2.1   Frequency Distributions and Their Graph

Example 1:
The following data set lists the midterm scores received by 50 students in a chemistry class:

45	85	92	99	37	68	67	78	81	25
97	100	82	49	54	78	89	71	94	87
21	77	81	83	98	97	74	81	39	77
99	85	85	64	92	83	100	74	68	72
65	84	89	72	61	49	56	97	92	82

Construct a frequency distribution, frequency histogram, relative frequency histogram, frequency polygon, and cumulative frequency graph (ogive) using 6 classes.

Example 2:
The heights (in inches) of 30 adult males are listed below.

70	72	71	70	69	73	69	68	70	71
67	71	70	74	69	68	71	71	71	72
69	71	68	67	73	74	70	71	69	68

Construct a frequency distribution, frequency histogram, relative frequency histogram, frequency polygon, and cumulative frequency graph (ogive) using 5 classes.

2.2   More Graphs and Displays

Example 1:
Weights of Carry-On Luggage in Pounds
(for a random sample of 40 passengers returning from a vacation to Hawaii)

30	27	12	42	35	47	38	36	27	35
22	29	17	3	21	0	38	32	41	33
26	45	18	43	18	32	31	32	19	21
33	31	28	29	51	12	14	21	18	26

Example 2:
The following table represents a recent survey of 500 people that answered the following question: "How long do you spend on home telephone after 5 pm?"

Time	Number
Less than 1/2 hr.	296
1/2 hr to 1 hr	83
more than 1 hr	121

Example 3:
What will most likely cause you to be late to your early morning class?

Cause	Frequency
snoozing after alarm goes off	20
car trouble	3
too long over breakfast	15
last minute studying	18
finding the right clothes	12
other	4

Example 4: The following table gives mean daily caloric intake (all residents) and infant mortality rate (per 1,000 births) for nine countries:

Country	Mean daily calories	Infant mortality rate
Afganistan	1523	154
Austria	3495	6
Colombia	2678	24
Ehtiopia	1610	107
Germany	3443	6
Liberia	1640	153
New Zealand	3362	7
Turkey	3429	44
U.S.	3671	7

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Example 5: You have been in the walking/jogging exercise program for 20 weeks, and for each week you have recorded the distance you covered in 30 minutes.

Week	1	2	3	4	5	6	7	8	9	10
Distance	1.5	1.4	1.7	1.6	1.9	2.0	1.8	2.0	1.9	2.0

Week	11	12	13	14	15	16	17	18	19	20
Distance	2.1	2.1	2.3	2.3	2.2	2.4	2.5	2.6	2.4	2.7

2.3   Measures of Central Tendency

Example 1:
The top 14 speeds, in mph, for Pro-Stock drag racing over the past two decades are:
181.1   202.2   190.1   201.4   191.3   201.4   192.2
201.2   193.2   201.2   194.5   199.2   196.0   196.2

Example 2:
The scores of the top ten finishers in a recent golf tournament:
71   67   67   72   76   72   73   68   72   72

Example 3:
The ages of 21 cars randomly selected in a student parking lot:
12 6 4 9 11 1 7 8 9 8 9 13 5 15 7 6 8 8 2 1 5

Example 4:
You are taking a class in which your grade is determined from:
Quizzes: 15% total
Exams (3): 15% each
Homework: 10%
Final: 30%

Your scores are: average quiz mean = 85, exams =78, 81, 92, homework mean = 85 and your final = 89.
a) If the minimum average for B+ is 87, did you get B+ at the end of the semester?

b) What if the quiz mean was not given, but the quiz scores are given as 10, 12, 8, 2, 9, 7 (out of 12 points each), and only best 4 quizzes count towards your grade?

Example 5:
The average starting salary for 50 employees at a company is given:
10 with high-school diploma: $27,000 each
25 with BA/BS degree: $ 35,000 each
10 with MA/MS degree: $47,000 each
5 with Ph.D. degree: $59,500 each

How would you find the mean salary for these employees?
Would you add the 4 $ amounts and divide by 4? Explain.

Example 6:
Approximate the mean of the grouped data:

Heights of Males	Frequency
63-65	3
66-68	6
69-71	7
72-74	4
75-77	3

2.4   Measures of Variation

Example 1:
Sample annual salaries (in thousand dollars) for public elementary school teachers are listed:
26.0   19.9   17.8   31.4   38.6   28.7   25.0

Example 2:
The heights (in inches) of ALL 10 adult males in an office are:
70   72   71   70   69   73   69   68   70   71

Example 3:
Midterm scores for 20 random students (in a class of 100):
82   45   37   98   100   74   87   89   63   76
75   61   43   99   86   86   75   92   65   80

What is the meaning of s (sample standard deviation)?

