Statistics assignment essay sample

To perform a certain type of blood analysis, lab technicians must perform two procedures. The first procedure requires either one or two separate steps, and the second procedure requires either one, two, or three steps. a. List the experimental outcomes associated with performing the blood analysis. Answer: There are two procedures that a lab technician must perform. The first procedure requires either one or two separate steps, which could be named as x1 and x2. The second procedure requires either one, two or three steps, which could be named as y1, y2 and y3. The experimental outcomes associated with performing the blood analysis from 1st procedure (x1, x2) and 2nd procedure: (y1, y2, y3): * (x1, y1), x1, y2, x1, y3

* x2, y1, x2, y2, x2, y3

b. If the random variable of interest is the total number of steps required to do the complete analysis (both procedures), show what value the random variable will assume for each of the experimental outcomes. Answer: Values for the random variable to be assumed for each of the outcomes. * (x1, y1)= 2 => the 1st procedure required 1 step and the 2nd procedure required 1 step * x1, y2= 3 => the 1st procedure required 1 step and the 2nd procedure required 2 steps * x1, y3= 4 => the 1st procedure required 1 step and the 2nd procedure required 3 steps * x2, y1= 3 => the 2nd procedure required 1 step and the 1st procedure required 1 step * x2, y2= 4 => the 2nd procedure required 1 step and the 1st procedure required 2 steps * x2, y3= 5 => the 2nd procedure required 1 step and the 1st procedure required 3 steps Chapter 5 – Section 2. Question 11

A technician services mailing machines at companies in the Phoenix area. Depending on the type of malfunction, the service call can take one, two, three, or four hours. The different types of malfunctions occur at about the same frequency. a. Develop a probability distribution for the duration of a service call Answer: A probability distribution for the duration of a service call, where x is the duration of the service call, and the probability of different malfunctions occur at the same frequency x| f(x)|

1| 0. 25|

2| 0. 25|

3| 0. 25|

4| 0. 25|

| 1. 00|

b. Draw a graph of the probability distribution.

Answer: A graph of the probability distribution

c. Show that your probability distribution satisfies the conditions required for a discrete probability function. Answer: Required conditions for a discrete probability functions are fx≥0=> f1= f2= f3= f4= 0. 25≥0

Σfx= 1=> f1+f2+f3+f4= 0. 25+0. 25+0. 25+0. 25= 1

d. What is the probability that a service call will take three hours? Answer: The probability that a service call will take three hours is 0. 25 f3= 0. 25

e. A service call has just come in, but the type of malfunction is unknown. It is 3: 00 pm and service technicians usually get off at 5: 00 pm. What is the probability that the service technician will have to work overtime to fix the machine today? Answer: The probability that the service technician will have to work overtime to fix the machine today is 0. 5. Since it is 3pm right now and technician stays overtime, then he might need three or four hours to fix the machine, because if it takes only one or two hour, the technician is done on time. Thus, the probability that it would take three or four hours: f3+f4= 0. 25+0. 25= 0. 5

Chapter 5 – Section 2. Question 13

A psychologist determined that the number of sessions required to obtain the trust of a new patient is either 1, 2, or 3. Let x be a random variable indicating the number of sessions required to gain the patient's trust. The following probability function has been proposed. fx= x6 for x= 1, 2 or 3

a. Is this probability function valid? Explain.

Answer: This probability function is valid, because it meets the required conditions for a discrete probability x≥0=> f1= 16≥0

f2= 26≥0

f3= 36≥0

Σfx= 1=> f1+f2+f3= 16+26+36= 1

b. What is the probability that it takes exactly two sessions to gain the patient's trust? Answer: The probability that is takes exactly two sections to gain the patient's trust is 0. 33, because Probability (x= 2)= f2= 26= 0. 3333

c. What is the probability that it takes at least two sessions to gain the patient's trust? Answer: The probability that is takes at least two sessions to gain the patient's trust is 0. 83, because Probability x≥2= f2+f3= 26+36= 0. 8333= 0. 83

Chapter 5 – Section 3. Question 17

a. Let x be a random variable indicating the number of times a student takes the SAT. Show the probability distribution for this random variable. Answer:

The probability distribution:

Number of Times (x)	Number of Students	f(x)
1	721, 769	0. 4752
2	601, 325	0. 3959
3	166, 736	0. 1098
4	22, 299	0. 0147
5	6, 730	0. 0044
	1, 518, 859	1. 0000

b. What is the probability that a student takes the SAT more than one time?

