Chapter 5

Exercise 1/

Some people are in favour of reducing federal taxes to increase consumer spending and others are against it. Two persons are selected and their opinions are recorded. Assuming no one is undecided, list the possible outcomes.

Outcome	Person	Person
1	Agree	Agree
2	Disagree	Disagree
3	Agree	Disagree
4	Disagree	Agree

Exercise 3/

A survey of 34 students at CBA, KSU showed the following majors:

Accounting	10
Finance	5
Economics	3
Management	6
Marketing	10

Suppose you selected a student at random and observe his major.

a/ What is the probability he is management major?

6/34

b/ Which concept of probability did you use to make this estimate?

Empirical approach

Exercise 7/

A sample of 40 oil industry executives was selected to test a questionnaire. One question about environmental issues required a yes or no answer.

a/ What is the experiment?

The survey of 40 people about environmental issue.

b/ List one possible event.

3/4 of the executives oppose the effect of the environmental issue.

c/ 10 of the 40 executives responded yes. Based on these sample responses. What is the probability that an oil industry executive will respond yes?

1/4

d/ What concept of probability does this illustrate?

Empirical approach

e/ Are each of the possible outcomes equally likely and mutually exclusive?

The outcomes are not equally likely, but they are mutually exclusive.

Exercise 17/ The probabilities of the events A and B are 0.2 and 0.3 respectively. The probabilities that both A and B occur is 0.15. What is the probability of either A or B occurring?

$$P(A \text{ or } B) = P(A) + P(B) – P(A \text{ and } B) = 0.2 + 0.3 – 0.15 = 0.35$$

Exercise 19/ suppose the two A and B are mutually exclusive events. What is the probability of their joint occurrence?

$P(A \text{ and } B) = 0$ since they cannot happen concurrently.

Exercise 21/ A survey of grocery stores in the southeast revealed 40 percent had a pharmacy, 50 percent had a floral shop, and 70 percent had a deli. Suppose 10 percent of the stores have all three departments, 30 percent have both a pharmacy and deli, 25 percent have both a floral shop and deli, and 20 percent have both a pharmacy and floral shop.

a/ what is the probability of selecting a store at random and find it has both a pharmacy and floral shop? P(pharmacy and floral shop) = 0.2

b/ what is the probability of selecting a store at random and find it has both a pharmacy and deli? P(pharmacy and deli shop) = 0.3

c/ Are the events “select a store with a deli” and “select a store with a pharmacy” mutually exclusive? No, since they could occur concurrently.

d/ what is the name given to the event of selecting a store with a pharmacy, a floral, and a deli?

Joint probability.

e/ what is the probability of selecting a store that does not have all three departments?

Let the event A = A store has all three departments

$$P(\sim A) = 1 – P(A) = 1- 0.1 = 0.9$$

Exercise 29/

Each salesperson at Puchett, Sheets, and Hogan Insurance Agency is rated either below average, average or above average with respect to sales ability. Each salesperson is also rated with respect to his or her potential for advancement- either fair, good, or excellent. These traits for the 500 salespeople were cross-classified into the following table:

Sales Ability	Fair	Good	Excellent	Total
Below average	16	12	22	50
Average	45	60	45	150
Above Average	93	72	135	300
Total	154	144	202	500

a. What is this table called?
   Contingency table.
b. What is the probability a salesperson selected at random will have above average sales ability and excellent potential for advancement?
   $P(A_3 \text{ and } B_3) = P(B_3) * P(A_3 \mid B_3) = 202/500 * 135/202 = 135/500 = 0.27$
   Or straightforwardly take 135/500 = 0.27
c. Construct a tree diagram showing all the probabilities, conditional probabilities, and joint probabilities.

Chapter 6

Exercise 5/

The information below the number of daily emergency service calls made by volunteer ambulance service of Walterboro, South California, for the last 50 days.

Number of Calls	Frequency
0	8
1	10
2	22
3	9
4	1
Total	50

What is the experiment, outcomes, random variable, events?

Experiment: counting the number of days where a specific number of calls is made.

Outcomes: 0, 1, 2, 3, 4 calls per day

Random variable: in a specific day the number of calls is random.

Events could be: 0 calls, 1 call, 2 calls, 3 calls, 4, calls.

a/ Convert this information on the number of calls to probability distribution.

Number of Calls (X)	Frequency	P(X)
0	8	0.16
1	10	0.20
2	22	0.44
3	9	0.18
4	1	0.02
Total	50	1

b/ Is this an example of discrete of continuous probability distribution?

Discrete, since the random variable (number of calls) take the values 0, 1, 2, 3, 4

c/ What is the mean number of emergence calls per day?

