FST NOTES 1-2
TOPIC: Centers of Data and Weighted Averages
GOAL
Discuss summation notation and the idea of weighted averages.

SPUR Objectives

A Calculate measures of center and spread for data sets.

B Calculate averages with weights, frequencies, and relative frequencies.

C Use Σ-notation to represent a sum or mean.

D Describe relations between measures of center and spread. .

VOCABULARY

mean ~ AVERAGE

median MIDDLE # or AVG. OF 2 MIDDLE #'S

measures of center, measures of central tendency MEAN, MEDIAN, MODE

mode MOST FREQUENT #

subscripted variables $X_1, X_2, X_3, \ldots X_n$

Σ, sigma SUM

index, i INDICATES WHICH SUBSCRIPTED VARIABLES ARE BEING ADDED

summation notation, sigma notation, Σ-notation

weighted average

relative frequency RATIO OF EVENT COMPARED TO TOTAL

We strongly recommend *not* discussing this lesson until students have had an opportunity to read it and try the questions on their own. Reading mathematics may be a new expectation for some students. To be most effective, the reading of mathematics should be an active, not passive, process. Students should read with a pencil in hand and paper to write on, watching for important terms and symbols.

After READING the NOTES
Answer the following:

1) What do I already know?

2) What did I learn?

3) Where will I use it?

CALC STEPS
(STAT), #1 Edit, enter data in L1
(STAT) → CALC, #1 1-Var Stats, L1 (2ND 1)
$\overline{X}$: MEAN   ↓ for Median (Med)

(left margin, rotated): SUM OF THE PRODUCTS OF THE VALUES MULTIPLIED BY THE SUM OF THE WEIGHTS / DIVIDED BY WEIGHT / SUM OF WEIGHT

In 1–3, give the mean, median, and mode of the data set.

1. 0, 10, 15, 20, 20, 25, 30, 30, 30, 40
   MEAN: $\frac{220}{10} = \boxed{22}$ MODE: $\boxed{30}$
   MEDIAN: $\frac{20+25}{2} = \boxed{22.5}$

2. 100, 110, 115, 120, 120, 125, 130, 130, 130, 140
   MEAN: $\frac{1220}{10} = \boxed{122}$
   MODE: $\boxed{130}$
   MEDIAN: $\frac{120+125}{2} = \boxed{122.5}$

3. $x, x+10, x+15, x+20, x+20, x+25, x+30, x+30, x+30, x+40$
   MEAN: $\frac{10x + 220}{10} = \boxed{x + 22}$
   MEDIAN: $\frac{2x + 45}{2} = \boxed{x + 22.5}$
   MODE: $\boxed{x + 30}$

Example 2 A family-friendly beach resort has a total of 32 family suites. Let $g_i =$ the number of guests who checked into each suite.

a. What does $\displaystyle\sum_{i=1}^{32} g_i$ represent?

$g_1 + g_2 + g_3 + \cdots + g_{32}$

$=$ Total guests who checked in

Weighted Average Formula

$$\frac{w_1 x_1 + w_2 x_2 + \cdots + w_n x_n}{w_1 + w_2 + \cdots + w_n}$$

b. Use $\sum$-notation to express the mean number of guests per room.

$$\frac{1}{32} \sum_{i=1}^{32} g_i \qquad OR \qquad \frac{\displaystyle\sum_{i=1}^{32} g_i}{32}$$

$x_i =$ a value in data set
$w_i =$ the weight of value

Weighted Averages — an average calculated when all items do not influence the average by the same factor

☆ GPA is a weighted average

In a college economics course, suppose that homework counts for 25%, quizzes 10%, tests 45%, and attendance 20% of each student's overall grade. Frances and her friend Adam earned the following scores during the semester. Who received the higher overall course grade?

