

## **LESSON TITLE: Weighted Averages**

**OVERVIEW:** This lesson focuses on weighted averages and their applications. This set of materials includes a short lecture, an in-class activity, and an out-of-class activity. Students will practice computing a weighted average in the context of figuring an overall class grade. Students will use a spreadsheet to calculate a weighted average and explore the effects of various changes in the data. They will follow directions on how to enter formulas related to weighted averages based on key pieces of information provided. Students will also generalize their knowledge to the context of financial portfolios as they compute a weighted average return.

### **PREREQUISITE IDEAS AND SKILLS:**

- Identifying and calculating percentages
- Identifying and calculating the mean/average
- Ability to follow the steps in a packet of directions and screenshots to create an Excel spreadsheet

### **MATERIALS NEEDED TO CARRY OUT THE LESSON:**

- Calculator
- Student access to internet to watch short tutorial videos if needed
- Student access to a device that has the Excel program
- Lecture Notes – Weighted Averages (optional)
- In-Class Activity Worksheet – Weighted Averages
- Excel Instructions – Weighted Averages
- Out-of-Class Activity – Weighted Averages

### **CONCEPTS TO BE LEARNED/APPLIED:**

- Students will understand that a weighted average takes into account the varying degrees of importance of quantities and hence some quantities contribute more than others to the final result.
- Students will understand weighted averages in the context of computing an overall class grade.
  - Students will understand that the variation in the output (weighted average) is dependent on the weights of the items/categories, as well as changes within those categories.
- Students will understand how to generalize the idea of weighted averages to the context of financial portfolios.
- Students will use a spreadsheet to calculate a weighted average and explore the effects of various changes in the data. They will follow directions on how to enter formulas related to weighted averages based on key pieces of information provided.

## **INSTRUCTIONAL PLAN:**

The instructor may provide a short lecture on weighted averages to the students prior to providing the In-Class Activity Worksheet or they may have the students work in groups to complete the In-Class Activity Worksheet and offer assistance as needed. Once the students have practiced computing weighted averages in the context of an overall class grade and have generalized the idea to a financial portfolio, they will complete an out-of-class activity on their own. A packet of directions and screenshots is included that shows step-by-step instructions for the Excel portion of the activity.

## **MIP COMPONENTS OF INQUIRY:**

Active Learning: In this activity, students will select, perform, and evaluate an action that computes an overall weighted grade. Students will engage in active learning as they will discover the relationship between various inputs, such as homework, test, and project grades, to an output, such as an overall grade. This use of covariational reasoning and multivariational reasoning (having multiple values changing in relation to each other) will be utilized via computations by hand on a worksheet, as well as a spreadsheet. By allowing students the ability to perform calculations on a spreadsheet, they will be able to complete actions more easily and hence focus on observing and evaluating the results.

Meaningful Applications: This activity enhances meaningful applications as students will have the opportunity to explore and identify relationships between quantities, such as their homework and test grades, to their overall grade in a class. They will make and justify claims for various scenarios, such as receiving a zero on a homework assignment or a zero on a test, and then use a spreadsheet to compute the overall grade. The use of a spreadsheet will allow the students to focus on the mathematical relationships, as opposed to performing the computations by hand. This activity is also mathematically meaningful as it engages students in generalizing the concept of weighted averages from a scenario of computing grades to a scenario about a financial portfolio.

Academic Success Skills: Students will be able to apply this activity to their own unique grades and understand the consequences of their decisions, such as going on vacation and missing a test. The use of a spreadsheet will allow students to easily and quickly perform computations for various scenarios, which may increase productive engagement in their education and lessen mathematics anxiety. Moreover, the use of technology to support calculations may help students focus on mathematical relationships, which in turn may build their confidence in their ability to do math. The scenarios may also support students in developing an appreciation of math as useful to their careers as students and as useful in their lives beyond being a student.