

Math

Common Core State Standards

6th Grade

Ratios & proportions, division, integers, expressions & equations, properties, volume, area, data analysis, probability & more!

RATIOS & PROPORTIONS

Ratio: Compares two numbers by division; expressed in one of three ways: 3 to 2, or $\frac{3}{2}$; ratios can be shown in different ways:



- **Part to parts:** The ratio of white stars to gold stars is $\frac{2}{3}$ or $\frac{1}{1.5}$.
- **Part to whole:** The ratio of white stars to the total number of stars is $\frac{2}{5}$ or $\frac{1}{2.5}$.
- **Whole to whole:** The number of circles to the number of stars is $\frac{5}{8}$.

Rate: A ratio comparing two numbers representing different units by division; rates must have labels; unit rate has a denominator of 1;
EX: 18 miles per gallon

Percent (%): Means "out of 100"; a ratio comparing a number to 100

Proportions: Two equal ratios; if two ratios are equal, then their cross products are equal

EX: $\frac{2}{3} = \frac{4}{6}$, so $2 \times 6 = 3 \times 4$, and $12 = 12$

Percent Ratios

x is what percent of y ?

$$\text{Solve using: } \frac{x}{100} = \frac{\%}{100}$$

$$\text{or, } \frac{x}{y} = \frac{\%}{100}$$

EX: What is 60% of 90? $\frac{x}{90} = \frac{60}{100}$

1,000 is what percent of 500? $\frac{1,000}{500} = \frac{x}{100}$

20 is 75% of what number? $\frac{20}{x} = \frac{75}{100}$

Speed Formula:

$$s = \frac{d}{t}, \text{ where: } s = \text{speed (rate)}$$

$$d = \text{distance}$$

$$t = \text{time}$$

A car travels at a constant speed of 65 miles per hour.
How far will the car travel in 3.5 hours?

$$65 \times 3.5 = 227.5 \text{ miles}$$

The car will travel 227.5 miles in 3.5 hours.

Equivalent Ratios

Legs	4	8	12	16	20
Coors	1	2	3	4	5
Ratio	1:4	2:8	3:12	4:16	5:20

Seconds	60	120	180	240	300
Minutes	1	2	3	4	5
Ratio	1:60	2:120	3:180	4:240	5:300

Minutes	60	120	180	240	300
Hours	1	2	3	4	5
Ratio	1:60	2:120	3:180	4:240	5:300

Hours	24	48	72	96	120
Days	1	2	3	4	5
Ratio	1:24	2:48	3:72	4:96	5:120

Days	7	14	21	28	35
Weeks	1	2	3	4	5
Ratio	1:7	2:14	3:21	4:28	5:35

Weeks	4.5	9.0	13.5	18.0	22.5
Months	1	2	3	4	5
Ratio	1:4.5	2:9.0	3:13.5	4:18.0	5:22.5

Months	12	24	36	48	60
Years	1	2	3	4	5
Ratio	1:12	2:24	3:36	4:48	5:60

Rate Conversions

To change 4 kilometers per minute to kilometers per hour:

$$\frac{4 \text{ km}}{1 \text{ min}} = \frac{60 \text{ min}}{1 \text{ hr}} = 240 \text{ km/hr}$$

To change 120 ounces per square inch to pounds per square foot:

$$\frac{120 \text{ oz}}{1 \text{ in}^2} = \frac{144 \text{ in}^2}{1 \text{ ft}^2} = \frac{16 \text{ lb}}{16 \text{ oz}} = \left(\frac{120 \times 144}{16} \right) \left(\frac{1 \text{ lb}}{16 \text{ oz}} \right) = 1,280 \text{ lb/ft}^2$$

EX: Madeline works 60 hours every 3 weeks. At this rate, how many hours will Madeline work in 12 weeks?

First, find the unit rate:

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

$$20 \times 12 = 240$$

Madeline will work 240 hours in 12 weeks.

Pens are being sold at a price of 3 pens for \$2.70. How much would 10 pens cost?

First, find the unit price:

$$\frac{\$2.70}{3} = \$0.90$$

$$\$0.90 \times 10 = \$9.00$$

Ten pens would cost \$9.00.

DIVISION

Dividing Fractions

Need common denominator?	No
Use a mixed number?	No, change to improper fraction
Cross cancel?	Yes
Use the reciprocal?	Multiply by the reciprocal
Process	"Keep it, change it, flip it"; then use multiplication rules
Reduce (simplify) to lowest terms?	Yes

EX:

$$\frac{5}{9} \div \frac{4}{9} = \frac{5}{9} \times \frac{9}{4} = \frac{5}{4} = 1 \frac{1}{4}$$

$$\frac{3}{5} \div \frac{2}{3} = \frac{3}{5} \times \frac{3}{2} = \frac{9}{10}$$

$$\frac{1}{3} \div \frac{7}{8} = \frac{1}{3} \times \frac{8}{7} = \frac{8}{21}$$

You can use models to divide fractions:



There are six $\frac{1}{6}$'s in $\frac{2}{3}$, so $\frac{5}{6} \div \frac{2}{3} = 1 \frac{1}{2}$

Jane is making bows that require $2 \frac{3}{4}$ feet of ribbon each.

How many bows can Jane make if she has a spool of ribbon with $7 \frac{1}{2}$ yards of ribbon on it?

$$\left(\frac{15}{2} \div \frac{5}{4} \right) = \frac{15}{2} \times \frac{4}{5} = \frac{60}{10} = 6$$

Jane can make 6 bows and will have $\frac{2}{11}$ feet of ribbon left over.

Dividing Multi-Digit Numbers

- Write the problem in long-division format
- Use compatible numbers to predict the first digit
- Multiply
- Subtract
- Bring down the next digit, if there is one
- Repeat the process until the number is too small to divide
- Record the remainder

$$\begin{array}{r} 207 \\ 25 \overline{)5407} \\ \underline{500} \\ 407 \\ \underline{400} \\ 70 \\ \underline{70} \\ 0 \end{array}$$

$$207 \text{ R } 12$$

$$207 \overline{)2484}$$

$$\underline{414}$$

$$\underline{134}$$

$$\underline{171}$$

$$\underline{12}$$

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AN Whitehead



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