

Revised: Spring2009 Huseyin Yuce and Urmi Ghosh-Dastidar

Revised: Urmi Ghosh-Dastidar and Grazyna Niezgodna (Spring 2013)

- 1) The following are the scores of 20 students at New York City College of Technology: 222, 233, 254, 241, 251, 268, 276, 220, 238, 253, 249, 236, 247, 256, 261, 227, 257, 244, 239, 242.
  - a) Construct a *frequency distribution using 6 classes*.
  - b) Draw a histogram for the *frequency distribution in part (a)*.
  - c) Draw a frequency polygon *for the frequency distribution in part (a)*.
- 2) There are six photocopying machines in a store. During the past week, these machines produced 110, 93, 89, 69, and 103 copies. Find the mean, median, mode, and standard deviation of the number of copies produced by these machines.  
 $\sum x = 464$ ,  $\sum x^2 = 44040$
- 3) In a recent contest, the mean score was 210 and the standard deviation was 25.
  - a) Find the z score of John who scored 190.
  - b) Find the z-score of Bill who scored 270.
  - c) If Mary had a z-score of 1.25, what was Mary's score?
- 4) A box contains 30 marbles: 15 red, 10 blue, and 5 green.
  - a) Two marbles are selected with replacement. Find the probability that both marbles are red.
  - b) Two marbles are selected without replacement. Find the probability of first selecting a blue marble then a green marble.
- 5) A study group is to be selected from 5 freshmen, 7 sophomores, and 4 juniors.
  - a) If a study group is to consist of 2 freshmen, 3 sophomores, and 1 junior, how many different ways can the study group be selected?
  - b) If a study group consisting of 6 students is selected, what is the probability that the group will consist of 2 freshmen, 3 sophomores, and 1 junior?
- 6) A club elects a president, vice-president, and secretary-treasurer. How many sets of officers are possible if there are 20 members and any member can be elected to each position? No person can hold more than one position.
- 7) From a group of 10 people, 4 will each win \$500. How many different winning groups are possible?
- 8) How many ways can gold, silver, and bronze medals be awarded for a race run by 8 people?
- 9) How many five-digit zip codes can be made where all digits are unique? The possible digits are the numbers 0 through 9.
- 10) Of a company's employee, 35% are women and 8% are married women. Suppose an employee is selected at random. Given that the selected employee is a woman, what is the probability that she is married?

- 11) A recent undergraduate student has applied to graduate schools of two universities, A and B. The student feels that she has a 60% chance of receiving an offer from university A and a 50% chance of receiving an offer from university B. If she receives an offer from university B, she believes that she has an 80% chance of receiving an offer from university A.
- What is the probability that both universities will make her an offer?
  - What is the probability that at least one university will make her an offer?
  - If she receives an offer from university B, what is the probability that she will not receive an offer from university A?

- 12) The following is the probability distribution of Jeanette's study hours for Mathematics in a given week.

X (hours)	2	4	5	6
P(X)	0.21	0.39	?	.15

- Find the probability of  $X=5$ .
  - Find the mean of the probability distribution.
  - Find the standard deviation of the probability distribution.
- 13) Jonathan likes to play soccer. Assume  $y$  = number of goals that Jonathan has scored during fall season and assume  $y$  can only take values from 0 to 4. The following table represents the probability distribution for the discrete random variable  $y$ .

