Review Problems (Midterm Examination, CMA151)

1. A study was performed to examine preferences for various types of potatoes. The following data were recorded regarding the preferences of 50 people:

Type of Potato	Frequency
Mashed	5
French Fries	13
Hash browns	20
Steak Fries	12

    a) What is the variable being measured?
    b) Is the variable qualitative or quantitative?
    c) What proportion of people prefers French Fries or Steak Fries?

2. The following stem and leaf plot represents the number of minutes an athlete spends training per day.

Stems	Leaves
4	2 3
5	
6	0 1 3 5
7	1 4 4 5 6 9 9
8	1 2 4 5 5 7 8 9

    a) How many days were studied?   _____
    b) What is the maximum minute spent for training?   _____
    c) What is the range of time spent?   _____
    d) Should Tchebysheff' s Theorem be applied to these data? Why or why not?

3. The following data represent the scores for a sample of students on a 20-point math quiz:

    8   8   10   12   13   15   16   16   16   18   19   20

    a) Mode is   _____
    b) Median is   _____
    c) The first quartile is   _____

4. The times required to service customers' cars at a repair shop are skewed to the right with a mean of 3 hours and a standard deviation of 1 hour.
    a) What can be said about the percentage of cars whose service time is either less than one hour or more than five hours?
    b) If it takes 7 hours to service a customer, compute the z score.
    c) Is the service time in question 3.2 considered unusual? Why or why not?

5. The following box plot represents the scores of 50 students.
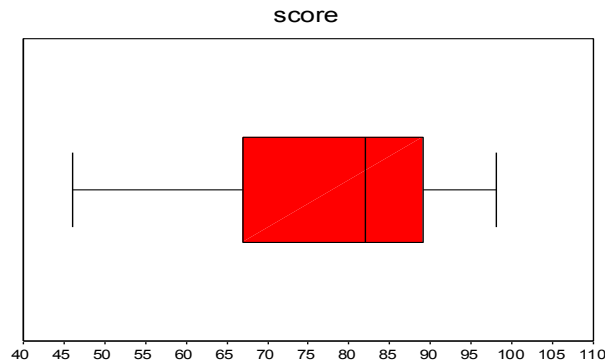
score

   a) Estimate the least score.
   b) Estimate the 3rd quartile.
   c) About how many students have the scores lie in the shaded box
   d) Would you describe the distribution of the data as symmetric, right skewed or left skewed?

6. You have three groups of distinctly different items, four in the first group, five in the second, and eight in the third. If you select one item from each group, how many different triplets can you form?

7. Five applicants apply for two different jobs. Applicants A and B are male; applicants C, D, and E are female. The HR officer selects two applicants at random to fill the two jobs.
   a) How many selections are there?
   b) What is the probability that the successful job applicants include exactly one male?

8. In how many ways can a judge award first, second, and third prizes in a contest having eight contestants?

9. A researcher studied the relationship between the salary of a working woman with the number of children she had. The results are shown in the following probability table:

Salary	Number of Children	
	2 or fewer children	More than 2 children
High salary	0.13	0.02
Medium salary	0.20	0.10
Low salary	0.30	0.25

   a) Find the probability that a working woman has a low salary.
   b) Find the probability that a working woman has 2 or fewer children and has a low salary.
   c) Find the probability that a working woman has more than 2 children or has a high salary.
   d) If a working woman has a low salary, what is the probability that she has 2 or fewer children?
   e) Are "High salary" and "Having more than 2 children" independent or not?

10. Of the delegates at a convention, 60% attended the breakfast forum, 70% attended the dinner speech, and 40% attended both events. A delegate is randomly selected.

a) Find the probability that he did not attend the dinner speech.
b) Find the probability that he attended the breakfast forum or the dinner speech.
c) Are attending the breakfast forum and attending the dinner speech independent? Why or why not?

