

This task was developed by high school and postsecondary mathematics and agriculture sciences educators, and validated by content experts in the Common Core State Standards in mathematics and the National Career Clusters Knowledge & Skills Statements. It was developed with the purpose of demonstrating how the Common Core and CTE Knowledge & Skills Statements can be integrated into classroom learning – and to provide classroom teachers with a truly authentic task for either mathematics or CTE courses.

TASK: YOGURT PACKAGING

TARGET COMMON CORE STATE STANDARD(S) IN MATHEMATICS:

N.Q.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.*

N.Q.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.*

6.RP.3d Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.

7.NS.3 Solve real world problems involving the four operations with rational numbers

7.RP.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, areas, and other quantities measured in like or different units.

7.EE.3 Solve multi-step real life and mathematical problems posed with positive and negative rational numbers in any form, using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.

TARGET STANDARDS FOR MATHEMATICAL PRACTICES

MP.1 Make sense of problems and persevere in solving them.

MP.2 Reason abstractly and quantitatively.

MP.6 Attend to precision.

TARGET CAREER AND TECHNICAL EDUCATION (CTE) KNOWLEDGE & SKILLS STATEMENTS:

AGPA.01.03.01 Prepare products for distribution using an analysis of available product preparation options.

AGPA01.02.01 Execute key processes related to food product development and enhancement.

RECOMMENDED MATHEMATICS COURSE(S):

Algebra 1 or Geometry; Integrated Math I or II; Food Science; Agriculture Sales and Service; Agribusiness Management

ADDITIONAL INSTRUCTIONS:

This task can be completed in one class period and might be used as a formative or summative assessment.

* Modeling standards appear throughout the CCSS high school standards and are indicated by a star symbol (*).

About the Common Core State Standards in Mathematics

The Common Core State Standards (CCSS) for Mathematics are organized by grade level in grades K–8. At the high school level, the standards are organized by conceptual category (number and quantity, algebra, functions, geometry, and probability and statistics), showing the body of knowledge students should learn in each category to be college and career ready, and to be prepared to study more advanced mathematics. The Standards for Mathematical Practice describe ways in which developing student practitioners of the discipline of mathematics increasingly ought to engage with the subject matter as they grow in mathematical maturity and expertise throughout the elementary, middle and high school years. www.corestandards.org

About the Common Core State Standards in English Language Arts/Literacy

The Common Core State Standards (CCSS) for ELA/Literacy are organized by grade level in grades K–8. At the high school level, the standards are organized by 9-10 and 11-12 grade bands. Across K-12 there are four major strands: Reading, Writing, Speaking and Listening, and Language. The CCSS also include Standards for Literacy in History/Social Studies, Science, and Technical Subjects, with content-specific (Reading and Writing) literacy standards provided for grades 6-8, 9-10, and 11-12, to demonstrate that literacy needs to be taught and nurtured across all subjects. www.corestandards.org

About the Career Cluster Knowledge and Skill Statements

As an organizing tool for curriculum design and instruction, Career Clusters™ provide the essential knowledge and skills for the 16 Career Clusters™ and their Career Pathways. It also functions as a useful guide in developing programs of study bridging secondary and postsecondary curriculum and for creating individual student plans of study for a complete range of career options. As such, it helps students discover their interests and their passions, and empowers them to choose the educational pathway that can lead to success in high school, college and career. <http://www.careertech.org/career-clusters/resources/clusters/agriculture.html>. Although not included in this template, all Clusters and Pathways have Foundational Academic Expectations and Essential Knowledge & Skills Statements, which, in some cases, overlap with the Common Core State Standards.

KEY TERMS

- Fluid ounces, cups, pints, quarts, gallons
- Grams
- Recommended daily allowance (RDA)

YOGURT PACKAGING– *The Task*

A local food company produces yogurt in $\frac{3}{4}$ cup tubs.



2 cups = 1 pint
 2 pints = 1 quart
 4 quarts = 1 gallon
 16 fl oz = 1 pint

Show all your work as you answer the questions below:

1. The tubs of yogurt are sold for 75¢ each. Twenty percent of this is profit for the food company. How much profit does the company make on each tub?

2. The machine that fills the $\frac{3}{4}$ cup tubs with yogurt runs 10 hours a day for 5 days a week. It fills 1600 tubs an hour. How many gallons of yogurt are needed to fill 1600 tubs?

