

Midterm

91. 11. 12

1. (10%)

Five observations taken for two variables follows:

<i>X</i>	2.7	3.5	3.7	3.3	3.6	3.0
<i>Y</i>	450	560	700	620	640	570

(a) Develop a scatter diagram for these data. What does the scatter diagram indicate about a relationship between *X* and *Y*? (5%)

(b) Compute and interpret the sample correlation coefficient. (5%)

2. (25%)

The following table shows the number of students in three different degree programs and whether they are graduate or undergraduate students:

	Business	Engineering	Science	Total
Under	150	150	100	400
Graduate	50	25	25	100
Total	200	175	125	500

(a) What is the probability that a randomly selected student is an undergraduate? (5%)

(b) What percentage of students is engineering majors? (5%)

(c) If we know that a selected student is an undergraduate, what is the probability that he or she is a business major? (5%)

(d) Let *A* denote the event that a student is undergraduate, let *B* denote the event that a student is majoring in Science, and let *C* denote the event that a student is majoring in Business. Are events *A* and *B* independent? Are events *A* and *C* mutually exclusive? Explain. (10%)

3. (15%)

An oil company has purchased an option on land in Alaska. Preliminary geologic studies have assigned the following prior probabilities.

$$P(\text{high - quality oil}) = 0.5$$

$$P(\text{medium - quality oil}) = 0.3$$

$$P(\text{no oil}) = 0.2$$

After 200 feet of drilling on the first well, a soil test is taken. The probabilities of finding the particular type of soil identified by the test follow.

$$P(\text{soil} \mid \text{high - quality oil}) = 0.2$$

$$P(\text{soil} \mid \text{medium - quality oil}) = 0.7$$

$$P(\text{soil} \mid \text{no oil}) = 0.1$$

Given the particular type of soil identified,

(a) what is the probability of finding medium-quality oil? (10%)

(b) what is the probability of finding oil? (5%)

4. (15%)

The data for the number of units produced by a production employee during the most recent 20 days are shown here.

160	170	181	156	176	148	200	179	162	150
162	156	179	178	151	157	154	179	152	156

Suppose the number of class is 5.

(a) Construct a frequency distribution and relative frequency distribution.

(5%)

(b) Construct a histogram. (5%)

(c) Construct an ogive. (5%)

5. (20%)

Consider a sample with data values of 7, 5, 5, 9 and 4. Compute

(i) 20th, 25th, 65th, and 75th percentile. (5%)

(ii) Compute the mode. (5%)

(iii) Compute the standard deviation. (5%)

(iv) Compute the z-scores for every data. (5%)

6. (30%)

(a) 5 students' birthdays are in this month (total 30 days). What is the probability of two students' birthdays (among 10 students) being today? (10%)

(b) Let the probability distribution of a discrete random variable X be

$$f(x) = c \left(\frac{1}{3} \right)^x, x = 1, 2, \dots$$

What is c ? (10%)

(c) Let $P(A) = 0.5, P(B) = 0.5, P(A \cup B) = \frac{2}{3}$. Find $P(A^c \cup B)$ and

$P(A^c \cap B^c)$. (10%)