

+ / - / × / ÷

decimals / fraction / negative

Grade 9 Math

Unit 3: Rational Numbers

Section 3.1: What is a Rational Number?

Integers, I, is a set of numbers that include positive and negative numbers and Zero.

Imagine a **number line**

ex) $-10 < -7$
small < bigger

ex) $1.3 > -2000$
big > small

ex) $4 + \emptyset = 4$
 $4 - \emptyset = 4$
 $4 \times \emptyset = \emptyset$
 $(\div) \rightarrow \frac{\emptyset}{4} = \emptyset \checkmark$
 $\frac{4}{\emptyset} = \text{undefine}$

These numbers are all integers. The set of integers does not include decimals or fractions.

Rational Numbers, Q, is any number that can be written ^{as a fraction} in the form, $\frac{m}{n}$ where m and n are both integers but $n \neq 0$.

Example: Using any two integers create a fraction and change to a decimal.

$\frac{1}{1} = 1$ (with smiley faces)

1a). $\frac{-2}{1} = -2$ *** notice -2 is an integer $\frac{-2}{1}$ and a rational number.

*** any integer can be written as a fraction using 1 as the denominator. $0.\overline{25} = \frac{25}{99}$ $0.\overline{137} = \frac{137}{999}$

$8 \overline{) 7.0}$
 $\underline{64}$
 60
 $\underline{56}$
 40
 $\underline{40}$

b). $\frac{2 \times 3}{3 \times 3} = \frac{6}{9} = 0.6666\dots$ *** $0.\overline{6}$ is a Repeating decimal and a rational number.
 $= 0.\overline{6}$

c). $\frac{7}{8} = 0.875$ *** 0.875 is a (stop) terminating decimal and a rational number.

d). $\frac{100}{25} = 4$ *** 4 is an integer and a rational number.

Therefore, **rational numbers** include all **integers**, **fractions**, **terminating decimals** and **repeating decimals**.

2. Identify the rational numbers below:

$3 \times 3 = 9$

a). $\frac{-1}{4} \rightarrow$ rational \rightarrow fraction

b). $\sqrt{9} \rightarrow 3 = \frac{3}{1}$ (rational) - integer

c). $\frac{-4}{-9} \rightarrow \frac{4}{9}$ (rational)

d). $\sqrt{75} \rightarrow = 8.660254038\dots$

e). $\pi \rightarrow = 3.1415926535\dots$

These numbers are **non-repeating** and **non-terminating decimals**. \rightarrow can't write as a fraction

These types of numbers are called **irrational numbers**, \bar{Q} .



Compare and Order Rational Numbers

1. Use $>$, $<$, or $=$ to determine which rational number is greater, where possible.

$0.375 > 0.360$

a). $\frac{4}{7} > \frac{5}{9}$

$7 \times 9 = 63$

* use a common denominator

$\dots 63$

$\frac{4 \times 9}{7 \times 9} > \frac{5 \times 7}{9 \times 7}$

$\frac{36}{63} > \frac{35}{63}$

* Larger numerator represents the greater fraction.

b). $\frac{-3}{8} > \frac{-5}{8}$

Same

$3 < 5$

$-3 > -5$

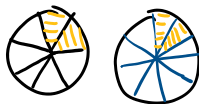
* already has a common denominator so look at the numerators.

With negative numbers closer to zero is greater,

since

$$\frac{\$20}{7} \sim \$3 \quad \frac{\$20}{9} \sim \$2$$

c). $\frac{2}{7} > \frac{2}{9}$



* for two positive fractions which have common numerators, the Smallest denominator is the greater fraction.

d). $\frac{-2}{7} < \frac{-2}{9}$

$$\frac{2}{7} > \frac{2}{9}$$

* for negative fractions which have common numerators, the larger denominator is the greater fraction.

e). $\frac{-3}{4} < \frac{3}{4}$



* Positive is always greater than negative.

* these fractions are called opposite.
For every positive fraction, or decimal, there is a corresponding negative fraction or decimal.

