

## RATIONAL AND IRRATIONAL NUMBERS

- A **rational number** is a number that can be made into a fraction. Decimals that repeat or terminate are rational because they can be changed into fractions.
- An **irrational number** is a number that cannot be made into a fraction. Decimals that do not repeat or end are irrational numbers. Pi is an irrational number.
- Any fraction can be changed into a decimal and any decimal can be changed into a fraction. This is because a decimal is based on the place values of tenths, hundredths, and thousandths etc., and most fractions can be changed to have a denominator of ten, hundred or thousand etc.



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- **Mixed numbers** are a whole number and a fraction such as  $1 \frac{4}{5}$ .
  - A mixed number can be changed into a fraction by multiplying the denominator by the whole number and then adding the numerator, this number becomes the new numerator and the denominator stays the same. The fraction,  $1 \frac{4}{5}$  would become  $\frac{9}{5}$ .
  - A fraction in which the numerator is greater than the denominator is called an **improper fraction**. To change an improper fraction into a mixed decimal, the numerator is divided by the denominator to get the whole number and the remainder. With the whole number, the remainder becomes the numerator and the denominator stays the same.

- A **square root** of a number is a number that when multiplied by itself will result in the original number. The square root of 4 is 2 because  $2 \cdot 2 = 4$ . A square root does not have to be a whole number. **The square root of 1.44 is 1.2.**

### How to use rational and irrational numbers:

- Most fractions can be written as a decimal as long as the denominator can be changed to 10, 100, 1000 etc.
- To change a denominator to 10, 100, or 1000, simply multiply the denominator by a factor of the number; if the denominator is 2, multiply 2 times 5 to get a new denominator of 10. Once the factor is found, multiply the numerator by this factor to get the new



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$$\begin{array}{r} \underline{12} \rightarrow 16 \ ) \ 12.00 \leftarrow \text{add zeros} \\ 16 \qquad \quad - \underline{112} \\ \qquad \qquad \qquad \quad \quad \quad \quad 80 \\ \qquad \qquad \qquad \quad \quad \quad \quad - \underline{80} \\ \qquad \qquad \qquad \quad \quad \quad \quad \quad \quad \quad 0 \end{array}$$

- To change a decimal into a fraction, simply change the number into the numerator and the place value into the denominator. So .78 would change into the fraction 78/100. The new fraction should also then be put into lowest terms, 78/100 would equal 39/50.
- When comparing fractions, all fractions should be changed into decimals. To compare .45 to 3/4, change 3/4 into .75 and then compare. The decimal, **.45 < 3/4.**

- Mixed numbers can be changed into improper fractions.

**Example:**

$$4 \frac{3}{5} = (5)(4) + 3 = 23 \text{ (new denominator) or } 23/5$$

- Improper fractions can be changed into mixed numbers.

**Example:**

Improper fraction,  $78/7 \rightarrow 7 \frac{1}{7}$   $\sqrt{78} = 11 \text{ R}1 \rightarrow$  mixed number,  $11 \frac{1}{7}$

- Square roots are used in many different ways. They can be used to find the length of the sides of a square if the area is given. They can also be used to determine if a triangle is a right triangle. To determine which two numbers a square root is between, look for



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## Try This!

Change the following into decimals:

$$\frac{6}{20} \underline{\hspace{2cm}} \quad \frac{8}{12} \underline{\hspace{2cm}} \quad \frac{9}{13} \underline{\hspace{2cm}}$$

Change the following into fractions:

$$.33333 \underline{\hspace{2cm}} \quad .825 \underline{\hspace{2cm}} \quad .125 \underline{\hspace{2cm}}$$

Order the fractions and decimals from least to greatest:

$$.45, \frac{2}{6}, \frac{3}{5}, .22 \underline{\hspace{2cm}}$$

Change the following into improper fractions:

$$4 \frac{5}{7}$$

$$3 \frac{7}{10}$$

$$2 \frac{16}{25}$$

$$\frac{45}{100}$$

$$\frac{38}{40}$$

$$\frac{29}{30}$$

$$\frac{29}{30}$$



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Which of the following numbers are rational and which are irrational?

$$\frac{3}{8}, .252525, .87524136\dots, .6543$$

Compute the square roots of these numbers:

$$\sqrt{169} \underline{\hspace{2cm}}$$

$$\sqrt{625} \underline{\hspace{2cm}}$$

$$\sqrt{2.25} \underline{\hspace{2cm}}$$

What two numbers is  $\sqrt{24}$  between?  $\underline{\hspace{2cm}}$