		Frances	Adam
25%	Homework	89	95
10%	Quizzes	82	90
45%	Tests	87	92
20%	Attendance	100	70

<u>By hand:</u>

Frances

$$\frac{(.25)(89) + (.10)(82) + (.45)(87) + (.20)(100)}{(.25 + .10 + .45 + .20)} = \boxed{89.6\%}$$

Adam

$$\frac{(.25)(95) + (.10)(90) + (.45)(92) + (.20)(70)}{(.25 + .10 + .45 + .20)} = \boxed{88.15\%}$$

<u>Using Calculator:</u>

STAT - EDIT

enter grades: Frances in L1
                    Adam in L2

enter weights (as decimals) in L3

Frances: L4 = L1 * L3
2ND LIST - MATH -5:sum(L4)

Adam: L5 = L2 * L3
2ND LIST - MATH -5:sum(L5)

1-2 FST Notes continued

Example 4
To celebrate the opening of a new branch, a clothing store advertised that the first 200 customers would randomly receive free gift cards valued a $5, $15, $50, or $100. An internal memo to the new store manager contained the following sentence: There will be 5 $100-dollar cards, 10 $50-dollar cards, 35 $15-dollar cards, and the rest will be $5-dollar cards.

$$200 - 5 - 10 - 35 = 150$$

a) Calculate the total dollar value of the gift cards.

$$5(\$100) + 10(\$50) + 35(\$15) + 150(\$5) = \boxed{\$2275}$$

b) Create a frequency table and calculate the weighted average. Graph the table in a bar chart.

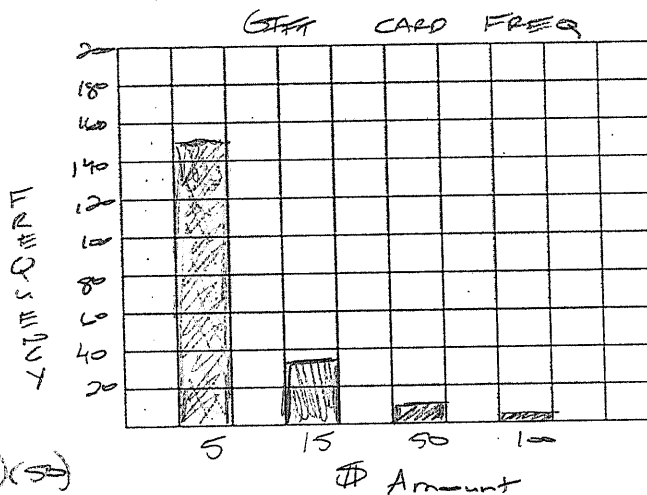| Amt	Freq (weight)
5	150
15	35
50	10
100	5

$$5(150) + 15(35) + 50(10) + 100(5) = 2275$$

$$\frac{\$2275}{200} = \$11.375$$

or $(.75)(5) + (.175)(15) + (.05)(50)$
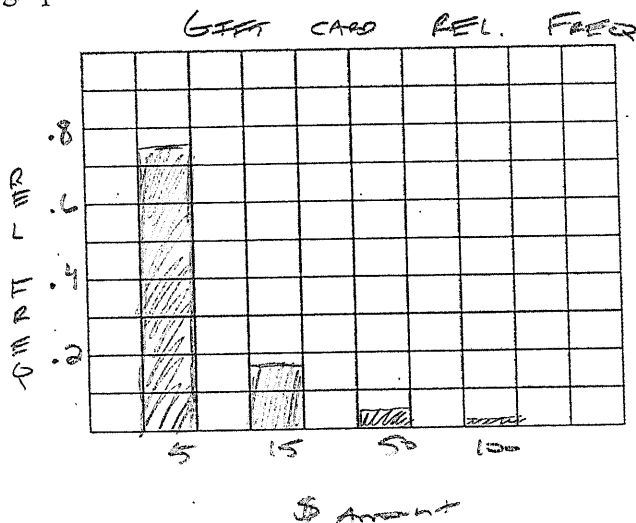$+ (.025)(100) = \$11.375$

GIFT CARD FREQ

Relative Frequency –
The ratio of the number of times a number or event occurs to the total number of numbers or events

c) Create a relative frequency table and graph.

Amt	Freq	Rel. Freq
5	150	150/200 = .75
15	35	35/200 = .175
50	10	10/200 = .05
100	5	5/200 = .025

GIFT CARD REL. FREQ

d) Compute the weighted average using the relative frequency values and compare that result to the one in Part a.

$$.75(5) + .175(15) + .05(50) + .025(100) = \boxed{\$11.375}$$

e) If there were an equal number of each gift card, what would the average be?

$$\frac{5 + 15 + 50 + 100}{4} = \frac{170}{4} = \boxed{\$42.50}$$