ABE 463 2022/2023 SET

1. Past experience indicates that an average number of 6 customer per hour stops for gasoline@ a gasoline pump what is the probability of 3 customer or less in an hour
2. If 3% of the electric bulb manufactured by a company are defective find the probability that in a sample of 100 bulb two bulb will be defective
3. 20% of bolt produced by a mechine are defective determine the probability that out of 4 bolt chosen at random one bolt will be defective
4. Suppose x has a hypergeometric distribution with N=100, N=4 and m=20 determine the probability of x=4
5. Which of the following is possible value of correlation coefficient value & indicate the strongest linear relationship between two quantity variable
6. If 3% of the electric bulb manufactured by a company are defective find the probability that in a sample of 100 bulb six bulbs are defective
7. Using hypergeometric distribution determine the probability of picking 2 men in a sample of 6 selected at random without replacement from a group of 10 people 5 of which are men
8. If 3% of the electric bulb manufactured by a company are defective find the probability that in a sample of 100 bulb one bulb will be defective
9. If 3% of the electric bulb manufactured by a company are defective find the probability that in a sample of 100 bulb four bulbs will be defective
10. Correlation between two variable is given by r=0.0 what does it mean for the test when rho=0; Tcal=8.0; Ttab=1.7 choose the direction and decision
11. The correlation is given as r=0.00

    What does this mean

    They were a lot of questions on hypergeomtry
12. In a skewness diagram, if the left tail is longer, what does it mean?
13. Three date ABC
    a. A: 47, 48, 49...and so on
    b. B: 50,50,49....



c. C: 46....

Find the total variation

A. 11 B. 14 C. 17.5

14. What is the formula for variation between the treatment

15. Options were in words, the answer is total variantion - variation within treatments sha

16. Definition of level of significance

17. Applications of chi-square test except

18. 10 defective items are produced per hour. What is the probability that 4 or less items are defective out of the output of the items produced per hour using poisson approximation to the binomial distribution(I'm not completely sure the English is like this but the figures are correct)

19. If 3% of bulbs from a factory are defective, out of 100 bulbs produced, what is the probability that at least one will be defective?

Note: Question appeared 3 times but value for x kept on changing(at least one, none, 2 bulbs, etc bulbs)

20. 3% succes rate, 100 in total, to pick 3,to pick 10 too was there

21. And that 75, 40, 25 and total of i don't remember... 200 or something, question under chi-square, asking for expected value of each

22. Let X be a Poisson distribution with mean of 0.72. Calculate the value of P(x=2)

Note the formula $f(x) = P(X=x) = (e^{-\lambda} \lambda^{x})/x!$.

23. A police department receives an average of 5 calls/hour. What is the probability of picking 2 calls/hour in an averagely selected hour?

24. If a fair die is rolled 4 times, then what is the probability that there are exactly 2 sixes.

25. If the probability of producing a defective screw is p=0.01. what is the probability that a lot of 100 screws will a greater than 2 defective screws, using either poison or binomial distribution.

26. 10% of tools are defective. Find the probability that in a sample of 10 tools chosen at random that 2 will be defective.



27. A delegation of labour union consists of 7 men and 3 women, if four of them are selected at random to give a talk.

28. What is the probability of selecting;

(I) 3 men and 1 woman.

(II) at least 2 women.

29. A committee of 5 is to be formed among 6 Ghanians, 8 Nigerians and 5 Gambians.

In how many ways can the committee be formed if;

(I) There is no restriction

(II) at most 2 Ghanians are on the committee

(III) one Nigerian is on the committee.

30. Simplify nCr + nCr-1

Practice makes things become part of you.

Acing this course is sorely based on practice, practice and practice.

Thank YOU.



4/12/2023

ABE 463

WTE Compiled Questions

WTE COMPILED QUESTIONS

Compiled and Edited by:
WTE ADMINS

1. If a fair die is rolled 4 times, then what is the probability that there are exactly 2 sixes?

2. If the probability of producing a defective screw is p=0.01. What is the probability that a lot of 100screws will have a greater that 2 defective screw, using either Poisson or Binomial distribution?

3. 10% of tools are defective. Find the probability that in a sample of 10 tools chosen at random 2 will be defective.

4. If a fair die is rolled 4 times, then what is the probability that there are exactly 2 sixes?

5. What is T-test used for? The t-test is used when the sample size is?

6. Full meaning of ANOVA.

7. In a class of 7boys and 3girls. What is the probability of selecting exactly 2 girls?

8. The total yearly meat production for cows in a herd is assumed to be Normally distributed with μ = 220 kg and d = 40kg.
   What is the probability that the meat production for a cow chosen a will be between 180 and 270kg?