y	0	1	2	3	4
P(y)	0.11	0.28	0.29	?	0.17

- Find the probability that Jonathan would score exactly 3 goals in the fall season.
  - Find the probability that Jonathan would score at least 2 goals in fall season.
  - Find the mean of the probability distribution.
  - Find the standard deviation of the probability distribution.
- 14) According to the NIH, 32% of all women will fracture their hip by age 90. If 8 women aged 90 are selected at random, what is the probability that exactly 5 of them will have suffered a hip fracture?
- 15) The number of major earthquakes in a year is approximately normally distributed with a mean of 20.8 and a standard deviation of 4.5.
- Find the probability that in a given year there will be less than 21 earthquakes.
  - Find the probability that in a given year there will be between 18 and 23 earthquakes.
- 16) A professor has found that the grades on the Statistics Final are normally distributed with a mean of 68 and a standard deviation of 15. If only the best 14% of the grade in the class will receive an A, what grade must a student obtain in order to get an A?
- 17) One tire manufacturer claims that his tires last an average of 42,000 miles with a standard deviation of 7800 miles. A random sample of 100 of his tires is taken. What is the probability that the average of these 100 tires will last greater than 41,000 miles?
- 18) In the past, patrons of a cinema complex have spent an average of \$5.00 for popcorn and other snacks, with a standard deviation of \$1.80. If a random sample of 32 patrons is taken, what is the probability that the mean expenditure of this sample is greater than \$4.20?

- 19) A recent report indicated that waiters and waitresses at a casual dining restaurant make an average of \$100 per night in tips with a standard deviation of \$15. Colleen works in a casual dining restaurant and does not think this is correct. She feels she makes less than \$100 on an average night. Over the next 30 work day nights, she computes her tips and the average is \$93. Does Colleen make significantly less than what the report stated? Use a 0.01 level of significance.
- 20) It is claimed that the average annual per person spending on prescription drugs is \$410. If a survey of 64 randomly selected people indicated an average spending of \$425 with a standard deviation of \$45, do we reject the claim that the average is \$410? Use a 5% level of significance.
- 21) The average length of a flight by regional airlines in the United States has been reported as 464 miles. A random sample of 36 flights by regional airlines shows average flight length of 479.6 miles with a standard deviation of 42.8 miles. Does the sample information indicate that a flight time is usually more than 464 miles? Use a 2.5% significance level.
- 22) A survey claims that a college graduate from Smith College can expect an average starting salary of \$42,000. Fifteen Smith College graduates had an average starting salary of \$40,800 with a standard deviation of \$2,250. At the 1% level of significance, can we conclude that the average starting salary of the graduates is significantly less than \$42,000?

23) Given the following data:

<b>X</b>	1	4	6	7
<b>Y</b>	9	7	8	1

Use  $\sum X = 18$ ,  $\sum Y = 25$ ,  $\sum X^2 = 102$ ,  $\sum Y^2 = 195$ ,  $\sum XY = 92$

- Find the coefficient of correlation.
  - Find the equation of the regression line.
  - What is the predicted value for Y if X=3?
- 24) How many 5-person committees are possible from a group of 11 people if:
- There are no restrictions
  - Both Jim and Mary must be on the committee
- 25) How many 5-digit ZIP code numbers are possible if consecutive digits must be different?
- 26) The following data represent the number of days absent (X) and final grade (Y) for college students in a general education course.
- Find the coefficient of correlation.
  - Using the coefficient of correlation, can you say that students with fewer absences (good attendance) are more likely to score higher on a final exam? Give reasons to your answer.
  - Find the equation of the regression line.
  - If one has 5 absences, can you predict using the regression line equation, what final grade will he/she get?
  - If one has 11 absences, can you predict using the regression line equation, what final grade will he/she get?

<u>X=Absences</u>	<u>Y=Final Grade</u>
2	83.5
5	73.9
7	71.8
3	81.1
9	66.2
6	64.3
4	78.2
8	65.5
0	89.2
1	86.4

Use  $\sum X = 45$ ,  $\sum Y = 760.1$ ,  $\sum X^2 = 285$ ,  $\sum Y^2 = 58509.93$ ,  $\sum XY = 3187.2$

27) The marks on a statistics exam are normally distributed with mean 70 and standard deviation of 10.

- Find the probability that a mark will be between 60 and 90.
- If less than 60 is a failing grade, what is the probability that a student fails the class.
- If only the best 10% of the grade in the class will receive an A, what grade must a student obtain in order to get an A?

28) A multiple-choice exam has 8 questions, and each question has 4 possible answers. If you guess the answer to each question and don't leave any blank, what is the probability you get exactly 5 answers correct?