Answer: The probability that a student takes the SAT more then one time is 0. 5248, because Probabilityx> 1= f2+f3+f4+f5= 0. 3959+0. 1098+0. 0147+0. 0044= 0. 5248 c. What is the probability that a student takes the SAT three or more times? Answer: The probability that a student takes the SAT three or more times is 0. 1289, because Probabilityx≥3= f3+f4+f5= 0. 1098+0. 0147+0. 0044= 0. 1289

d. What is the expected value of the number of times the SAT is taken? What is your interpretation of the expected value? Answer: The expected value of the number of times the SAT is taken is 1. 6772, because Ex= μ= Σxfx

x	f(x)	xf(x)
1	0. 4752	0. 4752
2	0. 3959	0. 7918
3	0. 1098	0. 3293
4	0. 0147	0. 0587
5	0. 0044	0. 0222

| | 1. 6772|

Expected value or mean shows the average of times a student takes the SAT. In this case, the student is expected to take the SAT 1. 6772 times e. What is the variance and standard deviation for the number of times the SAT is taken? Answer: The variance is 0. 5794 and standard deviation is 0. 7612 for the number of times the SAT is taken, because Variance= Varx= o2= Σx-μ2fx

x	x-μ	(x-μ)2	f(x)	x-μ2f(x)
1	-0. 6772	0. 4586	0. 4752	0. 2179
2	0. 3228	0. 1042	0. 3959	0. 0413
3	1. 3228	1. 7497	0. 1098	0. 1921
4	2. 3228	5. 3953	0. 0147	0. 0792
5	3. 3228	11. 0408	0. 0044	0. 0489
				0. 5794

Standard Deviation= σ= Varx= 0. 5794= 0. 7612

Chapter 5 – Section 3. Question 23

a. What is the expected value of the number of persons living in each type of unit? Answer: The expected value of the number of persons living in Rent-Controlled is 1. 57 and in Rent-Stabilized is 2. 08 Number of Persons| Rent-Controlled| Rent-Stabilized|

	f(x)	xf(x)	xf(x)	xf(x)
1	0. 61	0. 61	0. 41	0. 41
2	0. 27	0. 54	0. 30	0. 6
3	0. 07	0. 21	0. 14	0. 42

4| 0. 04| 0. 16| 0. 11| 0. 44|

5| 0. 01| 0. 05| 0. 03| 0. 15|

6| 0. 00| 0| 0. 01| 0. 06|

| | 1. 57| | 2. 08|

b. What is the variance of the number of persons living in each type of unit?

Answer: The variance of the number of persons living in Rent-Controlled is 0. 75 and in Rent-Stabilized is 1. 41 Number of Persons| Rent-Controlled|

x| x-μ| (x-μ)2| f(x)| x-μ2f(x)|

1| -0. 57| 0. 32| 0. 61| 0. 20|

2| 0. 43| 0. 18| 0. 27| 0. 05|

3| 1. 43| 2. 04| 0. 07| 0. 14|

4| 2. 43| 5. 90| 0. 04| 0. 24|

5| 3. 43| 11. 76| 0. 01| 0. 1176|

6| 4. 43| 19. 62| 0. 00| 0. 00|

| | | | 0. 75|

Number of Persons| Rent-Stabilized|

x| x-μ| (x-μ)2| f(x)| x-μ2f(x)|

1| -1. 08| 1. 17| 0. 41| 0. 48|

2| -0. 08| 0. 01| 0. 30| 0. 002|

3| 0. 92| 0. 85| 0. 14| 0. 12|

4| 1. 92| 3. 69| 0. 11| 0. 41|

5| 2. 92| 8. 53| 0. 03| 0. 26|

6| 3. 92| 15. 37| 0. 01| 0. 15|

| | | | 1. 41|

c. Make some comparisons between the number of persons living in rent-controlled units and the number of persons living in rent-stabilized units. Answer: The average number of persons living in Rent-Stabilized housing units is higher than number of persons living in Rent-Controlled units, because 2. 08> 1. 57. In terms variability, the number of persons in Rent-Stabilized housing units is also higher, than in Rent-Controlled, 1. 41> 0. 75 Chapter 5 – Section 4. Question 31

A Randstad/Harris interactive survey reported that 25% of employees said their company is loyal to them (USA Today, November 11, 2009). Suppose 10 employees are selected randomly and will be interviewed about company loyalty. a. Is the selection of 10 employees a binomial experiment? Explain. Answer: The selection of 10 employees is a binomial experiment, because: 1. There is a sequence of 10 identical trials

2. Probability is the same for all 10 employees

3. Trials or employees are independent

b. What is the probability that none of the 10 employees will say their company is loyal to them? Answer: The probability that none of the 10 employees will say their company is loyal to them is 0. 0563, because fx= nxpx(1-p)n-x

fx= 0= 1000. 250(1-0. 25)10-0= 0. 0563

c. What is the probability that 4 of the 10 employees will say their company is loyal to them? Answer: The probability that 4 of the 10 employees will say their company is loyal to them is 0. 146, because fx= nxpx(1-p)n-x

