

Similarity Notes #1

Name: _____

Ratios and Proportions

A ratio is a comparison of two quantities using division.

Example: $\frac{a}{b}$

A ratio can be represented in the following ways:

- 1.
- 2.
- 3.

Extended ratios can be used to compare three or more quantities. The expression $a : b : c$ means that the ratio of the first two quantities is $a : b$, the ratio of the last two quantities is $b : c$, and the ratio of the first and last quantities is $a : c$.

Examples:

1. Give each ratio in simplest form:

(a) $8 : 2$

(b) $\frac{24}{36}$

(c) $13xy : 39x$

2. Extended Ratios Examples: The ratio of the measures of the angles in a triangle is $3 : 4 : 5$. Find the measures of the angles.

A _____ is an _____ stating that two ratios are equal.

Example: $\frac{a}{b} = \frac{c}{d}$

The numbers a and d are called the extremes of the proportion, while the numbers b and c are called the means of the proportion.

The product of the extremes ad and the product of the means bc are called cross products.

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To Solve for an Unknown in a Proportion:
 Cross Multiply.

$$\frac{a}{b} = \frac{c}{d} \text{ then } ad = bc$$

2. Solve for x.

(a) $\frac{3}{4} = \frac{6}{x}$

(b) $3 : 5 = 6 : x$

(c) $2 : (x - 3) = 6 : (x + 5)$

Now you try!

3. (a) Reduce: $\frac{15}{60}$

(b) Solve for x.

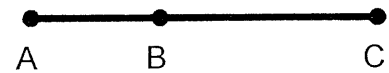
$$\frac{6}{18} = \frac{8}{x}$$

(c) Solve for x.

$$\frac{3}{(x+3)} = \frac{2}{(x+1)}$$

Examples:

4. Given: $AB = 8$ and $BC = 12$; State the following ratios.



(a) $AB : BC$

(b) $AC : BC$

(c) $AB : AC$

5. Will the following ratios form a proportion?

(a) $\frac{6}{24}$ and $\frac{4}{16}$ _____

(b) $\frac{2}{9} = \frac{3}{10}$ _____

6. A segment is divided in the ratio of $3 : 8$. If the segment is 44 cm long, find the length of each part of the segment.

7. Two complementary angles are in the ratio of $2 : 7$. Find the measure of each angle.

Check Your Understanding

— Step-by-Step Solutions begin on page R14.



Example 1

- PETS** Out of a survey of 1000 households, 460 had at least one dog or cat as a pet. What is the ratio of pet owners to households?
- SPORTS** Thirty girls tried out for 15 spots on the basketball team. What is the ratio of open spots to the number of girls competing?

Example 2

- The ratio of the measures of three sides of a triangle is 2:5:4, and its perimeter is 165 units. Find the measure of each side of the triangle.
- The ratios of the measures of three angles of a triangle are 4:6:8. Find the measure of each angle of the triangle.

Example 3

Solve each proportion.

$$5. \frac{2}{3} = \frac{x}{24}$$

$$6. \frac{x}{5} = \frac{28}{100}$$

$$7. \frac{2.2}{x} = \frac{26.4}{96}$$

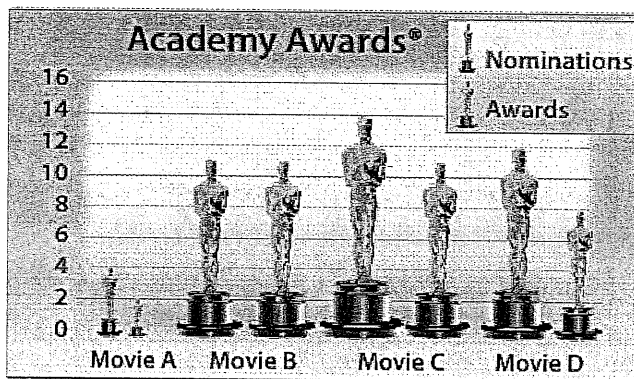
$$8. \frac{x-3}{3} = \frac{5}{8}$$

Example 4

- CCSS MODELING** Ella is baking apple muffins for the Student Council bake sale. The recipe that she is using calls for 2 eggs per dozen muffins, and she needs to make 108 muffins. How many eggs will she need?

Example 1

MOVIES For Exercises 10 and 11, refer to the graphic below.



- Of the films listed, which had the greatest ratio of Academy Awards to number of nominations?
- Which film listed had the lowest ratio of awards to nominations?

Example 2

- GAMES** A video game store has 60 games to choose from, including 40 sports games. What is the ratio of sports games to video games?

- The ratio of the measures of the three sides of a triangle is 9 : 7 : 5. Its perimeter is 191.1 inches. Find the measure of each side.
- The ratio of the measures of the three sides of a triangle is 3 : 7 : 5, and its perimeter is 156.8 meters. Find the measure of each side.
- The ratio of the measures of the three sides of a triangle is $\frac{1}{4} : \frac{1}{8} : \frac{1}{6}$. Its perimeter is 4.75 feet. Find the length of the longest side.
- The ratio of the measures of the three sides of a triangle is $\frac{1}{4} : \frac{1}{3} : \frac{1}{6}$, and its perimeter is 31.5 centimeters. Find the length of the shortest side.

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Find the measures of the angles of each triangle.

17. The ratio of the measures of the three angles is 3:6:1.
18. The ratio of the measures of the three angles is 7:5:8.
19. The ratio of the measures of the three angles is 10:8:6.
20. The ratio of the measures of the three angles is 5:4:7.

Solve each proportion.

21. $\frac{5}{8} = \frac{y}{3}$

22. $\frac{w}{6.4} = \frac{1}{2}$

23. $\frac{4x}{24} = \frac{56}{112}$

24. $\frac{11}{20} = \frac{55}{20x}$

25. $\frac{2x+5}{10} = \frac{42}{20}$

26. $\frac{a+2}{a-2} = \frac{3}{2}$

27. $\frac{3x-1}{4} = \frac{2x+4}{5}$

28. $\frac{3x-6}{2} = \frac{4x-2}{4}$

- 29. NUTRITION** According to a recent study, 7 out of every 500 Americans aged 13 to 17 years are vegetarian. In a group of 350 13- to 17-year-olds, about how many would you expect to be vegetarian?
- 30. CURRENCY** Your family is traveling to Mexico on vacation. You have saved \$500 to use for spending money. If 269 Mexican pesos is equivalent to 25 United States dollars, how much money will you get when you exchange your \$500 for pesos?

ALGEBRA Solve each proportion. Round to the nearest tenth.

31. $\frac{2x+3}{3} = \frac{6}{x-1}$

32. $\frac{x^2+4x+4}{40} = \frac{x+2}{10}$

33. $\frac{9x+6}{18} = \frac{20x+4}{3x}$

34. The perimeter of a rectangle is 98 feet. The ratio of its length to its width is 5:2. Find the area of the rectangle.
35. The perimeter of a rectangle is 220 inches. The ratio of its length to its width is 7:3. Find the area of the rectangle.
36. The ratio of the measures of the side lengths of a quadrilateral is 2:3:5:4. Its perimeter is 154 feet. Find the length of the shortest side.
37. The ratio of the measures of the angles of a quadrilateral is 2:4:6:3. Find the measures of the angles of the quadrilateral.