($\frac{1}{31}$ and $-\frac{1}{31}$ are opposites)

(1.31 and -1.31 are opposites).

f). $\frac{-10}{4} = -2.5$

* change $-\frac{10}{4}$ to a decimal or change -2.8 to a fraction.

$$\frac{10}{4} \div$$

$$\begin{array}{r} 2.5 \\ 4 \overline{)10.0} \\ \underline{8} \\ 20 \\ \underline{20} \\ 0 \end{array}$$

And $2.5 < 2.8$

$-2.5 > -2.8$

g). $\frac{-7}{8} = \frac{7}{-8}$

* Regardless of the position of the negative sign, these fractions are equal. A positive divided by a negative is always negative.

$$\frac{2}{-7}$$

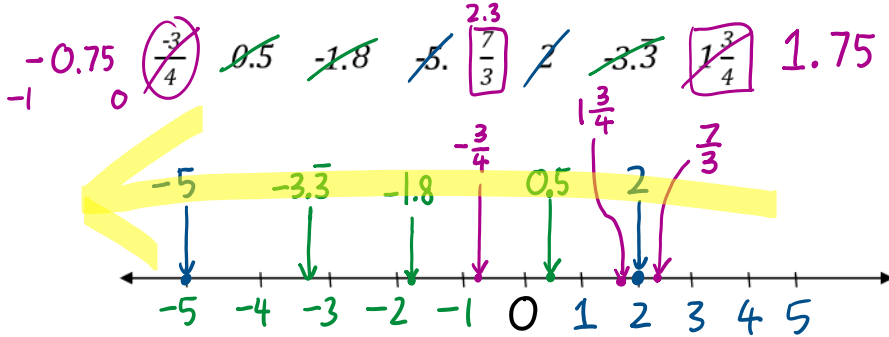
$$\$0.25 = \frac{1}{4} \quad \$0.75 = \frac{3}{4}$$

$$\$0.50 = \frac{2}{4}$$

$$\begin{array}{r} 2.3 \\ 3 \overline{) 7.0} \\ \underline{6} \\ 10 \\ \underline{9} \\ 10 \end{array}$$

Ext.

2. Place these rational numbers in descending order.



Descending Order (from largest to smallest)

$$\boxed{\frac{7}{3}, 2, 1\frac{3}{4}, 0.5, -\frac{3}{4}, -1.8, -3.3, -5}$$

Writing a Rational Number between two given numbers.

1. Identify a decimal between each pair of rational numbers.

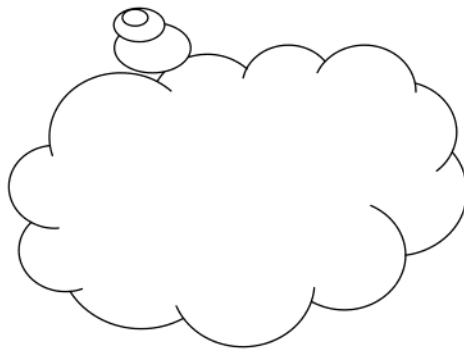
a. $\left(\frac{-1}{2}\right)$ and $\left(\frac{-1}{4}\right) \rightarrow -0.50$ and -0.25 **Ans: -0.31** *and more*

b. -0.250 and $-0.260 \rightarrow$ **Ans = -0.257**

2. Identify a fraction between each pair of rational numbers.

a. $\left(\frac{2}{3}\right)$ and $\left(\frac{3}{4}\right) \rightarrow$

b. $\frac{5}{2}$ and $\frac{7}{3} \rightarrow$



$$LCD = 3 \times 4 = 12$$

$$\frac{2 \times 4}{3 \times 4}$$

$$\frac{3 \times 3}{4 \times 3}$$

$$\frac{8 \times 2}{12 \times 2}$$

$$\frac{9 \times 2}{12 \times 2}$$

$$\frac{16}{24}$$

$$\frac{18}{24}$$

$$\boxed{\frac{17}{24}}$$