Evaluate each expression:

$$16 - 8 \div 2^2 + 14$$

$$15 - [10 + (3 - 2)^2] + 6$$

$$a^2(3b + 5) \div c \quad if \ a = 2, b = 6, c = 4$$

Warm -Up

Evaluate each expression:

$$16 - 8 \div 2^2 + 14$$

$16 - 8 \div 4 + 14$

$16 - 2 + 14$

$14 + 14$

28

Warm-Up

Evaluate each expression:

$$15 - [10 + (3 - 2)^2] + 6$$

$$15 - [10 + (\cdot 1)^2] + 6$$

$$15 - (10 + 1) + 6$$

$$15 - \ 11 + 6$$

$$4 + 6$$

$$\boxed{6} \quad \text{Warm-up}$$

Evaluate each expression:

$$a^2(3b + 5) \div c \qquad if \ a = 2, b = 6, c = 4$$

$2^2(3 \cdot 6 + 5) \div 4$
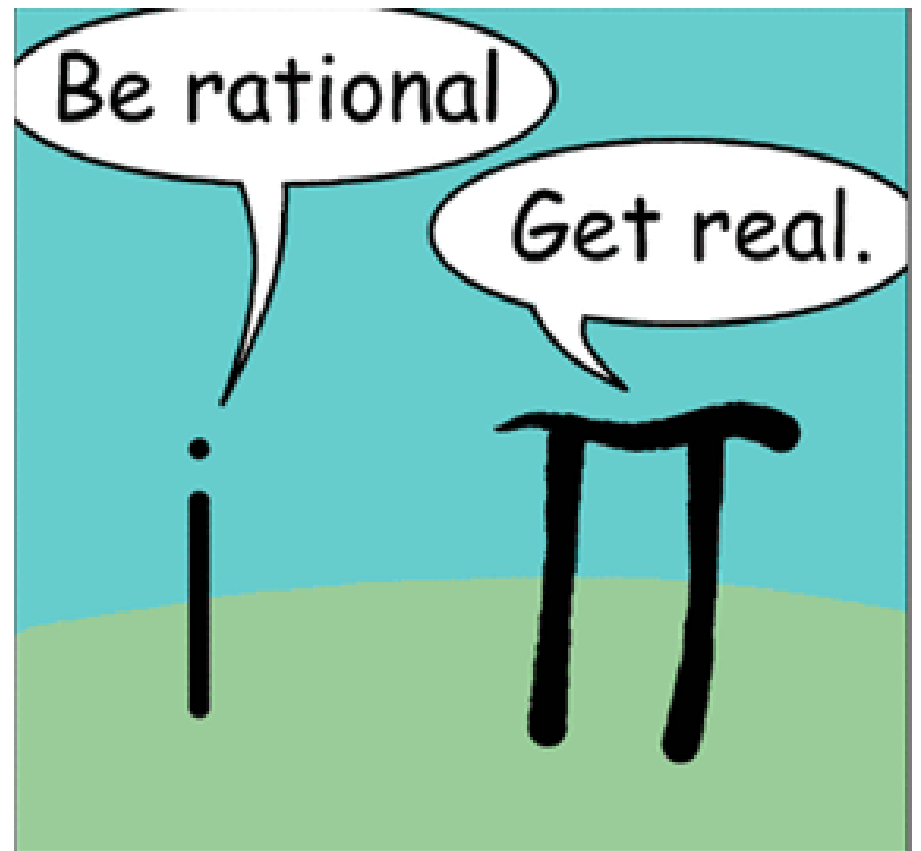
$2^2 (18 + 5) \div 4$

$2^2 \cdot 23 \div 4$

$4 \cdot 23 \div 4$

$92 \div 4$

23

Warm-Up

The Real Number System

Goals aligned to common core standards:

- You will understand how the real number system breaks down.

- You will be able to identify the properties.

Real Numbers

Rational Numbers (Q)

Integers (Z)

Whole Numbers (W)

Natural Numbers (N)

Irrational Numbers (I)

Real Numbers

Rational Numbers (Q)

Integers (Z)

Whole Numbers (W)

Natural Numbers (N)
Positve numbers starting with 1

Irrational Numbers (I)

Real Numbers

Rational Numbers (Q)

Integers (Z)

Whole Numbers (W)
Positve numbers starting with 0

Natural Numbers (N)
Positve numbers starting with 1

1, 2, 3, 4, 5, ...