Number of Calls (X)	P(X)	XP(X)
0	0.16	0
1	0.20	0.20
2	0.44	0.88
3	0.18	0.54
4	0.02	0.08
Total	1	1.70

μ = 1.7 calls in a particular day

d/ What the standard deviation of the number of calls made daily?

Number of Calls (X)	P(X)	XP(X)	$(X - \mu)^2$ P(X)
0	0.16	0	0.4624
1	0.20	0.20	0.0980
2	0.44	0.88	0.0396
3	0.18	0.54	0.3042
4	0.02	0.08	0.1058
Total	1	1.70	1.0100

$\sigma = \sqrt{1.0100}$ = 1 calls in a particular day

Exercise 14/

The United States Postal Service reports 95 percent of first class mail within the same city is delivered within two days of the time of mailing. Six letters are randomly sent to different locations within the same city.

a/ What is the probability that all six arrive within two days?

$P(6) = {}_6C_6\,(0.95)^6\,(1-0.95)^{6-6} = 0.7350$

b/ What is the probability that exactly five arrive within two days?

$P(5) = {}_6C_5\,(0.95)^5\,(1-0.95)^{6-5} = 0.2321$

c/ Find the mean number of letters that arrive within two days?

$\mu = n\pi = 6(0.95) = 5.7$ mails

d/ Compute the variance and the standard deviation of the number that will arrive within two days?

$\sigma^2 = n\pi(1-\pi) = 6\,(0.95)(1 - 0.95) = 0.285 \rightarrow\ \sigma = \sqrt{6(0.95)(0.5)} = 1.688$ mails

Exercise 23/

The speed with which utility companies can resolve problems is very important. GTC, the Georgetown, Telephone Company, reports it can resolve customer problems the same day they are reported in 70 percent of the cases. Suppose the 15 cases reported today are representative of all complaints.

a/ How many of the problems would you expect to be resolved today? What is the standard deviation?

$\mu = n\pi = 15(0.7) = 10.5$ problems resolved with the same day

$\sigma^2 = n\pi(1-\pi) = 15(0.7)(0.3), \rightarrow\ \sigma = \sqrt{15(0.7)(0.3)} = 1.7748$ problems resolved with the same day

b/ What is the probability that 10 of the problem can be resolved today?

$P(10) = {}_{15}C_{10}\,(0.7)^{10}\,(1-0.7)^{15-10} = 0.2061$

c/ What is the probability that 10 or 11 of the problem can be resolved today?

$P(10) + P(11) = {}_{15}C_{10}\,(0.7)^{10}\,(1-0.7)^{15-10} + {}_{15}C_{11}\,(0.7)^{11}\,(1-0.7)^{15-11} = 0.2061 + 0.2186 = 0.4247$

d/ What is the probability that more than 10 of the problem can be resolved today?

P(11) +P(12) + P(13) + P(14) +P(15) = 0.2186 + 0.1700 + 0.0916 + 0.0305 + 0.00047 = 0.5154

Exercise 27/

Kolzak Appliance Outlet just received a shipment of 10 DVD players. Shortly after they were received, the manufacturer called to report that he had inadvertently shipped 3 defective units. Ms.Kolzak, the owner of the outlet, decided to test 2 of the 10 DVD players she received. What is the probability that neither of the 2 DVD players tested is defective? Assume the samples are drawn without replacement.

$P(0) = ({}_{3}C_{0})({}_{10-3}C_{2-0})/({}_{10}C_{2}) = 0.4667$

Exercise 29/

Keth's Florists has 15 delivery trucks, used mainly to deliver flowers and flower arrangements in Greenville, South Carolina, area. Of these 15 trucks, 6 have brake problems. A sample of 5 trucks is randomly selected. What is the probability that 2 of those tested have defective brakes?

$P(2) = ({}_{6}C_{2})({}_{15-6}C_{5-2})/({}_{15}C_{5}) = 0.4196$

Exercise 31/

In Poisson distribution μ = 0.4

a/ What is the probability of that x = 0?

$P(0) = \frac{0.4^0 e^{-0.4}}{0!} = 0.6703$

b/ What is the probability of that x > 0?

1 – P(0) = 1- 0.6703 = 0.3297

Exercise 35/

It is estimated that 0.5 percent of the callers to customer service department of Dell Inc., will receive a busy signal. What is the probability that of today's 1200 callers at least 5 received a busy signal?

$\mu = n\pi$, $\mu = (0.005)(1200) = 6$

$P(X \geq 5) = 1- [P(0) + P(1) + P(2) + P(3) + P(4)] = 1-[\frac{6^0 e^{-6}}{0!} + \frac{6^1 e^{-6}}{1!} + \frac{6^2 e^{-6}}{2!} + \frac{6^3 e^{-6}}{3!} + \frac{6^4 e^{-6}}{4!}] = 1-[0.0025 + 0.0149 + 0.0446 + 0.0892 + 0.1339] = 0.7149$