Topic 9.1 – Understanding Ratios

Ratio – *a relationship where for every "x" units of one quantity there are "y" units of another quantity.*

Terms – *the quantities "x" and "y" in a ratio are called "terms."*

*A ratio can be written three ways:

1. x to y
2. x:y
3. $\frac{x}{y}$

*A ratio can compare "part to part" or "part to whole."

Example 1:

There are 14 cats and 17 dogs at PetSmart, for a total of 31 pets in the store. Write a ratio for each scenario.

1. Cats to Dogs: ① 14 to 17 ② 14:17 ③ $\frac{14}{17}$
2. Cats to Total: ① 14 to 31 ② 14:31 ③ $\frac{14}{31}$

Example 2:

A sixth-grade basketball team has 3 centers, 5 forwards, and 6 guards. Write a ratio for each comparison in three different ways.

TOTAL:
3
+ 5
+ 6
14

1. Forwards to Guards: 5 to 6 5:6 $\frac{5}{6}$
2. Centers to Total: 3 to 14 3:14 $\frac{3}{14}$
3. Centers to Guards: 3 to 6 3:6 $\frac{3}{6}$

Topic 9.2 – Equivalent Ratios

Proportion – *a mathematical statement where two rations are equivalent (equal to each other).*

***How can you find equivalent ratios?**

1. Use multiplication:

$$\frac{16}{48} \times 2 = \frac{32}{96}$$

★ Multiply both terms by the same nonzero number.

$$\frac{16}{48} = \frac{32}{96}$$ ★ This is a proportion!

2. Use division:

$$\frac{16 \div 2}{48 \div 2} = \frac{8}{24}$$

$$\frac{16 \div 16}{48 \div 16} = \frac{1}{3}$$

★ Divide both terms by the same nonzero number.

★ you can also divide the terms by their GCF (greatest common factor) to write the ratio in simplest form.

$$\frac{16}{48} = \frac{8}{24} = \frac{1}{3}$$

***How can you decide whether two ratios form a proportion?**

1. Compare the units to see if they are the same across the top and bottom.
2. Write each ratio in simplest form. Divide by the GCF (Greatest Common Factor).
3. Compare the simplest forms to see if they are the same. If they are the same, the two ratios form a proportion!

$$\frac{7 \text{ laps}}{14 \text{ min}} \qquad \frac{12 \text{ laps}}{24 \text{ min}}$$

Top and bottom units are the same.

$$\frac{7 \div 7}{14 \div 7} = \frac{1}{2} \qquad \frac{12 \div 12}{24 \div 12} = \frac{1}{2}$$

★ Both equal $\frac{1}{2}$ so the ratios are proportional

Topic 9.4 – Using Ratios Table

1. For every 7 cans of tennis balls sold at a sports store, 3 tennis rackets are sold. At this rate, how many cans of tennis balls would be sold if 15 tennis rackets were sold?

- Write a proportion. Use x for the number of cans of tennis balls that would be sold if 15 rackets were sold.

$$\frac{7 \text{ cans}}{3 \text{ rackets}} = \frac{x}{15 \text{ rackets}}$$

- Make a ratio table to solve the proportion. Find ratios equivalent to 7/3. Multiply both terms of the ratio by 2, 3, 4, and so on, until you find 15 tennis rackets sold.

cans	7	14	21	28	
rackets	3	6	9	12	15

$\frac{7}{3} \overset{\times 5}{=} \frac{35}{15}$ ($\times 5$)

35 cans

2. To make plaster, Kevin mixes 3 cups of water with 4 pounds of plaster powder. Complete a ratio table. How much water will he mix with 20 pounds of powder?

water	3	6	9	12	15
powder	4	8	12	16	20

$\frac{3}{4} \overset{\times 5}{=} \frac{x}{20}$ ($\times 5$)

15 cups of water

3. Answer the question and draw a ratio table to show how you solved the proportion.

a. $\frac{3}{7} \overset{\times 3}{=} \frac{x}{21}$ ($\times 3$)

3	6	9
7	14	21

9

b. $\frac{110}{2} \overset{\times 3}{=} \frac{x}{6}$ ($\times 3$)

110	220	330
2	4	6

330

Topic 9.5 – Ratios and Graphs

1. Ellen is shopping for supplies at Jake's Party Store. Make a table to show how much Ellen will spend to by 3, 6, 9, or 12 balloons. Then plot the pairs of values in a coordinate graph and use the graph to find how much Ellen would spend if she wanted to buy 18 balloons.

