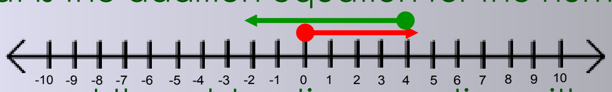
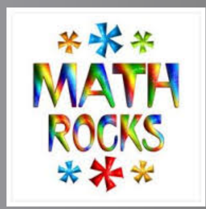
1) (-8) + (+3)

2) What is the addition equation for the number line?



3) Represent the subtraction equation with counters: (+7) - (-1)



4) (-3) - (-9)

5) 35 ÷ 7

6) 42 X 0.5

7) 523 X 2

8) What number is divisible by 4? a) 328 b)218 c) 110

9) What number is divisible by 6? a)232 b)332 c)432

10) 1/3 of 24

3.1 Fractions to Decimals

$\frac{1}{3}$

Numbers can be written in both fraction and decimal form.

For example, 3 can be written as $\frac{3}{1}$ and 3.0.

$3 = \frac{3}{1} = 3.0$

A fraction illustrates division;

that is, $\frac{1}{10}$ means $1 \div 10$. $= 0.1$

Recall that $\frac{1}{10}$ is 0.1 in decimal form.

$\frac{3}{100}$ is 0.03 in decimal form.

$\frac{45}{1000}$ is 0.045 in decimal form.

Fraction	$\frac{7}{10}$ ✓	$\frac{1}{100}$ ✓	$\frac{19}{100}$ ✓	$\frac{1}{1000}$ ✓	$\frac{23}{1000}$ ✓	$\frac{471}{1000}$ ✓
Decimal	0.7	0.01	0.19	0.001	0.023	0.471

You will need a calculator.

➤ Use a calculator.

Write each fraction as a decimal: $\frac{1}{11}, \frac{2}{11}, \frac{3}{11}, \frac{4}{11}$

What patterns do you see?

0.45 .54 .63 0.90909090

Use your patterns to predict the decimal forms of these fractions:

$\frac{5}{11}, \frac{6}{11}, \frac{7}{11}, \frac{8}{11}, \frac{9}{11}, \frac{10}{11}$

Use a calculator to check your predictions.

$\frac{1}{11} = 0.09090909$

$\frac{2}{11} = 0.18181818$

$\frac{3}{11} = 0.272727$

➤ Patterns sometimes occur when we write fractions in decimal form.

For example, ↓ repeating numbers

* $\frac{1}{99} = 0.\overline{01}$ * $\frac{2}{99} = 0.\overline{02}$ * $\frac{15}{99} = 0.\overline{15}$ * $\frac{43}{99} = 0.\overline{43}$

$0.\overline{14} = \frac{14}{99}$

For fractions with denominator 99, the digits in the numerator of the fraction are the repeating digits in the decimal.

$\frac{62}{99} = 0.\overline{62}$

We can use this pattern to make predictions.

To write $0.\overline{67}$ as a fraction, write the repeating digits, 67, as the numerator of a fraction with denominator 99.

$0.\overline{67} = \frac{67}{99}$

Similarly, $0.\overline{7} = 0.\overline{77} = \frac{77}{99} = \frac{7}{9}$

$0.\overline{47} = \frac{47}{99}$

$0.\overline{7} = 0.\overline{77} = \frac{77}{99}$

Example

a) Write each fraction as a decimal.

b) Sort the fractions as representing repeating or terminating decimals:
$\frac{13}{200}, \frac{1}{5}, \frac{11}{20}, \frac{3}{7}$

$\frac{17}{20} = 17 \div 20 =$

A Solution

a) Try to write each fraction with denominator 10, 100, or 1000.

$\frac{13}{200} \overset{\times 5}{\underset{\times 5}{=}} \frac{65}{1000}$, or 0.065

$\frac{13}{200} = \boxed{13 \div 200} = 0.065$

$\frac{1}{5} \overset{\times 2}{\underset{\times 2}{=}} \frac{2}{10}$, or 0.2

$$\frac{11}{20} \overset{\times 5}{=} \frac{55}{100}, \text{ or } 0.55$$

terminating decimal - it stops

$\frac{3}{7}$ cannot be written as a fraction with denominator 10, 100, or 1000.