3. How many gallons of yogurt are produced each week?

4. What is the percent increase in production if the machine runs for 7 days a week instead of 5 days a week?

5. Each tub of yogurt contains 1.85g of fat. The company would like to reduce this amount by 15%, but instead of changing the yogurt composition, the company would like to alter the serving size. How many fluid ounces will the new container be?

6. If 1.85g is 2.85% of the recommended daily allowance (RDA) for fat grams, what is the daily fat recommendation in grams?

7. The new smaller container has what percentage of your daily value of fat?

8. Fill in the table below to compare the fat content per fluid ounce of your two products (original and new sizes) to these competitors. Which brand of yogurt is the lowest fat content per fluid ounce? Make a recommendation for the best (healthiest) brand of yogurt to eat based on your findings.

Yogurt	Fat Content (grams)	Serving Size (cups)	Serving Size (fl oz)	Fat grams per fl oz	% Daily Recommended
Competitor A	2 g	1 cup			
Competitor B	1.45 g	$\frac{2}{3}$ cup			
Original Tub	1.85 g	$\frac{3}{4}$ cup			
New Tub					

YOGURT PACKAGING – Possible Solution(s)

- 20% of \$0.75 = \$0.15 or 15 cents
- 1600 tubs x $\frac{3}{4}$ cup = 1200 cups of yogurt
There are 16 cups in 1 gallon so 1200 cups / 16 = **75 gallons of yogurt in 1600 tubs.**
- (5 days per week)(10 hours per day) = 50 hours per week
(75 gallons per hour)(50 hours per week) = **3750 gallons of yogurt are produced per week**
- (7 days per week)(10 hours per day) = 70 hours per week
(75 gallons per hour)(70 hours per week) = **5250 gallons per week**
 $5250 / 3750 = 1.40$ or 140%
That means there is a **40% increase** with the 7-day schedule.
- 1 cup = 8 fluid ounces (oz) so $\frac{3}{4}$ cup = 6 oz
A 15% reduction of fat means the yogurt tub will be 85% of the original amount.
85% of 1.85 g of fat = 1.5725 g of fat

A proportion can be used to find the new tub size:

$$\frac{0.75 \text{ cup}}{1.85 \text{ g}} = \frac{x}{1.5725 \text{ g}}$$

$$1.85x = (0.75)(1.5725)$$

$$x = 1.79375 / 1.85$$

$$x = \mathbf{0.6375 \text{ cups} = 5.1 \text{ oz}}$$

- 1.85 g = (2.85%)(F)
F = 1.85 g / .0285 = **64.912...g** or approximately **65 grams of fat is the daily recommended allowance.**
- The new smaller cup has 1.5725 g of fat. The daily recommendation is about 65 grams so that means the **smaller cup is about 2.4% of the daily recommendation.**
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Yogurt	Fat Content (grams)	Serving Size (cups)	Serving Size (fl oz)	Fat grams per fl oz	% Daily Recommended
Competitor A	2 g	1 cup	8 oz	0.25 g/oz	3.1%
Competitor B	1.45 g	2/3 cup	5.3 oz	0.27 g/oz	2.2%
Original Tub	1.85 g	$\frac{3}{4}$ cup	6 oz	0.31 g/oz	2.8%
New Tub	1.5725 g	0.6375 cup	5.1 oz	0.31 g/oz	2.4%

This comparison shows that Yogurt A has the highest fat content overall but the lowest in fat grams per fluid ounce. If lower fat were the goal, then Yogurt B would be best, as it has the lowest % of the daily recommendation for fat. Both the Original and New Tubs have the same fat content per fluid ounce and are the highest for the comparison group.

YOGURT PACKAGING – *Possible Extensions*

The extensions below represent potential ways in which mathematics and/or CTE teachers can build on the task above. All of the extensions are optional and can be used in the classroom, as homework assignments, and/or as long-term interdisciplinary projects.

1. Construct a yogurt container for the original tub of yogurt ($\frac{3}{4}$ cup of yogurt) using paper and including the label (conversions required: ounces to cubic unit of measurement). Specify the empty space volume (air content).
2. Create a marketing and/or advertising plan for your yogurt that uses information about the “competitors” yogurts to formulate your plan (i.e., fat content). The plan should include a budget and potential sales projections.
3. You want to sell your yogurt abroad. Since other countries use the metric system, calculate the container sizes (in milliliters), using the conversion of 1 fluid ounce = 29.57353 milliliters, for both the original and the new smaller tub. Also determine the number of fat grams per milliliter for each.

