

Math 21 – Summer – Written Project 2 (Chapters 5-7)

Chapter 5

1) The faculty senate has 24 members.

a) In how many different ways can the senate elect a president, a vice president, and a secretary?

Selecting 3 out of 24 where order of selection matters (jobs are different) – so this is a permutation problem. $24P3 = 12,144$

b) In how many different ways can the senate select a 4-person committee to attend a statewide conference?

Selecting 4 out of 24 where order of selection does not matter (jobs are same) – so this is a combination problem. $24C4 = 10,626$

c) In how many different ways can the senate elect a person to oversee grievances and a 3-person support committee?

This is a mixture of permutations & combinations – one of the jobs is unique (person overseeing grievances) and 3 of them are the same (3 person support committee). $24P1 \times 23C3 = 42,504$

2) The probability of getting an A on this exam is 0.08, and the probability of getting a B is 0.14.

a) Find the probability that a student gets an A or a B.

Addition (“or”, disjoint events): $0.08 + 0.14 = 0.22$

b) Find the probability that a student gets a C or lower.

Complement Rule (every grade EXCEPT A or B): $1 - 0.22 = 0.78$

3) The probability that a COS student is female is 0.55, the probability that a COS student plans to transfer is 0.33, and the probability that a COS student is female and a transfer student is 0.11.

a) Find the probability that a COS student is female or a transfer student.

General Addition Rule (“or”, overlapping events): $0.55 + 0.33 - 0.11 = 0.77$

b) If a female student is selected at random, find the probability that she is a transfer student.

Conditional Probability (We are given the probability that a student is female (F), and are asked to find the probability the student is a transfer student (T)): $P(T|F) = P(F \text{ and } T) / P(F) = 0.11 / 0.55 = 0.2$

4)

a) A card is drawn from a well-shuffled deck. Find the probability that it is a face card.

Classical Probability (There are 12 face cards in a 52 card deck): $12/52 = 3/13$ [0.2308]

b) Three cards are drawn at random from a well-shuffled deck. Find the probability that all 3 are face cards.

Multiplication, Dependent Events (1st is a face card AND 2nd is AND 3rd is):
 $12/52 \times 11/51 \times 10/50 = 11/1105$ [0.0010]

5) Nine males and four females are to be interviewed for a job as a community college instructor.

The top three candidates are sent forward to the president for a second interview. If all the candidates are equally qualified, ...

a) find the probability that three males get a second interview.

Multiplication, Dependent Events (1st is a male AND 2nd is AND 3rd is):
 $9/13 \times 8/12 \times 7/11 = 42/143$ [0.2937]

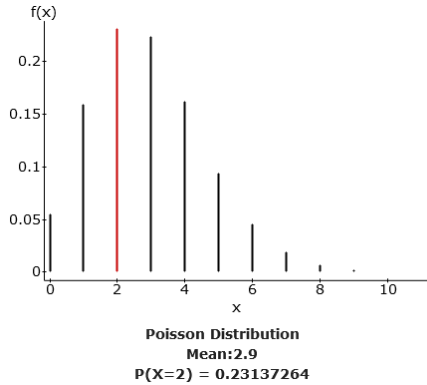
b) find the probability that at least one male gets a second interview.

"At Least 1" (1st is a face card AND 2nd is AND 3rd is):
 $1 - P(0 \text{ Males})$
 $= 1 - P(3 \text{ Females})$
 $= 1 - [4/13 \times 3/12 \times 2/11]$
 $= 1 - 2/143$
 $= 141/143$ [0.9860]

Chapter 6

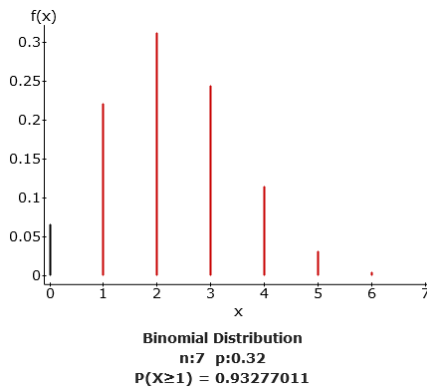
6) The number of bike crashes on a certain college campus follows a Poisson distribution with a mean of 2.9 crashes per day. Find the probability that there will be 2 bike crashes on that campus today.

[0.2313]



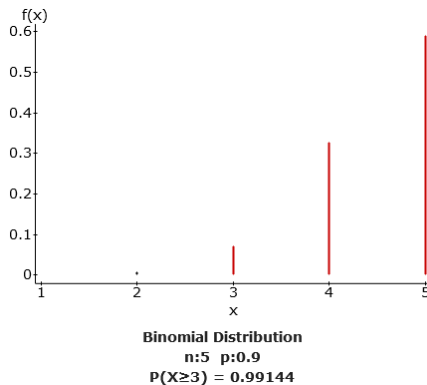
7) According to company data, 32% of the people who take cruises are at least 60 years old. If 7 people on a cruise ship are selected at random, find the probability that at least one of them is at least 60 years old.