- Balloons 3 for $2
- Hats 5 for $3
- Streamers 4 for $1

The ratio 3 balloons to $2 represents the cost of the balloons. Find equivalent ratios for 6, 9, and 12 balloons. Make a table using the equivalent ratios.

Balloons	3	6	9	12
cost	2	4	6	8

$\frac{3}{2} \times \frac{2}{2} = \frac{6}{4}$

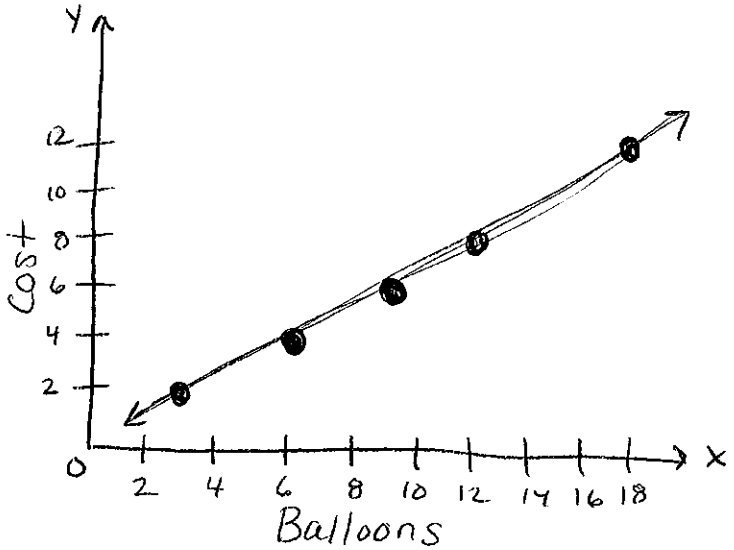
$\frac{3}{2} \times \frac{3}{3} = \frac{9}{6}$

$\frac{3}{2} \times \frac{4}{4} = \frac{12}{8}$

Plot the pairs of values on the coordinate plane for each ratio x to y. Connect the points with a dashed line and extend the line to find the cost of 18 balloons.

$\frac{3}{2} \times \frac{6}{6} = \frac{18}{12}$

$12



2. Complete the ratio table to show equivalent ratios for 3 to 8.

(a.) $\frac{3}{8} \times \frac{2}{2} = \frac{6}{16}$

(b.) $\frac{3}{8} \times \frac{3}{3} = \frac{9}{24}$

(c.) $\frac{3}{8} \times \frac{4}{4} = \frac{12}{32}$

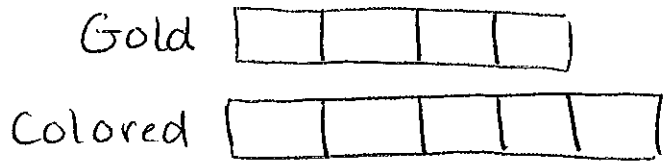
(d.) $\frac{3}{8} \times \frac{5}{5} = \frac{15}{40}$

	a.	b.	c.	d.
3	6	9	12	15
8	16	24	32	40

Topic 9.6 – Problem Solving: Draw a Picture

1. Gillian is making jewelry using gold beads and colored beads. The ratio of the number of gold beads to the number of colored beads used in a piece of jewelry is 4:5. What fraction of the beads are colored beads?

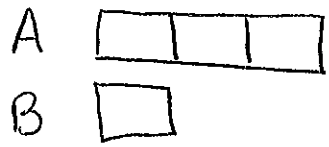
- Draw a picture to show the relationship. The ratio of the number of gold beads to the number of colored beads is 4:5.



- If there were 4 gold beads and 5 colored beads, there would be 9 beads in all. The fraction of colored beads would be 5/9.

$\frac{5}{9}$

2. Figure A is 3 times as long as Figure B.



- What is the ratio of the length of Figure A to Figure B?

3 to 1 3:1

- What fraction of the length of Figure A is the length of Figure B?

$\frac{1}{3}$

3. Tomas and Isaac shared a sum of money in the ratio 3:5.

- Express Isaac's share as a fraction of Tomas' share. $\frac{5}{3}$
- What fraction of the whole sum of money is Tomas' share? $\frac{3}{8}$
- What fraction of the whole sum of money is Isaac's share? $\frac{5}{8}$