Summary **Properties of Real Numbers**

Let a, b, and c represent real numbers.

Property	Addition	Multiplication
Closure	$a + b$ is a real number.	ab is a real number.
Commutative	$a + b = b + a$	$ab = ba$
Associative	$(a + b) + c = a + (b + c)$	$(ab)c = a(bc)$
Identity	$a + 0 = a, 0 + a = a$	$a \cdot 1 = a, 1 \cdot a = a$
Inverse	$a + (-a) = 0$	$a \cdot \frac{1}{a} = 1, a \neq 0$
Distributive		$a(b + c) = ab + ac$

The Additive Inverse of a number is its OPPOSITE.

The opposite of a number is....

- The same distance from zero but on the other side of zero
- Same # but different sign
- The sum of opposites is always ZERO.

The Multiplicative Inverse of a number is it's RECIPROCAL.

The reciprocal of a number ....

- Is one over that number
- Has the same sign as that number
- The product of a number and its reciprocal is always ONE.

Find the opposite and reciprocal of each number

	Opposite	Reciprocal
$-0.13 = \frac{13}{100}$	0.13	$-\frac{100}{13}$
$5\frac{2}{3} = \frac{17}{3}$	$-5\frac{2}{3}$	$\frac{3}{17}$
$a - b$	$-(a-b)$ $= -a + b$	$\frac{1}{a-b}$

Are there any numbers that are reciprocals of themselves?

If yes, which ones?

Yes, 1 & -1

Solve this equation for Q.

$$AB - QC = W$$

Subtract AB from both sides

$-QC = W - AB$

Divide both sides by -C

$$Q = \frac{W - AB}{-C}$$

$$AB - QC = W \qquad\qquad Q = \frac{W - AB}{-C}$$

State the restrictions on the variables.

$C \neq 0$

Solve this equation for K.   State the restrictions on the variables.

Here is one method:

$$G(K + E) - X = D$$

Add X to both sides

$G(K + E) = D + X$

distribute the G

$GK + GE = D + X$

subtract GE from both sides

$GK = D + X - GE$

Divide both sides by G

$$K = \frac{D + X - GE}{G}$$

Restrictions: $G \neq 0$

Solve this equation for K.

State the restrictions on the variables.

Here is another method:

$$G(K + E) - X = D$$

Add X to both sides $\quad G(K + E) = D + X$

divide both sides by G $\quad K + E = \dfrac{D + X}{G}$

subtract E from both sides $\quad K = \dfrac{D + X}{G} - E$

Restrictions: $\quad G \neq 0$

Solve this equation for Y. **State restrictions on the variables.**

$$\dfrac{RY - B}{G} = K$$

1. Multiply both sides by G
2. Add B to both sides
3. Divide both sides by R

$$Y = \dfrac{KG + B}{R}$$

Restrictions: $\quad R \neq 0$
$\quad G \neq 0$

Solve this equation for A. **State restrictions on the variables.**

$$AC - AE = N$$

1. Factor out A from the two terms on the left side
2. Divide both sides by the quantity C-E

$$\dfrac{A(C - E)}{C - E} = \dfrac{N}{C - E}$$

$$A = \dfrac{N}{C - E}$$

Restrictions:

$$C - E \neq 0$$

OR

$$C \neq E$$

Solve for R. **State restrictions on the variables.**

$$\dfrac{\sqrt{KR - M}}{A} - B = G$$

1. Add B to both sides
2. Mult both sides by A
3. Square both sides
4. Add M to both sides
5. Divide both sides by K

$$R = \dfrac{\left((G + B)A\right)^2 + M}{K}$$

Restrictions: $\quad A \neq 0$
$\quad K \neq 0$
$\quad KR - M \geq 0$

Solve for C.   State restrictions on the variables.

$$(C - A)Q = \frac{C + P}{C - A} \cdot C - A$$ Multiply both sides by (C - A)

$$CQ - AQ = C + P$$ distribute Q on the left side of the equation

$$-C + AQ \quad -C + AQ$$ subtract C from both sides and add AQ to both sides

Factor out C

$$CQ - C = P + AQ$$

$$C(Q - 1) = P + AQ$$
$$\frac{}{Q - 1} \qquad \frac{}{Q - 1}$$ divide both sides by Q-1

$$C = \frac{P + AQ}{C - 1}$$

Restrictions:
$$C - A \neq 0 \rightarrow C \neq A$$
$$C - 1 \neq 0 \longrightarrow C \neq 1$$

Solve this equation for Q. State restrictions on the variables.

$$\frac{A}{M - P} = \frac{K}{G + Q}$$ Cross Multiply

$$\frac{A(G + Q)}{A} = \frac{K(M - P)}{A}$$ divide both sides by A

$$G + Q = \frac{K(M - P)}{A}$$ subtract G from both sides
$$-G \qquad \qquad -G$$

$$Q = \frac{K(M - P)}{A} - G$$

Restrictions:
$$A \neq 0$$
$$M - P \neq 0 \rightarrow M \neq P$$
$$G + Q \neq 0 \rightarrow G \neq -Q$$