Irrational Numbers (I)

Real Numbers

Rational Numbers (Q)

Integers (Z)
Positive and negative numbers and 0, NO fractions/decimals

Whole Numbers (W)
Positve numbers starting with 0

0, 1, 2, 3, 4, 5, ...

Natural Numbers (N)
Positve numbers starting with 1

1, 2, 3, 4, 5, ...

Irrational Numbers (I)

Real Numbers

Rational Numbers (Q)
can be written as a **fraction**, **repeating or terminating decimals**, whole number, can be positive or negative

Integers (Z)
Positive and negative numbers and 0, NO fractions/decimals
. . . ,-3, -2, -1, 0, 1, 2, 3, ...

Whole Numbers (W)
Positve numbers starting with 0
0, 1, 2, 3, 4, 5, ...

Natural Numbers (N)
Positve numbers starting with 1
1, 2, 3, 4, 5, ...

Irrational Numbers (I)

Real Numbers

Rational Numbers (Q)
can be written as a **fraction**, **repeating or terminating decimals**, whole number, can be positive or negative

4   5/22   -2/3   4.121212...   3.25

Integers (Z)
Positive and negative numbers and 0, NO fractions/decimals

$\ldots, -3, -2, -1, 0, 1, 2, 3, \ldots$

Whole Numbers (W)
Positve numbers starting with 0

$0, 1, 2, 3, 4, 5, \ldots$

Natural Numbers (N)
Positve numbers starting with 1

$1, 2, 3, 4, 5, \ldots$

Irrational Numbers (I)
cannot be written as a fraction, **non-repeating and non-terminating decimals**, square roots of non-perfect squares

Real Numbers

Rational Numbers (Q)
can be written as a **fraction**, **repeating** $\sqrt{4}$ **or terminating decimals**, whole number, can be positive or negative

4   5/22   -2/3   4.121212...   3.25

Integers (Z)
Positive and negative numbers and 0, NO fractions/decimals
... ,-3, -2, -1, 0, 1, 2, 3, ...

Whole Numbers (W)
Positive numbers starting with 0
0, 1, 2, 3, 4, 5, ...

Natural Numbers (N)
Positive numbers starting with 1
1, 2, 3, 4, 5, ...

Irrational Numbers (I)
cannot be written as a fraction, **non-repeating** and **non-terminating decimals**, square roots of non-perfect squares

5.676776777.......

12.34567891011.......

π e

$\sqrt{2}$

$1 + \sqrt{3}$

Which set or sets of numbers do the following belong in?

$1 + \sqrt{9}$

$1 + 3 = \boxed{4}$

Q, Z, W, N, R

-11

Z, R, Q

1.75

Q, R

$\dfrac{2}{3}$

Q, R
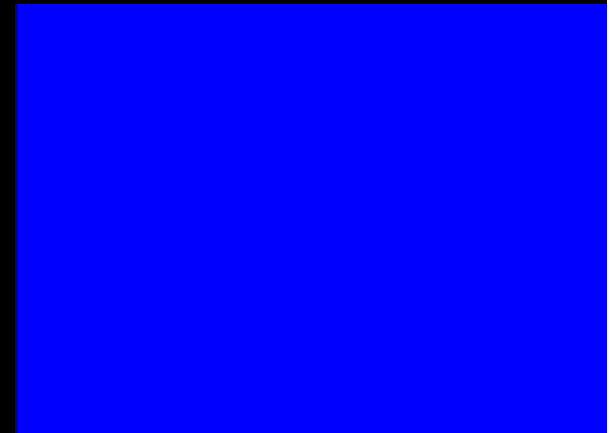
$3 - \sqrt{7}$

I, R

1.112123 ...

I, R

Additive Identity

What can you add to a number so that it never loses its identity?

