

5.1 Ratios and Rates p.164

RATIO: comparison of 2 quantities using division

*usually written as a fraction; **LEAVE IMPROPER**

*can be written 3 different ways:

$$\frac{5}{3} \quad 5:3 \quad 5 \text{ to } 3$$

no words

RATE: a ratio of 2 quantities w/different units

* $\frac{60 \text{ miles}}{2 \text{ hours}} \quad \frac{2 \text{ in}}{8 \text{ sec}} \quad \frac{\$50}{10 \text{ boxes}}$

Use words

UNIT RATE: a rate w/a denominator of 1.

common unit rates: mph mpg \$/h ft/s ~~* never write the 1 / or per mean 1~~

means for 1

*To find the unit rate **DIVIDE** the numerator by the denominator.

*Unit rates must always have the units (words describing the numbers)

***NEVER** write the unit rate as a fraction

30 mph
30 mi/h
3 niperh

Something per something

0.25 in/sec \$5/box

Examples:

There are 45 males and 60 females in a subway car. The subway car travels 2.5 miles in 5 minutes.

a) What is the ratio of females to males?

$$\frac{\text{females}}{\text{males}} = \frac{60}{45} = \boxed{\frac{4}{3}}$$

b) What is the ratio of males to females?

$$\frac{\text{males}}{\text{females}} = \frac{45}{60} = \boxed{\frac{3}{4}}$$

c) What is the ^[unit] speed rate of the subway car?

Something per something $\frac{\text{rate}}{\text{5 min}} = \frac{\text{unit rate}}{\text{0.5 mi/min}}$

d) What is the ratio to females to all passengers?

$$\frac{\text{females}}{\text{all (total)}} = \frac{60}{105} = \boxed{\frac{4}{7}}$$

Use the **ratio table** to find the cost of artificial turf (unit rate): *divide*

sq ft	25	100	400	600
costs	\$100	\$400	\$1600	\$2400

per sq ft
per \$

$$\frac{\$}{\text{sq ft}}$$

$$\frac{100}{25}$$

$$\frac{400}{100}$$

$$\frac{1600}{400}$$

$$\frac{2400}{600}$$

$$\$4 / \text{sq ft}$$

$$\$4 \text{ per sq ft}$$

per means 1

Important to remember:

- ⚡ **MONEY** (\$) is ALWAYS the **numerator** (# on top)
- ⚡ **TIME** is ALWAYS the **denominator** (# on bottom)
- ↳ min, h, s, years, weeks etc.

$$\frac{n}{d}$$

Find the unit rate:

need words

something per something

a) 48 cups in 12 quarts

b) 3 pounds for \$17.85

$$\frac{\text{cups}}{\text{quarts}} \quad \frac{48}{12}$$

$$\frac{\$}{\text{lb}} \quad \frac{17.85}{3}$$

$$4 \text{ cups} / \text{qt}$$

$$\$5.95 / \text{pound}$$

$$\$5.95 / \text{lb}$$

c) 4 hours in 26 miles

d) 3 boxes costs \$12.60

$$\frac{\text{miles}}{\text{hours}} \quad \frac{26}{4}$$

$$\frac{\$}{\text{boxes}} \quad \frac{12.60}{3}$$

$$6.5 \text{ miles per hour}$$

$$6.5 \text{ mi/h}$$

$$\$4.20 / \text{box}$$

$$6.5 \text{ mph}$$

- miles → mi
- meters → m
- minutes → min

- seconds → s
- hours → h
- pound → lb
- ounce → oz

5.1 (continued)

The table shows the amount of money you can raise by dancing for a charity. Find the unit rate.

Time (hrs)	6	12	18	24
Money (\$)	\$90	\$180	\$270	\$360

$$\frac{\$}{\text{hr}} \quad \frac{90}{6} = \boxed{\$15/\text{h}} \quad \frac{180}{2} \text{ or } \frac{270}{18} \text{ or } \frac{360}{24}$$

MONEY IS ALWAYS IN THE NUMERATOR (TOP NUMBER)

Find the unit rate:

a) 150 grapes eaten in 30 minutes

$$\frac{\text{grapes}}{\text{min}} \quad \frac{150}{30} \quad \boxed{5 \text{ grapes/min}}$$

b) $21 \frac{3}{4}$ meters in $2 \frac{1}{2}$ hours

$$\frac{\text{meters}}{\text{hours}} \quad 21 \frac{3}{4} \div 2 \frac{1}{2} = \frac{87}{4} \div \frac{5}{2} = \frac{87}{4} \cdot \frac{2}{5} = \frac{87}{10} = \boxed{8 \frac{7}{10} \text{ m/h}} \text{ or } \boxed{8.7 \text{ m/h}}$$

c) $26 \frac{1}{10}$ miles in $3 \frac{3}{5}$ hours

$$\frac{\text{miles}}{\text{hours}} \quad 26 \frac{1}{10} \div 3 \frac{3}{5} = \frac{261}{10} \div \frac{18}{5} = \frac{261}{10} \cdot \frac{5}{18} = \frac{29}{2} = \boxed{7 \frac{1}{4} \text{ mph}} \text{ or } \boxed{7.25 \text{ mph}}$$

Since they are terminating decimals, you can convert

Which is the better buy: **[cheapest]** Find the unit rate for each, and compare

Dish Detergent			
Size	Volume (fl oz)	Price (\$)	
mini	12 fl oz	\$1.20	$\frac{1.20}{12} = \$0.10/\text{fl oz}$
family	28 fl oz	\$2.24	$\frac{2.24}{28} = \$0.08/\text{fl oz}$
Costco	40 fl oz	\$3.60	$\frac{3.60}{40} = \$0.09/\text{fl oz}$

The family size is the better buy because it is the least per fluid ounce.