Use a calculator.

$\boxed{\frac{3}{7}} = \underline{3 \div 7} = \underline{0.428\,571\,429}$

This appears to be a terminating decimal.

We use long division to check.

Since we are dividing by 7, the remainders must be less than 7.

Since we get a remainder that occurred before, the division repeats.

So, $\frac{3}{7} = 0.\overline{428\,571}$

```
  0.4285714  2857142
7) 3.00000000
   28
    20
    14
     60
     56
      40
      35
       50
       49
        10
         7
         30
         28
          20
```

The calculator rounds the decimal to fit the display:

$\frac{3}{7} = 0.428\,571\,428\,571\ldots$

This is the last digit in the display.

Since this digit is 5, the calculator adds 1 to the preceding digit.

So, the calculator displays an approximate decimal value:

$\frac{3}{7} \doteq 0.428\,571\,429$

b) Since 0.065, 0.2, and 0.55 terminate, $\frac{13}{200}$, $\frac{1}{5}$, and $\frac{11}{20}$ represent terminating decimals.
Since $0.\overline{428\ 571}$ repeats, $\frac{3}{7}$ represents a repeating decimal.

R or T

$\frac{13}{200} = 0.065$ T

$\frac{6}{99} = 0.\overline{06}$ R

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

$\frac{11}{20} = 0.55$ T

Practice

Use a calculator when you need to.

1. a) Write each fraction as a decimal.

i) $\frac{2}{3}$ ii) $\frac{3}{4}$ iii) $\frac{4}{5}$ iv) $\frac{5}{6}$ v) $\frac{6}{7}$

b) Identify each decimal as terminating or repeating.

2. Write each decimal as a fraction.

a) 0.9 b) 0.26 c) 0.45 d) 0.01 e) 0.125

p. 88
q. 1-5,

3. a) Write each fraction as a decimal.

i) $\frac{1}{27}$ = ii) $\frac{2}{27}$ iii) $\frac{3}{27}$

b) Describe the pattern in your answers to part a.

c) Use your pattern to predict the decimal form of each fraction.

i) $\frac{4}{27}$ ii) $\frac{5}{27}$ iii) $\frac{8}{27}$

4. For each fraction, write an equivalent fraction with denominator 10, 100, or 1000. Then, write the fraction as a decimal.

a) $\frac{2}{5}$ b) $\frac{1}{4}$ c) $\frac{13}{25}$ d) $\frac{19}{50}$ e) $\frac{37}{500}$

5. Write each decimal as a fraction in simplest form.

a) $0.\overline{6}$ b) $0.\overline{5}$ c) $0.\overline{41}$ d) $0.1\overline{6}$

Q.- 1-5
Q. 9

9. a) Write each fraction as a decimal.

i) $\frac{1}{999}$ ii) $\frac{2}{999}$ iii) $\frac{54}{999}$ iv) $\frac{113}{999}$

b) Describe the pattern in your answers to part a.

c) Use your pattern to predict the fraction form of each decimal.

i) $0.\overline{004}$ ii) $0.\overline{089}$ iii) $0.\overline{201}$ iv) $0.\overline{326}$

13. Take It Further

a) Write each fraction as a decimal.
Identify the decimals as repeating or terminating.
i) $\frac{7}{8}$ ii) $\frac{5}{18}$ iii) $\frac{3}{10}$ iv) $\frac{8}{27}$ v) $\frac{4}{25}$

b) Write the denominator of each fraction in part a as a product of prime factors.

c) What do you notice about the prime factors of the denominators of the terminating decimals? The repeating decimals?

d) Use your answers to part c.
Predict which of these fractions can be written as terminating decimals.
i) $\frac{7}{15}$ ii) $\frac{13}{40}$ iii) $\frac{5}{81}$ iv) $\frac{9}{16}$

A prime number has exactly two factors, itself and 1. We can write 12 as a product of prime factors:
$2 \times 2 \times 3$