[0.9328]



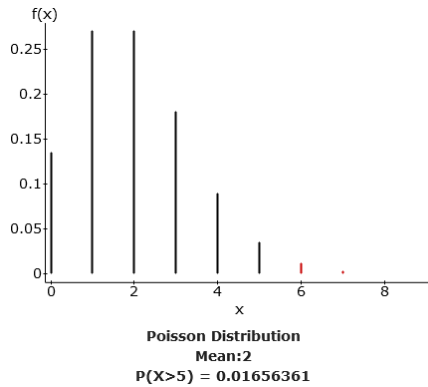
8) Ten percent of the adults in a certain city hold a bachelor's or higher degree. If 5 adults from this city are selected at random, find the probability that at least 3 do not have a bachelor's or higher degree.

[0.9914]



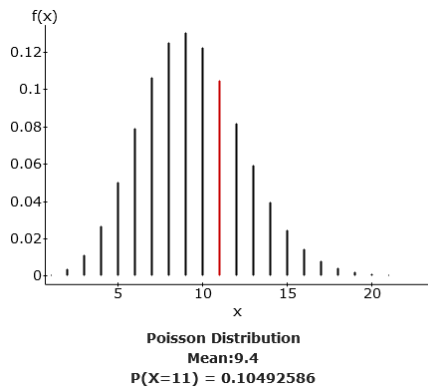
9) The number of teachers absent in a small school district follows a Poisson distribution with a mean of 2 absences per day. If the district has 5 substitute teachers available, find the probability that the district will not have enough substitute teachers on a given day.

[0.0166]



10) The number of runs scored by a minor league baseball team follows a Poisson distribution with a mean of 4.7 runs per game. Find the probability that the team scores exactly 11 runs in the next two games.

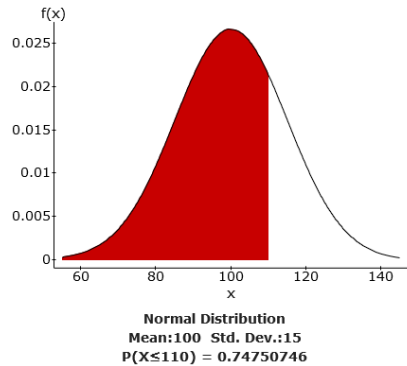
[0.1049]



Chapter 7

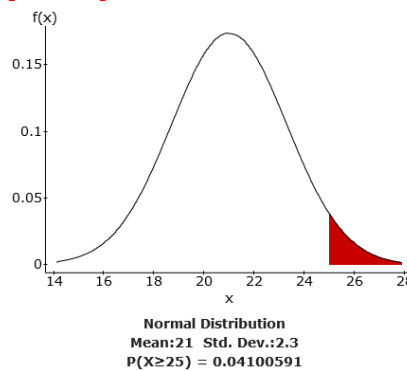
11) IQ scores are approximately normally distributed with a mean of 100 points, and a standard deviation of 15 points. Find the probability that a person has an IQ of 110 or lower.

[0.7475]



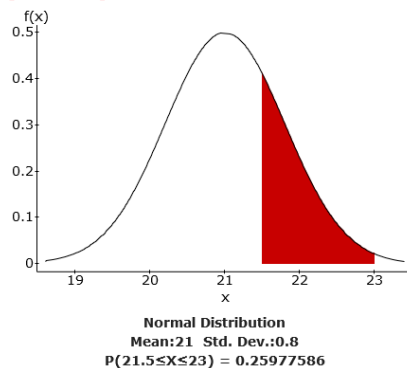
12) The weights of salmon fillets at a fish market follow a normal distribution with a mean of 21 ounces and a standard deviation of 2.3 ounces. Find the probability that an individual salmon fillet will weigh more than 25 ounces.

[0.0410]



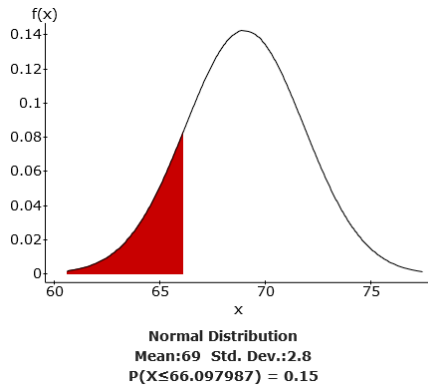
13) The lengths of newborn baby girls follow a normal distribution with a mean of 21 inches and a standard deviation of 0.8 points. Find the probability that a randomly selected newborn baby girl has a length between 21.5 inches and 23 inches.

[0.2598]



14) The heights of adult males are normally distributed with a mean of 69.0 inches and a standard deviation of 2.8 inches. What height separates the shortest 15% of adult males from the rest?

[66.1 inches]



15) Here are the IQ's of 15 randomly selected statistics students. Are they normally distributed? (The critical value is $r = 0.939$.)

95, 97, 98, 98, 99, 100, 100, 101, 103, 103, 104, 106, 108, 110, 125

[Not normally distributed because the correlation statistic, 0.885, is less than the critical value of 0.939.]