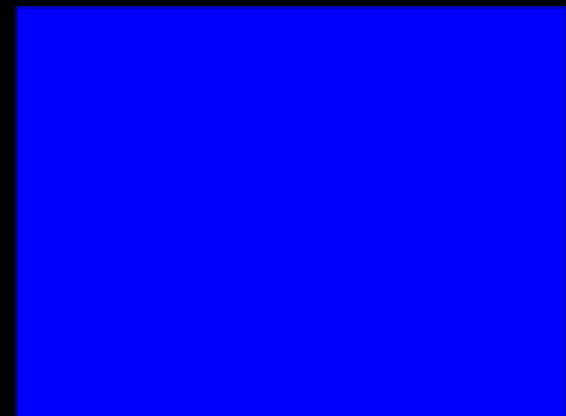*For any number a, the sum of a and 0 is a.*

$$a + 0 = a$$

$$7 + 0 = 7$$

Additive Inverse

What is the oppositve of a positive number?

A number and its opposite are additive inverses of each other.
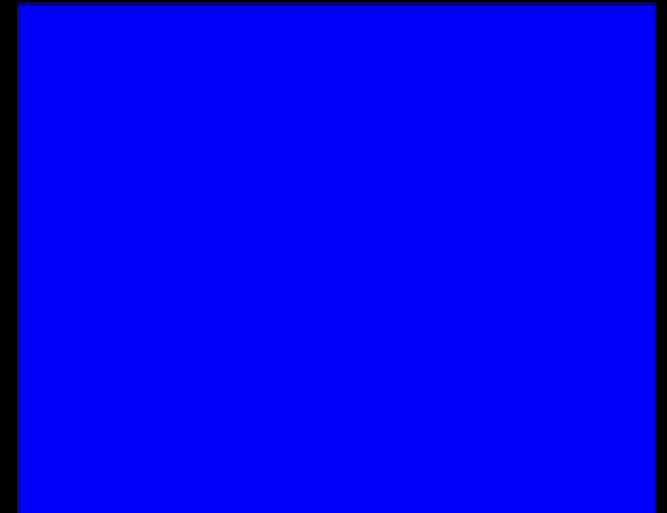
$$a + (-a) = 0$$

$$3 + (-3) = 0$$

Multiplicative Identity

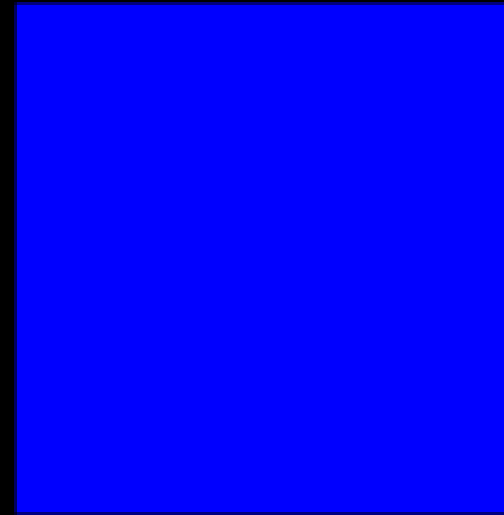What can you multiply a number by so that it doesn't lose its identity?

$$a(1) = a$$

$$3(1) = 3$$

Multiplicative Property of Zero

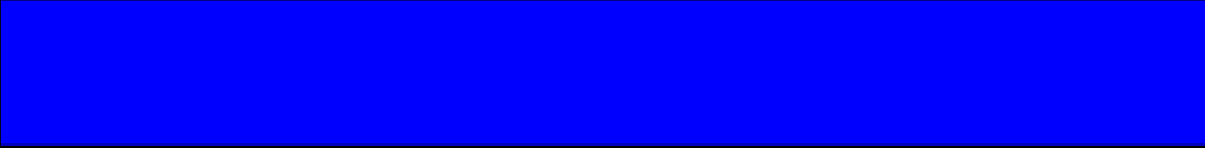What can you multiply a number by so that it is always zero?
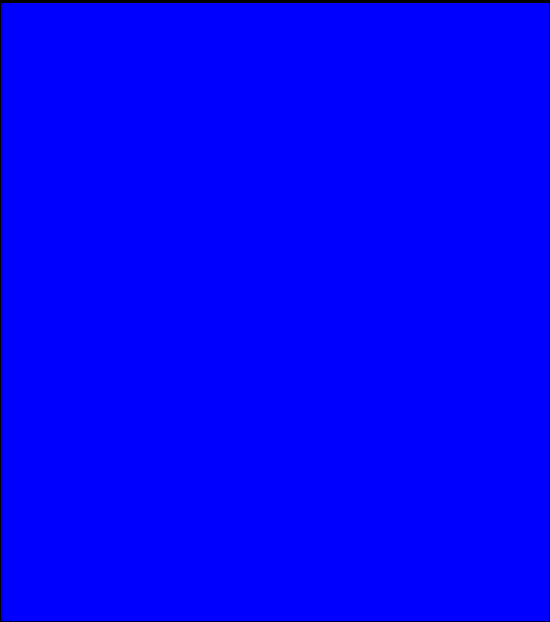
$$a(0) = 0$$

