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MAIN EXAMINATION

JANUARY – APRIL 2018 TRIMESTER

FACULTY OF COMMERCE

DEPARTMENT OF ACCOUNTING AND FINANCE

REGULAR PROGRAMME

CMS 311: BUSINESS STATISTICS

Date: APRIL 2018	**Duration: 2 Hours**
INSTRUCTIONS: Answer Question ONE and ANY OTHER TWO Questions	

Q1. I) In each of the 4 races, the democrats have 60% chance of winning. Assuming that the races are independent of each other, what is the probability that:

a) The Democrats will win 0 races, 1 race, 2 races, 3 races, or 4 races? **(8 marks)**

b) The Democrats will win at least 1 race. **(4 marks)**

c) The Democrats will win a majority of the races. **(4 marks)**

II) A discrete random variable (RV) has the following Probability Distribution:

X	1	2	4	5	8
Pr(x)	0.20	0.25		0.30	0.10

Required:

a) Find the Pr(4) **(2 marks)**
b) Find the ((Pr(x) = 2) or (Pr(x) = 4)). **(2 marks)**
c) Find the Pr($x \leq 4$) **(2 marks)**
d) Find the Pr($x < 4$) **(2 marks)**

III) The Regional Chairman of the Muscular Dystrophy Association is typing to estimate the amount each caller will pledge during the annual MDA

telethon. Using data gathered over the past 10 years, she has computed the following probabilities of various pledge amounts. Draw a graph illustrating this probability distribution: **(6 marks)**

Dollar pledge	25	50	75	100	125
probability	0.45	0.25	0.15	0.10	0.05

Q2. An insurance salesperson sells an average of 1.4 policies per day.

a) Using the Poisson formula, find the probability that this salesperson will sell no insurance policy on a certain day. **(5 marks)**

b) Let x denote the number of insurance policies that this salesperson will sell on a given day. Using the Poisson probabilities table, write the probability distribution of x. **(5 marks)**

c) Find the mean, variance, and standard deviation of the probability distribution developed in part b. **(10 marks)**

Q3. a) The ages of all students in a class is normally distributed. The 95 percent of total data is between the age 15.6 and 18.4. Find the mean and standard deviation of the given data. **(5 marks)**

b) If mean of a given data for a random value is 81.1 and standard deviation is 4.7, then find the probability of getting a value more than 83. **(5 marks)**

c) The average speed of a car is 65 kmph with a standard deviation of 4. Find the probability that the speed is less than 60 kmph. **(5 marks)**

d) The average score of a statistics test for a class is 85 and standard deviation is 10. Find the probability of a random score falling between 75 and 95. **(5 marks)**

Q4. a) Suppose the training-program director wants to know the probability that a particular chosen at random would require between 550 and 650 hours to complete the required work. **(5 marks)**

b) Find the mean, variance, and standard deviation for the number of sixes that appear when rolling 30 dice. **(5 marks)**

c) If there are 500 customers per eight-hour day in a check-out lane, what is the probability that there will be exactly 3 in line during any five-minute period**?** **(5 marks)**

d) Candidates A, B, C and D are running for office. Vote for two, what are the possible combinations. **(2.5 marks)**

e) There are 100 applicants for 3 jobs openings. Indicate your first, second and third choices. **(2.5 marks)**

CMS 311 BUSINESS STATISTICS FORMULAE

PARAMETERS

- Population mean = $\mu = (\Sigma X_i) / N$
- Population standard deviation = $\sigma = \text{sqrt} [\Sigma (X_i - \mu)^2 / N]$
- Population variance = $\sigma^2 = \Sigma (X_i - \mu)^2 / N$
- Variance of population proportion = $\sigma_P^2 = PQ / n$
- Standardized score = $Z = (X - \mu) / \sigma$

Statistics

Unless otherwise noted, these formulas assume simple random sampling.

