**Mathematics**

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**Parent Handbook**

**Grade 6**

**Module 1 Topic B:**

**Ratios**

Topic B:

In Topic B, students explore collections of equivalent ratios in real world contexts.  A new tool to explore equivalent ratios will be introduced, the ratio table. The students will build ratio tables and study their additive and multiplicative structure. This simply means, they will be able to see patterns forming between each ratio.  Students will continue to apply reasoning to solve ratio problems while they explore representations of collections of equivalent ratios and relate those representations to the ratio table.

Building on their experience with number lines, students represent collections of equivalent ratios with a double number line model.  A double number line model is yet another tool that can be used to help show equivalent ratios. We will also begin to relate ratio tables to equations using the value of a ratio defined in Topic A.

Finally, students expand their experience with the coordinate plane as they represent collections of equivalent ratios by plotting the pairs of values on the coordinate plane.

**Terminology**

New or Recently Introduced Terms

**Ratio Table:** A table that is used to show equivalent ratios.

|  |  |
| --- | --- |
| Spring Sugar Water Mixture | |
| Sugar (cups) | Water (cups) |
| 6 | 4 |
| 15 | 10 |
| 18 | 12 |
| 27 | 18 |

**Double Number line:** A tool that is made up of two number lines that begin at 0 and show the ratio relationship between the items being compared. Below is a double number line based on the ratio table shown above.

0 6 15 18 27 (c. of sugar)

0 4 10 12 18 (c. of water)

**Ordered Pair:** A pair of numbers used to locate a point on a coordinate plane.

(x, y)

**Coordinate Plane:** A grid formed when the x-axis and the y-axis intersect.

**Lesson 9**

Objectives:

* Students understand that a ratio is often used to describe the relationship between the amount of one quantity & the amount of another quantity as in the cases of mixtures or constant rates.
* Students understand that a *ratio table* is a table of equivalent ratios & use ratio tables to solve problems.

Example: To make Paper Mache, the art teacher mixes water & flour. For every 2 cups of water, she needs to mix in 3 cups of flour to make the paste. Find equivalent ratios for the ratio relationship of 2 cups water to 3 cups flour. Represent the equivalent ratios in a ratio table.

|  |  |
| --- | --- |
| Cups of Water | Cups of Flour |
| 2 | 3 |
| ***4*** | ***6*** |
| ***6*** | ***9*** |
| ***8*** | ***12*** |

To find equivalent ratios, you can multiply the original ratio by any number you choose, however, if you multiply the cups of water by 2, you need to multiply the cups of flour by 2 as well. Therefore, there are many more equivalent ratios than listed in the above table.

Part B: What can you say about the value of the ratios in the table above?

*The value of the ratios are all equivalent. (Remember, the value of the ratio is writing a ratio in its simplest form)*

*Proof:*

*4:6 (divide by 2) = 2:3 6:9 (divide by 3) = 2:3 8:12 (divide by 4) = 2:3*

**Lesson 10**

Objectives:

* Students explore both the additive and multiplicative structure of a ratio table & use the structure to make additional entries in the table.
* Students use ratio tables to solve problems.

Example: Imagine that you are making a fruit salad. For every quart of blueberries you add, you would like to put in 3 quarts of strawberries. Create 3 ratio tables that show the amounts of blueberries and strawberries you would use if you needed to make fruit salad for greater numbers of people.

* Table 1 should contain amounts where you have added fewer than 10 quarts of blueberries to the salad.
* Table 2 should contain amounts of blueberries between 10 and 50 quarts.

|  |  |
| --- | --- |
| **Table 1** | |
| **Quarts of Blueberries** | **Quarts of Strawberries** |
| 1 | 3 |
| 2 | 6 |
| 3 | 9 |
| 4 | 12 |
| 5 | 15 |

|  |  |
| --- | --- |
| **Table 2** | |
| **Quarts of Blueberries** | **Quarts of Strawberries** |
| 10 | 30 |
| 20 | 60 |
| 30 | 90 |
| 40 | 120 |
| 50 | 150 |

1. Describe any patterns you see in the tables. Be specific in your descriptions.

*In both tables, the quarts of strawberries is 3x the amount of quarts of blueberries or the quarts of blueberries is 1/3 the amount of quarts of strawberries.*

1. How are the values in the strawberry column in table 1 related?

*As you move down the strawberry column the amounts are increasing by 3.*

**Lesson 11**

Objective:

* Students solve problems by comparing different ratios using 2 or more tables.

