

## 0.1 Plan for Problem Solving

- 4 Step Problem Solving Plan

1. Read and Understand the Problem
2. Plan the Solution / find Variable
3. Solve
4. Check the Solution

Recall to undo  
 Add  $\rightarrow$  Sub  
 Mult  $\rightarrow$  Division

### Example

Mr. Nelson's lawn is 50 feet long and 35 feet wide. He paid a lawn service \$350 to aerate and reseed his lawn. What did the lawn service charge per square foot?

$$\begin{array}{r} 50 \times 35 \\ \text{Area} \cdot \text{Cost per sq. foot} = 350 \\ \hline 1750 \cdot x = 350 \\ 1750 \qquad 1750 \end{array}$$

$$x = .20$$

.20 per square foot

### Example

A used book store had a sale on all paperbacks for \$0.45 each. The store had \$72.45 in sales. How many books did the store sell?

$$\begin{array}{r} b \\ \text{Books} \cdot \text{Cost per book} = \text{Profit} \\ b \cdot .45 = 72.45 \end{array}$$

161 books

### Example

$$b = 161$$

The table shows donations for Stuff-A-Truck that the National Honor Society sponsored. How much money was donated in all?

Number of Students	Amount of Each Donation
10	\$25
25	\$10
30	\$5
15	\$2

$$10 \times 25 + 25 \times 10 + 30 \times 5 + 15 \times 2 =$$

\$680

## 1 Real Numbers

### Set

- a collection of objects called elements or members

Example: Set: Baseball Positions Element: Pitcher, Catcher

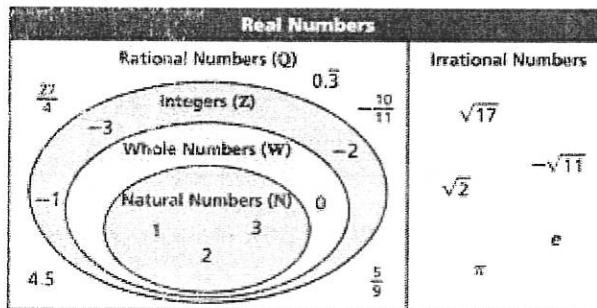
Even #s

2, 4, 6, ...

Two sets are equal if and only if all elements are the same

### Common Sets

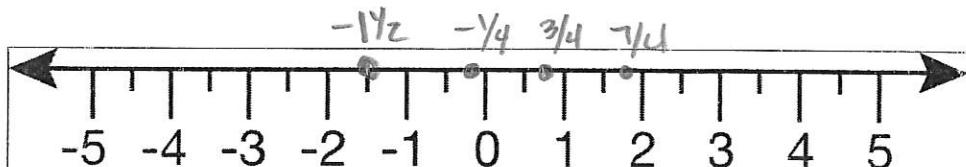
- Whole Numbers - 0, 1, 2, 3
- Integers - -2, -1, 0, 1, 2, ...
- Rational #s - the set of all numbers that are terminating or non-terminating decimals with pattern
- Irrational Numbers - Can't be written as fraction. Decimal no pattern doesn't stop
- Real Numbers



### Example

Graph each set of numbers on a number line. Then order the numbers from least to greatest.

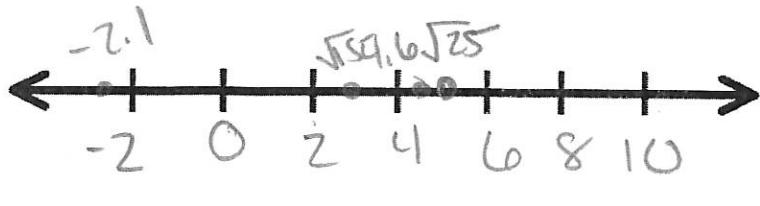
a)  $\left\{ \frac{3}{4}, -\frac{1}{4}, \frac{7}{4}, -1\frac{1}{2} \right\}$



$-1\frac{1}{2}, -\frac{1}{4}, \frac{3}{4}, \frac{7}{4}$

b)  $\{\sqrt{25}, 4.6, \sqrt{15}, -2.1\}$

$(-2.1, \sqrt{15}, 4.6, \sqrt{25})$



## 0.4 Adding and Subtracting Rational Numbers

To Add or Subtract Fractions you must first find a common denominator.

