

1.7

## Multiplication of Real Numbers

Positive · Positive = Positive

Positive · Negative = Negative

Negative · Positive = Negative

Negative · Negative = Positive

Or

if they have the same sign, product is positive

if they have different signs, product is negative

ex)  $(4)(5) = 20$        $(-4)(5) = -20$

▪  $(-4)(-5) = 20$        $(4)(-5) = -20$

Forget about the signs when multiplying, then apply above rule.

### The Commutative Property of Multiplication

if  $a, b$  real then  $ab = ba$

### The Associative Property of Multiplication

if  $a, b, c$  real then  $(ab)c = a(bc)$

### Multiplying Multiple Numbers

take 'em 2 at a time.

### Multiplication of 0 and 1

if  $a$  is real then  $a \cdot 0 = 0$  and  $0 \cdot a = 0$

$a \cdot 1 = a$  and  $1 \cdot a = a$

## Division of Real Numbers

positive  $\div$  positive = positive

positive  $\div$  negative = negative

negative  $\div$  positive = negative

negative  $\div$  negative = positive

or

the division of same sign is positive

the division of different sign is negative.

ex  $10 \div 2 = 5$        $-10 \div 2 = -5$   
 $10 \div -2 = -5$        $-10 \div -2 = 5$

If  $a$  is real then  $\frac{a}{1} = a$  and  $\frac{a}{a} = 1$  ( $a \neq 0$ )

**You CANNOT DIVIDE BY ZERO!**

why? Notice  $10 \div 2 = 5 \Rightarrow 10 = 2 \cdot 5$

$$10 \div 0 = x \Rightarrow 10 = 0 \cdot x = 0$$

multiplicative inverse (or reciprocal)

ex) the multiplicative inverse of 3 is  $\frac{1}{3}$   
 (because  $3 = \frac{3}{1}$  flip this over & you get  $\frac{1}{3}$ )

Notice: dividing by a # is the same as multiplying by its multiplicative inverse.

ex)  $12 \div 4 = 3$       and       $12 \times \frac{1}{4} = \frac{12}{4} = 3$

Recall,

When dividing by a fraction, we multiply by the reciprocal. So

(ex.) If we want  $\frac{1}{2} \div \frac{3}{4}$  (note dividing by  $\frac{3}{4}$  = fraction) we will need the reciprocal of  $\frac{3}{4}$  which is  $\frac{4}{3}$ . Then we change  $\div$  to  $\times$

$$\text{So } \frac{1}{2} \div \frac{3}{4} = \frac{1}{2} \times \frac{4}{3} = \frac{4}{6} \text{ or } \frac{2}{3}$$

$$\text{(ex.) } \frac{2}{3} \div \frac{5}{4} = \frac{2}{3} \times \frac{4}{5} = \frac{8}{15}$$

$$\text{(ex.) } 5 \div \frac{1}{2} = \frac{5}{1} \times \frac{2}{1} = \frac{10}{1} = 10$$

$$\text{(ex.) } \frac{2}{5} \div 6 = \frac{2}{5} \times \frac{1}{6} = \frac{2}{30} \text{ or } \frac{1}{15}$$

## Negative Signs & Parentheses

If you have a negative sign outside a parenthesis you must "distribute" the negative over.

$$\textcircled{\text{ex}} - (2x+3) \\ \overbrace{- (2x+3)} = -2x-3 \\ = \boxed{-2x-3}$$

$$\textcircled{\text{ex}} - (5x-8) \\ \overbrace{- (5x-8)} = -5x--8 \\ = \boxed{-5x+8}$$

notice a shortcut: distributing a negative just changes all the signs!

$$\textcircled{\text{ex}} -3(2x-5) \\ \overbrace{-3(2x-5)} = (-3)(2x) - (-3)(5) \\ = -6x--15 \\ = \boxed{-6x+15}$$

$$\textcircled{\text{ex}} \text{Simplify } -2(5x-8) - 3(2x+4) \\ = \overbrace{-2(5x-8)} - \overbrace{3(2x+4)} \\ = -10x+16 - 6x-12 \\ = \boxed{-16x+4}$$