

RWM101: Foundations of Real World Math



UNIT 1: NUMBER PROPERTIES

COMMUTATIVE LAW OF ADDITION & MULTIPLICATION

Tells us that the order you use to add or multiply numbers does not matter

if a and b are real numbers, then

$$a + b = b + a$$

$$a \cdot b = b \cdot a$$

When you change order it does not matter

EXAMPLE

$$\begin{array}{rcl} 5 + 3 &=& 3 + 5 \\ 8 & & 8 \end{array}$$

$$\begin{array}{rcl} 5 \cdot 3 &=& 3 \cdot 5 \\ 15 & & 15 \end{array}$$

ASSOCIATIVE LAW OF ADDITION & MULTIPLICATION

Tell us that no matter how we group or "associate" the numbers we add or multiply, the outcome remains the same

if a, b, c are real numbers, then

$$\begin{aligned} (a+b)+c &= a+(b+c) \\ (a \cdot b) \cdot c &= a \cdot (b \cdot c) \end{aligned}$$

EXAMPLE

$$\begin{array}{rcl} (7+8)+2 &=& 7+(8+2) \\ 15+2 &=& 7+10 \end{array}$$

$$\begin{array}{rcl} (5 \cdot \frac{1}{3}) \cdot 3 &=& 5 \cdot (\frac{1}{3} \cdot 3) \\ (\frac{5}{3}) \cdot 3 &=& 5 \cdot 1 \end{array}$$

ADDITIVE IDENTITY

Simply states that there is an additive called zero

$$0 + 5 = 5$$

$$0 + (-7) = -7$$

INVERSE PROPERTY OF ADDITION

for any real number a ,

$$a + (-a) = 0$$

$-a$ is the additive inverse of a

$$5 + (-5) = 0$$



$$-6 + 6 = 0$$



MULTIPLICATIVE IDENTITY PROPERTY

States that if you multiply any number by 1, the answer is simply the number you started with

$$1 \times 3 = 3 \quad (-5) \times 1 = -5$$

INVERSE PROPERTY OF MULTIPLICATION

for any real number $a \neq 0$

$$a \cdot \frac{1}{a} = 1$$

$\frac{1}{a}$ is the multiplicative inverse of a

"always returns 1"

$$5 \times \frac{1}{5} = 5$$

$$-3 \times \frac{1}{-3} = -3$$

$$\frac{2}{3} \times \frac{3}{2} = 1$$

UNIT 1: NUMBER PROPERTIES

MULTIPLICATION BY ZERO

Multiplying with zero is always zero, why?
One way to consider 5 plates with zero cookies

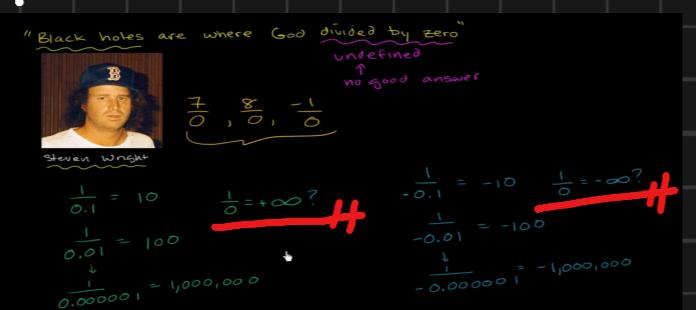
$$0 + 0 + 0 + 0 + 0 = 5, \text{ which is } 5 \times 0 = 0$$

DIVISION BY ZERO IS UNDEFINED

Any number divided by zero, the answer is undefined

$$5/0 = \text{undefined}$$

$$0/5 = 0$$



DISTRIBUTIVE PROPERTY

encoded in the distributed law. This property tells how to distribute a multiplication across a sum (we write the sum in parenthesis)

abstract statement of distributed law:

$$a \times (b + c) = (a \times b) + (a \times c)$$

as its name suggest, we are distributing the multiplied number a to each number in the sum

$$\begin{aligned} 4(8+3) &\rightarrow 4(11) \rightsquigarrow 44 \\ &\quad \downarrow \text{distributive} \\ 4 \cdot 8 + 4 \cdot 3 & \\ 32 + 12 & \\ = 44 & \end{aligned}$$

$$\begin{array}{r} 00000000 + 000 \\ 00000000 + 000 \\ 00000000 + 000 \\ 00000000 + 000 \\ \hline 4 \cdot 8 + 4 \cdot 3 \end{array}$$

$$\begin{aligned} 5(9-4) &\rightarrow 5(25) = 25 \\ &\quad \downarrow \\ 5 \cdot 9 - 5 \cdot 4 & \\ 45 - 20 & \\ = 25 & \end{aligned}$$

UNIT 2: COMMON MULTIPLES & COMMON FACTORS

