Rational Numbers

SEMINAR NOTES
Learning Guide 5
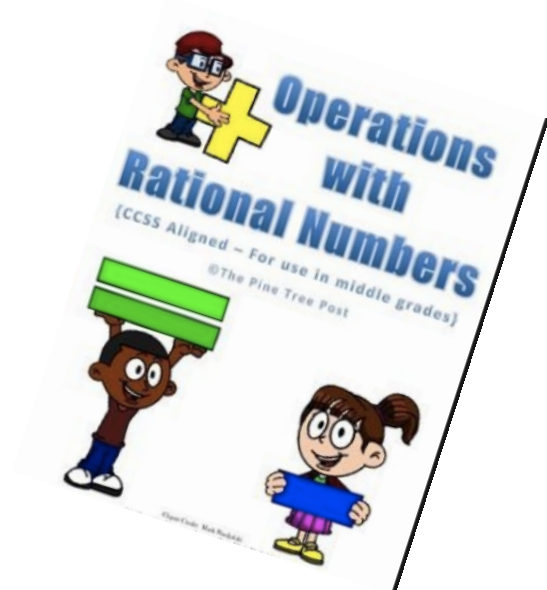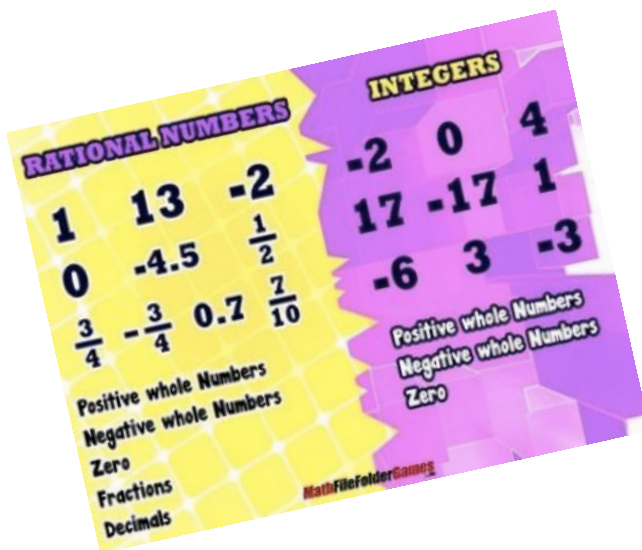
Rational Numbers

What is a Rational Number?

Rational numbers are numbers that can be written in fraction form.

**Ex.** Which of the following numbers are rational?

$\dfrac{3}{4}$	-0.375	$2.\overline{34}$	$0.1247823...$	π
Yes	**Yes**	**Yes**	**No**	**No**
It already is a fraction.	It is a terminating decimal.	The decimal has a repeating pattern.	The decimal is infinite but has no repeating pattern	The decimal is infinite but has no repeating pattern

Identifying Rational Numbers on a Number Line

Count the number of divisions between the integers. When identifying the rational number remember to count from the side where zero is.
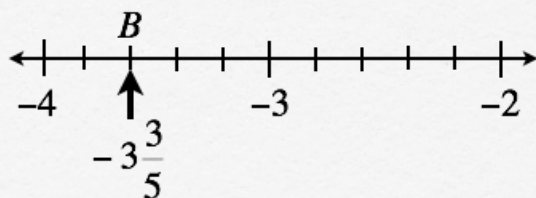
Ex. Write the rational number represented by the letter on the number line.

A

−6   −5

−5.4
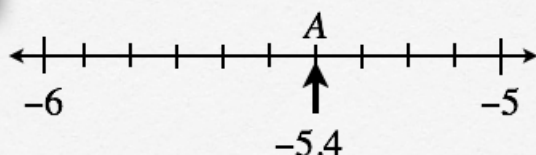
Count the divisions between integers.

Ex. Write the rational number represented by the letter on the number line.

B

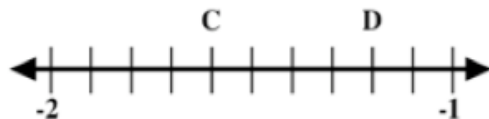−4   −3   −2
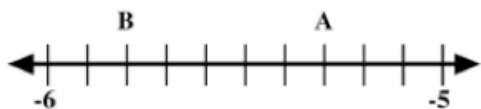
$-3\dfrac{3}{5}$

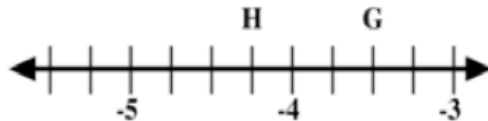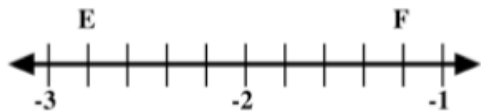Count the divisions between integers.

Try $5\dfrac{3}{8}$

Identify the rational number represented by the letter on the number line (as a decimal):

Identify the rational number represented by the letter on the number line (as a fraction):

Finding a Rational Number Between Two Numbers

To find a rational number between pairs of decimals, add zeroes to the end of the decimals.

Ex. Find a rational number between the following pair of decimals.

Add zeroes to the decimals.

1.1   1.2

1.10   1.20

$\boxed{1.15}$

To find rational numbers between pairs of fractions, convert them to common denominators.

Ex. Find a rational number between the following pair of fractions.

