



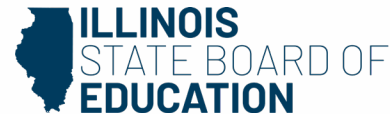
# Culinary Math 2.0: Changing Yields and Costing Recipes

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USDA Professional Standards: Operations 2130



**Illinois Extension**  
UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN





# COURSE OBJECTIVES

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1. Learn how to convert recipes to larger or smaller yields
2. Learn how to figure ingredient cost in a recipe
3. Learn how to figure total recipe cost and portion cost
4. Discuss “Make or Buy Analysis”



# Recipe Conversion





# Converting Recipes

- **Yield:** a specific quantity of a food produced by a recipe.
- **Converting the recipe:** to change the yield of a recipe
- **Conversion Factor** =  $\text{New Yield} \div \text{Old Yield}$
- **New quantity** =  $\text{Old Quantity} \times \text{Conversion Factor}$

 $x$ 

## **FINDING THE CONVERSION \_\_\_\_\_ FACTOR**

You can also use the term  
“scaling factor”



## EXAMPLE 1:

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A recipe for potatoes au gratin that has a yield of **50 servings** requires 1 pound, 8 ounces of shredded cheese.

If the recipe is scaled to yield **100 servings**, how much cheese is needed?





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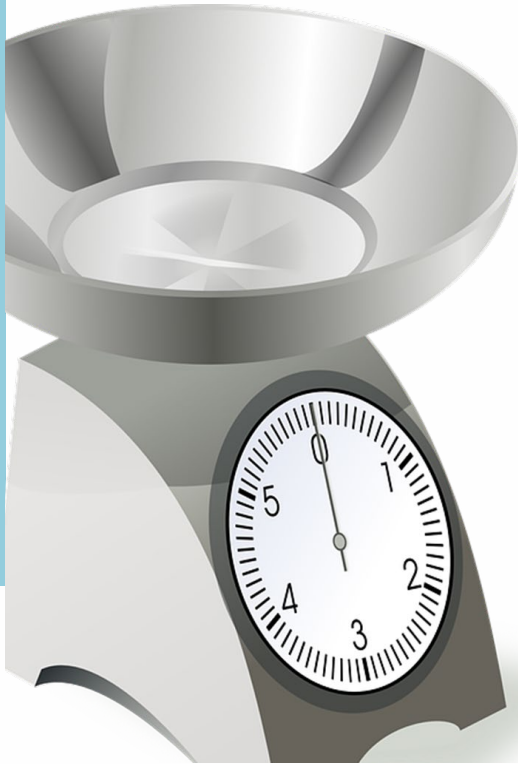
## ANSWER

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NEW  
OLD

100  
50

Conversion factor = 2  
1.5 lbs. of cheese x 2 = 3 lbs. of cheese



# COMMON UNITS OF MEASURE

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Convert

- Pounds to ounces
- Tablespoons to teaspoons
- Quarts to cups
- Gallons to quarts



## QUICK KITCHEN CONVERSIONS

### Volume Equivalents

1 gallon	=	16 cups	=	128 fl oz	=	4 quarts
1/2 gallon	=	8 cups	=	64 fl oz	=	2 quarts
1 quart	=	4 cups	=	32 fl oz	=	1/4 gallon
1 pint	=	2 cups	=	16 fl oz	=	1/2 quart
1 cup	=	16 Tbsp	=	8 fl oz	=	1/2 pint
7/8 cup	=	14 Tbsp	=	7 fl oz		
3/4 cup	=	12 Tbsp	=	6 fl oz		
2/3 cup	=	10 Tbsp + 2 tsp	=	5.3 fl oz		
5/8 cup	=	10 Tbsp	=	5 fl oz		
1/2 cup	=	8 Tbsp	=	4 fl oz		
3/8 cup	=	6 Tbsp	=	3 fl oz		
1/3 cup	=	5 Tbsp + 1 tsp	=	2.67 fl oz		
1/4 cup	=	4 Tbsp	=	2 fl oz		
1/8 cup	=	2 Tbsp	=	1 fl oz		
1 Tbsp	=	3 tsp	=	0.5 fl oz		
60 drops	=	1 tsp	=	1 tsp		

