

(4) 1. Answer True (T) or False (F):

- (a) \_\_\_\_\_ The Chebyshev Theorem can **only** be used in normal distributions.  
 (b) \_\_\_\_\_ The distance between two cities is a continuous variable.  
 (c) \_\_\_\_\_ For a continuous random variable  $x$ , the probability of a single value of  $x$  is always zero.  
 (d) \_\_\_\_\_ For a standard normal distribution,  $\mu = 1$  and  $\sigma = 0$ .  
 (e) \_\_\_\_\_  $Q_3$  and  $P_{75}$  have the same meaning.  
 (f) \_\_\_\_\_ It could happen that two events are both mutually exclusive and independent.  
 (g) \_\_\_\_\_ By convention,  $\mu$  and  $\sigma$  are used to denote the mean and standard deviation of a given sample respectively.  
 (h) \_\_\_\_\_ The function  $f(x) = \frac{1}{4}$ ,  $x = 0, 1, 2, 3$  is a probability distribution function.

(8) 2. In a town of 3240 families, the provincial tax department randomly selected 500 families to check their family income. From this group a mean of \$54781 is computed. Match the items in Column II with the statistical terms in Column I.

**Column I**

**Column II**

- |                  |   |
|------------------|---|
| _____ Variable   | (a) <i>The computed \$54781</i>                               |
| _____ Data (set) | (b) <i>The 3240 families in the town</i>                      |
| _____ Experiment | (c) <i>The 500 families</i>                                   |
| _____ Parameter  | (d) <i>The income of the 500 families</i>                     |
| _____ Population | (e) <i>The income of one family</i>                           |
| _____ Sample     | (f) <i>The mean family income of all families in the town</i> |
| _____ Statistics | (g) <i>The income \$74500 of one family</i>                   |
| _____ Data(one)  | (h) <i>The process used to select the 500 families</i>        |

(3) 3. There are 7 professors and 4 students as candidates for a committee consisting of 4 people. How many different committees are possible if the committee must contain 2 professors?

(11) 4. A group of twelve male students has the following weights in kilograms:

60, 50, 65, 75, 60, 60, 80, 55, 47, 48, 49, 55

- (a) Rank the data.  
 (b) Draw an ordered stem and leaf plot.  
 (c) Find the mean, median, mode, range and  $P_{90}$ .  
 (d) Give the 5-number summary and draw a box and whiskers plot.

(3) 5. For two events  $A$  and  $B$ ,  $P(A) = 0.6$ ,  $P(B) = 0.1$  and  $P(A \cap B) = 0.03$ . Find

- (a)  $P(A \cup B)$   
 (b)  $P(B|A)$   
 (c) Are  $A$  and  $B$  mutually exclusive events? Justify your answer.
- (2) 6. Lions prey on zebras. The odds that a lion catches a zebra are 1 : 15. What is the probability that a lion fails to catch a zebra?
- (11) 7. A sample of 200 towns are randomly selected to collect the number of people moving out of a town in a given period. The following table gives the frequency distribution:

# of people moving out of a town (Class limits)	# of towns $f$	Class Mark $x$	$xf$	$x^2f$	Cumulative Frequency	Cumulative Rel. Freq.
0–20	20					
20–40	40					
40–60	76					
60–80	48					
80–100	16					

- (a) Complete the table above and find the mean and standard deviation for this distribution.  
 (b) Draw a histogram and ogive for the distribution.
- (3) 8. From a random sample of 400 people, the following data were obtained relating gender to vision.

	Good	Moderate	Myopia	Total
Male	50	100	60	210
Female	80	90	20	190
Total	130	190	80	400

Suppose a person is randomly selected from this particular sample.

- (a) What is the probability that the person has good vision?  
 (b) What is the probability that the person has moderate vision provided this person is a female?  
 (c) What is the probability that the person is male provided this person has myopia?
- (6) 9. A box contains two balls, three cubes and four prisms. Two objects are randomly chosen from the box (one after one) **without replacement**.
- (a) Draw a tree diagram and assign probabilities to each branch. In your tree diagram, you can use letter “b” for balls, letter “c” for cubes and letter “p” for prisms.  
 (b) Define the events: B: at least one object is a ball, C: both objects are cubes and D: one is a prism and one is a ball. Find  $P(B)$ ,  $P(C)$  and  $P(D|B)$
- (3) 10. The mean monthly mortgage paid by all home owners in a city is \$1365 with a standard deviation of \$240.

