

# PLTW GTT FS MATH Frameworks

**PLTW Course GTT Flight and Space**

**Math Strand being addressed** Number & Operation

**Math Standard being addressed** 6.1.2.4

## **Overview:**

**Math Standard and Benchmarks** 6.1.2; Understand the concept of ratio and its relationship to fractions and to the multiplication and division of whole numbers. Use ratios to solve real-world and mathematical problems.

- 6.1.2.4; Use reasoning about multiplication and division to solve ratio and rate problems. *For example:* If 5 items cost \$3.75, and all items are the same price, then 1 item costs 75 cents, so 12 items cost \$9.00.

**Correlation to Common Core Math Standards: MN 6.1.2.4 ≈ CCSS 6.RP.3**

## **Essential Understandings/Big Ideas:**

The concept of ratio is a critical foundation in the learning progression of algebra concepts, connecting rational numbers to proportion to function in future years. Students at this level use simple reasoning about multiplication and division to solve ratio and rate problems. For example, Use your data to calculate the average velocity (speed) of the dragster for each force used.  $\text{Speed} = \text{distance} \div \text{time}$  then use the calculated velocity (speed) and the time to determine the acceleration.  $\text{Acceleration} = \text{velocity} \div \text{time}$  Thus, they expand the repertoire of problems that they can solve by multiplication and division, and build on their understanding of fractions to understand ratios. Students apply their knowledge of ratios, equivalent fractions, and percents to solve a wide variety of problems, including calculating for force (F), is Force equals mass (m) times acceleration (a) ( $F = ma$ ).

**What should students know and be able to do [at a mastery level] related to these benchmarks? –**

- Use reasoning about multiplication and division to solve ratio and rate problems;
- Use reasoning about multiplication and division to determine equivalent ratios;
- Determine unit rates;

## **Misconceptions:**

### **Student Misconceptions:**

Students may not understand that order matters in a ratio. For example, students may believe that 3:1 and 1:3 are the same ratios;

- Given the ratio 3 boys to every 7 girls, students may think there are exactly only 3 boys and 7 girls;
- When scaling up by non-integer values, students revert to additive structures (e.g., When asked, "If it takes 6 pizzas to feed 24 people, how many pizzas will it take to feed 36 people," students add  $6 + 12$  rather than multiply  $6 \times 1.5$ );
- Students do not understand unit rates as fractions (e.g., 25 students per bus means 1bus25students)

### Teacher resources:

**Teacher Notes** When introducing these concepts into the "Measuring Energy" activity, make the problem relevant to them. Set up the problem by properly going through the introduction.

- When students are calculating their results make sure to have students properly label their work this will allow them to plug the data into its correct location.
- Make sure to guide them to self discover of how to figure out the desired answer.

Student struggle most is when they are taking the data that they have compiled and try to apply that data to their formulas.

### New Vocabulary

**rate:** a ratio that compares two quantities measured in different units; may be expressed using the word *per*. *Examples:* 4buses100students; 100 students per 4 buses.

**ratio:** a comparison of two quantities by division. *Examples:* 12 to 25, 12:25, 25/12

**unit rate:** a rate with a denominator of 1 unit. *Example:* \$3

### Vignette:

Students will record their finding onto a data sheet. Then they will have to calculate unit rate of the given question. They will perform different experiments and their objective to learn Newton's law of motion by using a math stand of unit rate.

### Additional Instructional Resources

<http://www.khanacademy.org/v/finding-unit-rates?p=Developmental%20Math>

**Assessment:**

**Assessment:** You will run the dragster a total of 9 times – 3 times at each specified amount of force. Your instructor will set the force levels on the compressor.

- 3 runs with a force of 40 psi
- 3 runs with a force of 60 psi
- 3 runs with a force of 80 psi

Record the time and distance traveled for each run

Force	Distance	Time	Average Velocity (distance/time)	Acceleration (velocity /time)	Average Acceleration
40 psi					
40 psi					
40 psi					
60 psi					
60 psi					
60 psi					
80 psi					
80 psi					
80 psi					

*DOK Level 3)*

5. A drink recipe calls for 1 part lemonade, 3 parts orange juice, and 4 parts water. How much lemonade, orange juice, and water are needed to make 64 fluid ounces of the drink using the recipe? Explain how you found your answer.

**Answer:** Sixty-four fluid ounces of the drink will require 8 fluid ounces lemonade, 24 fluid ounces orange juice, and 32 fluid ounces water. My first step was to find the total number of parts: 1 part + 3 parts + 4 parts = 8 parts. Then I divided the total number of fluid ounces by the total number of parts: 8 parts 64 fluid ounces = 1 part 8 fluid ounces. Next I

multiplied the number of parts by 1 part8 fluid ounces to find the number of fluid ounces of each ingredient:

lemonade - 1 part

orange juice - 3 parts

water - 4 parts

I know my answer is reasonable because when I add the number of fluid ounces of each ingredient, I get 64 fluid ounces: (8 fluid ounces lemonade + 24 fluid ounces orange juice + 32 fluid ounces water = 64 fluid ounces drink).

### Differentiation:

#### Gifted and Talented:

*How could this standard/benchmark be "extended" for students that already understand the basic concept? This needs to be something more complex, not just something "more to do"...*

Have the student record their data into a spreadsheet and graph their finds. Then have them explain the results.

#### Special Education:

#### English Language Learners

Create a visual glossary that includes examples of ratios represented in different forms, rates, unit rates, and proportions;

### Parents and Administration:

#### Administrative/Peer Classroom Observation

Students Are: (descriptive list)	Teachers Are: (descriptive list)
Investigating	Facilitating
Testing	Guiding
Problem solving	Advising
Collaborative groups	Questioning
Using problem solving skill	Monitoring
	Listening
	Redirecting

**Professional Learning Communities:**

Reflection – Critical Questions regarding the teaching and learning of these benchmarks

Materials – suggest articles and books for book study with PLC

**Parent Resources:** suggested activities, materials, websites,

**References:**

Project Lead the Way curriculum

Minnesota State Math Standards

SciMath Minnesota