YOGURT PACKAGING– *Appendix: Alignment Ratings*

The rating system used in the following charts is as follows:

3 EXCELLENT ALIGNMENT:

The content/performance of the task is clearly consistent with the content/performance of the Common Core State Standard.

2 GOOD ALIGNMENT:

The task is consistent with important elements of the content/performance of the CCSS statement, but part of the CCSS is not addressed.

1 WEAK ALIGNMENT:

There is a partial alignment between the task and the CCSS, however important elements of the CCSS are not addressed in the task.

N/A:

For Mathematical Practices a content rating does not apply.

In the charts **C = Content Rating** and **P = Performance Rating**

COLOR KEY

- **Black** = Part of CCSS/K&S Statement aligned to task
- **Gray** = Part of CCSS/K&S Statement *not* aligned to task

Task-to-Mathematical Practice Alignment Recording Sheet

Task Name	Aligned CCSS Mathematical Practice Standards	C	P	Alignment Comments (Standards selection, partial alignments, reasons for rating, etc.)	Task Comments (Strengths, weaknesses, possible improvements, effectiveness, etc.)
YOGURT PACKAGING	MP.1 Make sense of problems and persevere in solving them.	N/A	3	For this task students analyze givens, constraints, relationships, and goals. They must make conjectures about the form and meaning of the solution and plan a solution pathway. They must check the reasonableness of their solution, continually asking themselves, "Does this make sense?" The task requires multi-step problem solving, sense making, and understanding relationships.	This is a multi-stage problem with real life applications and considerations. Students must identify measurements and quantities and perform quantitative calculations. They must show their work at each step of the process.
	MP.2 Reason abstractly and quantitatively.	N/A	2	This task involves quantitative relationships. It requires that students make sense of quantities and their relationships in the problem situation. They must attend to the meaning of the quantities and pay attention to units as they represent the quantities and measures in a table. There is no emphasis on abstract reasoning in this task.	
	MP.6 Attend to precision.	N/A	3	For this task students need to attend to units as they perform calculations and also be careful about specifying units in their answers. Rounding and estimation are a key part of the thinking that students must use to accurately answer the questions.	

Task-to-Common Core State Standards Alignment Recording Sheet

Task Name	Aligned CCSS Content Standards	C	P	Alignment Comments (Standards selection, partial alignments, reasons for rating, etc.)	Task Comments (Strengths, weaknesses, possible improvements, effectiveness, etc.)
YOGURT PACKAGING	N.Q.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.*	2	2	This task does not ask students to interpret units or to choose the scale and the origin in graphs or data displays.	This complex real-world task involves multiple calculations with work shown to support results.
	N.Q.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.*	3	3	The task requires rounding in some cases when expressing units.	
	6.RP.3d Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.	3	3	This task requires extensive use of ratios to convert units and proportional reasoning in the solution of some of the problems.	
	7.NS.3 Solve real world problems involving the four operations with rational numbers.	3	3	This task represents a real-world situation using operations with rational numbers.	
	7.RP.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, areas, and other quantities measured in like or different units.	3	3	This task requires students to demonstrate a working knowledge of conversion and measures using fractions and decimals are used throughout this task.	
	7.EE.3 Solve multi-step real life and mathematical problems posed with positive and negative rational numbers in any form, using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.	2	2	This task does not require students to use negative rational numbers.	

* Modeling standards appear throughout the CCSS high school standards and are indicated by a star symbol (*).

Task-to-National Career Cluster Knowledge & Skills Statements Alignment Recording Sheet

Task Name	Aligned National Career Cluster Knowledge & Skills Statements	C	P	Alignment Comments	Task Comments
YOGURT PACKAGING	AGPA.01.03.01 Prepare products for distribution using an analysis of available product preparation options.	2	1	The task provides the majority of the information associated with preparing products for distribution, but does reinforce the application of different considerations of the process.	The instructional task integrates planning and reinforces the importance of calculations in delivering products that meet economic thresholds and customer expectations.
	AGPA01.02.01 Execute key processes related to food product development and enhancement.	1	1	The task tangentially connects to the enhancement of food product development, but focuses on the base understanding of planning and packaging.	