Study the following.

proportion (pruh-**por**-shuhn) - an equation showing that two ratios are equal. (I used a proportion to find out how much flour to put in the recipe.)

examples: $\frac{1}{9} = \frac{4}{36}$

1 to 9 = 4 to 36

1 : 9 = 4 : 36

term (**turm**) - each number in a proportion. There are 4 terms in each proportion.
A term is also each number in a ratio. There are two terms in a ratio. (The first term in the ratio is a 1.)

scale (**skale**) - a special ratio of the measurement on a map or model, to the measurement of the real object. (The blueprint of the house was drawn using a scale of 1:40.)

scale drawing - a drawing of a real object that has the same shape, but is smaller or larger than the real object. (My scale drawing of Europe was shaped like Europe, but was much smaller.) (Maps are scale drawings.) (Blueprints are scale drawings of buildings drawn on blue paper.)

model (**mod**-uhl) - a small copy of something. (I built a model of an airplane.) (I have a model of an old car.)

scale model - a model of a real object that has the same shape, but is smaller or larger than the real object. (My doll house is a scale model of the house I live in.) (The sculptor made a small scale model of the statue before making the large real one.)

Say each word out loud and write it in the blank.

proportion_____
term_____
scale_____
model_____

Write each definition in your own words.

proportion

term

scale

scale drawing

model

scale model

Circle each term in the proportions.

2 to 4 = 3 to 6

8 : 11 = 16 : 22

$\frac{6}{20} = \frac{24}{80}$

Write two sentences using each word below.

proportion
1.

2.

term
1.

2.

scale
1.

2.

scale drawing
1.

2.

model
1.

2.

scale model
1.

2.

Matching.

proportion	each number in a proportion
term	a drawing of a real object that has the same shape, but is smaller or larger than the real object
scale	an equation showing that two ratios are equal
scale drawing	a model of a real object that has the same shape, but is smaller or larger than the real object.
model	a small copy of something.
scale model	a special ratio of the measurement on a map or model, to the measurement of the real object

Study the following.

To say a proportion you say "is to" instead of "to", and "as" instead of equals.
Examples: 6 to 7 = 12 to 14
You say "6 is to 7 as 12 is to 14."

12 : 15 = 4 : 5
You say "12 is to 15 as 4 is to 5."

Write the following proportions as you would say them.
Say them out loud.

1. $\frac{5}{10} = \frac{15}{30}$

2. $\frac{\text{deer}}{\text{woods}} = \frac{\text{cow}}{\text{field}}$

3. 8 : 20 = 24 : 60

4. 2 to 3 = 8 to 12

Study the following.

A proportion can be written two ways.

Type 1: One way is with the numerators relating to the same thing and with the denominators relating to the same thing.

Type 2: The other way is the first ratio is relating to the same thing and the second ratio is relating to the same thing.

Type 1 example: 3 feet to 4 seconds = 9 feet to 12 seconds

Written like a fraction: $\frac{3 \text{ feet}}{4 \text{ seconds}} = \frac{9 \text{ feet}}{12 \text{ seconds}}$

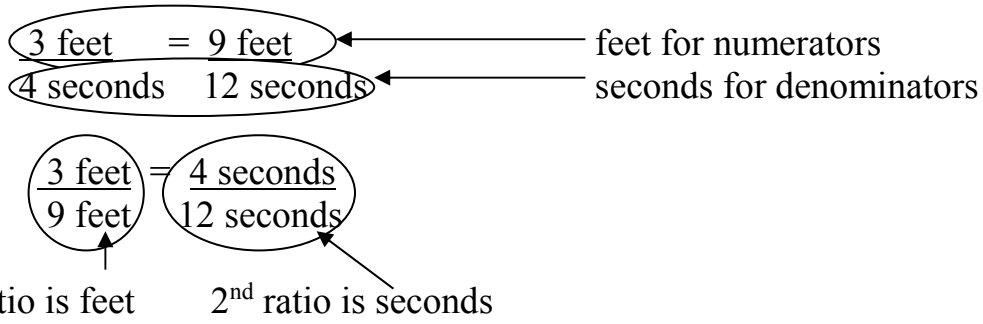
The numerators are both feet.
The denominators are both seconds.

Type 2 example: 3 feet to 9 feet = 4 seconds to 12 seconds

Written like a fraction: $\frac{3 \text{ feet}}{9 \text{ feet}} = \frac{4 \text{ seconds}}{12 \text{ seconds}}$

The first ratio is feet.
The second ratio is seconds.

Comparing Type 1 and Type 2.



Note: It is important to keep the numbers matched up correctly. In the example above, if the 3 feet is matched up and down with the 4 seconds, then when you write it as a type 2, the 3 feet must be matched across with the 4 seconds.

You would **not** do this. $\frac{3 \text{ feet}}{4 \text{ seconds}} = \frac{\quad}{\quad}$ **(incorrect)**

You would do this. $\frac{3 \text{ feet}}{4 \text{ seconds}} = \frac{4 \text{ seconds}}{3 \text{ feet}}$ (correctly matched)

Or $\frac{\quad}{3 \text{ feet}} = \frac{\quad}{4 \text{ seconds}}$ (correctly matched)

Write these Type 1 proportions as Type 2.

1. $\frac{2 \text{ miles}}{10 \text{ minutes}} = \frac{6 \text{ miles}}{30 \text{ minutes}}$

2. $\frac{4 \text{ pies}}{1 \text{ hour}} = \frac{8 \text{ pies}}{2 \text{ hours}}$

3. $\frac{\$3.00}{2 \text{ boxes}} = \frac{\$9.00}{6 \text{ boxes}}$

Write these Type 2 proportions as Type 1.

