ME 2: Section 10.3: Proportions

Vocabulary: **Proportion**: an equation of ratios in the form $\frac{a}{b} = \frac{c}{d}$ where b & d are not equal to zero.

Example: $\frac{x \text{ miles}}{2 \text{ inches}} = \frac{50 \text{ miles}}{1 \text{ inch}}$

Exploration 1: $\frac{x \text{ miles}}{2 \text{ inches}} = \frac{50 \text{ miles}}{1 \text{ inch}}$ multiply both sides by 2 inches

$$x \text{ miles} = \frac{50 \text{ miles} \cdot 2 \text{ inches}}{1 \text{ inch}} = 100 \text{ miles}$$

$\boxed{x = 100}$

Example 1: a) $\frac{\$6}{4 \text{ bottles}} = \frac{\$x}{10 \text{ bottles}}$

b) $\frac{\$x}{\$6} = \frac{10 \text{ bottles}}{4 \text{ bottles}}$ or $\frac{4 \text{ bottles}}{\$6} = \frac{10 \text{ bottles}}{\$x}$

c) it does not matter.

$$\$6 \cdot \frac{\$x}{\$6} = \frac{10 \text{ bottles}}{4 \text{ bottles}} \cdot \$6$$

$$\$x = \$\frac{60}{4} = \$15$$

$\boxed{\$x = \$15}$

Example 2: $\frac{3 \text{ bags}}{\$2.79} = \frac{7 \text{ bags}}{\$C}$, $\frac{3 \text{ bags}}{7 \text{ bags}} = \frac{\$2.79}{\$C}$, $\frac{\$C}{\$2.79} = \frac{7 \text{ bags}}{3 \text{ bags}}$,

$$7 \text{ bags} \cdot \frac{\$C}{7 \text{ bags}} = \frac{\$2.79}{3 \text{ bags}} \cdot 7 \text{ bags}$$

$\boxed{\$C = \$6.51}$

Example 3: Tabular: 1 gallon = 8 pints

pints	1	8	16	28
gallons	.125	1	2	3.5

Unit Rate: $\frac{1 \text{ gallon}}{8 \text{ pints}} = \frac{1}{8}$ gallon per pint

$\frac{1}{8} \cdot 28 =$ **3.5 gallons**

Proportion: $\frac{1 \text{ gallon}}{8 \text{ pints}} = \frac{x \text{ gallons}}{28 \text{ pints}}$ $\cdot 28$ pints

3.5 gallons = x gallons

Example 4: Tabular:

Time (min)	# Leaves Cut
0	0
7	4
14	8
21	12
28	16
35	20
42	24
49	28
56	32
63	36

(can't find exact answer without the use of another method as well)

Proportion:

$\frac{4 \text{ leaves}}{7 \text{ min}} = \frac{x \text{ leaves}}{60 \text{ min}}$

$\frac{240 \text{ leaves}}{7} =$ **34.29 leaves** $= x$ leaves in an hour

Unit Rate:

$\frac{4 \text{ leaves}}{7 \text{ min}} = \frac{x \text{ leaves}}{1 \text{ min}}$

$\frac{4}{7}$ leaves in 1 min

$\frac{4}{7} \cdot 60$ in 1 hour

34.29 leaves

Example 5:

Time (min)	Distance (mi.)
0	0
3	.25
6	.5
12	1
15	1.25
30	2.5
45	3.75

OR $\frac{45 \text{ min}}{} \cdot \frac{.25 \text{ miles}}{3 \text{ min}} = \frac{x \text{ miles}}{45 \text{ min}} \cdot 45 \text{ min}$

$x \text{ miles} = 3.75 \text{ miles}$

Example 6: $\frac{15 \text{ tagged}}{} \cdot \frac{35 \text{ prairie dogs}}{3 \text{ tagged}} = \frac{x \text{ prairie dogs}}{15 \text{ tagged}} \cdot 15 \text{ tagged}$

175 prairie dogs = x prairie dogs

Exploration 2: $\frac{30 \text{ cm}}{8000 \text{ miles}} = .00375 \text{ cm per mile}$

$100 \text{ miles} \cdot \frac{.00375 \text{ cm}}{1 \text{ mile}} = .375 \text{ cm}$

$200 \text{ mi} \cdot \frac{.00375 \text{ cm}}{1 \text{ mile}} = .75 \text{ cm}$

$18000 \text{ mi} \cdot \frac{.00375 \text{ cm}}{1 \text{ mi}} = 67.5 \text{ cm}$

$2100 \text{ mi} \cdot \frac{.00375 \text{ cm}}{1 \text{ mi}} = 7.875 \text{ cm}$

$240{,}000 \text{ mi} \cdot \frac{.00375 \text{ cm}}{1 \text{ mi}} = 900 \text{ cm}$

Practice Exercises: 1) a) $\frac{14}{42} = \frac{x}{6}$ $\frac{2}{6} = \frac{x}{6}$ $\boxed{x = 2}$

b) $\frac{x}{15} = \frac{3}{5}$ $x = \frac{3}{5} \cdot 15$ $\boxed{x = 9}$

c) $x \cdot \frac{16}{x} = \frac{4}{9} \cdot x$ $9 \cdot 16 = \frac{4x}{9} \cdot 9$ $\frac{144}{4} = \frac{4x}{4}$ $\boxed{x = 36}$

2) a) $3\text{lbs} \cdot \frac{\$70}{5\text{lbs}} = \frac{x}{3\text{lbs}} \cdot 3\text{lbs}$

$\$42 = x$

b) $\frac{\$70}{5\text{lbs}} = \frac{x}{1\text{lb.}}$ $\$14 = x$

$\boxed{\$14 \text{ per pound}}$

3) $\frac{P \text{ bats}}{80 \text{ tagged}} = \frac{150 \text{ bats}}{6 \text{ tagged}} = \frac{25 \text{ bats}}{1 \text{ tagged}}$

$P \text{ bats} = \frac{25 \cdot 80}{1} \text{ bats}$

$P \text{ bats} = \boxed{2000 \text{ bats}}$