

**SHOW ALL FORMULAS AND WORK FOR EACH PROBLEM. INCLUDE A SKETCH WHEN APPROPRIATE.**

1) In each of these statements, tell whether descriptive or inferential statistics have been used.

- a. In the year 2010, 148 million Americans will be enrolled in an HMO (Source: *USA TODAY*).
- b. Nine out of ten on-the-job fatalities are men (Source: *USA TODAY Weekend*).
- c. Expenditures for the cable industry were \$5.66 billion in 1996 (Source: *USA TODAY*).
- d. The median household income for people aged 25–34 is \$35,888 (Source: *USA TODAY*).
- e. Allergy therapy makes bees go away (Source: *Prevention*).
- f. Drinking decaffeinated coffee can raise cholesterol levels by 7% (Source: American Heart Association).
- g. The national average annual medicine expenditure per person is \$1052 (Source: *The Greensburg Tribune Review*).
- h. Experts say that mortgage rates may soon hit bottom (Source: *USA TODAY*).

2) Classify each variable as qualitative or quantitative.

- a. Number of bicycles sold in 1 year by a large sporting goods store.
- b. Colors of baseball caps in a store.
- c. Times it takes to cut a lawn.
- d. Capacity in cubic feet of six truck beds.
- e. Classification of children in a day-care center (infant, toddler, preschool).
- f. Weights of fish caught in Lake George.
- g. Marital status of faculty members in a large university.

3) Classify each variable as discrete or continuous.

- a. Number of doughnuts sold each day by Doughnut Heaven.
- b. Water temperatures of six swimming pools in Pittsburgh on a given day.
- c. Weights of cats in a pet shelter.
- d. Lifetime (in hours) of 12 flashlight batteries.
- e. Number of cheeseburgers sold each day by a hamburger stand on a college campus.
- f. Number of DVDs rented each day by a video store.
- g. Capacity (in gallons) of six reservoirs in Jefferson County.

4) Classify each sample as random, systematic, stratified or cluster.

- a. In a large school district, all teachers from two buildings are interviewed to determine whether they believe the students have less homework to do now than in previous years.
- b. Every seventh customer entering a shopping mall is asked to select her or his favorite store.
- c. Nursing supervisors are selected using random numbers in order to determine annual salaries.
- d. Every 100th hamburger manufactured is checked to determine its fat content.
- e. Mail carriers of a large city are divided into four groups according to gender (male or female) and according to whether they walk or ride on their routes. Then 10 are selected from each group and interviewed to determine whether they have been bitten by a dog in the last year.

5) Identify each study as observational or experimental.

- a. Subjects were randomly assigned to two groups, and one group was given an herb and the other group a placebo. After 6 months, the numbers of respiratory tract infections each group had were compared.
- b. A researcher stood at a busy intersection to see if the color of the automobile that a person drives is related to running red lights.
- c. A researcher finds that people who are more hostile have higher total cholesterol levels than those who are less hostile.
- d. Subjects are randomly assigned to four groups. Each group is placed on one of four special diets—a low-fat diet, a high-fish diet, a combination of low-fat diet and high-fish diet, and a regular diet. After 6 months, the blood pressures of the groups are compared to see if diet has any effect on blood pressure.

6) The following people have agreed to participate in a study. Using the Table of Random Digits, beginning at line 142, choose a random sample of 10.

01 Sam	07 Randy	13 Amy	19 Kevin	25 Emily
02 Jack	08 Kristin	14 Chip	20 Lauren	26 Bret
03 Mark	09 Ben	15 Brad	21 Sally	27 Lindy
04 Jan	10 Weslie	16 Pete	22 Cole	28 Blake
05 Hannah	11 Jane	17 Susan	23 Meg	29 Kelly
06 Chase	12 Paul	18 Ashley	24 Clara	30 Kevin

7) Determine whether the distribution represents a probability distribution.

If not, state why.

a) 

$X$	1	2	3	4	5
$P(X)$	$\frac{1}{10}$	$\frac{3}{10}$	$\frac{1}{10}$	$\frac{2}{10}$	$\frac{3}{10}$

b) 

$X$	10	20	30
$P(X)$	0.1	0.4	0.3

c) 

$X$	8	12	16	20
$P(X)$	$\frac{5}{8}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$

8) PROBABILITY DISTRIBUTION PROBLEMS:

a) **Number of Radios per Household** A study was conducted to determine the number of radios each household has. The data are shown here. Draw a graph for the data.

Number of radios	0	1	2	3	4
Probability $P(X)$	0.05	0.30	0.45	0.12	0.08

d) **Customers in a Bank** A bank has a drive-through service. The number of customers arriving during a 15-minute period is distributed as shown. Find the mean, variance, and standard deviation for the distribution.

