

## Homework on Weighted Average & Expected Value

**Overview:** A weighted average is calculated as  $\frac{\sum w_i x_i}{\sum w_i}$ , where  $w_i$  represents the weights of the data points  $x_i$ . In other words, you calculate the weighted average by multiplying each data point by its weight, summing the results, and dividing the result by the sum of the weights.

**Special case #1:** If the weights  $w_i$  are all equal, the formula simplifies to  $\frac{\sum x_i}{n}$ , which is simply the arithmetic mean (or average) of the  $n$  items.

**Special case #2:** When calculating expected values in probability, the weights  $w_i$  are just the probabilities of the values  $x_i$ . In that case, the sum of the weights in the denominator is equal to 1 (that's because the probabilities will sum to 100% if you are considering the full probability distribution), and hence the formula simplifies to just  $\sum w_i x_i$ .

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- Expected Value... or Weighted Average?** An electronics store wants to sell customers a one-year full-service warranty on a \$500 television set. The store's actuary estimates that there is a 5% chance they will end up performing a repair valued at \$50, a 1% chance they will end up performing a repair valued at \$200, and a 0.2% chance of performing a repair of \$500 within the first year. If the store wants to make an average profit of about \$5 on each warranty it sells, how much should it charge for this warranty?
- Grade Categories.** Mrs. Franklyn uses the following grade categories for her science class:
  - 40% labs and activities
  - 20% quizzes
  - 30% total for two midterm exams
  - 10% final examShow how to calculate a student's science grade if here scores were as follows:  
80% average on the labs, 76% average on the quizzes, 72% and 80% respectively on the two midterm exams, and 68% on the final exam.
- Grade Point Averages.** At a certain Midwest university, students' GPAs are calculated as follows:
  - 4 grade points per credit of A
  - 3.5 grade points per credit of AB
  - 3 grade points per credit of B
  - 2.5 grade points per credit of BC
  - 2 grade points per credit C
  - 1 grade point per credit D
  - 0 grade points per credit of F
  - This semester, Jorge had a B in math (4 credits), a C in history (3 credits), an AB in art (3 credits), and an A in physical education (3 credits). What is Jorge's grade point average this semester? (Hint: Grade points are weighted by the number of credits.)
  - Prior to this semester, Jorge had a grade point average of 2.63 with 56 credits earned. He needs a 2.75 GPA for admission into his program. Will his performance this semester be enough to raise his GPA to 2.75?
- What Do I Need on the Final Exam?** At the end of the semester, Anita Gudgrade (get it?) has already earned 78% of the 450 points available so far this semester. All that remains is the 150 point final exam. She really needs a B in the class, and she wants to know what score she needs on the final so she can raise her average up to the 82% needed for a B. What score does she need?
- Guess My Data Set:** I'm thinking of a data set that consists of 7 positive integers, all of which are less than 20. The mean is 13, and the modes are 12 and 16. The max and the min are both prime numbers, but the median (which is between the modes) is not. Can you guess my data set? (Is there more than one possibility?)