### Abbreviations

Tbsp = tablespoon  
tsp = teaspoon  
fl oz = fluid ounce  
c = cup  
pt = pint  
qt = quart  
gal = gallon  
oz = ounce  
lb = pound  
g = gram  
kg = kilogram

### Scoop/Disher Capacity

#100	=	2 tsp
#70	=	2 + 3/4 tsp
#60	=	3 + 1/4 tsp
#50	=	3 + 3/4 tsp
#40	=	1 + 2/3 Tbsp
#30	=	2 Tbsp
#24	=	2 + 2/3 Tbsp
#20	=	3 + 1/3 Tbsp
#16	=	1/4 cup
#12	=	1/3 cup
#10	=	3/8 cup
#8	=	1/2 cup
#6	=	2/3 cup

### Weight Equivalents

16 oz	=	1 lb	=	1 lb	=	454 g
12 oz	=	3/4 lb	=	0.75 lb	=	340 g
8 oz	=	1/2 lb	=	0.5 lb	=	227 g
4 oz	=	1/4 lb	=	0.25 lb	=	113 g
1 oz	=	1/16 lb	=	0.063 lb	=	28 g

**ABCs**  
of school nutrition

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 [go.illinois.edu/abc](http://go.illinois.edu/abc)

 [schoolnutrition@illinois.edu](mailto:schoolnutrition@illinois.edu)

## USE RESOURCES!

- You can do culinary math without having all the conversions memorized
- We have a great printable poster for you*

# Example

## *Cream of Chicken Soup*



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# Recipe Conversion: Increase Yield

## *Practice Exercises for Factor Method of Recipe Adjustment*

### **Example #1:**

For the Cream of Chicken Soup recipe below, determine the amount of each ingredient needed to make 175 servings.



**Cream of Chicken Soup**      **Desired Yield:** 175      **Current Yield:** 50      **Factor:** \_\_\_\_\_

Ingredients	50 Servings (Recipe Amount)	Converted Quantities	Factor	175 Servings (Calculated Amount)	175 Servings (Common Measure)
Margarine	12 oz				
Flour	2½ cups				
Chicken stock	2 qt + 2 cups				
Milk, low fat	2 gal + 2 qt				
Cooked chicken	3 lb 2 oz				

To get the scaling factor take new divided by old:  
$$175/50 = 3.5$$

# Change to common measurement

## Practice Exercises for Factor Method of Recipe Adjustment

### Example #1:

For the Cream of Chicken Soup recipe below, determine the amount of each ingredient needed to make 175 servings.



Cream of Chicken Soup      Desired Yield: 175      Current Yield: 50      Factor:       

Ingredients	50 Servings (Recipe Amount)	Converted Quantities	Factor	175 Servings (Calculated Amount)	175 Servings (Common Measure)
Margarine	12 oz				
Flour	2½ cups				
Chicken stock	2 qt + 2 cups				
Milk, low fat	2 gal + 2 qt				
Cooked chicken	3 lb 2 oz				

- Flour 2 ½ cups = 2.5 cups
- Chicken Stock 2 qt. + 2 cups = 10 cups
- Milk 2 gal. + 2 qt. = 8 qt. + 2 qt. = 10 qt.
- Chicken 3 lbs. 2 oz. = 50 ounces\*

\*Reminder there are 16 ounces per pound



Margarine 12 oz. x 3.5 = 42 oz.

Flour 2.5 cups x 3.5 = 8.75 cups

Chicken Stock 10 cups x 3.5 = 35 cups

Milk 10 qt. x 3.5 = 35 qts.

Chicken 50 oz. x 3.5 = 175 oz.