Example:

The tables below show the comparison of the amount of water to the amount of juice concentrate (JC) in grape juice made by three different people. Whose juice has the greatest water-to-juice concentrate ratio, and whose juice would taste strongest? Be sure to justify your answer.



\*To solve this type of problem, the students need to look for common amounts that are shared between the tables.

*Both Laredo’s juice & Franca’s juice have 15 cups of water. In Laredo’s the ratio of water to juice concentrate is 15:5, while in Franca’s it’s 15:3. Therefore, Franca’s grape juice will have the greater water to juice concentrate ratio.*

\*Next we need to compare Milton’s juice to Franca’s to see if she still has the highest water to juice concentrate.

*Both Franca & Milton have the amount 40 in their water column. Franca’s water to juice concentrate ratio is 40:8, while Milton’s is 40:10. Therefore, Franca still has the higher water to juice concentrate ratio.*

\*Finally, to figure out whose juice would taste the strongest, you can find the value of the ratio (ratio in simplest form) for each of the tables.

*Laredo’s: W:J 12:4 = 3:1 So, based on the value of the ratios,*

*Franca’s: W:J 10:2 = 5:1 Laredo’s is the strongest, Milton’s is next*

*Milton’s: W:J 8:2 = 4:1 & Franca’s is the weakest.*

**Lesson 12**

Objectives:

* Students create equivalent ratios using a ratio table & represent these ratios on a double number line diagram.
* Students extend & use a double number line diagram to solve ratio problems related to the real world.

Example:

Part A: The amount of sugary beverages Americans consume is a leading health concern. For a given brand of cola, a 12-ounce serving of cola contains about 40 grams of sugar. Complete a ratio table, using the given ratio to find equivalent ratios.

|  |  |  |  |
| --- | --- | --- | --- |
| Cola (ounces) | 6 | 12 | 18 |
| Sugar (grams) | 20 | 40 | 60 |

Part B: A 1-liter bottle of cola contains approximately 34 fluid ounces. How many grams of sugar would be in a 1-liter bottle of the cola? Explain and show how to arrive at the solution.

0 6 12 18 24 30 34 36 (oz. cola)

0 20 40 60 80 100 120 (g. sugar)

*34 oz. of cola is between 30 & 36 on the double number line. First, you need to figure out the scale (amount you are counting by for the cola number line & sugar number line). The scale for the cola is 6 (counting by 6’s) & the scale for sugar is 20 (counting by 20’s). For the cola, 34 is 4/6 or 2/3 of the way between 30 & 36, so the answer to the grams of sugar will be 4/6 or 2/3 between 100 & 120. Since the interval is by 20, you need to find 2/3 x 20/1:*

***grams of sugar in 34 oz. of cola***

**Lesson 13**

Objectives:

* Students restate a ratio in terms of its value; e.g., if the ratio of length *A* to length *B* is 3:5 (in the same units), students state that “length *A* is 3/5 of length *B*.
* Students us the value of the ratio to problem-solve by writing & solving equations.

Example:

Jorge is mixing a special shade of orange paint. He mixed 1 gallon of red paint with 3 gallons of yellow paint. Based on the information on red and yellow paint, complete the table below.

|  |  |
| --- | --- |
| Red Paint (R) | Yellow Paint (Y) |
| 1 | 3 |
| 2 | 6 |
| 3 | 9 |
| 4 | 12 |
| 5 | 15 |

X 3

Part A: How is the amount of yellow paint related to the amount of red paint?

*\*Students should draw an arrow from the red side to the yellow side seeing how the amounts are related. The yellow paint amount is 3x as much as the red paint amount.*

Part B: Write an equation to show the relationship of the amount of yellow paint related to the amount of red paint.

*To do this, we will use the letter “y” to represent the yellow paint & the letter “r” to represent the red paint.*

*y = 3r or 3r = y*

*(yellow paint is equal to 3 times the amount of red paint)*

**Lesson 14**

Objectives:

* Students associate each ratio *A:B* with the ordered pair (*A, B)* and plot it in the coordinate plane.
* Students represent ratios in ratio tables, equations, and double number line diagrams and then represent those ratios in the coordinate plane.

Example:

Kellyann tutors children in math and charges $20 per hour. Complete the table below. Then determine the ordered pairs, and create a labeled graph.

|  |  |  |
| --- | --- | --- |
| Hours Tutoring | Charge | Ordered Pairs |
| 1 | ***30*** | ***(1, 30)*** |
| 2 | ***60*** | ***(2, 60)*** |
| 3 | ***90*** | ***(3, 90)*** |
| 4 | ***120*** | ***(4, 120)*** |