29) One of the products produced by Branco Food Company is All-Bran Cereal, which competes with three other brands of similar all-bran cereals. The company's research office wants to investigate if the percentage of people who consume all-bran cereal is the same for each of these four brands. Let us denote the four brands of cereal A, B, C, and D. A sample of 1000 persons who consume all-bran cereal was taken, and they were asked which brand they often consume. The responses on consumption of cereal are listed in the table below. Does the sample provide enough evidence to reject null hypothesis that the percentage of people who consume all-bran cereal is the same for all four brands? Use significance level  $\alpha = 0.05$ .

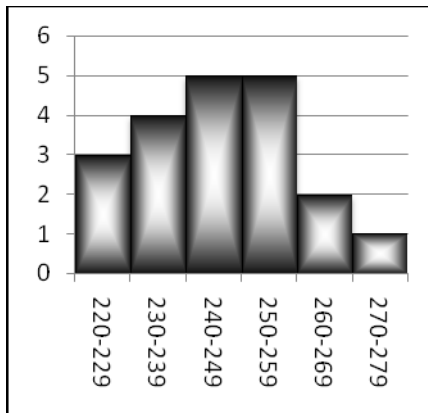
<b>Cereal Brand</b>	A	B	C	D
<b>Consumption</b>	212	284	254	250

**Answers:**

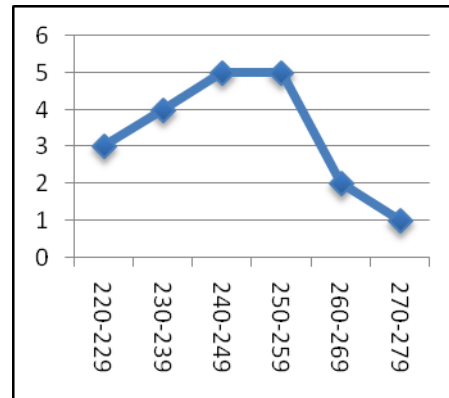
1) a)

Class	Frequency
220-229	3
230-239	4
240-249	5
250-259	5
260-269	2
270-279	1

b)



c)



2) mean = 92.8 median = 93 mode = none standard deviation = 15.66

3) a) -0.8 b) 2.4 c) 241.25

4) a)  $\frac{1}{4}$  b)  $\frac{5}{87}$

5) a) 1400 b) 0.1748

6) 6840

7) 210

8) Only those 3 who finish first will get the medals: 336 ways

9) 30240

10) 0.2286

11) (a) 0.4 (b) 0.7 (c) 0.2

12) a) 0.25 b)  $\mu = 4.13$  c)  $\sigma = 1.29$

13) a) 0.15 b) 0.61 c) 1.99 d) 1.24

14) 0.059

15) a) 0.516 b) 0.4203

16) 84.2

17) 0.8997

18) 0.5319

19)  $H_0: \mu \geq 100$ ,  $H_1: \mu < 100$  (claim). Not enough evidence to support the claim  
(critical value = -2.33,  $z = -0.09$ )

20)  $H_0: \mu = 410$  (claim),  $H_1: \mu \neq 410$  Enough evidence to support the claim  
(critical values =  $\pm 1.96$ ,  $z = 0.04$ )

21)  $H_0: \mu \leq 464$ ,  $H_1: \mu > 464$  (claim) Not enough evidence to support the claim  
(critical value = 1.96,  $z = 0.06$ )

22) Cannot accept  $H_0: \mu = 42000$ ,  $H_1: \mu < 42000$  (critical value = 2.977,  $t = -2.07$ )

23) a)  $r = -0.7186$  b)  $Y = 10.642 - 0.976X$  c) 7.714

24) a) 462 b) 84

25) 65610

26) a) -0.94739 b) Yes. Having a high negative coefficient correlation value means days absent and final grade are highly negatively correlated; *i.e.* one goes up other goes down; Therefore, students with good attendance are expected to have good grades. c)  $Y = 88.73273 - 2.82727X$  d) 74.5963 e) 57.6327

27) a) 0.818594 b) 0.158655 c) 82.8

28) 0.023

29) Critical value:  $\chi^2 = 7.815$ ; *test statistic* :  $\chi^2 = 10.464$ ; reject  $H_0$ .