9. What is the coefficient of skewness? What's a_3?

10. An important measure of skewness using the third moment about the mean expressed in dimensionless form.

11. If a mean weight of a distribution is 180lb and its standard deviation is 15lb. Find the probability distribution if the maximum and minimum weight are 180lb and 160lb respectively.

12. In a sample of a large group of people, the mean of their weights is 180kg and variance is 15 what is the probability that when two people are chosen at random, their weights are 160kg and 180kg?

13. Meaning of null hypothesis.

WTE COMPILED QUESTIONS

14. Definition of correlation. Is correlation quantitative or qualitative?

15. Questions of rejecting null hypothesis when tcal and ttab are given.

    rho= 0 tcal= 5.something, ttab = 1. Something
    Option A: reject the null hypothesis
    Option B: Reject both the null hypothesis and alternate hypothesis...

    Reject the null hypothesis

16. Find M1 and M4 about the mean. Question is from the group data question inside the material (on moment).

17. What's the strongest R
    R = 0.65
    R = 0.60
    R = 0.10

18. Definition of F-test.

19. Correlation has the strongest linear ... something like this

20. Formula for dimensionless coefficient.

21. Definition of Skewness and Kurtosis.

22. Formula for dimensionless moment of skewness & kurtosis.

23. Formula for rth moment.

24. Then a particular question, can't really remember the question but it's options are like
A: population is greater than 30
B: population is less than 30
C: population is equal to 30

25. Formula of chi square.

26. Over weight men is greater than over women is what type of hypothesis
    a) Null hypothesis
    b) Alternative hypothesis
    c) Both null and alternative

WTE COMPILED QUESTIONS

27. A police department receives an average of 5 calls/hour. What is the probability of receiving 2calls/hour in an averagely selected hour?

28. The price of a textbook in college is the same price all over the internet is a
    a) Null hypothesis
    b) Alternative hypothesis
    c) Neither Null or alternative
    d) Both Null and alternative

29. Which one is the weakest r
    r = 0.60
    r = 0.65
    r = 0.11
    r = 0.00
    When r=0.0 (has the least strength)

30. Z score is used when data is
    A. Greater than 30
    B. Less than 30
    C. Greater than 50
    D. Less than 50

31. For what value do we use t- table (t-distribution)
    A. Greater than 30
    B. Less than 30
    C. Greater than 50
    D. Less than 50

    For what value is the t-table application
    Options: **less than 30**, greater than 30, less than 50, greater than 50

32. If an average of 2 cars enter a parking lot per minute. Find the probability that during any given minute, 4 or more cars will enter the parking lot.

33. Assuming 6 cars pass thru a toll gate per minute during rush hour, what is the probability that at most 3 cars pass through the toll gate at any given minute?

34. There was one question with mean of 8300kg standard deviation of 100kg. Calculate z smtn using a given formula.

WTE COMPILED QUESTIONS

35. Using a Hypergeometric distribution, determine the probability of drawing 3 clubs in 5cards without replacement from 5200 cards (1300 club and 3900 non club).

    N = 5200, M = 1300, n = 5, x = 3, P(x=3)

36. Average of 2 cars enter every minute. Find the problem of 4 or more cars enter in a minute.

37. Find the probability that a student weighs 270kg if the average weight is 220kg and the standard deviation is 40

38. Find m2 & m4 given

    m1' = 0.48
    m2' = 8.73
    m3' = 8.91
    m4' = 204.93

39. If 20% of the bolts produced by a machine are defective, determine the probability that, out of 4 bolts chosen at random, (a) 1, (b) 0, and (c) at most 2 bolts will be defective. If 20% of the bolts produced by a machine are defective, determine the probability that, out of 4 bolts chosen at random, (a) 1, (b) 0, and (c) at most 2 bolts will be defective.

    a) 0.4096 b) 0.4096 c) 0.9728

40. The probability that an entering student will graduate is 0.4. Determine the probability that out of 5 students, (a) none will graduate, (b) 1 will graduate, (c) at least 1 will graduate, (d) all will graduate
    a)0.07776 or about 0.08 b) 0.2592 or about 0.26 c) 0.92224 or 0.92 d) 0.01024 or about 0.01

