King Fahd University of Petroleum and Minerals
Department of Mathematics
Stat 201
Major Exam I
251
September 29, 2025
Net Time Allowed: 90 Minutes

USE THIS AS A TEMPLATE

Write your questions, once you are satisfied upload this file.

1. (Exercise 2-56) Orders for a computer are summarized by the optional features that are requested as follows:

Optional Features	**Proportion of Orders**
No optional features	0.18
One optional feature	0.62
More than one optional feature	0.20

What is the probability that an order requests at least one optional feature?

(a) 0.820
(b) 0.620
(c) 0.200
(d) 0.380
(e) 0.124

2. (Exercise 2-79) The analysis of shafts for a compressor is summarized by conformance to specifications.

	Roundness Conforms	
Surface Finish	Yes	No
Yes	329	18
No	17	12

What is the probability that the selected shaft either conforms to surface finish requirements or does not conform to roundness requirements?

(a) 0.9548
(b) 0.9234
(c) 0.0798
(d) 0.9069
(e) 0.1277

3. (Exercise 2-95) A lot of 40 semiconductor chips contains 5 that are defective. Two are selected randomly, without replacement, from the lot. What is the probability that the second one selected is defective given that the first one was defective?

   (a) $\frac{4}{39}$
   (b) $\frac{1}{8}$
   (c) $\frac{5}{39}$
   (d) $\frac{1}{10}$
   (e) $\frac{1}{78}$

4. (Suggested Problem 2-29) The rise time of a reactor is measured in minutes (and fractions of minutes). Let the sample space be positive, real numbers. Define the events A and B as follows:

   $$A = \{x \mid x < 45.5\}, \qquad B = \{x \mid x > 20.5\}.$$

   Which of the following best describes $A \cap B$?

   (a) $\{x \mid 20.5 < x < 45.5\}$
   (b) $\{x \mid x > 0\}$
   (c) $\{x \mid x \geq 45.5\}$
   (d) $\{x \mid x \leq 20.5\}$
   (e) $\{x \mid 25.5 < x < \infty\}$

5. (Exercise 2-135) Disks of polycarbonate plastic from a supplier are analyzed for scratch and shock resistance. The results from 95 disks are summarized as follows:

	Shock Resistance	
Scratch Resistance	High	Low
High	73	7
Low	10	5

Let A denote the event that a disk has high shock resistance, and let B denote the event that a disk has high scratch resistance. Which one of the following statements is **not** true?

(a) A and B are independent

(b) A and B are not mutually exclusive

(c) $P(A \mid B) = \dfrac{73}{80}$

(d) $P(B \mid A) = \dfrac{73}{83}$

(e) $P(A' \mid B') = \dfrac{1}{3}$

6. (Suggested Problem 2-147) Customers are used to evaluate preliminary product designs. In the past, 90% of highly successful products received good reviews, 70% of moderately successful products received good reviews, and 20% of poor products received good reviews. In addition, 50% of products have been highly successful, 35% have been moderately successful, and 15% have been poor products. If a product does not attain a good review, what is the probability that it will be a highly successful product?

(a) 0.1818

(b) 0.6207

(c) 0.3818

(d) 0.1001

(e) 0.5922

7. (Exercise 3-89) A particularly long traffic light on your morning commute is green 10% of the time that you approach it. Assume that each morning represents an independent trial. Over 30 mornings, what is the probability that the light is green on more than two days?

(a) 0.5886

(b) 0.4114

(c) 0.2277

(d) 0

(e) 0.2361

8. (Exercise 3-29) An assembly consists of three mechanical components. Suppose that the probabilities that the first, second, and third components meet specifications are 0.92, 0.88, and 0.83, respectively. Assume that the components are independent. Determine the probability mass function of X: the number of components in the assembly that meet specifications.

