A Recipe Size Conversion and Cost Analysis for Pesto Pasta

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Introduction

This paper presents a recipe that serves 6 people and the steps necessary to scale the recipe up to an even that would serve 211 people.

The recipe we chose is one that is very personal and meaningful to us. In our early days of college, the author had a housemate who enjoyed preparing elaborate, gourmet meals. By making lots of food with this person, we gained what we would call a basic "food sense." The intuition we have in the kitchen is largely due to this person. One if the tenets of this person's philosophy of food is that you do not need a lot of ingredients to make a gourmet meal. In fact, often only a few ingredients are necessary. One such dish is pesto pasta. At the time, we thought that making it on our own was not even within the realm of possibility. We thought that it must be a complex and delicate process that is so easy to mess up that it is not even with the effort to try. To our surprise and delight, this person showed us that pesto is very easy to make, and very difficult to mess up. In fact, pesto has only a few ingredients.

Below is a recipe for pesto pasta inspired by my friend that we will be using for this project:

3 oz Basil (minced)
3 oz Parmesan Cheese (finely grated)
3 fl oz Olive Oil
2 oz Pine Nuts (minced)
1 oz Garlic (minced)
12 oz Pasta (dry)

As written, this recipe could serve 6 people. It would be lovely for an afternoon get together with a few good friends. However, our task is to scale this recipe up to serve an event with 211 confirmed guests. The rest of this paper outlines the steps we would take to make this happen.

The Size Conversion Calculation

To scale up the recipe to the desired number of portions, we will calculate the recipe conversion factor, or *RCF*. This will involve comparing the new number of portions, 211, to the old number of portions:

$$RCF = \frac{N}{O} = \frac{211\ portions}{6\ portions} = 35.166666667$$

The above calculation tells us that we need to scale up each recipe item by 35.166666667 times the original quantity the pesto recipe calls for. We multiply each ingredient quantity in our above recipe by *RCF*= 35.166666667 to obtain the following ingredient quantities:

105.5 oz Basil (minced)
105.5 oz Parmesan Cheese (finely grated)
105.5 fl oz Olive Oil
70.33 oz Pine Nuts (minced)
35.17 oz Garlic (minced)
422 oz Pasta (dry)

The above is the recipe we would use to handle an event with 211 guests.

The Cost Conversion Calculation

We will now calculate the cost of each ingredient. Since we will be using the formula

$$Cost = CPU \times APQ$$

to make our cost calculation, we will need to calculate both the *CPU* and *APQ* for each item. Also, since the recipe calls for some items to be fabricated, we will need the yield percent for these items. In particular, we will need the yield percent of **Garlic** and **Basil**. A yield percent estimation of **Garlic** is given by our textbook: 87% (Blocker and Hill, 2007). We obtained a yield percent estimation for **Basil** from the Culinary Institute of America: 56% (Culinary Institute of America).

As of the writing of this paper, an online search for ingredients gave us the following prices for our ingredients:

Basil: $2.59 per bunch;
Parmesan Cheese: $3.94 for an 8 oz package
Olive Oil: $5.88 for a 25.4 fl oz bottle
Pine Nuts: $19.99 per pound (16 oz)
Garlic: $0.45 per bulb
Deluxe Pasta: $6.99 for a 500 gram (17.64 oz) package (dry)

The above gives us what we need to calculate our *CPU*s:

Basil: A bunch of basil is $2.59. We estimate that a bunch is about 2.5 oz ("How much is in a Bunch of Basil?"). *CPU*=$2.59/2.5 oz=$1.04/oz
Parmesan Cheese: *CPU*=$3.94/8 oz=$0.50/oz
Olive Oil: *CPU*=$5.88/25.4 fl oz=$0.24/fl oz
Pine Nuts: *CPU*=$19.99/oz=$1.24/oz
Garlic: A bulb of garlic is about $0.45. We estimate that a bulb of garlic is about 2 oz. ("How much Minced Garlic is in a Clove?"). *CPU*=$0.45/2 oz=$0.23/oz
Deluxe Pasta: $6.99 for a 500 gram (17.64 oz) package (dry). *CPU*=$6.99/17.64=$0.40/oz

We now calculate the amount we will need to purchase (*APQ*) to make the recipe. In the case of **Parmesan Cheese**, **Olive Oil**, **Pine Nuts**, and **Pasta**, we may simply take the edible portion amounts required by the recipe we which calculated for our *RCF* calculation above since *APQ=EPQ* for these items (that is, since *Y*%=100%). On the other hand, in the cases of **Basil** and **Garlic**, both require fabrication after purchase. So, we will need to consider yield percent to calculate *APQ*. We will use the percent triangle calculation:

$$APQ = \frac{EPQ}{Y\,\%}$$

As stated above, for **Basil**, Y%=56%. Thus, *APQ=EPQ*/*Y*%=105.5 oz/0.56=188.4 oz.