41. Which of the following uses mean =np and S.D = sqrt (npq)
    (Ans is Probability distribution)

42. The probability of getting exactly 2 heads in 6 tosses of a fair coin (Ans =0.4167)

WTE COMPILED QUESTIONS

43. What is the probability of getting at least four heads in 6 tosses of a fair coin? (Ans= 0.34375)

44. Ten percent of the tools produced in a certain manufacturing process turn out to be defective. Find the probability that in a sample of 10 tools chosen at random exactly 2 will be defective by using (a) the binomial distribution and (b) the Poisson approximation to the binomial distribution

    a)0.1937 or 0.19 b) 0.1839 or 0.18

45. Observed 15 35 49 58 65 76 72 60 35 29 6
    Expected 13.9 27.8 41.7 55.6 69.5 83.4 69.5 55.6 41.7 27.8 13.9

    $\chi 2 = \sum (Oj - ej) 2\ j\ ej\ / = 10.34$

    P value corresponding to 10.34 is 0.411 because of the large value of P, **the throwing is fair.**

46. If 3% of the electric bulbs manufactured by a company are defective, find the probability that in a sample of 100 bulbs (a) 0, (b) 1, (c) 2, (d) 3, (e) 4, and (f) 5 bulbs will be defective

    Answers
    (a) 0.04979; (b) 0.1494; (c) 0.2241; (d) 0.2241; (e) 0.1680; (f) 0.1008.

47. Let X be a Poisson distribution with a mean of 0.72, calculate the value of P (x=2)

48. If n=12, r=0.6241; check the hypothesis to reject or accept

49. Find t_{cal} if n=20 and r= -0.971

50. When r=0 (Is it perfect +ve, perfect –ve e.t.c)

51. What is the probability of obtaining 6 when a fair dice is rolled 6 times?

52. The mean speed of a car is 65kmph, if the S.D =4 find the probability of the speed less than 60kmph

53. Determine using Poisson to approximate distribution (Binomial) n=100, p=0.01

WTE COMPILED QUESTIONS

54. Find the strongest r in the following (options; **0.85**, 0.60, 0.65 etc)

55. Condition for moderately correlated.

56. Find the probability of tossing 4 head in 6 tosses of a coin.

57. Which of the following can be described as a one-way classification or one factor experiment?

58. Each sample of water has a 10% chance of containing a particular organic pollutant. Assume that the samples are independent with regard to the presence of the pollutant. Find the probability that in the next 8 samples, exactly 2 will contain pollutant.

59. The test for hypothesis for two variables is such that rho=0, t_{cal}=6.0387, and t_{tab}=1.7709. Find whether it's a null hypothesis or an alternate hypothesis or both.

60. What is the Variation between treatment?

61. The Hypergeometric distribution has the following data:
N = 10, M = 3, n = 2, x = 2

62. Which of this don't define Engineering statistics
a) Design of engine parts ...

63. Using a Hypergeometric distribution, find the probability of picking 2 men in a sample of 6 selected at random without replacement from 10 people in which 5 are men.

There's a question groups: something like in 6, 2 are men and 4 are women... In 10, 5 are men and 5 are women.
The correct option is **0.238** if we use combination in calculator.

N = 10, M = 5 n = 6 x = 2 P(x=2)

WE COMPILED QUESTIONS

64. The Chi-square is used in all of the following except
These are the applications of chi square except...

65. If a dice is rolled 500 times. Fill in the blank space.

x	2	3	4	5	6	7	8	9	10	11	12
P(x)	1/36	2/36	3/36	4/36	5/36	?	5/36	4/36	3/36	2/36	1/36

WTE COMPILED QUESTIONS

ABE 463 2022/2023 SET

1) $\mu = 6$ $x = 3$ customers or less $P = \frac{\mu^x e^{-\mu}}{x!}$

$x = (0, 1, 2, 3)$

$P = P_0 + P_1 + P_2 + P_3$ (or use calculator)

$P_0 = \frac{6^0 e^{-6}}{0!} = 0.0025$

$P_1 = 0.0149$

$P_2 = 0.0446$

$P_3 = 0.0892$

$P = 0.0025 + 0.0149 + 0.0446 + 0.0892 = \boxed{0.1512}$

2) $P = 3\% = 0.03$, $q = 97\% = 0.97$ $P = {}^nC_x P^x q^{n-x}$

$n = 100$, $x = 2$

$P = {}^{100}C_2 \times 0.03^2 \times 0.97^{100-2}$

$= 0.2252$

3) $P = 20\% = 0.2$, $q = 80\% = 0.8$ $(q = 1 - p)$

$n = 4$, $x = 1$

$P = {}^4C_1 \times 0.2^1 \times 0.8^{4-1}$

$= 0.4096$

4) $N = 100$; $n = 4$, $m = 20$, $x = 4$

With replacement:

