# Compare Measures and Bake Cookies

## Description

In this activity, students will scale ingredients using both imperial and metric measurements. They will understand the relationship between imperial and metric units that are typically used in baking. The discrepancy of measuring ingredients by volume will also be examined.

Students will scale ingredients for an oatmeal chocolate chip cookie recipe using imperial measurements first, followed by metric. Students will also measure a cup of flour of various densities and compare it to the weight of a cup of water. They will proceed to make and bake the cookies in the metric format, and evaluate the final product for doneness and quality.

A quiz or worksheet on identifying units of measure and measurement conversions is included. This activity can be done in conjunction with Baker’s Math: Scaling a Recipe Activity Plan.

## Lesson Objectives

Students will be able to:

* measure ingredients using a digital scale and/or a baker’s scale
* tare (or zero out) a container
* choose correct equipment to measure by volume or weight
* identify and describe the units of the metric, imperial, and volumetric systems of measurement
* convert between metric and imperial measures of weight and volume, and
* evaluate chocolate chip cookies for doneness and quality.

## Safety Considerations

Basic food and kitchen safety

## Assumptions

* Students know basic math functions (addition, subtraction, multiplication, division) and understand the concept and use of decimals.
* Students have an understanding of ingredient measurement, food handling safety, and appropriate clothing and personal attire in kitchens.



This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License unless otherwise indicated.

## Terminology

**Baker’s scale**: A mechanical balance scale that is used to measure in imperial or metric weight units.

**Digital scale**: An electronic scale that measures items according to weight, in various units and increments.

**Imperial**: A system of weights and measures originally developed in England. Similar but not always the same as US standard units.

**Metric**: A decimal system of weights and measures based on the metre as a unit of length, the gram as a unit of mass, and the litre as a unit of volume.

**Tare**: Reset the scale to zero, regardless of the container and/or ingredients already on the scale.

## Estimated Time

75 minutes

## Recommended Number of Students

This activity may be done individually or in pairs.

## Facilities

Home Economics lab or cafeteria kitchen

# Demonstrating Skills And Knowledge

## Procedure

1. Have all ingredients accessible.
2. Review the recipe.
3. Guide students in converting the recipe from volume measure to weight in both metric and imperial.
4. Guide students through mixing make-up procedure. Have the students use the metric measures.
5. Bake the cookies. Weigh a cookie before baking to compare to baked weight.
6. While cookies are baking, review the differences in measuring methods.
7. Have students weigh ingredients that have been volume measured to show the challenges.
   1. dry measures: packed vs. sifted flour (or other examples)
   2. liquid measures: honey vs. water (or other examples)
8. Weigh a cookie after baking to demonstrate weight loss.
9. Evaluate the cookies. Remind the students to take photos of their cookies for their portfolio.

## Pre-work or Extension

Have students complete the worksheet/quiz on conversions.

## Evaluation Guidelines

Consider co-creating the assessment criteria with your students at the beginning of the activity/ project. You may want to include the following

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Emerging** | **Developing** | **Proficient** | **Extending** |
| Maintains food handling safety, personal hygiene, and workspace and tool and equipment cleanliness. |  |  |  |  |
| Demonstrates an understanding of the relationship between volume and weight and imperial and metric measures. |  |  |  |  |
| Applies proper measurement and practical technique to the make up and baking of cookies. |  |  |  |  |
| Evaluates and reflects on their work and adds to their portfolio with appropriate reflection to demonstrate their learning. |  |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Emerging** | **Developing** | **Proficient** | **Extending** |
| Evaluates own cookies on the following criteria: .cookies are round; golden brown on outside and paler in centre; and consistent in size. |  |  |  |  |
| Completes the conversion quiz. |  |  |  |  |

**Important note for students: When reviewing imperial measurements, remember that there are 16 ounces (oz.) to 1 pound (lb.).**

To convert ounces (oz.) to a decimal fraction of 1 pound (lb.), divide the number of ounces by 16.

### Example

1.5 lb. = 1 lb. + (0.5 × 16) oz.

= 1 lb. 8 oz.

To convert decimals of a pound into ounces, multiply by 16.

### Example

3.625 lb. = 3 lb. + (.625 × 16) oz.

= 3 lb. 10 oz.

|  |  |
| --- | --- |
| **Ounces** | **Decimal Fraction of a Pound** |
| 1 | 0.0625 |
| 2 | 0.125 |
| 3 | 0.1875 |
| 4 | 0.25 |
| 5 | 0.3125 |
| 6 | 0.375 |
| 7 | 0.4375 |
| 8 | 0.5 |
| 9 | 0.5625 |
| 10 | 0.625 |
| 11 | 0.6875 |
| 12 | 0.75 |
| 13 | 0.8125 |
| 14 | 0.875 |
| 15 | 0.9375 |
| 16 | 1.0 |

# Oatmeal Chocolate Chip Cookies

### Yield

1425 g (24 × 60 g cookies, or 48 × 30 g cookies)