Also as stated above, for **Garlic**, Y%=87%. Thus, *APQ=EPQ*/*Y*%=35.17 oz/0.87=41.0 oz.

Summarizing the above for the reader's convenience, we list the amount we need to purchace (*APQ*s) for all ingredients based upon the above:

Basil: 188.4 oz.
Parmesan Cheese: 105.5 oz
Olive Oil: 105.5 fl oz
Pine Nuts: 70.33 fl oz
Garlic: 41.0 oz
Deluxe Pasta: 422 oz

Now that we know the *CPU*s and *APQ*s for each ingredient, we may now determine the cost of each ingredient by using the formula

$$Cost = CPU \times APQ$$

Basil: $Cost = \frac{\$1.04}{oz} \times 188.4\, oz = \$195.94$

Parmesan Cheese: $Cost = \frac{\$0.50}{oz} \times 105.5\, oz = \$52.75$

Olive Oil: $Cost = \frac{\$0.24}{fl\, oz} \times 105.5\, fl\, oz = \$25.32$

Pine Nuts: $Cost = \frac{\$1.25}{oz} \times 70.33\, oz = \$87.92$

Garlic: $Cost = \frac{\$0.23}{oz} \times 41.0\, oz = \$9.43$

Deluxe Pasta: $Cost = \frac{\$0.40}{oz} \times 422\, oz = \$168.80$

The total cost of this recipe is then

$195.94 + $52.75 + $25.32 + $87.92 + $9.43 + $168.80 = $540.16.

As a quick check of the above work, we multiply the cost of the original recipe, $15.37 (see the food cost form in the appendix), by the *RCF* calculated in the previous section. That is,

$$New\, Cost = RCF \times Old\, Cost = 35.166666667 \times \$15.37 = \$540.52$$

We note that there is some difference between the above due to round off in the preceding calculations. We note that with a completely filled out food cost form (again, see the appendix), the above calculations can be replaced by *RCF* calculations. We also note that by performing both of the calculations above that we were able to reduce the error of our calculations.

Conclusions

The above is a complete size and cost analysis which scales up a favorite recipe from 6 portions to 211 portions. We learned that cost calculations are detailed and that it is quite easy to make errors. As such, these types of calculations should be checked by doing the calculation from at least two points of view as illustrated in the previous section. A careless calculation could mean the difference between a successful an profitable event and an event that is disastrous to a culinary professional's bottom line and, most importantly, their reputation.

References

Blocker, Linda and Hill, Julie. *Culinary Math*, 4th ed.Wiley, 2007.

Culinary Institute of America. “Kitchen Calculations.” https://www.ciachef.edu/uploadedFiles/Pages/Admissions_and_Financial_Aid/Educators/Educational_Materials/Technique_of_the_Quarter/techniques-calculations.pdf. Accessed 11 Nov. 2021.

“How much is in a Bunch of Basil?” https://www.howmuchisin.com/produce_converters/basil. Accessed 11 Nov. 2021.

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Appendix: Completely Filled-Out Food Cost Form

Menu Item: Mr. Holt's Pesto Pasta Date: 11/20/2021

Number of Portions: 6 Portion Size: 2 oz

Cost Per Portion: $2.57 Selling Price: $9.99 Food Cost %: 25.7%

Ingredient	**Purchase Price**	**Purchase Quantity** (weight/volume/count)	**CPU** Cost per Unit	**APQ** (weight/ volume/ count)	**Yield Percent**	**EPQ** (weight/ volume/ count)	**Ingredient Cost** **CPU×APQ**
Basil	$2.59	1 bunch =2.5 oz	$1.04/oz	5.36 oz	56%	3 oz	$5.58
Parmesan Cheese	$3.94	8 oz	$0.50/oz	3 oz	100%	3 oz	$1.50
Olive Oil	$5.88	750ml =25.4 fl oz	$0.01/ml =$0.24/fl oz	3 fl oz	100%	3 fl oz	$0.72
Pine Nuts	$19.99	16 oz	$1.25/oz	2 oz	100%	2 oz	$2.50
Garlic	$0.45	1 bulb=2 oz	$0.23/oz	1.15 oz	87%	1 oz	$0.27
Deluxe Pasta	$6.99	500 grams =17.64 oz	$0.02/gram =$0.40/oz	12 oz (dry)	100%	12 oz (dry)	$4.80

Total Cost of Recipe: $15.37