Px= 4= 1040. 254(1-0. 25)10-4= 0. 145998001

d. What is the probability that at least 2 of the 10 employees will say their company is loyal to them? Answer: The probability that at least 2 of the 10 employees will say their company is loyal to them is 0. 756, because Px≥2= P2+P3+P4+P5+P6+P7+P8+P9+P10

or

PX≥2= 1-PX <2= 1-P0-P1, where P0= 0. 0563 from part A

P1= 1010. 251(1-0. 25)10-1= 0. 187711715

then PX≥2= 1-PX <2= 1-P0-P1= 1-0. 0563-0. 1877= 0. 756

Chapter 5 – Section 3. Question 33

Twelve of the top 20 finishers in the 2009 PGA Championship at Hazeltine National Golf Club in Chaska, Minnesota, used a Titleist brand golf ball (GolfBallTest website, November 12, 2009). Suppose these results are representative of the probability that a randomly selected PGA Tour player uses a Titleist brand golf ball. For a sample of 15 PGA Tour players, make the following calculations. a. Compute the probability that exactly 10 of the 15 PGA Tour players use a Titleist brand golf ball. Answer: The probability that exactly 10 of the 15 PGA Tour players use a Titleist brand golf ball is 0. 1859, because Px= nxpx(1-p)n-x, where p= 1220= 0. 60

P0= 15100. 6010(1-0. 60)15-10= 0. 185937844

b. Compute the probability that more than 10 of the 15 PGA Tour players use a Titleist brand golf ball. Answer: The probability that more than 10 of the 15 PGA Tour players use a Titleist brand golf ball is 0. 2173, because Px> 10= P11+P12+P13+P14+P15 where

P11= 15110. 60111-0. 6015-11= 0. 126775803

P12= 15120. 60121-0. 6015-12= 0. 063387901

P13= 15130. 60131-0. 6015-13= 0. 021941965

P14= 15140. 60141-0. 6015-14= 0. 00470185

P15= 15150. 60151-0. 6015-15= 0. 000470185

then

Px> 10= 0. 126775803+0. 063387901+0. 021941965+0. 00470185+0. 0000470185= 0. 217277704 c. For a sample of 15 PGA Tour players, compute the expected number of players who use a Titleist brand golf ball. Answer: The expected number of players who use a Titleist brand golf ball is 900, because Ex= np= 15*0. 6= 900

d. For a sample of 15 PGA Tour players, compute the variance and standard deviation of the number of players who use a Titleist brand golf ball. Answer: The variance is 3. 6 and standard deviation is 1. 8974 of the number of players who use a Titleist brand golf ball, because Varx= np1-p= 15×0. 6×1-0. 6= 3. 6

Standard Deviation= 3. 6= 1. 897366596

Chapter 5 – Section 5. Question 41

During the period of time that a local university takes phone-in registrations, calls come in at the rate of one every two minutes. a. What is the expected number of calls in one hour?

Answer: The expected number of calls in one hour is 30, because there are 60

minutes in one hour and calls come at the rate of every two minutes, then

Ex= 0. 5×60= 30 calls per hour

b. What is the probability of three calls in five minutes?

Answer: Since the calls come in at the rate of one every two minutes, there would be 2. 5 calls in 5 minutes, because µt= 1×52= 52= 2. 5

then the probability of three calls in five minutes is 0. 2138, because Px= 3= µke-µx!= 2. 53e-2. 53!= 0. 213763017

c. What is the probability of no calls in a five-minute period? Answer: The probability of no calls in a five-minute period is 0. 0821 Px= 0= µke-µx!= 2. 50e-2. 50!= 0. 082084998

Chapter 5 – Section 5. Question 43

Airline passengers arrive randomly and independently at the passenger-screening facility at a major international airport. The mean arrival rate is 10 passengers per minute. a. Compute the probability of no arrivals in a one-minute period Answer: The probability of no arrivals in a one-minute period is 0. 0000454, because Px= 0= µke-µx!= 100e-100!= 0. 0000454

b. Compute the probability that three or fewer passengers arrive in a one-minute period. Answer: The probability that three or fewer passengers arrive in a one-minute period is 0. 0103, because

Px≤3= P0+P1+P2+P3= 0. 000453999+0. 002269996+0. 007566655= 0. 01029065 where

P0= 0. 0000454 from part A

P1= µke-µx!= 101e-101!= 0. 000453999

P2= 102e-102!= 0. 002269996

P(3)= 103e-103!= 0. 007566655

c. Compute the probability of no arrivals in a 15-second period. Answer: The probability of no arrivals in a 15-second period is 0. 0821, because P0= μke-μx!= 2. 50e-2. 50!= 0. 082084998

μ= 15×1060= 2. 5 arrivals*

*Since there are 60 seconds in one minute and I have a 15-second time period d. Compute the probability of at least one arrival in a 15-second period. Answer: The probability of at least one arrival in a 15-second period is 0. 9179 Pno arrivals= 1-P0= 1-0. 082084998= 0. 917915001