# MATH 5: HANDOUT 8

## More Ratios and Ratio Word Problems

### Ratios

**Ratios — Key Ideas**

**A ratio** compares two quantities by division:

$$\text{ratio of } a \text{ to } b = \frac{a}{b} \quad \text{or} \quad a : b.$$

Ratios describe how large one quantity is *relative to* another, not their actual difference.

### Ratios in word problems

Irene has 1686 balloons in colors red, blue, and green. The ratio of red : blue is 2 : 3. She sells $\frac{3}{4}$ of the blue balloons, $\frac{1}{2}$ of the green balloons, and none of the red ones. After selling, she has 922 balloons left. How many blue balloons did she have at first?

**Solution:**

1. Let red $= 2x$, blue $= 3x$, green $= g$.
2. Total before sale: $2x + 3x + g = 1686$.
3. After sale: $2x + \frac{1}{4}(3x) + \frac{1}{2}g = 922$.
4. Solve:
$$5x + g = 1686, \quad 2x + \tfrac{3}{4}x + \tfrac{1}{2}g = 922.$$
Simplify second: $\frac{11}{4}x + \frac{1}{2}g = 922$.
5. Multiply by 4: $11x + 2g = 3688$. Subtract 2 times first: $11x + 2g - 2(5x + g) = 3688 - 3372$, so $x = 316$.
6. Hence blue $= 3x = 948$, red $= 632$, green $= 106$.

**Key Takeaways**

- Ratios compare quantities by division.
- Equivalent ratios show the same relationship.

## Homework

1. The ratio of boys to girls in $6^{\text{th}}$ grade is $9:11$, and in $7^{\text{th}}$ grade the ratio of girls to boys is $31:29$. There are $100$ and $120$ students in $6^{\text{th}}$ and $7^{\text{th}}$ grades, respectively. If all students attend a dance, what is the overall ratio of boys to girls?
2. A merchant accidentally mixed candies of the first type (priced at \$3 per pound) with candies of the second type (priced at \$2 per pound). If the total cost of each type before mixing was the same, at what price per pound should the mixture be sold so that there is no loss?
3. Six oxen or eight cows can graze a field in $28$ days. How long would $9$ oxen and $2$ cows take to graze the same field?
4. The ratio of the ages of A and B is $7:9$. After $6$ years, their ages will be in the ratio $4:5$. Find their present ages.
5. A machine makes $360$ parts in $9$ hours. How many machines working at the same rate are needed to make $1{,}200$ parts in $5$ hours?
6. A map is drawn to a scale of $1:50{,}000$. If two towns are $8$ cm apart on the map, what is the real distance between them in kilometers?