Ex)  $\frac{2}{5} + \frac{1}{5} = \frac{3}{5}$

E)  $\frac{2}{3} - \frac{1}{4}$        $\frac{4}{4} \left( \frac{2}{3} \right) - \left( \frac{1}{4} \right) \frac{3}{3}$   
Need to be same #       $\frac{8}{12} - \frac{3}{12} = \boxed{\frac{5}{12}}$

### Example – No Calculator

Find each sum or difference.

a)  $\frac{5}{11} + \frac{3}{11} = \boxed{\frac{8}{11}}$

b)  $\frac{4}{5} + \frac{7}{10}$        $\frac{8}{10} + \frac{7}{10} = \frac{15}{10} = \frac{3}{2} = \boxed{1\frac{1}{2}}$

c)  $\frac{11}{18} - \frac{7}{18} = \boxed{\frac{4}{18}}$

d)  $\frac{3}{8} - \frac{5}{8} = \boxed{-\frac{2}{8}} = \boxed{-\frac{1}{4}}$

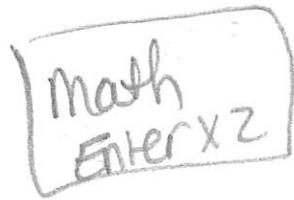
e)  $\frac{5}{6} - \frac{5}{18}$   
 $\frac{15}{18} - \frac{5}{18} = \frac{10}{18} = \boxed{\frac{5}{9}}$

f)  $\frac{3}{10} - \frac{3}{4}$   
 $\frac{6}{20} - \frac{15}{20} = \boxed{-\frac{9}{20}}$

### Example

Write 0.23232323 ... as a fraction in simplest form.

$$\boxed{23/\cancel{99}}$$



Write 0.88888... as a fraction in simplest form.

$$\frac{8}{9}$$

- Perfect Square – #s when you take Square root you get a solid value

2	3	4	5	6	7	8	9	10	11	12
4	9	16	25	36	49	64	81	100	121	144

### Example – No Calculator

Simplify each square root.

$$\sqrt{\frac{64}{16}} = \frac{8}{4} = \boxed{2}$$

$$-\sqrt{\frac{25}{144}} = \boxed{-\frac{5}{12}}$$

### Example – No Calculator

Estimate each square root to the nearest whole number.

$$\sqrt{34}$$

$$\sqrt{97}$$

$$\sqrt{17}$$

$$\sqrt{27}$$

$$6$$

$$10$$

$$4$$

$$5$$

## 0.5 Multiplying and Dividing Rational Numbers

Positive X Positive = Pos

Negative X Negative = PoS

Positive X Negative = Neg

Negative X Positive = Neg

### Examples

a)  $-5.4(0.05) = -.27$

b)  $-6.84 \div (-2.4) = 2.85$

c)  $7.2(3.4) = 24.48$

Recall to multiply and divide fractions, you do not need a common denominator!

$$\rightarrow \frac{2}{3} \cdot \frac{4}{5} = \frac{8}{15}$$

### Examples

Find each product

a)  $\frac{4}{7} \cdot \frac{4}{5} = \boxed{\frac{16}{35}}$

b)  $\frac{1}{4} \cdot 3\frac{5}{6}$

$$\frac{1}{4} \cdot \frac{23}{6} = \boxed{\frac{23}{24}}$$

c)  $\frac{3}{8} \cdot \frac{2}{3} = \frac{6}{24} = \boxed{\frac{1}{4}}$

To divide fractions you may remember a short cut Keep, Change, Flip.

$$\frac{2}{3} \div \frac{1}{5}$$

$$\frac{2}{3} \stackrel{\text{change}}{\cdot} \frac{5}{1} = \boxed{\frac{10}{3}}$$

Example

means use  
Reciprocal

$$\frac{1}{2} \rightarrow \frac{2}{1}$$

$$\frac{3}{5} \rightarrow \frac{5}{3}$$

Find each quotient.