Example 4:
The mean value of land and buildings per acre from a sample of farms is $2,400, with a standard deviation pf $450. Which of the following prices ($/acre) would be considered unusual?
3325   2450   3200   1490   1675   2950

Example 5:
A random sample of the age of employees in a City Hall:

Age	frequency
20-29	5
30-39	10
40-49	12
50-59	8
60-69	5

What percentage of the City Hall employees are between 31.8 and 68.4 years old?

If there are 120 employees in a City Hall, approximately how many of them are:
a) between 31.8 and 56.2 years old?
b) older than 68.4?

Example 6:
How long will it take you to graduate from college? (These are responses from a sample of students on campus.)

Years	f
3	10
4	48
5	25
6	10
7	6
8	1

Assuming the bell-shaped distribution (normal distribution):
What percentage of students will need:
a) more than 7.9 years to graduate?
b) between 3.5 and 5.7 years to graduate?
c) more than 1 .3 years to graduate?

Example 7:
The mean time in a women's 400-m dash is 57.07 s, with a standard deviation of 1.05 s. Apply Chebychev's Theorem to the data using k=3. Explain the meaning of the values that you find. If there is a sample 0f 350 women, about how many would have time between 54.97 s and 59.17 s?

Example 8:
In a random sample, 10 students were asked to compute the distance they travel one way to school to the nearest tenth of a mile. The data is listed:
1.1   5.2   3.6   5.0   4.8   1.8   2.2   5.2   1.5   0.8
Using Chebychev's Theorem, approximate the percentage of students travel between 0 and 6.76 miles (one way) to school.

If there are 25,000 students on campus, approximate the number of students who travel between 0 and 6.76 miles (one way) to school.

Example 9:
SAT verbal scores are normally distributed with a mean of 489 and a standard deviation of 93. Use the Empirical Rule (also called 68-95-99.7 Rule) to determine what percentage of the scores lie:
a) between 303 and 582.
b) above 675?

Example 10:
The batting averages of Sammy Sosa and Barry Bonds for 13 recent years:

Sosa: $\bar{x} = 0.279, s = 0.033$

Bonds: $\bar{x} = 0.312, s = 0.027$

Which player is more consistent? Why?

Example 11:
Which data set has the highest a) mean ,   b) standard deviation

i)
0	9
1	5 8
2	3 3 7 7
3	2 5
4	1

ii)
0	
1	5 8 9
2	3 3 7 3
3	2 5 6
4	

iii)
10	9
11	5 8
12	3 3 7 7
13	2 5
14	1

Example 12:

Data entries: a   b   c   d   Mean of a, b, c, d is $\bar{x}$, and the standard deviation is s.

What will happen to the mean and standard deviation if we add 5 to each data entry?

What will happen to the mean and standard deviation if each data entry is 3 times larger.

2.5   Measures of Position

Example 1:
The ACT math scores of 15 high-school seniors:
18   15   25   24   21   17   32   30   20   27   28   24   18   27   28

Example 2:
In a random sample, 18 students were asked how far (in miles) from campus do they live.
4.2   3.7   15.4   12.7   0.5   0   4.3   1.6   13.8
14.0   11.3   8.2   4.0   12.9   20.5   18   7.5   2.1

Example 3:
The heights (in inches) of 20 women are listed below.
70   71   65   60   62   68   67   68   70   73
60   61   61   65   64   68   69   69   63   65
a) Find the score that corresponds to 65th percentile.
b) What percentile corresponds to the score of 70?
c) What is the score that corresponds to 27th percentile?

Example 4:

10	4 9 3
11	5 9 8 3
12	3 9 7 7 6
13	2 6 5
14	0 6 3

a) Find the score that corresponds to 44th percentile?
b) What percentile corresponds to the score of 135?
c) What is the score that corresponds to 11th percentile?

Example 5:
John is taking biology and math. On the biology exam the mean is 82 with a standard deviation of 6, and on the math exam the mean is 78 with a standard deviation of 3. John received 85 on the biology exam, 80 on the math exam.

Use z-scores to determine on which test he performed better. What would you say if John scored 92 on the math exam? What if John received 79 on the biology exam and 76 on the math exam?