- (a) If we assume the mortgages paid is normally distributed, approximately what percentage of all homeowners in the city pay a monthly mortgage of \$645 to \$2085?
- (b) If we assume **nothing** about the shape of the distribution, approximately what percentage of all homeowners in the city pay a monthly mortgage of \$645 to \$2085?
- (6) 11. Let  $x$  be the number of cars that a randomly selected auto mechanic repairs on a given day. The following table lists the probability distribution of  $x$ :
- |        |      |      |     |      |     |
|--------|------|------|-----|------|-----|
| $x$    | 2    | 3    | 4   | 5    | 6   |
| $p(x)$ | 0.05 | 0.22 | 0.4 | 0.23 | 0.1 |
- (a)  $P(x \leq 3) =$
- (b)  $P(3 \leq x \leq 5) =$
- (c)  $P(x = 1) =$
- (d) Find the mean and standard deviation of  $x$  using an extension table.
- (5) 12. According to a survey, 60% of Canadians said that they take expired medicines. Suppose this result is true for the current population of Canada. Find the probability that in a random sample of 14 Canadians, the number who takes expired medicine is
- (a) exactly 9
- (b) 9 to 11
- (c) at least 4
- (2) 13. The probability of success on a single trial of a binomial experiment is known to be  $1/3$ . The random variable  $x$  has a mean of 70. Find the number of trials and the standard deviation of  $x$ .
- (5) 14. The student health center of a university treats an average of 7 cases of mononucleosis per day during the week of final examinations. Find the probability that on a given day during the final exam weeks, the number of cases of mononucleosis treated at this health center will be
- (a) exactly 3
- (b) at most 3
- (c) at least 4
- (5) 15. Draw a picture, shade the area which is represented, and evaluate:
- (a)  $P(0 < z < 1.95)$
- (b)  $P(1.19 < z < 2.12)$
- (c)  $P(z > -0.75)$
- (d)  $t(16, 0.9)$
- (e) If  $P(z < z_0) = 0.209$ , what is  $z_0$ ?
- (5) 16. The manufacturer of aspirin claims that the proportion of headache sufferers who get relief with just two aspirins is 53%. What is the probability that in a random sample of 400 headache sufferers, 180 to 230 obtain relief with just two aspirins? (Use normal approximation to binomial distribution)
- (7) 17. The manufacturer of cans of salmon that are supposed to have a net weight of 6 ounces tells you that the net weight is actually a normal random variable with a mean of 6.05 ounces and a standard deviation of 0.18 ounces.

- (a) Suppose that you select **one** can. What is the probability that the can weighs less than 5.97 ounces?
- (b) Suppose that you select a random sample of 36 cans. Find the probability that the **mean** weight of this sample is less than 5.97 ounces.
- (3) 18. A researcher wants to determine a 95% confidence interval for the mean number of hours that high school students spend doing homework per week. She knows that the standard deviation for hours spent per week is 9. How large a sample should the researcher select so that the estimate will be within 1.5 hours of the population mean?
- (4) 19. According to a study, households that own one dog spend an average of \$144 per year on veterinary care. Assume that this average is based on a random sample of 51 such dog owners and that the **sample** standard deviation is \$45.
- (a) What is the point estimate of the mean annual expenditure on veterinary care for all such dog owners?
- (b) Find a 90% confidence interval for the mean annual expenditure on veterinary care for all such dog owners.
- (4) 20. A mail-order company promises its customers that the products ordered will be mailed within 72 hours after the order is placed. The quality control department took a sample of 50 orders and found that 35 of them were mailed within 72 hours of placement of orders. Construct a 98% confidence interval for the true proportion of all orders that are mailed within 72 hours of their placement.