a)  $\frac{3}{5} \div \frac{1}{4} = \frac{3}{5} \cdot \frac{4}{1} = \boxed{\frac{12}{5}}$

b)  $\frac{3}{10} \div \frac{2}{9} = \frac{3}{10} \cdot \frac{9}{2} = \boxed{\frac{27}{20}}$

c)  $\frac{7}{8} \div 2\frac{1}{3} = \frac{7}{8} \cdot \frac{3}{7} = \boxed{\frac{21}{56}}$

d)  $-\frac{2}{3} \div \frac{4}{5} = -\frac{2}{3} \cdot \frac{5}{4} = \boxed{-\frac{5}{6}}$

## 0.6 The Percent Proportion

- Percent - ratio that compares a number to 100

$$79\% = \frac{79}{100} = 0.79$$

$$35\% = \frac{35}{100} = 0.35$$

$$8\% = \frac{8}{100} = 0.08$$

- Percent Proportion -  $\frac{\text{part}}{\text{whole}} \stackrel{\text{is}}{=} \frac{\%}{100}$



### Examples

Express each percent as a fraction

a) 43%  $\frac{43}{100}$

b) 130%  $\frac{130}{100}$

c) 0.2%  $\frac{0.2}{100} = \frac{2}{1000} = \frac{1}{500}$

### Examples

Find each number

a) 24% of 25 is what number?

$$\frac{x}{25} = \frac{24}{100}$$

$$100x = 600$$

(6)

b) 14 is 20% of what number?

$$\frac{14}{x} = \frac{20}{100}$$

$$20x = 1400$$

(70)

c) 76.5 is 75% of what number?

$$\frac{76.5}{x} = \frac{75}{100}$$

$$7650 = 75x$$

100

d) 13 is what percent of 70?

$$\frac{13}{70} = \frac{x}{100}$$

$$70x = 1300$$

8.57%

e) 19 is what percent of 15?

$$\frac{19}{15} = \frac{x}{100}$$

$$1900 = 15x$$

126.6%

Flash Cards

Example

In a bag of party favors, 39 out of 60 are whistles. What percent of the part favors are whistles?

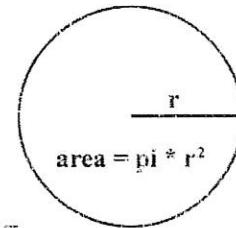
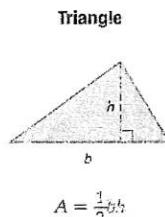
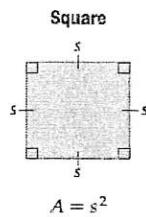
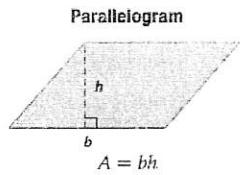
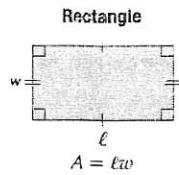
$$\frac{39}{60} = \frac{x}{100}$$

$$3900 = 60x$$

65%

## 0.8 Area

- Area - # of square units needed to cover a surface



### Examples

Find the area of each figure.

- a) A parallelogram with a base of 9 yards and a height of 7 yards.

$$A = bh$$
$$9 \cdot 7 = 63 \text{ yd}^2$$

- b) A triangle with a base of 13 centimeters and height of 8 centimeters.

$$A = \frac{1}{2}bh$$
$$\frac{1}{2} \cdot 13 \cdot 8 = 52 \text{ cm}^2$$

- c) A circle with a radius of 4 kilometers.

$$A = \pi r^2$$
$$\pi \cdot 4^2 = 50.3 \text{ Km}^2$$

- d) A circle with a diameter of 15 feet.