$$6(0) = 0$$

Multiplicative Inverse

What can you multiply a number by so that the answer is always 1?

*mulitply by the reciprocal!!

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

$$\frac{2}{3} \cdot \frac{3}{2} = \frac{6}{6} = 1$$

Reflexive Property

You want the same thing on both sides of the equal mark.

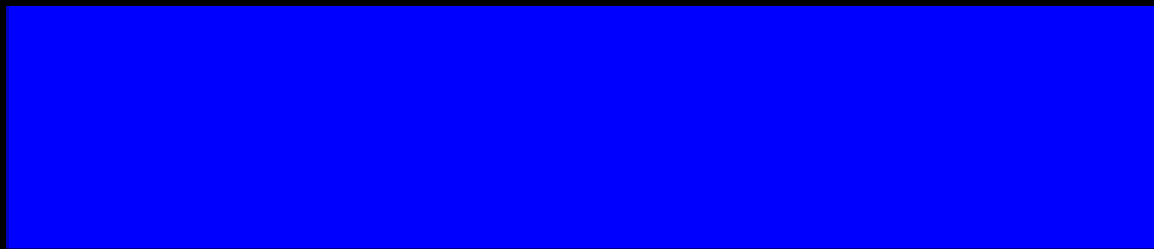*A quantity is equal to itself.*

$$8 = 8$$

$$a + b = a + b$$

$$7 + 6 = 7 + 6$$

Symmetric

The problem = the answer and the answer = the problem. It doesn't matter how you write it.

$2 + 3 = 5$ then $5 = 2 + 3$

Transitive
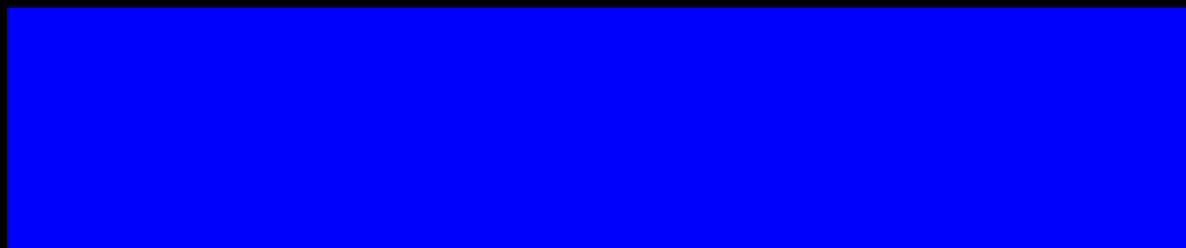
If a = b and b = c, then a = c.

2 + 3 = 4 + 1 and 4 + 1 = 5, then 2 + 3 = 5

Substitution

Think about what substitution means.
You replace one thing with another.

If x = 2, then 3x = 3(2).

Commutative

Does order matter when you are adding or multiplying numbers?

The order in which you add or multiply numbers does not change their sum or product.

$$a + b = b + a \qquad a(b) = b(a)$$

$$4 + 5 = 5 + 4 \qquad 2(3) = 3(2)$$

Associative

When adding or multiplying, does it matter how you group numbers?

The way you group three or more numbers when adding or multiplying does not change their sum or product.

$(a + b) + c = a + (b + c)$ $(a * b)c = a(b * c)$

$(1 + 2) + 3 = 1 + (2 + 3)$ $(1 * 2)3 = 1(2 * 3)$

Distributive

Distribute the number outside of the parentheses to everything on the inside.

$$2(a + b) = 2a + 2b$$

Can you Identify the Properties??