$F(x) = {}^nC_x \left(\frac{M}{N}\right)^x \left(1 - \frac{M}{N}\right)^{n-x}$

$= {}^{4}C_{4}\left(\frac{20}{100}\right)^{4}\left(1-\frac{20}{100}\right)^{4-4}$

$= 0.0013$

Without replacement

$F(x) = \frac{M_{C_x} \; {}^{N-M}C_{n-x}}{N_{C_n}}$

$= \frac{{}^{20}C_4 \times {}^{100-20}C_{4-4}}{{}^{100}C_4} = \frac{{}^{20}C_4 \times {}^{80}C_0}{{}^{100}C_4}$

$= 0.0012$

5)

6) $P = 3\% = 0.03$, $q = 97\% = 0.97$, $n = 100$, $x = 6$

$P = {}^{100}C_6 \times 0.03^6 \times 0.97^{100-6}$

$= 0.0496$

7) $N = 10$, $M = 5$, $n = 6$, $x = 2$

without replacement

$F(x) = \frac{{}^{5}C_2 \times {}^{10-5}C_{6-2}}{{}^{10}C_6} = \frac{{}^{5}C_2 \times {}^{5}C_4}{{}^{10}C_6}$

$= 0.2381$

8) $P = 3\% = 0.03$, $q = 97\% = 0.97$, $n = 100$, $x = 1$

$P = {}^{100}C_1 \times 0.03^1 \times 0.97^{100-1}$

$= 0.1471$

9) $P = 0.03$, $q = 0.97$, $n = 100$, $= 4$

$P = {}^{100}C_2 \times 0.03^4 \times 0.97^{100-4} = 0.1706$

10) $r = 0.0$, $rho = 0$, $T_{cal} = 8.0$, $T_{tab} = 1.7$

$t_{cal} > t_{tab}$

rejects the null hypothesis

11) when $r = 0.00$ there is no correlation

12)



Negative skewness

14) $V_B = \frac{1}{b}\sum_j T_j^2 - \frac{T^2}{n_b}$

15)

16) Level of significance :- In testing a given hypothesis the maximum probability with which we are willing to risk a type I error

17)

18)

(19) $p = 0.03$, $q = 0.97$, $n = 100$

x = at least one ($x \geq 1$)

$P(x \geq 1) = 1 - P(x < 1)$

when $x < 1$, $x = 0$

$P_0 = {}^{100}C_0 \times 0.03^0 \times 0.97^{100-0} = 0.0476$

$\therefore P(x \geq 1) = 1 - 0.0476 = \boxed{0.9524}$

20) $p = 0.03$, $q = 0.97$, $n = 100$

To pick 3 $\therefore x = 3$

$P = {}^{100}C_3 \times 0.03^3 \times 0.97^{100-3}$

$= \boxed{0.2275}$

To pick 10, $x = 10$

$P = {}^{100}C_{10} \times 0.03^{10} \times 0.97^{100-10}$

$= \boxed{0.0007}$

22) $\mu = 0.72$, $x = 2$

$f(x) = \dfrac{\mu^x e^{\mu}}{x!} = \dfrac{0.72^2 e^{-0.72}}{2!}$

$= \boxed{0.1262}$

23) $\mu = 5$, $x = 2$

$f(x) = \dfrac{5^2 e^{-5}}{2!} = 0.0842$

2.4) $n = 4$, $P(A) = \frac{1}{6}$, $q = \frac{5}{6}$, $x = 2$

$f(x) = {}^4C_2 \left(\frac{1}{6}\right)^2 \left(\frac{5}{6}\right)^{4-2}$ = **0.1157**

2.5) $P = 0.01$, $q = 1 - P = 1 - 0.01 = 0.99$, $n = 100$

$x <=$ greater than 2, $\mu = nP = 100 \times 0.01 = 1$

Poisson, $f(x) = \frac{\mu^x e^{-\mu}}{x!}$

Probability of greater than 2 = 1 − Probability of 2 or less

$x = 1, 2$

$f(1) = \frac{1^1 e^{-1}}{1} = 0.3679$

$f(2) = \frac{1^2 e^{-1}}{2} = 0.18395$

$P(x > 2) = 1 - (f(1) + f(2)) = 1 - (0.3679 + 0.18395)$

$= 1 - 0.5519$ = **0.4481**

2.6) $P = 0.1$, $q = 0.9$, $n = 10$, $x = 2$

$f(x) = {}^{10}C_2 (0.1)^2 (0.9)^{10-2}$

= **0.1937**

27 & 28) Selecting 3 men and 1 woman out of 7 men and 3 women. Total people = 10, total to be chosen = 4

$$\frac{{}^{7}C_{3} \times {}^{3}C_{1}}{{}^{10}C_{4}} = \boxed{\frac{1}{2} = 0.5}$$