(a)

x	0	1	2	3
$P(X = x)$	0.001632	0.038704	0.287696	0.671968

(b)

x	1	2	3
$P(X = x)$	0.038016	0.278784	0.681472

(c)

x	0	1	2	3
$P(X = x)$	0.001632	0.287696	0.038704	0.671968

(d)

x	1	2	3
$P(X = x)$	0.034656	0.291744	0.671968

(e)

x	0	1	2	3
$P(X = x)$	0.004913	0.071961	0.351339	0.571787

9. (Exercise 3-42) Errors in an experimental transmission channel are found when the transmission is checked by a certifier that detects missing pulses. The number of errors found in an eight-bit byte is a random variable with the following distribution:

$$F(x) = \begin{cases} 0, & x < 0, \\ 0.45, & 0 \leq x < 3, \\ 0.62, & 3 \leq x < 5, \\ 0.90, & 5 \leq x < 8, \\ 1, & 8 \leq x. \end{cases}$$

What is the probability that there are 4 errors in an eight-bit byte i.e., $P(X = 4)$?

(a) 0
(b) 0.45
(c) 0.62
(d) 0.28
(e) 0.17

10. (Exercise 3-175) From 500 customers, a major appliance manufacturer will randomly select a sample without replacement. The company estimates that 30% of the customers will provide useful data. If this estimate is correct, what is the probability mass function of the number of customers that will provide useful data? Assume that the company samples 5 customers.

(a) Hypergeometric with $n = 5$, $K = 150$ and $N = 500$
(b) Binomial with $n = 5$ and $p = 0.3$
(c) Poisson with $\lambda = 1.5$
(d) Hypergeometric with $n = 150$, $K = 5$ and $N = 500$
(e) Binomial with $n = 500$ and $p = 0.3$

11. (Exercise 3-138) The number of flaws in bolts of cloth in textile manufacturing is assumed to be Poisson distributed with a mean of 0.22 flaw per square meter. What is the probability that there is one flaw in 9 square meters of cloth?

    (a) 0.273
    (b) 0.177
    (c) 0.244
    (d) 0.862
    (e) 1.589

12. (Exercise 6-6) Suppose that you add 7 to all of the observations in a sample. How does this change the sample mean? How does it change the sample standard deviation?

    (a) The sample mean increases by 7; the sample standard deviation is unchanged.
    (b) Both the sample mean and the sample standard deviation increase by 7.
    (c) The sample mean is unchanged; the sample standard deviation increases by 7.
    (d) The sample mean increases by 7; the sample standard deviation decreases by 7.
    (e) Both the sample mean and the sample standard deviation are unchanged.

13. (Exercise 6-55) The twelve measurements that follow are furnace temperature recorded on successive batches in a semiconductor manufacturing process (units are °C): 498.17, 504.23, 504.83, 510.30, 511.35, 511.36, 511.46, 514.20, 514.84, 518.37, 529.91, 535.49. Using the Interquartile Range (IQR) method, which one of the following statements about outliers in this dataset is correct?

(a) 535.49 is the only outlier.

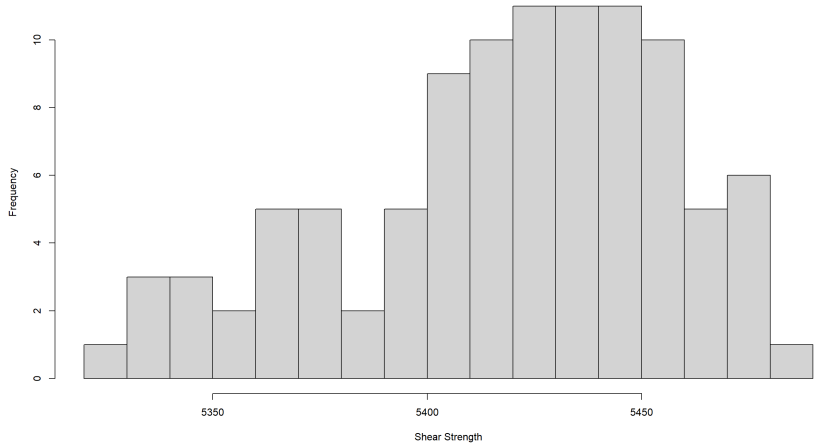
(b) 498.17 and 535.49 are the two outliers.

(c) 498.17 is the only outlier.

(d) There is no outlier.

(e) 529.91 and 535.49 are the two outliers.

14. (Exercise 6-47) The shear strengths of 100 spot welds in a titanium alloy are recorded. A histogram of these data is presented below.



Which one of the following statements about this histogram is true?

(a) The data is negatively skewed.

(b) The data is positively skewed.

(c) The data is symmetric.

(d) The mean shear strength is around 5350.

(e) The median shear strength is around 5350.