# Converting ounces up to pounds

1. Divide total ounces by 16
2. Take the whole number derived and multiply by 16
3. Subtract that answer from original number of ounces
4. Document final answer in pounds and ounces

Example: 175 ounces of chicken

1.  $175/16 = 10.94$  (10 is the # of pounds)
2.  $10 \times 16 = 160$
3.  $175 - 160 = 15$  (this is the # of leftover ounces)
4. 10 lbs 15 oz. chicken

# Last Step!!

Margarine 12 oz x 3.5 = 42 oz

Flour 2.5 cups x 3.5 = 8.75 cups

Chicken Stock 10 cups x 3.5 = 35 cups

Milk 10 qt x 3.5 = 35 quarts

Cooked Chicken 50 oz x 3.5 = 175 oz

Margarine (go to pounds) 16 oz x 2 = 32 oz = 2 lbs 10 oz

Flour can stay in cups (if it were a liquid, would go to quarts) = 8  $\frac{3}{4}$  cups

Chicken Stock 35 cups (go to gallons) = 2 gal + 3 quarts

Milk 35 qt (go to gallons) = 8 gal + 3 quart

Cooked chicken 175 oz (go to pounds) 16 oz x 10 = 160 oz 10 lbs 15 oz



# Completed Recipe

## *Answer Key Practice Exercises for Factor Method of Recipe Adjustment*

### **Example #1**

**Cream of Chicken Soup**

**Desired Yield: 175**

**Current Yield: 50**

**Factor: 3.5**

<b>Ingredients</b>	<b>50 Servings (Recipe Amount)</b>	<b>Converted Quantities</b>	<b>Factor</b>	<b>175 Servings (Calculated Amount)</b>	<b>175 Servings (Common Measure)</b>
Margarine	12 oz	12 oz or .75 lb	3.5	42 oz or 2.62 lb	2.62 lb or 2 lb 10 oz
Flour	2½ cups	2.5 cups	3.5	8 ¾ cups	8 ¾ cups
Chicken stock	2 qt + 2 cups	10 cups	3.5	35 cups	2 gal + 3 cups
Milk, low fat	2 gal + 2 qt	10 qt	3.5	35 qt	8 gal + 3 qt
Cooked chicken	3 lb 2 oz	3.125 lb or 50 oz	3.5	10.94 lb or 175 oz	10.94 lb or 10 lb 15 oz



# **Recipe Conversion Activity: Decreasing Recipe**



# EXAMPLE 2: TUNA SALAD

Find conversion factor

$$\frac{\text{New}}{\text{Old}} = \frac{75}{100}$$

Answer is .75

Ingredient	Amount for 100 servings	Converted Quantity	Scaling Factor	Calculated Amount	Amount for 75 servings
Canned chunk-style tuna	16 lb 4 oz	260 oz		195 oz	
Fresh onion, chopped	2 lb 8 oz	40 oz			1 lb 14 oz
Fresh celery, chopped	4 lb	4 lb			
Dill pickle relish	2 cups	2 cups			
Hard-cooked eggs	16 eggs	16 eggs			
Low-fat mayonnaise	5 lb 3 oz			62.25 oz	3 lbs 14 oz

# TUNA SALAD



Multiplied by .75

Items more than 16 ounces need to be converted

Ingredient	Amount for 100 servings	Converted Quantity	Scaling Factor	Calculated Amount	Amount for 75 servings
Canned chunk-style tuna	16 lb 4 oz	260 oz	.75	195 oz	12 lbs 3 oz
Fresh onion, chopped	2 lb 8 oz	40 oz	.75	30 oz	1 lb 14 oz
Fresh celery, chopped	4 lb	4 lb	.75	3 lbs	3 lbs
Dill pickle relish	2 cups	2 cups	.75	1.5 cups	1.5 cups
Hard-cooked eggs	16 eggs	16 eggs	.75	12 eggs	12 eggs
Low-fat mayonnaise	5 lb 3 oz	83 oz	.75	62.25 oz	3 lbs 14 oz



# CONVERTING OUNCES TO POUNDS

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1. Divide total ounces by 16
2. Take the whole number derived and multiply by 16
3. Subtract that answer from original number of ounces
4. Document final answer in pounds and ounces

## **Example: 195 ounces of tuna**

$195/16 = 12.187$  (12 is the # of pounds)

$12 \times 16 = 192$

$195 - 192 = 3$  (this is the # of leftover ounces)

12 lbs 3 oz tuna



## **One more sample question**



## EXAMPLE 3

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When catering a music banquet, the school nutrition staff made 10.5 gallons of iced tea. After the banquet, there were only 3 quarts remaining.