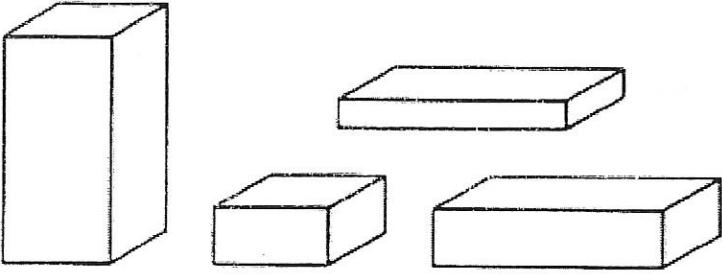
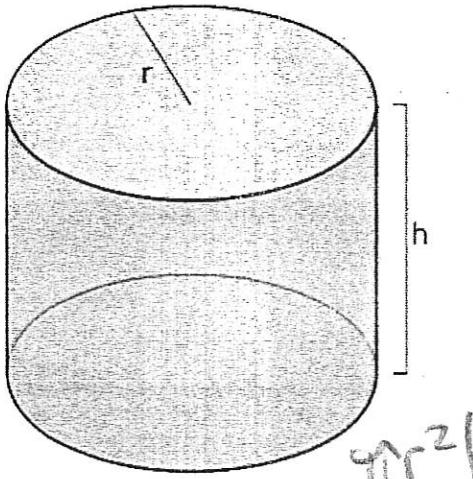
$$\text{diameter} = 2 \times \text{radius}$$

$$15 = 2r$$
$$r = 7.5$$

$$A = \pi \cdot 7.5^2$$
$$176.7 \text{ ft}^2$$

## 0.9 Volume

- Volume - Space occupied by Solid units<sup>3</sup>

Rectangular Prism	Cylinder
 $l \cdot w \cdot h$	 $\pi r^2 h$

### Examples

Find the volume of each prism.

a) A rectangular prism with a length of 12 meters, width of 9 meters, and height of 4 meters.

$$12 \cdot 9 \cdot 4 = 432 \text{ m}^3$$

b) A cylinder with a height of 2mm and a radius of 3 mm.

$$\pi \cdot 3^2 \cdot 2 = 56.5 \text{ mm}^3$$

c) A cylinder with a height of 5 feet and a diameter of 20 feet. change to radius

$$\pi \cdot 10^2 \cdot 5 = 1570 \text{ mm}^3$$

### Example

A rectangular box has a volume of 234 cubic centimeters. If the length of the box is 9 centimeters and the width is 13 centimeters, what is the height of the box?

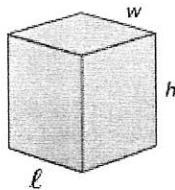
$$\begin{aligned} l \cdot w \cdot h &= V \\ 9 \cdot 13 \cdot h &= 234 \\ 117h &= 234 \end{aligned}$$

2cm Note not cubed b/c length

## 0.10 Surface Area

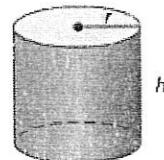
- Surface Area – sum of all surfaces,  
think wrapping a present units<sup>2</sup>

Prism



$$S = 2\ell w + 2\ell h + 2wh$$

Cylinder



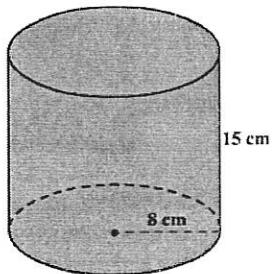
$$S = 2\pi rh + 2\pi r^2$$

why 2?

Examples

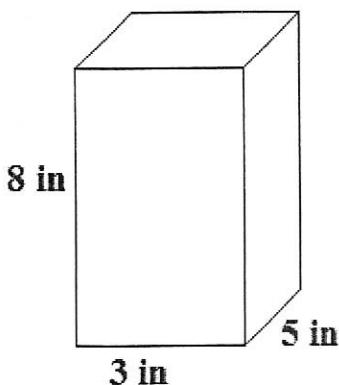
Find the surface area of each solid. Round to the nearest tenth if necessary.

a)



$$\frac{2\pi \cdot 8 \cdot 15 + 2\pi \cdot 8^2}{1158.1 \text{ cm}^2}$$

b)



$$2 \cdot 8 \cdot 5 + 2 \cdot 3 \cdot 5 + 2 \cdot 8 \cdot 3$$

$$158.1 \text{ in}^2$$