## Enrichment Problems

Do these problems on a separate sheet of paper.

11 The compound inequality $-3 < x \leq 5$, where $x \in$ reals, represents an interval on the number line which can also be written with the interval notation (-3, 5]. The parenthesis here means "do not include the -3," and the bracket means "include the 5." Write an interval notation for these sets.

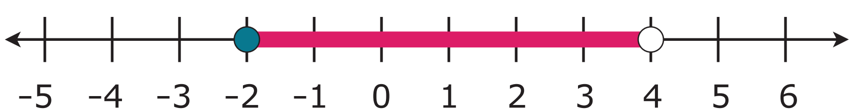
a $-9 \leq y < 10$ b $0 < w \leq 3$ c $4 < p < 100$

12 Another way to represent $x > 3$ where $x \in$ reals, is to use the interval notation $(3, +\infty)$. We use the round bracket with infinity since we never reach it! Write $x \leq 7$ using interval notation.

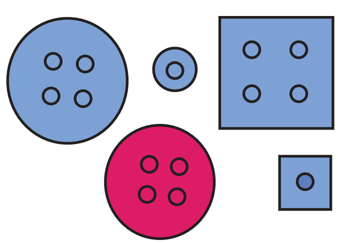
13 How would you write all the real numbers using interval notation?

14 Write a compound inequality for the following: $(-\infty, -3] \cup (2, +\infty)$. Hint: It's an OR statement.

15 Write the compound inequality and the interval notation for the graph below.




16 Connie has 8 small blue buttons that are round. She has 3 large buttons that are blue and square. 5 buttons are blue and square and also small. She knows she has 28 buttons that are small and a total of 26 that are blue. 2 buttons are red, small, and also square. If in total she has 50 buttons, how many are large, square but not blue? Use a Venn diagram to find the answer.



17 Write a word problem where the intersection of *A* and *B* has 7 elements, the union of *A* and *B* has 23 elements and *B* has 17 elements.

18 Use a Venn diagram to show if this statement is valid or not valid. No *X* is in *Y*. Every *Q* is an *X*. Therefore, no *Q* is a *Y*. What is the relationship between *Q* and *X*?

# Operations and Properties of Rational Numbers

In this section we will review operations (+ − • ÷) with rational numbers. Remember to use the number line to help you. Later, you will use your graphing calculator to speed the arithmetic process, but it's important to understand the concepts so you know if your answers make sense.

## Addition of Rationals

When adding two numbers, if the signs are the same, add and keep the sign.

1 $5 + 10 = 15$

2 $-3 + (-4) = -7$

3 $-\frac{1}{2} + \left(-\frac{3}{4}\right) = -1\frac{1}{4}$

Parentheses are used to help you read the problem.

Remember that to add (or subtract) fractions a common denominator is needed.

When adding two numbers, if their signs are different, subtract the two numbers and keep the sign of the number farthest away from 0. This is the number with the larger **absolute value**.

Remember: the **absolute value** of a number is written like this $|5|$ and the answer is **always positive**. $|5| = 5$ and $|-5| = 5$.

4 $-5 + 8 = 3$

5 $-10 + 4 = -6$

6 $-6 + 6 = 0$

7 $-\frac{1}{2} + \frac{3}{4} = \frac{1}{4}$

8 $2.04 + (-5.46) = -3.42$

Property 1: **Addition Property of Zero**
Add **0** to any real number to get the same number. Zero is the **identity** for addition.

$$n + 0 = n$$

Property 2: **Additive Inverse Property**
Two numbers whose sum is 0 are called additive inverses.

$$n + -n = 0$$

## Steps 4 and 5 Together – Solving Two-Step Equations

Do you remember that to follow the order of operations we always do multiplication or division (left to right) and then addition or subtraction (left to right)? Now since we're trying to solve equations we will be working backwards to find our answer. When solving two-step equations, you must undo addition or subtraction **(step 4)** before the multiplication or division or using reciprocals **(step 5)**. Remember to start on the side that has the variable.

**1**

$$5x - \cancel{6} = 79$$
$$\underline{\quad + \cancel{6} \quad + 6}$$
$$\frac{\cancel{5}x}{\cancel{5}} = \frac{85}{5}$$
$$x = 17$$

Undo – 6 by adding 6.
Undo the 5 by dividing by 5.

Remember to do the same on each side of the equation.

$1 \cdot x$ is the same as $x$.

**2**

$$0 = \frac{4}{5}x - \cancel{20}$$
$$\underline{+ 20 \qquad + \cancel{20}}$$
$$20 = \frac{4}{5}x$$
$$\frac{5}{4} \cdot 20 = \cancel{\frac{5}{4}} \cdot \cancel{\frac{4}{5}}x$$
$$25 = x$$

Undo – 20 by adding 20.

Undo $\frac{4}{5}$ by multiplying by the multiplicative inverse or reciprocal $\frac{5}{4}$.
4 goes into 20 five times and 5 times 5 = 25.

Don't forget you can always check your answer.

$0 = \frac{4}{5} \cdot 25 - 20?$

$0 = 20 - 20?$ Yes!

**3**

$$-\frac{6}{7}w + \cancel{8} = 50$$
$$\underline{\qquad - \cancel{8} \quad - 8}$$
$$-\frac{6}{7}w = 42$$
$$\cancel{-\frac{7}{6}} \cdot \cancel{-\frac{6}{7}}w = 42 \cdot -\frac{7}{6}$$
$$w = -49$$

Undo + 8 by adding -8 (or subtracting 8).

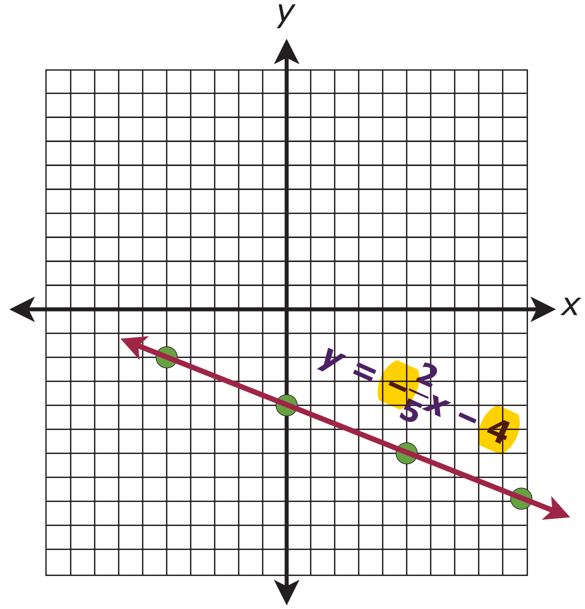
Remember to watch your signs.

Then undo with the multiplicative inverse of $-\frac{6}{7}$ by multiplying by $-\frac{7}{6}$ on each side.

Let's look at one example where the slope is negative.

1 Graph $y = -\frac{2}{5}x - 4$.

The slope is $\frac{-2}{5}$ *or* $\frac{2}{-5}$. You can give the negative to either the numerator or the denominator, but NOT both as that would make it a positive. So start at –4, the *y*-intercept. Go down 2 units and to the right 5 units. You can also go up 2 units and to the left 5 units.




2 Graph $3y = 6x$.
Be sure to solve for *y*. So dividing both sides by 3, $y = 2x$.

The *y*-intercept is 0 and the slope is 2. Change 2 to $\frac{2}{1}$ or $\frac{-2}{-1}$.