- How much tea was used?
- **Convert gallons to quarts first**



# ANSWER

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- $10.5 \text{ gallons} \times 4 \text{ (quarts in a gallon)}$   
 $= 42 \text{ quarts}$
- $42 - 3 = 39 \text{ quarts}/4$   
 $= 9.75 \text{ gallons were used}$



# Portion Cost





## PORTION COST

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The school nutrition manager is considering adding a new menu item and needs to know the serving cost. The case price is \$52.00 and there are 96 servings per case.

How much will each serving cost?



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# PORTION COST

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Cost of One Case = \$52.00

Number of portions per case = 96

\$52.00 divided by 96 servings = 0.5416 or  
\$0.54/person



# Recipe Costing





## NEXT STEP

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How do we figure out what a made-from-scratch recipe costs per serving?



# RECIPE COSTING

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- Prices for the food we receive come from vendor invoices
- We must calculate the unit cost of the item





# **Powerhouse Chili Example**



# POWERHOUSE CHILI



**YIELD:**  
**100 servings**

Ingredient	Amount	Unit Cost	Total Cost
Fresh onions, diced	6 lbs	\$0.95/lb	\$5.70
Fresh garlic, minced	8 oz (1/2 lb.)	\$6.20/lb	
Low-sodium vegetable stock	12 ½ cups	\$3.88/qt	
Canned low-sodium black beans drained, rinsed	12 lbs	\$1.28/lb	\$15.36
Fresh red bell peppers, diced ½”	2 lbs 8 oz	\$1.25/lb	\$3.13
Canned low-sodium diced tomatoes	11 lbs 12 oz	\$1.38/lb	\$16.22
Canned low-sodium tomato sauce	3 ½ qts	\$2.70/qt	\$9.45
Chili powder	4 oz	\$9.53/lb	
		Total Recipe Cost	\$67.47

# RECIPE COSTING

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Vegetable stock is \$3.88 per quart. We need 12.5 cups. Convert cost in quarts to cost in cups.

$$\$3.88/4 = \$.97 \times 12.5 = \$12.13$$

Diced tomatoes are \$1.38 per pound. We need 11 lbs. 12 oz.. Have to change the 12 oz. to a fraction of a pound. So it is  $12/16 = \frac{3}{4} = .75$ .

$$\text{Take } \$1.38 \times 11.75 = \$16.22$$

Chili powder is \$9.53 per pound. We need 4 ounces (or  $\frac{1}{4}$  lb).  $\$9.53 \times .25 = \$2.38$

# POWERHOUSE CHILI



Ingredient	Amount	Unit Cost	Total Cost
Fresh onions, diced	6 lbs	\$0.95/lb	\$5.70
Fresh garlic, minced	8 oz	\$6.20/lb	\$3.10
Low-sodium vegetable stock	12 ½ cups	\$3.88/qt	\$12.13
Canned low-sodium black beans drained, rinsed	12 lbs	\$1.28/lb	\$15.36
Fresh red bell peppers, diced ½”	2 lbs 8 oz	\$1.25/lb	\$3.13
Canned low-sodium diced tomatoes	11 lbs 12 oz	\$1.38/lb	\$16.22
Canned low-sodium tomato sauce	3 ½ qts	\$2.70/qt	\$9.45
Chili powder	4 oz	\$9.53/lb	\$2.38
		Total Recipe Cost	\$67.47

ANSWER:  
.67



# CONVENIENCE VS. SCRATCH PREPARATION

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The decision of whether to “**make**” or “**buy**” involves three major factors:

1. **Product quality**
2. **Product cost**
3. **Nutrition content**

It is important to remember that **make** or **buy** decisions typically affect both food and labor costs



# **Beef Stew: Make Or Buy?**



# DETERMINING ACTUAL PRODUCT COST

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We costed out a recipe for homemade beef stew. Using commodity stew meat and commodity canned corn, our cost per 8 oz. serving is \$0.94.