11. A manufacturer of widgets has 2 assembly lines: A and B. The percentages of output produced by the lines are 30% and 70%, respectively. The probability that a widget from line A is defective is 0.02 and 0.05 if from line B. If a randomly selected widget is defective, what is the probability that it is from line A?

12. Let the random variable x be the weight gain in pounds month for a calf. The probability distribution of x is shown below:

x	$P(x)$
0	0.1
5	0.5
10	0.3
15	0.1

a) Find the average weight gain in pounds per month for a calf.
b) Find the variance and standard deviation of the weight gain.
c) Find $P(x \leq 10)$
d) Find $P(x = 11)$

13. Let x have a binomial probability distribution with $p = 0.4$ and $n = 12$. Use the binomial TABLE to find

a) $P(x \geq 6)$ b) $P(x = 8)$ c) $P(x < 4)$

d) $P(3 \leq x \leq 7)$ e) $P(1 < x \leq 8)$ f) $P(x = 0)$

14. A population consists of 8 items, five of which are defective. Take a sample of four items at a time.
a) What is the probability that exactly two items are defective?
b) Let x be the number of non-defective items found. Find the probability distribution of x.

15. A recent study revealed that 65 percent of Thai drivers use their seat belts. A sample of 5 drivers in Bangkok are random selected.
a) What is the probability that exactly two drivers are wearing seat belts?
b) What is the probability that at least two drivers are wearing seat belts?

16. A province in Thailand has averaged one small business failure per week over the past several years. The number of failures follows the Poisson distribution.
a) Let x denote the number of small business failures in the next five weeks. Find $P(x \leq 3)$.
b) Find the probability that there are 5 small business failures in the three weeks.

Answers of Review Problems

1. a) type of potato   b) qualitative (norminative)   c) proportion of people prefers French Fries or Steak Fries=(13+15)/50=25/50=1/2

2.   a) 21   b) 89   c) 47
     d) Yes, the theorem can be applied to any shape of the data distribution.

3.   a) 16   b) 15.5   c) 10.5

4.   a) At most 25% of cars ….
     c) Yes, quite unusual because the z-score = …… , which is more than 3.

5.   a) About 47.   b) About 89 or 90   c) 25 students   d) left skewed.
6.   160
7.   a) 20   b) 0.6
8.   336
9.   a) 0.55   b) 0.3   c) 0.5   d) 30/55
     e) dependent because ……………
10. a) 0.3   b) 0.9   c) not independent because ………..
11. 6/41

12.1 Given $P(S)=0.3$, $P(S^C)=0.7$, $P(F/S)=0.9$, and $P(F/S^C)=0.5$
     $P(F)=0.62$

12. a) 7   b) 16, and 4   c) 0.9   d) 0

13. a) 0.3348   b) 0.042   c) 0.2253   d) 0.8593   e) 0.9651

14. a) 3/7   b) $P(x=k) = \dfrac{C_k^3 C_{4-k}^5}{C_4^8}$, for $k = 0,1,2,3$

15. a) 0.1811   b) $P(x \geq 2) = \displaystyle\sum_{x=2}^{5} \binom{5}{x}(0.65)^x(0.35)^{5-x} = $ .... + ... +.... +.... + = ...

     Or $P(x \geq 2) = 1 - \displaystyle\sum_{x=0}^{1} \binom{5}{x}(0.65)^x(0.35)^{5-x} = $ ..... = ...

16. a) 0.265   lambda = 5*1 business failures/ 5 weeks
                  X=#business failures in 5 weeks
                  P(X<=3)=ppois(3,5)
                        = 0.2650259

    b) lambda =1*3 business failures/ 3 weeks
    Y=#business failures in 3 weeks
    P(Y=5) = lambda^5*e^(-lambda)/5!
           = 3^5*exp(-3)/factorial(5)   (use R command)
           = 0.1008188
    Or we can compute by
    P(Y=5) = dpois(5,3)
           = 0.1008188