Selecting at least 2 women

= Probability of selecting 2 women and 2 men + Probability of selecting 3 women and 1 man

$$= \frac{{}^{7}C_{2} \times {}^{3}C_{2}}{{}^{10}C_{4}} + \frac{{}^{7}C_{1} \times {}^{3}C_{3}}{{}^{10}C_{4}}$$

$$= \boxed{0.333}$$

29) No. to be chosen = 5, Ghanians = 6, Nigerians = 8, Gambians = 5

Total people = 19

i) No restrictions:- ${}^{19}C_{5} = \boxed{11628}$

ii) At most 2 Ghanians:-

no Ghanian + one Ghanian + two Ghanians
and 5 others and 4 others and 3 others

no of others = 8+5 = 13

$$= \binom{13}{5} + \left({}^{6}C_{1} \times {}^{13}C_{4}\right) + \left({}^{6}C_{2} \times {}^{13}C_{3}\right)$$

$$= \boxed{9867}$$

iii) One Nigerian and 4 others

no of others = 6 + 5 = 11

$$= {}^{8}C_{1} \times {}^{11}C_{4}$$

$$= \boxed{2640}$$

• Now,

$$^{n}C_{r} + {}^{n}C_{r-1}$$

$$= \frac{n!}{r!(n-r)!} + \frac{n!}{(r-1)!(n-r+1)!}$$

$$= \frac{n!}{(r-1)!(n-r)!}\left[\frac{1}{r} + \frac{1}{(n-r+1)}\right]$$

$$= \frac{n!}{(r-1)!(n-r)!}\left[\frac{(n+1)}{r(n-r+1)}\right]$$

$$= \frac{(n+1)!}{r!(n-r+1)!} = \boxed{{}^{(n+1)}C_{r}}$$

1) $P(6) = 1/6$.

n = number of rolls = 4

$q = 5/6$

$= {}^{n}C_x (P)^x (q)^{n-x}$

x = exactly 2.

$= {}^{4}C_2 \left(\frac{1}{6}\right)^2 \left(\frac{5}{6}\right)^2$

$= 25 \times 0.1157$

216

2) $P = 0.01$

$q = 1 - P = 1 - 0.01$

$q = 0.99$

$n = 100$ screws

x = greater than '2' defective screw.

Using Poisson or Binomial Expansion.

Solution.

$\mu = np$

$= 100 \times 0.01$

$= 1$

Poisson, $f(x) = \frac{\mu^x e^{-\mu}}{x!}$

for $x = 0, 1, 2$:

for x greater than 2 = 1 − x lesser than 2

$$P(x > 2) = 1 - P(x < 2)$$

$$P(x < 2) = \text{sum } 1 \text{ to } 2.$$

$$f(x) \text{ at } x = 0 = \frac{4^0 e^{-4}}{0!} = \frac{1^0 \times e^{-1}}{0!}$$

$$F(x) = \frac{1^0 \times e^{-1}}{0!} + \frac{1^1 \times e^{-1}}{1!} + \frac{1^2 \times e^{-1}}{2!}$$

$$= e^{-1}\left[\frac{1^0}{0!} + \frac{1^1}{1!} + \frac{1^2}{2!}\right]$$

$$= 0.3679\, e^{-1}\left[1 + 1 + \frac{1}{2}\right]$$

$$= e^{-1}\left[\frac{3}{2}\right]$$

$$P(x < 2) = 0.5519$$

$$P(x > 2) = 1 - P(x < 2)$$

$$= 1 - 0.5519$$

$$= 0.4481$$

$$\approx 0.45$$

3) $P(x) = {}^nC_x\, p^x\, q^{n-x}$

$n = 10$ | $x = 2$

$p = 10\% = 0.1$

$q = 90\% = 0.9$

$= {}^{10}C_2 (0.1)^2 (0.9)^8$

$= 0.1937$

4) Same as 1

5) T-test is used to compare the means of 2 groups.

T-test is used when sample size is small.

6) ANOVA → Analysis of variance.