# BEEF STEW: MAKE OR BUY?

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Heat and serve beef stew is \$52.00 per 15-pound case

To get the cost per serving:

- A. Find cost per pound  $\$52/15 = \$3.47$
- B. Convert to serving size  $\$3.47 \times .5 = \$1.74$

Premade Beef Stew = \$1.74 per portion

Homemade Beef Stew = \$0.94 per portion



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# BEEF STEW: MAKE OR BUY?

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Even though it costs less to make the beef stew, what else do we need to look at?

*Do I have enough staff, can they cook?*

*Do I have the equipment needed?*

*Which one is more nutritious?*

*How do I serve the homemade stew?*

*What will labor and packaging cost?*

# MUST CONSIDER LABOR COST

**Figure 7.5 Frijoles: 50 Pounds**

Component	Cost of Convenience Product	Cost of Scratch Product
Beans	\$40.00 (\$0.80/lb.)	\$ 18.00 (\$0.36/lb.)
Seasoning	0	2.00
Labor	8.00 (1 hour)	32.00 (4 hours)
Fuel	1.40	4.40
Total Cost	49.40	56.40

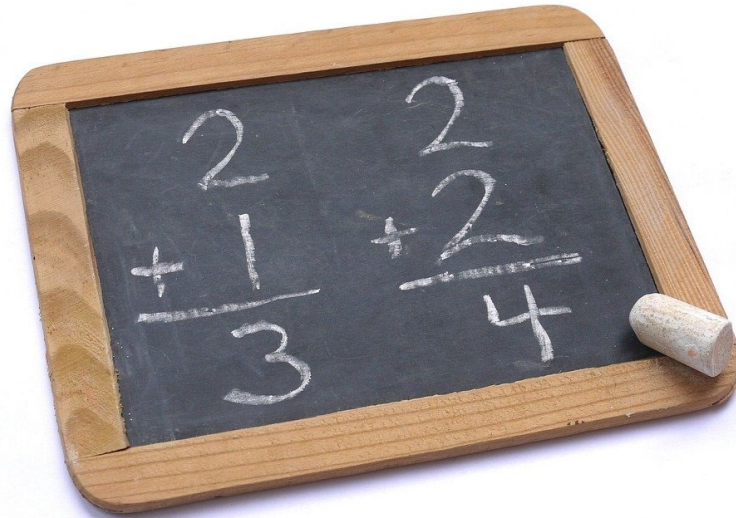


**Can there be a successful school menu that offers both convenience foods and made-from-scratch foods?**



# CHECK OUR PROGRESS

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## QUESTIONS TO ASK

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- What items on your menu do you think you could make from scratch?
- Would it be a significant savings?
- Would the kids find it more appealing?
- Do you have enough staff to prepare it when it is on the menu?



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# **Optional Recipe Costing Activity**

## Home made Cheese Sauce





# Please take a few moments to complete this survey

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**Survey Name: PDO Culinary Math Costing Out Recipes**

Use the link or QR code below to take this survey

<https://bit.ly/46QaSI7>



## Resources:

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The Institute of Child Nutrition

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United States Department of Agriculture

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Food and Beverage Cost Control 6th Ed. by John Wiley and Sons

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School Nutrition Association

# THANK YOU!



<http://go.Illinois.edu/abcs>

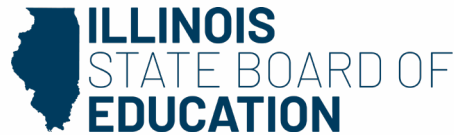


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