

Math 7 Notes
Lesson 4.1
Terminating and Repeating Decimals

A fraction is a division problem.

Any fraction can be expressed as a decimal by dividing the numerator by the denominator.

$$\frac{5}{12} \quad 12 \overline{) 5.0000} \quad \frac{1}{3} \quad 3 \overline{) 1.000}$$

Handwritten long division for $\frac{5}{12}$ shows a repeating remainder of 80, resulting in $0.41\bar{6}$.
Handwritten long division for $\frac{1}{3}$ shows a repeating remainder of 1, resulting in $0.\bar{3}$.

The decimal form of a fraction is either

*terminating If the remainder eventually becomes zero when you divide, the decimal is terminating.

$$\frac{1}{2} = 0.5 \quad 2 \overline{) 1.00} = 0.50$$

or

*repeating If the decimal has one or more digits that repeat, it can be written using bar notation.

$$\frac{1}{3} = 0.\bar{3}$$

Write each of these repeating decimals with correct bar notation.

0.636363... $0.\bar{63}$ 0.244444... $0.2\bar{4}$

0.156666... $0.15\bar{6}$ 0.2454545... $0.2\bar{45}$

Show the meaning of the bar notation for these decimals.

$0.\bar{91}$.919192... $0.2\bar{3}$ 0.2333...

$0.\bar{245}$ 0.245245245... $0.1\bar{23}$ 0.1232323...

To find the decimal for a fraction, without using a calculator, ask yourself these questions:

Is it a fraction I have memorized?

Memory List

$$\frac{1}{2} = 0.5$$

$$\frac{1}{3} = 0.\bar{3}$$

$$\frac{2}{3} = 0.\bar{6}$$

$$\frac{1}{4} = 0.25$$

$$\frac{3}{4} = 0.75$$

$$\frac{1}{5} = 0.2$$

$$\frac{2}{5} = 0.4$$

$$\frac{3}{5} = 0.6$$

$$\frac{4}{5} = 0.8$$

$\rightarrow \frac{1 \times 2}{5 \times 2} = \frac{2}{10} \quad \frac{2}{10}$

$$\frac{1}{6} = .1\bar{6}$$

$$\frac{2}{6} = \frac{1}{3} = .\bar{3}$$

$$\frac{3}{6} = \frac{1}{2} = .5$$

$$\frac{4}{6} = \frac{2}{3} = .\bar{6}$$

$$\frac{5}{6} = .8\bar{3}$$

MEMORIZE these
fraction/decimal relationships

| | | |
|-----------------------|---------------------------|----------------------|
| $\frac{1}{8} = 0.125$ | $\frac{1}{9} = 0.\bar{1}$ | $\frac{1}{10} = 0.1$ |
| $\frac{2}{8} = 0.250$ | $\frac{2}{9} = 0.\bar{2}$ | $\frac{2}{10} = 0.2$ |
| $\frac{3}{8} = 0.375$ | $\frac{3}{9} = 0.\bar{3}$ | $\frac{3}{10} = 0.3$ |
| $\frac{4}{8} = 0.5$ | $\frac{4}{9} = 0.\bar{4}$ | $\frac{4}{10} = 0.4$ |
| $\frac{5}{8} = 0.625$ | $\frac{5}{9} = 0.\bar{5}$ | $\frac{5}{10} = 0.5$ |
| $\frac{6}{8} = 0.75$ | $\frac{6}{9} = 0.\bar{6}$ | $\frac{6}{10} = 0.6$ |
| $\frac{7}{8} = 0.875$ | $\frac{7}{9} = 0.\bar{7}$ | $\frac{7}{10} = 0.7$ |
| | $\frac{8}{9} = 0.\bar{8}$ | $\frac{8}{10} = 0.8$ |
| | | $\frac{9}{10} = 0.9$ |

$\frac{1}{4} = \frac{25}{100} = 0.250$

$\frac{5}{8} = \frac{125}{1000} = 0.625$

$\frac{1}{3}$

$\frac{2}{3}$

Can the fraction be simplified to
a fraction I have memorized?

$\frac{7}{14} \rightarrow \frac{1}{2} = 0.5$

$\frac{9}{27} = \frac{1}{3} = 0.\bar{3}$

$\frac{12}{16} = \frac{3}{4} = 0.75$

$\frac{20}{25} = \frac{4}{5} = 0.8$

$\frac{35}{40} = \frac{7}{8} = 0.875$

Does it have a denominator that
is a power of ten (10,100,1000...)?

Think...place value as you read the fraction

$\frac{13}{1000}$ "thirteen thousandths" 0._____ =

$\frac{7}{100}$ "seven hundredths" 0.____ =

Can the fraction easily be rewritten with a
denominator of 10, 100, 1000, ...?

Think...Rewrite it with a new denominator.

$\frac{7}{20}$

$\frac{11}{25}$

Last Resort....Do long division!

$\frac{\text{numerator}}{\text{denominator}} \rightarrow \text{denominator} \overline{) \text{numerator}}$

$\frac{3}{16}$

$\frac{7}{11}$