7) Boys = 7 $P(B) = 7/10$

Girls = 3 $P(G) = 3/10$

x = Exactly 12 girls

$= {}^nC_x (P)^x (1-P)^{n-x}$

$= {}^{10}C_2 (3/10)^2 (7/10)^8$

$= 0.2335$

8) $\mu = 220kg$

$\sigma = 40kg$

x = Between 180kg and 270kg.

Solution.

$$Z = \frac{x - \mu}{\sigma}$$

$Z_1 = \frac{180 - 220}{40} = \frac{-40}{40} = -1$

$Z_1 = -1$

$Z_2 = \frac{270 - 220}{40} = \frac{50}{40} = 1.25$

$Z_2 = 1.25$

From table

Z_1 on table gives $\rightarrow 0.1587$

$Z_2 \rightarrow 0.8944$

$Z_2 - Z_1 = 0.8944 - 0.1587$

$P = 0.7357$

9) Coefficient of skewness is a measure of the degree of asymetry of a probability distribution.

10)

11) $\mu = 1806$

$\sigma = 156$

Minimum $= 1806$

Maximum $= 1806$

from calculator.

$P = 0.4088$

12) Similar to 11 but variance = 15

S.D = $\sqrt{15}$ ∴ P = 0.4999

13) Null hypothesis is a statement that assumes there is no significant difference between two populations or two sets of data

14) Correlation is a statistical measure that describes the strength and direction of a relationship between two variables.

1 Correlation is a quantitative

15) $g = 0$

$t_{cal} = 5$

$t_{tab} = 1$

$t_{cal} > t_{tab}$ → reject the null hypothesis

16)

Height (in)	Class mark (x)	frequency (f)
60 - 62	61	5
63 - 65	64	18
66 - 68	67	42
69 - 71	70	27
72 - 74	73	8

Solution.

X	$u = \frac{X-A}{c}$	f	fu	fu^2	fu^3	fu^4
61	-2	5	-10	20	-40	80
64	-1	18	-18	18	-18	18
A-67	0	42	0	0	0	0
70	1	27	27	27	27	27
73	2	8	16	32	67	128
Σ		100	15	97	33	253

$$m_1' = c\frac{\Sigma fu}{N} = 3 \times \left(\frac{15}{100}\right) = 0.45$$

$$m_2' = c^2\frac{\Sigma fu^2}{N} = 3^2 \times \left(\frac{97}{100}\right) = 8.73$$

$$m_3' = c^3\left(\frac{\Sigma fu^3}{n}\right) = 3^3 \times \left(\frac{33}{100}\right) = 8.91$$

$$m_4' = c^4\left(\frac{\Sigma fu^4}{N}\right) = 3^4 \times \left(\frac{253}{100}\right) = 204.93$$

Thus $M_1 = 0$

$M_2 = m_2' - (m_1')^2 = 8.73 - (0.45)^2 =$

$M_2 = 8.5275$

$M_3 = m_3' - 3m_1'm_2' + 2(m_1')^3 = 8.91 - 3(8.73 \times 0.45) + 2(0.45)^3$; $M_3 = -2.69325$

$M_4 = m_4' - 4m_1'm_3' + 6(m_1')^2m_2' - 3(m_1')^4$

$= 204.93 - 4(0.45 \times 8.91) + 6(0.45^2 \times 8.73) - 3(0.45^4)$

$M_4 = 199.3759$

$M_1 = 0$

$M_4 = 199.37559$

$M_2 = 8.5275$

$M_3 = -2.69325$

17) Which is the strongest R.

$R = 0.65$

$R = 0.60$

$R = 0.40$

18) F-test is a statistical test that is used to compare the variance of two populations. It is also used to determine whether the means of several groups are equal.

19) Correlation has the strongest linear relationship between two variables.

20) Dimensionless skewness $= a_3 = \frac{M_3}{S^3} = \frac{M_3}{(\sqrt{M_2})^3}$

21) Skewness is the degree of asymmetry of a distribution.

Kurtosis is the degree of peakedness of a distribution.

22) Dimensionless moments (of kurtosis) $= a_4 = \frac{M_4}{S^4} = \frac{M_4}{(\sqrt{M_2})^4}$

$$a_4 = \frac{M_4}{M_2^2}$$

23) For moment $\Rightarrow$ $19r = \frac{Mr}{S^r} = \frac{M_r}{(\sqrt{M_2})^r}$

24)

25) $X^2 = \sum \frac{(O-E)^2}{E}$ $\Rightarrow$ Chi-square

26) Alternative hypothesis.

