g. $3 \cdot 7 =$

  $1 \cdot 25 =$

  $5 \cdot 12 =$

MULTIPLICATION OF WHOLE NUMBERS IS

$3 \cdot 7 =$

$=$

- WHAT IF WE **SUBTRACT**?
  - $7 - 3 =$
  - $42 - 5 =$
  - $6 - 8 =$ ← NEED TO DEFINE
  - $=$

INTEGERS:

$\mathbb{Z} =$

OPERATIONS ON INTEGERS

- WE CAN **ADD OR SUBTRACT** ANY TWO INTEGERS AND GET ANOTHER INTEGER

  e.g. $7 + 12 =$, $1 - 8 =$, $-4 + 1 =$, ...

- WE CAN **MULTIPLY** ANY TWO INTEGERS AND GET ANOTHER INTEGER

  e.g. $5 \cdot 4 =$, $3 \cdot 8 =$, $100 \cdot (-4) =$

- WHAT ABOUT **DIVIDING**?
  - $10 \div 2 =$
  - $-32 \div 8 =$
  - $7 \div 3 =$ ← NEED TO DEFINE

RATIONAL NUMBERS: NUMBERS THAT CAN BE...

e.g.

DECIMALS: RATIONALS CAN ALSO BE WRITTEN AS

①

②

RECAP

EXPONENTIATION + ROOTS

NATURAL EXPONENTS: IF n IS A NATURAL NUMBER, a^n

e.g.

PROPERTIES:

$a^m \cdot a^n =$

$(a^m)^n =$

$\frac{a^n}{a^m} =$

ZERO AND NEGATIVE EXPONENTS

$a^0 =$

$a^{-n} =$

e.g.

① $3^{-4} =$

② $(-2)^{-3} =$

③ $\frac{x^2 y^3}{x^4 y} =$

④ $\left(\frac{x^5}{y^4}\right)^2 =$

⑤ $\left(\frac{x^5}{y^4}\right)^{-2} =$

⑥ $(x^2 y^3 z^5)^4 =$

⑦ SOLVE $x^3 = 64$

⑧ SOLVE $x^4 = 81$



FRACTIONAL EXPONENTS: $a^{m/n} =$ OR

e.g. $x^3 = 64$ $x^4 = 81$

e.g.

① $4^{3/2} =$ ② $9^{3/2} =$

③ $8^{5/3} =$ ④ $16^{-1/2} =$

⑤ $x^2 = 2 \longrightarrow x = \sqrt{2}$??

NOT RATIONAL!

REAL NUMBERS:



e.g.

SO WHAT...?

WE'VE FOUND THE NATURAL _____ CORRESPONDS TO A NATURAL _____

* ORDER OF OPERATIONS:

EXAMPLES:

① $10 + 2 \cdot (5 - 3) = 10 + 2 \cdot 2$

$= 10 + 4$

$= \boxed{14}$

② $18 + (6 - 8)^3 =$

③ $9 - 18 \div 3^2 =$

④ $25 \div 5^2 - 7 =$

⑤ $-2 \cdot [16 \div (8-4)^2]^2 =$

⑥ SIMPLIFY THE EXPRESSION $4x + x(13-7)$

⑦ SIMPLIFY THE EXPRESSION $9(y+8) - 27$

⑧ SIMPLIFY THE EXPRESSION $9x + 4x(2+3) - 4(2x+3x)$