- Sample mean = $x = (\Sigma x_i) / n$
- Sample standard deviation = $s = \text{sqrt} [\Sigma (x_i - x)^2 / (n - 1)]$
- Sample variance = $s^2 = \Sigma (x_i - x)^2 / (n - 1)$
- Variance of sample proportion = $s_p^2 = pq / (n - 1)$

Counting

- n factorial: $n! = n * (n-1) * (n - 2) * . . . * 3 * 2 * 1$. By convention, $0! = 1$.
- Permutations of *n* things, taken *r* at a time: ${}_nP_r = n! / (n - r)!$
- Combinations of *n* things, taken *r* at a time: ${}_nC_r = n! / r!(n - r)! = {}_nP_r / r!$

Probability

- Rule of addition: $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
- Rule of multiplication: $P(A \cap B) = P(A)\, P(B|A)$
- Rule of subtraction: $P(A') = 1 - P(A)$

Random Variables

In the following formulas, *X* and *Y* are random variables, and *a* and *b* are constants.

- Expected value of X = $E(X) = \mu_x = \Sigma [x_i * P(x_i)]$
- Variance of X = $\text{Var}(X) = \sigma^2 = \Sigma [x_i - E(x)]^2 * P(x_i) = \Sigma [x_i - \mu_x]^2 * P(x_i)$
- Normal random variable = z-score = $z = (X - \mu)/\sigma$
- Chi-square statistic = $X^2 = [(n - 1) * s^2] / \sigma^2$
- f statistic = $f = [s_1^2/\sigma_1^2] / [s_2^2/\sigma_2^2]$
- Expected value of sum of random variables = $E(X + Y) = E(X) + E(Y)$
- Expected value of difference between random variables = $E(X - Y) = E(X) - E(Y)$

Sampling Distributions

- Mean of sampling distribution of the mean = $\mu_x = \mu$
- Mean of sampling distribution of the proportion = $\mu_p = P$
- Standard deviation of proportion = σ_p = sqrt[P * (1 - P)/n] = sqrt(PQ / n)
- Standard deviation of the mean = $\sigma_x = \sigma/\text{sqrt}(n)$
- Standard deviation of difference of sample means = σ_d = sqrt[$(\sigma_1^2 / n_1) + (\sigma_2^2 / n_2)$]

Standard Error

- Standard error of proportion = $SE_p = s_p$ = sqrt[p * (1 - p)/n] = sqrt(pq / n)
- Standard error of difference for proportions = $SE_p = s_p$ = sqrt{ p * (1 - p) * [$(1/n_1) + (1/n_2)$] }
- Standard error of the mean = $SE_x = s_x = s/\text{sqrt}(n)$
- Standard error of difference of sample means = $SE_d = s_d$ = sqrt[$(s_1^2 / n_1) + (s_2^2 / n_2)$]
- Standard error of difference of paired sample means = $SE_d = s_d$ = { sqrt [$(\Sigma(d_i - d)^2 / (n - 1)$] } / sqrt(n)

Discrete Probability Distributions

- Binomial formula: $P(X = x) = b(x; n, P) = {}_nC_x * P^x * (1 - P)^{n - x} = {}_nC_x * P^x * Q^{n - x}$
- Mean of binomial distribution = $\mu_x = n * P$
- Variance of binomial distribution = $\sigma_x^2 = n * P * (1 - P)$
- Negative Binomial formula: $P(X = x) = b^*(x; r, P) = {}_{x-1}C_{r-1} * P^r * (1 - P)^{x - r}$
- Mean of negative binomial distribution = $\mu_x = rQ / P$
- Variance of negative binomial distribution = $\sigma_x^2 = r * Q / P^2$
- Poisson formula: $P(x; \mu) = (e^{-\mu}) (\mu^x) / x!$
- Mean of Poisson distribution = $\mu_x = \mu$
- Variance of Poisson distribution = $\sigma_x^2 = \mu$

Multinomial formula: $P = [n! / (n_1! * n_2! * ... n_k!)] * (p_1^{n_1} * p_2^{n_2} * . . . * p_k^{n_k})$

END