1. $x + 0 = x$
2. $x(0) = 0$
3. $x + 1 = x + 1$
4. $3 + 4 = 7$ then $7 = 3 + 4$
5. $(3/4)(4/3) = 1$
6. $1 + 2 = 4 -1, 4 - 1 = 3$, so $1 + 2 = 3$
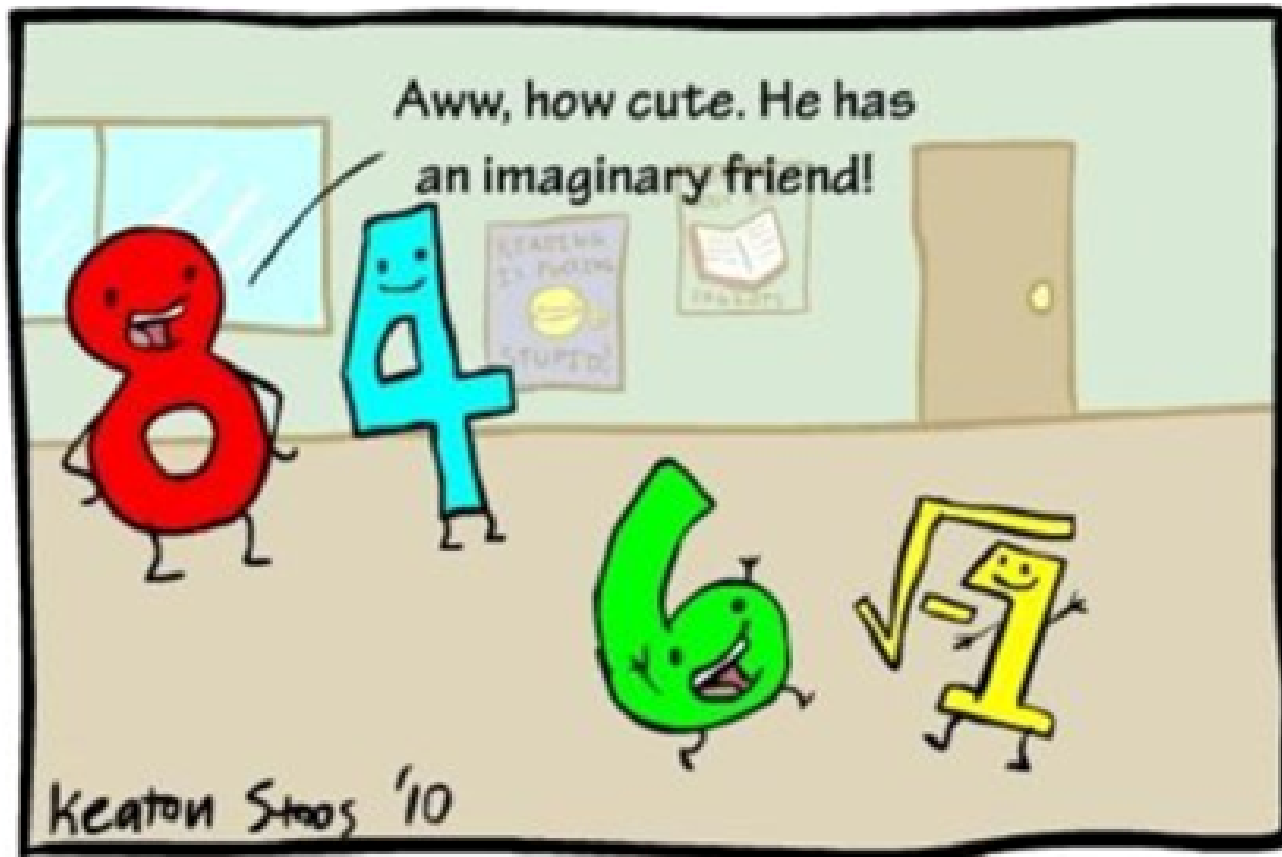7. $x(1) = x$
8. $2(3) = 3(2)$
9. $(4 + 5) + 2 = 4 + (5 + 2)$
10. If $x = 6$, then $5x = 5(6)$
11. $4 + (-4) = 0$

Goals aligned to common core standards:

- You understand how the real number system breaks down.

- You can identify the properties.

Assignment: Worksheet