27) $F(x) = \frac{\mu^x e^{-\mu}}{x!}$ $\rightarrow$ Poisson's distribution

$\mu = 5$ (calls per hour)

$x = 2$

$= \frac{5^2 e^{-5}(1)}{2!} =$

$f(x) = 0.08422$

28) Null hypothesis.

29) Weakest $r \rightarrow r = 0.00$ (least strength

30) Z score is used when data is greater than 30

31) T-table is used when data is less than 30.

32) $\mu = 2$ cars per minute

$x =$ greater than 4 cars.

Solution.

$P(x > 4) = 1 - P(x < 4)$

$P(x < 4) = 0, 1, 2, 3$

From calculator:

$P = 0.14287$

33) $\mu = 6$

x = at most 3 cars $= 0, 1, 2, 3$

from calculator using Poisson distribution.

$P = 0.1513$

34) hypergeometric distribution

$$P(x = k) = \frac{\binom{K}{k}\binom{N-K}{n-k}}{\binom{N}{n}}$$

where N = population size

K = number of success states in the population

n = number of draws:

k = number of successes

$\binom{a}{b}$ = binomial coefficient

$$= \frac{\binom{M}{x}\binom{N-M}{n-x}}{\binom{N}{n}}$$

$N = 5200$ cards

$M = 1300$ clubs

$n = 5$ cards → number of draws.

$x = 3$ clubs

$$P(x) = \frac{{}_{1300}C_3 \times {}_{5200-1300}C_{5-3}}{{}_{5200}C_5}$$

$$= 0.08783$$

36) Same as 32

37) $x = 270\text{kg}$

Average weight, $\mu = 220\text{kg}$

$\sigma = 40\text{kg}$

Solution:

From calculator

$P = 4.566 \times 10^{-3}$ *

$$Z = \frac{x - \mu}{\sigma} = \frac{270 - 220}{40} = 1.25$$

from table → $P = 0.8944$

38) $m_1 = 0$

$m_2 = 8.52$

$m_3 = -2.69$

$m_4 = 199.37$

39) $P = 20\% = 0.2$

$q = 80\% = 0.8$

$n = 4$.

Solution:

i) P(1 book will be defective)

$x = 1$

$= {}^nC_x \, P^x \, q^{n-x}$

$= {}^4C_1 (0.2)^1 (0.8)^3$

$= 0.4096$

ii) P(0 books will be defective):

$x = 0$

$= {}^4C_0 (0.2)^0 (0.8)^4$

$= 0.4096$

iii) P(at most 2 will be defective) $\Rightarrow x = 0, 1, 2.$

$P(x) = P(0) + P(1) + P(2)$

$P(2) = {}^4C_2 (0.2)^2 (0.8)^2 = 0.1536$

P(at most 2) $= 0.4096 + 0.4096 + 0.1536$

$= 0.9728$

40) $P = 0.4$

$q = 0.6$

$n = 5$.

i) P(none will graduate) $\rightarrow x = 0$

$= {}^nC_x \, p^x \, q^{n-x}$

$= {}^5C_0 \, (0.4)^0 (0.6)^5$

$= 0.07776$.

ii) P(1 will graduate) $\rightarrow x = 1$

$= {}^5C_1 \, (0.4)^1 (0.6)^4$

$= 0.2592$

iii) P(at least 1 will graduate) $\rightarrow P(x \geq 1)$

$= 1 - P(x \leq 1)$

$P(x \leq 1) = x = 0 + x = 1$

$= 0.07776 + 0.2592$

$= 0.33696$ $\quad 1 - 0.07776$

$= 1 - 0.33696 = 0.92224$

iv) P(all will graduate) $\Rightarrow x = 5$

${}^5C_5 \, (0.4)^5 (0.6)^0$

$= 0.01024$

41) Probability distribution.

Mean = np

S.D = $\sqrt{npqr}$

42) $n = 6$

x = exactly 2

And $p = 1/2$

$q = 1/2$

$P(x) = {}^6C_2 (1/2)^2 (1/2)^4$

$= 15/64 = \text{Nearly } 0.2344$

43) P(at least 4) head in a 6 tosses of a fair coin.

Solution.

$n = 6$. $P = 1/2$; $q = 1/2$

x = at least 4

P(at least 4) = $P(x \geq 4)$

$x = 4, 5, 6$

$P(4) + P(5) + P(6)$

$P(x) = {}^nC_x p^x q^{n-x}$

${}^6C_4 (1/2)^4 (1/2)^2 + {}^6C_5 (1/2)^5 (1/2)^1 + {}^6C_6 (1/2)^6$

$= 0.34375$

44) $P = 10\% = 0.1$

$q = 90\% = 0.9$

$n = 10$ $x =$ exactly 2.

a) Use Binomial distribution

b) Poisson distribution.

