Math 90
Unit 1
Rational Numbers

N9.2

Demonstrate understanding of rational numbers including: comparing and ordering, relating to other types of numbers, solving situational questions.

Name: _____

What is a Rational Number?

Classifying Numbers

When working with numbers we can break them into certain groups based on different characteristics. We do this because some problems only work for certain types of numbers and not others, and because some types of numbers are more difficult to work with. Many of these should be familiar to you.

Whole Numbers: Whole numbers are the _____ numbers, including 0, and do not include _____.

{0, 1, 2, 3, 4, …}

Integers: Integers are similar to whole numbers because they do not include decimals or fractions. However, integers include the _____ numbers

{..., -3, -2, -2, 0, 1, 2, 3, …}

Rational numbers: a rational number is any number that can be written as a _____. All terminating and repeating decimals are rational numbers

Ex: $\frac{4}{18}$, $0.\overline{6}$, 8, 0.25, etc

Irrational numbers: an irrational number is a number that can not be written as a fraction. For example, 0.12345678971234567897712345…

Real Numbers: Any number you can place on a number line (this includes all the numbers you have learned about so far)

Name: _____

We are going to focus on rational numbers.

Example:

Determine if the following numbers are whole numbers, integers, rational numbers, or irrational numbers

1. $\frac{-6}{3}$

2. -7

3. 190 341

4. 0.875

5. 3.14159265…

Name: _____

Example:

1. If a number is a whole number is it also an integer? Find an example that shows if this is true or not

2. If a number is an integer is it also a rational number? Find an example that shows if this is true or not

3. If a number is a rational number is it also a whole number? Find an example that shows if this is true or not

Name: _____

We can create a venn diagram to help show these relationships

Name: _____

Ordering and Comparing Rational Numbers

As we saw in the previous lesson, rational numbers can be whole numbers, integers, fractions, or decimals. This means that if we want to compare them we need them to be in similar forms.

Example:
Decide which is the bigger number in the following pairs

1. $\frac{-3}{8}$ or $\frac{-5}{8}$

2. $\frac{-10}{4}$ or -2.8

3. 0.75 or $\frac{1}{4}$

Note: We can either change both to a decimal or both to a fraction. Remember that when we compare fractions they need to have the same denominator!

4. $\frac{6}{8}$ or $\frac{3}{5}$

Name: _____

Example:

1. Compare the following numbers and place them in order from **smallest to largest**

   $\frac{-3}{4}$, 0.5, -1.8, -5, $\frac{7}{3}$, 2, $-3.\overline{3}$, $1\frac{3}{4}$

2. Place the following numbers on the number line

   $\frac{1}{2}$, -0.75, -2, 4, $-2.\overline{6}$, $\frac{5}{4}$, $\frac{60}{10}$

Name: _____

3. Identify a **decimal** between each pair of rational numbers

a) $\frac{-1}{2}$ and $\frac{-1}{4}$

b) -0.55 and -0.35

4. Identify a **fraction** between each pair of rational numbers

a) $-\frac{2}{3}$ and $\frac{-2}{5}$

b) $\frac{5}{2}$ and $\frac{7}{5}$

Name: _____

Adding and Subtracting Rational Numbers

Adding and Subtracting Integers Review

1. (4) + (-3)=

2. (-5) + (-8)=

3. (-7) + (1)=

Note: when we subtract a negative we can turn it into an addition statement

4. (-4) - (-2)=

5. (-10) - (2)=

Adding and Subtracting Decimals Review

1. (0.25) + (0.13)=

2. (-0.127) + (1.718)=

3. (2.35) - (0.168)=

4. (-0.26) - (-1.28)=

Name: _____

Adding and Subtracting Fractions Review

In order to add and subtract fractions they need to have the same denominator

1. $(\frac{-7}{9})$ + $(\frac{5}{9})$=

2. $(1\frac{2}{3})$ + $(-6\frac{1}{3})$=

3. $(\frac{5}{6})$ - $(\frac{11}{6})$=

If they do not have common denominators we need to make them common denominators first. You CAN NOT subtract or add fractions without common denominators!

4. $(\frac{-7}{8})$ + $(\frac{3}{4})$=

5. $(-\ 3\frac{1}{3})$ - $(2\frac{3}{4})$=

*always write your fractions in lowest form and as improper fractions!

Name: _____

Examples:

1. The temperature at St. John's is $6.5^{\circ}c$. In Corner Brook it is $8^{\circ}c$ colder. What is the temperature in Corner Brook?

2. A person climbs $12\frac{2}{3}$ meters above the water to the top of a cliff. He dives into the water and reaches $-3\frac{1}{6}$ meters below the surface. What is the difference in these heights?