### Ingredients

1. cup butter/margarine 1 cup white sugar

¾ cup brown sugar

½ tbsp vanilla 2 eggs

11⁄3 cups all purpose flour 3 cups oatmeal

½ tsp salt (omit if using salted butter or margarine) 1 tsp baking powder

1. cups chocolate chips

### Preparation

* 1. Have all ingredients at room temperature.
  2. Place the butter and sugar in a bowl with the paddle attachment (or beat vigorously with wooden spoon).
  3. When fluffy and smooth, add eggs one at a time and vanilla.
  4. Scrape bowl.
  5. Stir in dry ingredients just until incorporated. Don’t overmix.
  6. Stir in chocolate chips.
  7. Scoop or use table spoon and roll into balls of desired size.
  8. Place on parchment lined or very lightly greased pan, leaving a half cookie width between units.
  9. Flatten slightly.
  10. Bake at 177°C (350°F) for approximately 15 minutes for 30 g cookies, 18 minutes for 60 g cookies. They should be golden and moist. There will be some “carry-over” baking.
  11. Let cool before de-panning.

# Measurement Conversion Table for Common Baking Ingredients

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Ingredient** | **Ounces per cup** | **Grams per cup (oz.)** | **Grams per teaspoon (t)** | **Grams per tablespoon (T)** |
| Baking powder or soda |  |  | 4.6 | 13.8 |
| Butter | 8 | 227 | 4.8 | 14.2 |
| Flour (all purpose) | 5 | 140 | 2.6 | 7.8 |
| Milk | 8 | 245 | 5.1 | 15.3 |
| Milk powder | 3 | 125 | 1.5 | 4.25 |
| Salt, fine |  |  | 6 | 18 |
| Shortening | 8 | 227 | 4.3 | 12.8 |
| Sugar brown | 7 | 200 | 4.6 | 13.4 |
| Sugar white, granulated | 7 | 200 | 4.2 | 12.5 |
| Vegetable oil | 7 | 220 | 4.5 | 13.7 |
| Water | 8 | 237 | 5.3 | 14.8 |
| Yeast instant rapid |  |  | 2.8 | 8 |

**Measurement Conversions and Calculations Quiz**

1. Change 9 lb., 2 oz. to kg: a. 1.293 kg

b. 2.212 kg

c. 4.139 kg

d. 4.528 kg

1. Change 18 litres of H O into grams:

2

a. 800

b. 1800

c. 18 000

d. 180 000

1. Change recipe into kg: 4 lb., 3 oz. equals: a. 1.899 kg

b. 2.985 kg

c. 3.312 kg

d. 4.120 kg

1. Change recipe into kg: 6 lb., 14 oz. equals: a. 2.129 kg

b. 3.029 kg

c. 3.119 kg

d. 4.231 kg

1. Multiply the following ingredients: 3.325 kg × 11 equals: a. 30.921 kg

b. 32.375 kg

c. 35.575 kg

d. 36.575 kg

1. Change recipe into kg: 12 lb., 13 oz. equals: a. 5.812 kg

b. 5.915 kg

c. 6.732 kg

d. 7.314 kg

1. Change recipe into kg: 9 oz. equals: a. 1.329 kg

b. 0.850 kg

c. 0.255 kg

d. 0.200 kg

1. Divide the following ingredients: 21.379 kg ÷ 8 equals: a. 1.492 kg

b. 2.222 kg

c. 2.672 kg

d. 2.937 kg

1. Multiply the following ingredients: 12.155 kg × 5 equals: a. 56.329 kg

b. 60.775 kg

c. 62.392 kg

d. 62.421 kg

1. Multiply the following ingredients: 2.3 kg × 7 equals: a. 12.317 kg

b. 15.900 kg

c. 16.100 kg

d. 16.315 kg

1. Multiply the following ingredients: 16.354 kg × 7 equals: a. 114.478 kg

b. 120.739 kg

c. 210.316 kg

d. 212.491 kg

1. Change the recipe into kg: 1 lb., 4 oz. equals: a. 4.930 kg

b. 1.291 kg

c. 0.567 kg

d. 0.391 kg

1. Change recipe into kg: 2 lb., 8 oz. equals: a. 3.219 kg

b. 2.341 kg

c. 1.300 kg

d. 1.134 kg

1. Change recipe into kg: 5 lb., 7 oz. equals: a. 2.466 kg

b. 2.520 kg

c. 2.939 kg

d. 3.121 kg

1. Divide the following ingredients: 9.625 kg ÷ 4 equals: a. 1.129 kg

b. 1.736 kg

c. 2.139 kg

d. 2.406 kg

# Answer Key

1. c. 4.139 kg

2. c. 18 000

3. a. 1.899 kg

4. c. 3.119 kg

5. d. 36.575 kg

6. a. 5.812 kg

7. c. 0.255 kg

8. c. 2.672 kg

9. b. 60.775 kg

10. c. 16.100 kg

11. a. 114.478 kg

12. c. 0.567 kg

13. d. 1.134 kg

14. a. 2.466 kg

15. d. 2.406 kg