# Ratio and Proportion Cheat Sheet

1. **Writing a Ratio:**
   a. The quantity written first is the numerator
   b. The word "to" separates the quantities
   c. The quantity written second is the denominator
   d. Always write in lowest terms, and always as a fraction
   Example: Write the ratio of 60 days of sun to 20 days of rain.

$$\frac{60}{20} = \frac{30}{10} = \frac{3}{1}$$

($\div 2$ above the first step, $\div 10$ below the second step; leave as a fraction)

   e. Ratios are written with LIKE terms
   Example: 2 days to 8 hours
   *2 days = 48 hours

$$\frac{48}{8} = \frac{6}{1}$$

($\div 8$ above the first step)

2. **Using Mixed Numbers in Ratios:**
   a. Write out the ratio
   b. Write numbers as improper fractions
   c. Rewrite the problem horizontally, using the ÷ symbol
   d. Change the ÷ to × and flip the second term

   Example: 2 days to $2\frac{1}{4}$ days

$$\frac{2}{2\frac{1}{4}} = \frac{\frac{2}{1}}{\frac{9}{4}} = \frac{2}{1} \div \frac{9}{4} = \frac{2}{1} \times \frac{9}{4} = \frac{8}{9}$$

(lowest terms)

3. **Writing Rates:**
   *Units are not the same and need to be included as part of the rate*
   a. Write the rate as a fraction in lowest terms

   Example: 160 dollars for 8 hours

$$\frac{160\ dollars}{8\ hours} = \frac{20\ dollars}{1\ hour}$$

**4. Finding Unit Rates:**

*Denominator is 1*

a. Write the rate as a fraction
b. Divide top number by the bottom number

Example: $810 in 6 days

$$\frac{\$810}{6\ days}$$

```
      135
   6 | 810
     -6
      21
     -18
      30
     -30
       0
```

→ $135/day

use "per" or "/" to write unit rates

**5. Finding the Best Buy:**

*The best buy is the item with the lowest cost per unit*

a. Divide the total price by the number of units
b. Round to the thousandths if necessary
c. Compare to find the lowest cost per unit

Example: Find the best buy for cereal.
12 ounces for $2.49
14 ounces for $2.89

```
    0.2075
12 | 2.49 _ _
   -2.4
    09
    -0
     90
    -84
     60
    -60
      0
```

```
    0.20642
14 | 2.89 _ _ _
   -2.8
    09
    -0
     90
    -84
     60
    -56
      40
     -28
      12
```

$0.2064/oz
*best buy

6. Finding Best Buy with Coupons:
    a. Take discount from coupon off total price
    b. Divide new total price by the number of units
    c. Compare to find the lowest cost per unit

    Example: Find the best buy on grapes. You have a coupon for $0.50 off 2 pounds, or $0.75 off 3 pounds.

    2 pounds for $2.75 - $0.50 coupon = $2.25

    3 pounds for $4.15 - $0.75 coupon = $3.40

```
   1.125
2 | 2.25_
  -2
  0.2
   -2
    05
    -4
     10
     -10
      0
```

$1.125/lb
*best buy

```
    0.2075
12 | 2.49 _ _
   -2.4
     09
     -0
      90
      -84
       60
       -60
        0
```

**7. Writing Proportions:**

*A proportion states that two ratios are equal*

a. To write a proportion, write each ratio separately, with an equal symbol (=) in between.

Example: 5 is to 6 as 25 is to 30

$$\frac{5}{6} = \frac{25}{30}$$

b. To check if a proportion is correct, cross multiply. The two cross products should be equal.

Example: $\frac{5}{6} \quad \frac{25}{30}$

$$5 \times 30 = 6 \times 25$$
$$150 = 150$$

the products are equal
so the proportion is true

8. Solving the Proportion:
    a. Cross multiply
    b. Show that the cross products are equal
    c. Divide both sides by the number touching "*x*"

Example:

$$\frac{12}{x} = \frac{6}{8}$$

$$\frac{12}{x} \times \frac{6}{8} \quad \leftarrow \text{cross multiply}$$

$$12 \times 8 = x \times 6 \quad \leftarrow \text{cross products are equal}$$

$$96 = 6x$$

$$\frac{96}{6} = \frac{\cancel{6}x}{\cancel{6}} \quad \leftarrow \text{Divide both sides by 6 to get } x \text{ by itself}$$

$$16 = x \quad \leftarrow x \text{ is 16}$$

    d. To check your work, place your value for *x* in the proportion and multiply to see that the cross products are equal ← we found *x*=16

Example:

$$\frac{12}{x} = \frac{6}{8}$$

$$\frac{12}{16} \times \frac{6}{8} \quad \leftarrow \text{replace } x \text{ with } 16$$

$$12 \times 8 = 16 \times 6 \quad \leftarrow \text{cross multiply}$$

$$96 = 96 \quad \leftarrow \text{cross products are equal}$$