**Ratio Word Problems   
with Solutions and Explanations - Grade 9**

Detailed solutions and full explanations to [math word problems - grade 9](http://www.analyzemath.com/middle_school_math/grade_9/ratio.html) are presented.

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| |  | | --- | | 1. There are 600 pupils in a school. The ratio of boys to girls in this school is 3:5. How many girls and how many boys are in this school?   Solution   In order to obtain a ratio of boys to girls equal to 3:5, the number of boys has to be written as 3 x and the number of girls as 5 x where x is a common factor to the number of girls and the number of boys. The total number of boys and girls is 600. Hence   3x + 5x = 600   Solve for x   8x = 600   x = 75   Number of boys   3x = 3 × 75 = 225   Number of girls   5x = 5 × 75 = 375 | |

1. There are **r** red marbles, **b** blue marbles and **w** white marbles in a bag. Write the ratio of the number of blue marbles to the total number of marbles in terms of **r**, **b** and **w**.   
     
   Solution   
     
   The total number of marbles is   
     
   **r** + **b** + **w**   
     
   The total ratio of blue marbles to the total number of marbles is   
     
   **r** / (**r** + **b** + **w)**
2. The perimeter of a rectangle is equal to 280 meters. The ratio of its length to its width is 5:2. Find the area of the rectangle.   
     
   Solution   
     
   If the ratio of the length to the width is 5:2, then the measure L of the length and and the measure W of the with can be written as   
     
   L = 5x and W = 2x   
     
   We now use the perimeter to write   
     
   280 = 2(2L + 2W) = 2(5x + 2x) = 14x   
     
   Solve for x   
     
   280 = 14x   
     
   x = 280 / 14 = 20   
     
   The area A of the rectangle is given by   
     
   A = L × W = 5x × 2x = 10x2 = 10×202 = 4000 square meters

4 The angles of a triangle are in the ratio 1:3:8. Find the measures of the three angles of this triangle.   
  
Solution   
  
If the ratio of the three angles is 1:3:8, then the measures of these angles can be written as x, 3x and 8x. Also the sum of the three interior angles of a triangle is equal to 180°. Hence   
  
x + 3x + 8x = 180   
  
Solve for x   
  
12x = 180   
  
x = 15   
  
The measures of the three angles are   
  
x = 15°   
  
3x = 3 × 15 = 45°   
  
8x = 8 × 15 = 120°

5 The measures of the two acute angles of a right triangle are in the ratio 2:7. What are the measures of the two angles?   
  
Solution   
  
If the ratio of the two angles is 2:7, then the measures of two angles can be written as 2x and 7x. Also the two acute angles of a triangle is equal to 90°. Hence   
  
2x + 7x = 90   
  
9x = 90   
  
x = 10   
  
Measures of the two acute angles are   
  
2x = 2 × 10 = 20°   
  
7x = 7 × 10 = 70°

1. A jar is filled with pennies and nickels in the ratio of 5 to 3 (pennies to nickels). There are 30 nickles in the jar, how many coins are there?   
     
   Solution   
     
   A ratio of pennies to nickels of 5 to 3 means that we can write the number of pennies and nickels in the form   
     
   number of pennies = 5x and number of nickels = 3x   
     
   But we know the number of nickels, 30. Hence   
     
   3x = 30   
     
   Solve for x   
     
   x = 10   
     
   The total number of coins is given by   
     
   5x + 3x = 8x = 8 × 10 = 80
2. A rectangular field has an area of 300 square meters and a perimeter of 80 meters. What is the ratio of the length to the width of this field?   
     
   Solution   
     
   Let L and W being the length and the width (with L > W) of the rectangular field. The area and the perimeter are given; hence   
     
   L × W = 300 (I)   
     
   2L + 2W = 80 (II) which is equivalent to L + W = 40 (III)   
     
   We need to find the ratio L / W. Equation (I) gives   
     
   W = 300 / L   
     
   Substitute W by 300 / L in equation (III)   
     
   L + 300 / L = 40   
     
   Multiply all terms in the above equation by L and simplify   
     
   L2 + 300 = 40L   
     
   Rewrite the equation in standard form, factor and solve   
     
   L2 - 40 L + 300 = 0   
     
   (L - 10)(L - 30) = 0   
     
   Solutions: L = 10 and L = 30   
     
   We now calculate W   
     
   For L = 10 , W = 300 / L = 300 / 10 = 30 m   
     
   For L = 30 , W = 300 / L = 300 / 30 = 10   
     
   Since L > W, we select the soultion   
     
   L = 30 and W = 10   
     
   and the L / W is equal to   
     
   30 / 10 = 3 / 1 or 3:1
3. Express the ratio 3 2/3 : 7 1/3 in its simplest form.   
     
   Solution   
     
   We first convert the mixed numbers 3 2/3 and 7 1/3 into fractions   
     
   3 2/3 = 3\*3 / 3 + 2 / 3 = 11 / 3   
     
   7 1/3 = 7\*3 / 3 + 1 / 3 = 22 / 3   
     
   The ratio 3 2/3 : 7 1/3 can be expressed as   
     
   11 / 3 ÷ 22 / 3 = 11 / 3 × 3 / 22   
     
   Simplify   
     
   = 11 / 22 = 1 / 2   
     
   The ratio is 1 / 2 or 1:2

1. The length of the side of square A is twice the length of the side of square B. What is the ratio of the area of square A to the area of square B?   
     
   Solution   
     
   Let x be the length of the side of square A and y be the length of the side of square B with x = 2 y. Area of A and B are given by   
     
   A = x2 and B = y2  
     
   But x = 2y. Hence   
     
   A = (2y)2 = 4 y2  
     
   The ratio of A to B is   
     
   4 y2 / y2 = 4 / 1 or 4:1

1. The length of the side of square A is half the length of the side of square B. What is the ratio of the perimeter of square A to the perimeter of square B?
2. At the start of the week a bookshop had science and art books in the ratio 2:5. By the end of the week, 20% of each type of books were sold and 2240 books of both types were unsold. How many books of each type were there at the start of the week?
3. At the start of the month a shop had 20-inches and 40-inches television sets in the ratio 4:5. By the end of the month, 200 20-inches and 500 40-inches were sold and the ratio of 20-inches to 40-inches television sets became 1:1. How many television sets of each type were there at the start of the month?
4. The aspect ratio of a tv screen is the ratio of the measure of the horizontal length to the measure of the vertical length. Find the horizontal length and vertical height of a tv screen with an aspect ratio of 4:3 and a diagonal of 50 inches.

Answers to the Above Questions

1. 375 girls , 225 boys:
2. b / (r + b + w)
3. 4000 square meters
4. 15 degrees, 45 degrees and 120 degrees
5. 20 degrees and 70 degrees
6. 80 coins (pennies and nickels)
7. 3:1
8. 1:2
9. 4:1
10. 1:2
11. 800 science books and 2000 art books
12. 1200 20-inches and 1500 40-inches
13. horizontal length = 40 inches and vertical length = 30 inches