Add zeroes to the numerator and denominator, if necessary.

$$\frac{1}{2} \qquad \frac{2}{3}$$

$$\frac{3}{6} \qquad \frac{4}{6}$$

$$\frac{30}{60} \quad \frac{35}{60} \quad \frac{40}{60}$$

Try | Write 3 rational numbers between each pair of numbers:

3.6, 3.8   -2.5, -2.4   1.6, 1.9   8.61, 8.82

Write 3 rational numbers between each pair of numbers:

$$\frac{3}{5}, \frac{4}{5} \qquad\qquad \frac{3}{5}, \frac{4}{5} \qquad\qquad \frac{3}{5}, \frac{4}{5} \qquad\qquad \frac{3}{5}, \frac{4}{5}$$
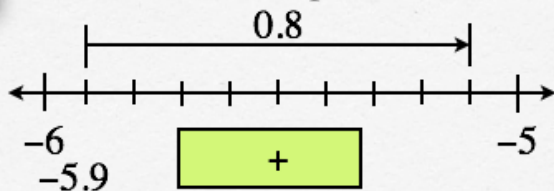
Using Number Lines to Add Rationals

Using a number line can help you understand how to add rational numbers.

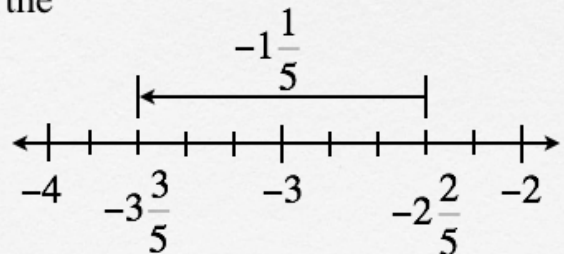**Ex.** Write the addition statement that the number line represents.

$$0.8$$

-6
-5.9

$+$

-5

$=$

Ex. Use the number line to complete the following addition statement.

$=$

$-1\dfrac{1}{5}$

-4 $\quad -3\dfrac{3}{5}$ $\quad -3$ $\quad -2\dfrac{2}{5}$ $\quad -2$

Adding and Subtracting Basic Fractions

When adding basic fractions you must only add or subtract when there is a common denominator.

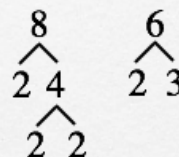**Ex.** Find the sum of the following fractions.

$$\frac{3^{\times 3}}{8^{\times 3}}+\frac{1^{\times 4}}{6^{\times 4}}=\frac{9}{24}+\frac{4}{24}=\frac{13}{24}$$

Find the LCM of the two denominators.

$$8 = 2\times 2\times 2$$
$$6 = 2\times 3$$
$$LCM = 2\times 2\times 2\times 3$$
$$= 24$$

$$\begin{array}{c} 8 \\ \diagup \diagdown \\ 2 \quad 4 \\ \diagup \diagdown \\ 2 \quad 2 \end{array} \qquad \begin{array}{c} 6 \\ \diagup \diagdown \\ 2 \quad 3 \end{array}$$

Ex. Find the difference between the following fractions.

$$\frac{7^{\times 3}}{8^{\times 3}}-\frac{5^{\times 4}}{6^{\times 4}}=\frac{21}{24}-\frac{20}{24}=\frac{1}{24}$$

Try $\dfrac{1}{5}-\dfrac{5}{6}$

Adding Rational Numbers

When the signs of the rational numbers are the same, add the numbers and keep the sign.

When the signs of the rational numbers are different, subtract the numbers and take the sign of the larger number.

Ex. Find the sum of the following fractions.

$$\left(-2\frac{1}{3}\right)+\left(-3\frac{1}{2}\right)=\left(\frac{-7}{3}^{x2}\right)+\left(\frac{-7}{2}^{x3}\right)$$ Change to improper fractions.

$$=\left(\frac{-14}{6}\right)+\left(\frac{-21}{6}\right)$$ Rewrite with common denominators.

$$=\frac{-35}{6}=\left(-5\frac{5}{6}\right)$$ Change to mixed number. | igns are alike.

Try $2\frac{3}{8}+4\frac{1}{5}$

Subtracting Rational Numbers

When subtracting rational numbers change the operation to addition and change the sign of the number following. Then use addition rules.

Ex.   Find the difference between the following fractions.

$$\left(-2\frac{1}{2}\right)-\left(3\frac{3}{4}\right)=\left(\frac{-5}{2}\right)-\left(\frac{15}{4}\right)$$ Change to improper fractions.

$$=\left(\frac{-10}{4}\right)-\left(\frac{15}{4}\right)$$ Rewrite with common denominators.

$$=\left(\frac{-10}{4}\right)+\left(\frac{-15}{4}\right)$$ Add the opposite.

$$=\frac{-25}{4} \quad =-6\frac{1}{4}$$ Change to mixed number.

Add numerators since the signs are alike.

Add the following:

$$\frac{3}{4} + \frac{5}{8} =$$

$$\frac{2}{3} + \frac{3}{5} =$$

$$\frac{7}{12} + \left(\frac{-5}{6}\right) =$$

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

Add the following:

$$2\frac{1}{2} + 1\frac{2}{3} =$$

$$3\frac{1}{3} + \left(-1\frac{3}{5}\right) =$$

$$\left(-3\frac{3}{5}\right) + \left(-2\frac{2}{3}\right) =$$

Subtract the following:

$$2\frac{1}{2} - 1\frac{2}{3} =$$

$$\left(\frac{-2}{3}\right) - \left(\frac{3}{5}\right) =$$

$$\left(-1\frac{7}{8}\right) - \left(\frac{-5}{6}\right) =$$

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