4. $\frac{3 \text{ girls}}{30 \text{ girls}} = \frac{6 \text{ books}}{60 \text{ books}}$

5. $\frac{8 \text{ eggs}}{4 \text{ eggs}} = \frac{2 \text{ omelets}}{1 \text{ omelet}}$

6. $\frac{10 \text{ sticks}}{40 \text{ sticks}} = \frac{5 \text{ logs}}{20 \text{ logs}}$

Make up 2 examples of a Type 1 proportion.

Make up 2 examples of a Type 2 proportion.

Study the following.

When you know only 3 of the numbers in a proportion, you can solve to find the fourth.

There are two ways to solve proportions.

First Way: Make an equivalent fraction.

$\frac{3}{4} = \frac{?}{8}$

$\frac{3}{4} \times \frac{\_\_}{\_\_} = \frac{\_\_}{8}$ Four times what gives 8? (or 8 divided by 4 is what ?)
The number is 2.

$\frac{3}{4} \times \frac{2}{2} = \frac{6}{8}$ Multiply numerator and denominator by 2.
You get a 6 for the missing number. The answer is 6.

Solve by making equivalent fractions.

1. 2/5 = ?/10

2. 8/3 = 16/?

3. 2/9 = ?/18

4. 1/7 = ?/28

Study the following.

Second Way: Cross multiplication.

$\frac{3}{4} = \frac{?}{8}$ Cross multiply.

3 times 8 = 4 times ?

$24 = 4 \times ?$ Divide 24 by 4 to get the answer.

? = 6 The answer is 6.

Solve by using cross multiplication.

1. $\frac{1}{8} = \frac{?}{24}$

2. 4/5 = 12/?

3. 2/9 = ?/18

4. $\frac{1}{7} = \frac{?}{28}$

Solve using either method.

1. $2/9 = 6/?$

2. $\frac{8}{10} = \frac{16}{?}$

3. $?/4 = 1/2$

4. $9/? = 27/18$

5. $\frac{6}{7} = \frac{?}{35}$

6. $33/? = 11/3$

7. $? : 2 = 50 : 20$

8. $14 : ? = 7 : 4$

9. $12/8 = ?/4$

10. $2/5 = 12/?$

Write as a proportion and solve for the missing number.

Example: Sammy types 3 letters in 15 minutes. How many letters can he type in 30 minutes?

$$\frac{3 \text{ letters}}{15 \text{ minutes}} = \frac{? \text{ letters}}{30 \text{ minutes}}$$ (letters for numerators) (minutes for denominators)

$3 \times 30 = ? \times 15$ (cross multiply)
$90 = ? \times 15$ (multiply 3×30)
$? = 6$ (divide $90 \div 15$)

1. The teacher has a ratio of 3 math books to 2 history books. He is going to order 27 math books. How many history books should he order to keep the same ratio of books?

2. To make 45 cookies, the recipe calls for 3 cups of flour. How many cookies can be baked with 4 cups of flour?

3. A chef cooks 8 waffles in 10 minutes. How long will it take him to make 16 waffles?

4. Dad mixes cement using 3 bags of sand with two bags of cement. How much sand will he need to mix with 14 bags of cement?

5. Jim biked 48 miles in 4 hours. How many miles can he bike in 7 hours?

Solve the following.

Example: A map has a scale of 1 inch to a hundred miles. If the points on the map between Louisville and Smithville are two inches apart, how far apart are the cities?

$$\frac{1 \text{ inch}}{100 \text{ miles}} = \frac{2 \text{ inches}}{? \text{ miles}}$$ (inches for numerators) (miles for denominators)

$1 \times ? = 2 \times 100$ (cross multiply)
$1 \times ? = 200$ (multiply 2×100)
$? = 200$ (divide $200 \div 1$)

1. A map has a scale of 2 inches to 100 miles. If the points on the map between Eaton and Greenberg are 6 inches apart, how far apart are the cities?

2. A map has a scale of 3 inches to 50 miles. If the cities of Stockton and Landenberg are 200 miles apart, how far apart are the points on the map for these cities?

3. A map has a scale of 1 inch to 500 miles. If the points on the map between Smalltown and Brighton are 2 inches apart, how far apart are the cities?

4. A map has a scale of 2 inches to 300 miles. If the cities of Bloomberg and West Chester are 900 miles apart, how far apart are the points on the map for these cities?

5. A map has a scale of 2 inches to 100 miles. If the points on the map between Brownsville and Fishtown are 5 inches apart, how far apart are the cities?

6. A blueprint (a drawing on blue paper) of a house is drawn on a scale of 1 inch to 40 feet. If the side of the house in the drawing is 2 inches, how long will the actual side of the house be?

7. A blueprint of a house is drawn on a scale of 1 inch to 60 feet. If the actual side of the house is 120 feet, how long will the side of the house in the drawing be?

8. A blueprint of a house is drawn on a scale of 1 inch to 50 feet. If the side of the house in the drawing is 3 inches, how long will the actual side of the house be?

9. A model of a house is built on a scale of 1 inch to 2 yards. If the door of the model is 1 inch high, how high is the door of the real house?

10. A model of a building is built on a scale of 1 inch to 4 yards. If the side of the model is 3 inches long, how long is the side of the real building?

11. A model of an airplane is built on a scale of 3 inches to 2 feet. If the wing of the plane is 16 feet, how long is the wing of the model?

12. A model of a rocket ship is built on a scale of 2 inches to 10 yards. If the height of the rocket ship is 105 yards, how high is the model?