Solution.

a) ${}^nC_x\, p^x q^{n-x}$

$= {}^{10}C_2 (0.1)^2 (0.9)^8$

$= 0.1937$

b) Mean, $\mu = np = 10 \times 0.1 = 1$

$= \frac{\mu^x e^{-\mu}}{x!}$

$= \frac{1^2 \times e^{-1}}{2!}$

$= 0.1839$

45) $X^2 = \frac{\sum (O^n - E^n)^2}{E}$

$X^2 = 10.34$

Corresponding P value $= 0.411$. The guessing is fair

46) $P = 3\% = 0.03$

$q = 0.97$

$n = 100$

a) 0 (b) 1 (c) 2 (d) 3 up to 5 number

defective.

Solution:

a) $x = 0$

$P(x) = {}^{n}C_x \, p^x \, q^{n-x}$

$= {}^{100}C_0 \, (0.03)^0 \, (0.97)^{100}$

$= 0.04755$

b) $x = 1$

$P(x) = 0.14707$

c) $x = 2$

$P(x) = 0.2252$

d) $x = 3$

$P(x) = 0.2275$

e) $x = 4$

$P(x) = 0.1706$

f) $x = 5$

$P(x) = 0.1013$

47) $\mu = 0.72$

$x = 2$

$$P(x) = \frac{\mu^x e^{-\mu}}{x!}$$

$$= \frac{0.72^2 \times e^{-0.72}}{2!}$$

$$P(x) = 0.1262$$

48) $n = 12$

$r = 0.6241$

Check the hypothesis to accept or reject.

Solution:

$$t_{cal} = \frac{r - B}{\sqrt{\frac{1 - r^2}{n - 2}}}$$

$$= \frac{0.6241 - 0}{\sqrt{\frac{1 - 0.6241^2}{12 - 2}}}$$

$df = n - 2$

$df = 10$

$t_{cal} = 2.5259$

49) find t_{cal} if $n = 20$ and $r = -0.971$

$$t_{cal} = \frac{-0.971 - 0}{\sqrt{\frac{1 - (-0.971)^2}{20 - 2}}}$$

$$t_{cal} = -17.2311$$

50)

51) Probability of obtaining 6 when a fair die is rolled 6 times.

Solution.

$P(6) = 1/6$

$q(6) = 5/6$

$n = 6$

$x = 1$

$= {}^{n}C_x P^x q^{n-x}$

$= {}^{6}C_1 (1/6)^1 (5/6)^5$

$= 0.4019$

$= 0.40187$

52) $\mu = 65$

$S.D = \sigma = 4$

Find x = less than 60

Solution.

$P(x) = \dfrac{x - \mu}{\sigma}$

$Z = \dfrac{60 - 65}{4} = -1.25$

P value = 0.1056

53) $n = 100$

$p = 0.01$

$\mu = np = 1$

$P(x) = \frac{\mu^x e^{-\mu}}{x!}$

$\Rightarrow$ Same as Q2.

54) Strongest $r \rightarrow 0.85$

55)

56) Same Q3. 1.43

57)

58) $p = 10\% = 0.1$

$n = 8$

$q = 0.9$

$x = 2$

$= {}^8C_2 (0.1)^2 (0.9)^6$

$P(x) = 0.1488$

59) $t_{cal} = 6.0887$

$t_{tab} = 1.7709$

$t_{cal} > t_{tab} \rightarrow$ reject Null hypothesis

60)

61) Hypergeometric distribution

$N = 10 \quad n = 2$

$M = 3 \quad x = 2$

Solution:

$$\frac{\binom{M}{x} \times \binom{N-M}{n-x}}{\binom{N}{n}}$$

$$= \frac{{}^{3}C_2 \times {}^{7}C_0}{{}^{10}C_2}$$

$$= 1/15$$

62)

63)

$N = 10$ → Population size

$M = 5$ → number of success states.

$n = 6$ → number of draws selected at random

$x = 2$ → number of success that is desired

$$= \frac{{}^{M}C_{x} \times {}^{N-m}C_{n-x}}{{}^{N}C_{n}}$$

$$= \frac{{}^{5}C_{2} \times {}^{10-5}C_{6-2}}{{}^{10}C_{6}}$$

$$= 5/21 \qquad = 0.2381$$

64) Applications of Chi-square

65) $7 \rightarrow 6/36$