3. A guardrail needs to be exactly 19.77m long. A contractor has 3 pieces measuring 2.21m, 9.14m, and 3.21m. Does he have enough to complete the guardrail?

Name: _____

Adding and Subtracting Rational Numbers in Different Forms

In order to do anything with rational numbers in different forms, we need to put them in the same form like we did when comparing them. So if we want to add and subtract rational numbers in different forms, we need them to be in the same form first.

Example:

1. (0.167) + ($\frac{2}{5}$)=

2. (-1$\frac{2}{4}$) - (0.25)=

3. $-\ 1.276$ - ($\frac{-3}{4}$)=

4. ($\frac{125}{275}$) + (-0.4)=

Name: _____

5. During the recycling drive $\frac{1}{5}$ of the material collected was bottles, 0.25 was paper, and $\frac{1}{10}$ were cardboard boxes. What fraction of the total collected items is represented by these three items?

6. Jasmine's cd collection is 0.375 pop and $\frac{1}{4}$ rap. What decimal makes up the rest of her collection?

7. Three students ran for president of the student council. Eddie received 0.2 of the vote, Alex received $\frac{3}{8}$ of the votes. If Juliet received the rest of the votes, what fraction of the vote did she receive?

Name: _____

Multiplying Rational Numbers

Multiplying and dividing

+ and + = + Same signs = POSITIVE
- and - = -
+ and - = - Different signs = NEGATIVE
- and - = -

Multiplying Integers and Decimals

1. (-6) x (-3) =

2. (20) x (-2) =

3. (1.5) x (1.8) =

4. (-2.6) x (-3.25) =

Multiplying Fractions

When we multiply fractions we do not need common denominators, we can just multiply straight across.

1. $\frac{-2}{3}\ x\ \frac{3}{8}$ =

2. $\frac{5}{7}\ x\ \frac{-2}{4}$ =

Name: _____

We will change mixed fractions into improper fractions before we multiply

1. $2\frac{1}{7} \; x \; \frac{3}{2}$ =

2. $3 \; x \; 5\frac{4}{9}$ =

Multiplying Rational Numbers in Different Forms

Before we multiply rational numbers in different forms, we need to put them in the same form. It is up to you if you put them as fractions or decimals.

1. -0.25 x $\frac{-7}{10}$ =

2. $\frac{-6}{3}$ x 1.267 =

3. $\frac{241}{350}$ x 0.12 =

4. 0.133 x $\frac{-55}{220}$ =

Name: _____

Dividing Rational Numbers

Multiplying and dividing

+ and + = + Same signs = POSITIVE
- and - = -
+ and - = - Different signs = NEGATIVE
- and - = -

Dividing Integers and Decimals

1. (-15) ÷ (-5) =

2. (-18) ÷ (9) =

3. (20.4) ÷ (-6) =

4. (8.42) ÷ (2) =

Name: _____

Dividing Fractions

When dividing fractions **keep** the first fraction the same, **change** the division to multiplication, and **flip** the second fraction

1. $\frac{3}{4} \div \frac{-9}{8}$ =

2. $-\ 2\frac{4}{5} \div \frac{-6}{8}$ =

Dividing Rational Numbers in Different Forms

Before we divide rational numbers in different forms, we need to put them in the same form. The simplest way to do this is by writing both as fractions. Since we are working with rational numbers they can always be written as fractions

1. $\frac{3}{4} \div 0.25$ =

2. $12.6 \ \div \ \frac{9}{3}$ =

3. $0.3 \div \frac{5}{7}$ =

Name: _____

Order of Operations Involving Rational Numbers

Remember order of operations follows BEDMAS

B: _____

E: _____

D: _____

M: _____

A: _____

S: _____

Order of operations does not change for whole numbers, integers, or rational numbers

Example:

1. 0.25(-3 + 7) =

2. $(\frac{3}{5})+ (\frac{7}{4})$ x $(\frac{-5}{2})$ =

Name: _____

3. $(0.25 - \frac{3}{4}) + \frac{7}{10} \times 0.5 =$

Looking for Errors

Look through the following work and determine where the mistake was made. Then correct it and find the right answer

1. $\frac{3}{4} + \frac{7}{2} - (\frac{5}{6} \times -2)$

   $= \frac{17}{4} - (\frac{5}{6} \times -2)$

   $= \frac{41}{12} \times -2$

   $= \frac{-41}{6}$

2. $\frac{4}{5}(0.5 + \frac{2}{8})$

   $= \frac{2}{5} + \frac{2}{8}$

   $= \frac{13}{20}$