Number of customers $X$	0	1	2	3	4
Probability $P(X)$	0.12	0.20	0.31	0.25	0.12

b) **Coins in a Box** A box contains five pennies, three dimes, one quarter, and one half-dollar. Construct a probability distribution and draw a graph for the data.

e) **Museum Visitors** At a small community museum, the number of visitors per hour during the day has the distribution shown here. Find the mean, variance, and standard deviation for the data.

Number of visitors $X$	13	14	15	16	17
Probability $P(X)$	0.12	0.15	0.29	0.25	0.19

c) **Tie Purchases** At Tyler's Tie Shop, Tyler found the probabilities that a customer will buy 0, 1, 2, 3, or 4 ties, as shown. Construct a graph for the distribution.

Number of ties $X$	0	1	2	3	4
Probability $P(X)$	0.30	0.50	0.10	0.08	0.02

9) Binomial Distribution Problems:

a) A study indicates that 4% of American teenagers have a tattoo. If 200 teenagers are randomly selected, find the mean, variance and standard deviation of the number of teenagers who have a tattoo.

e) **Pizza for Breakfast** Three out of four American adults under age 35 have eaten pizza for breakfast. If a random sample of 20 adults under age 35 is selected, find the probability that exactly 16 have eaten pizza for breakfast.

Source: Harper's Index.

b) **Drug Calculation Test** If 75% of nursing students are able to pass a drug calculation test, find the mean, variance, and standard deviation of the number of students who pass the test in a sample of 180 nursing students.

f) **Driving Ages** If 90% of all people between the ages of 30 and 50 drive a car, find these probabilities for a sample of 20 people in that age group.

- Exactly 20 drive a car.
- At least 15 drive a car.
- At most 15 drive a car.

c) **Train Rides to Work** If 30% of all commuters ride the train to work, find the probability that if 10 workers are selected, 5 will ride the train.

d) **Pizza for Breakfast** One out of four Americans over age 55 has eaten pizza for breakfast. If a sample of 10 Americans over age 55 is selected at random, find the probability that at most 3 have eaten pizza for breakfast.

Source: Harper's Index.

g) **Drug Dizziness** If 10% of the people who are given a certain drug experience dizziness, find these probabilities for a sample of 15 people who take the drug.

- At least two people will become dizzy.
- Exactly three people will become dizzy.
- At most four people will become dizzy.

## 10) Normal Distribution Problems:

A. Find the area under the standard normal distribution curve for each.

- Between  $z = 0$  and  $z = 1.95$
- Between  $z = 0$  and  $z = 0.37$
- Between  $z = 1.32$  and  $z = 1.82$
- Between  $z = -1.05$  and  $z = 2.05$
- Between  $z = -0.03$  and  $z = 0.53$
- Between  $z = +1.10$  and  $z = -1.80$
- To the right of  $z = 1.99$
- To the right of  $z = -1.36$
- To the left of  $z = -2.09$
- To the left of  $z = 1.68$

B. Using the standard normal distribution, find each probability.

- $P(0 < z < 2.07)$
- $P(-1.83 < z < 0)$
- $P(-1.59 < z < +2.01)$
- $P(1.33 < z < 1.88)$
- $P(-2.56 < z < 0.37)$
- $P(z > 1.66)$
- $P(z < -2.03)$
- $P(z > -1.19)$
- $P(z < 1.93)$
- $P(z > -1.77)$

C. **Salaries for Auto Mechanics** If the mean salary of auto mechanics in the United States is \$27,635 and the standard deviation is \$2550, find these probabilities for a randomly selected auto mechanic. Assume the variable is normally distributed.

- The mechanic earns more than \$27,635.
- The mechanic earns less than \$25,000.

D. **Speed Limits** The speed limit on Interstate 75 around Findlay, Ohio, is 65 mph. On a clear day with no construction, the mean speed of automobiles was measured at 63 mph with a standard deviation of 8 mph. If the speeds are normally distributed, what percentage of the automobiles are exceeding the speed limit? If the Highway Patrol decides to ticket only motorists exceeding 72 mph, what percentage of the motorists might they arrest?

E. **Suitcase Weights** The average weight of an airline passenger's suitcase is 45 pounds. The standard deviation is 2 pounds. If 15% of the suitcases are overweight, find the maximum weight allowed by the airline. Assume the variable is normally distributed.

F. **Test Scores** An educational study to be conducted requires a test score in the middle 40% range. If  $\mu = 100$  and  $\sigma = 15$ , find the highest and lowest acceptable test scores that would enable a candidate to participate in the study. Assume the variable is normally distributed.