AChor/MFM1P **Name: _____**
Date: _____

Ratios and Proportions

RATIOS:

> A **ratio** is a comparison of **like** quantities with the **same** units.
> **Equivalent** ratios have the **same simplest form** or the **same comparison**.

How many boys do we have in our class today? _____ Boys (1 quantity)
How many girls do we have in our class today? _____ Girls (1 quantity)

What is the ratio of number of boys to number of girls in the class?

Boys to Girls

What is the ratio of number of girls to number of boys in the class?

Girls to Boys

Note the difference between the two ratios. **The order of the quantities is important.

EQUIVALENT RATIOS:

Ratios are fractions, so we have to reduce ratios to the lowest terms as well.
Write the following ratios in lowest terms. Each pair of ratios is equivalent to one another.

3. (a) 4 : 12 (b) 15 : 35 (c) 3 : 9 : 27

How many minutes are there in 1 hour? How many cm are there in 1 m?
Units are not written in ratios.

Write each ratio using the given information.
4. (a) 10 cm to 1 m (b) 4 min to 1 h (c) 15 s to 1 min

PROPORTIONS:

> A **proportion** is a statement of **equality** between **equivalent** ratios.
> *There must be an equal sign "=" between the two equivalent ratios.

1. Find a ratio that is equivalent to each ratio then write a proportion using the equivalent ratios.

(a) 2:5 (b) 8:6 (c) 1.5:3

SOLVING PROPORTIONS FOR UNKNOWN QUANTITY:

2. Solve for the Unknown Value.

Two Terms:

(a) $x : 3 = 1 : 6$

Method 1: Algebraically

Method 2: Scale Factor

(b) $4 : 7 = 8 : y$

Method 1: Algebraically

Method 2: Scale Factor

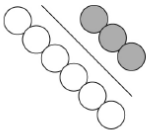
Three Terms:

(c) $5 : 3 : 1 = 15 : x : y$

Method 1: Algebraically

Method 2: Scale Factor

A **part-to-part ratio** compares different parts of a group to each other.



The ratio of white circles to grey circles is 6 : 3 or 6 to 3.
The ratio in lowest terms is 2 : 1 or 2 to 1.

A **part-to-whole ratio** compares one part of a group to the whole group.

The ratio of white circles to the total number of circles is 6 : 9 or 6 to 9.
The ratio in lowest terms is 2 : 3 or 2 to 3.
A part-to-whole ratio can be written as a fraction, a decimal, and a percent.

The ratio of $\frac{\text{grey}}{\text{total}}$ is $\frac{3}{9}$ or $\frac{1}{3}$, $0.\overline{3}$, $33.\overline{3}\%$.

A **proportion** is a relationship that says that two ratios are equal.
A proportion can be expressed in fraction form.

$\frac{1}{2} \overset{\times 7}{=} \frac{7}{14}$ $\quad$ $\frac{5\text{ cm}}{45\text{ cm}} \overset{\div 5}{=} \frac{1\text{ cm}}{9\text{ cm}}$

To compare items using a ratio, the units must be the same.

1. Set up a proportion for each situation and then solve for the unknown value.

(a) On a diagram of a machine part, 2 cm represents 200 cm. The actual length of a part is 400 cm, how long is the machine part on the diagram?

(b) A telephone pole that is 12 m tall casts a shadow that is 2 m long. What is the length of the shadow cast by a student who is 1.5 m tall?

(c) "Four Legs and One Tail" is a pet shop that only sells dogs and cats. The number of dogs to the number of cats in the shop is 3 : 2. If there are 12 dogs, how many pets are for sale in the shop?