Final Exam Review

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Final Exam Review

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DEPARTMENT OF MATHEMATICS

Description of Final Exam

- 24 multiple choice questions
- Questions 1 - 22 worth 4 points, questions 23 & 24 worth 6 points.
- Have 110 minutes (1 hour 50 minutes) to take the exam.

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Discrete Probability Distribution

A random varaible X has a probabiltiy distribution as follows:

X	0	1	2	3
P(X)	$2k$	$3k$	$6k$	$4k$

1. What is the value of k?

2. Calculate the mean and variance.

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Expected Values and Variances

Rainwater was collected in water collectors at thirty different sites near an industrial basin and the amount of acidity (pH level) was measured. The mean and standard deviation of the values are 5.2 and 1.8 respectively. When the pH meter was recalibrated back at the laboratory, it was found to be in error. The error can be corrected by adding 0.2 pH units to all of the values and then multiply the result by 1.2. Find the mean and standard deviation of the corrected pH measurements.

Probabilities of Events

Given:

$$P(E) = 0.35,\ P(F) = 0.54, \text{and } P(E \cup F) = 0.62$$

1. Find $P(E \cap F)$.

2. Find $P(E|F)$.

3. Find $P(F|E)$.

4. Are the events E and F independent?

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Conditional Probabilities

The probability that a student correctly answers on the first try (the event A) is P(A) = 0.3. If the student answers incorrectly on the first try, the student is allowed a second try to correctly answer the question (the event B). The probability that the student answers correctly on the second try given that he answered incorrectly on the first try is 0.4. Find the probability that the student correctly answers the question on the first or second try.

Geometric Distribution

A quarter back completes 34% of his passes. We want to observe this quarterback during one game to see how many pass attempts he makes before completing one pass. Determine the probability that it takes more than 15 attempts before he completes a pass.

Binomial Distribution

Suppose that in a large metropolitan area, 80% of all households have a flat screen television. Suppose you are interested in selecting a group of six households from this area. Let X be the number of households in a group of six households from this area that have a flat screen television.

1. For what proportion of groups will exactly four of the six households have a flat screen television?

2. For what proportion of groups will at most two of the households have a flat screen television?

3. What is the expected number of households that have a flat screen television?

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Normal Distribution

The length of time needed to complete a certain test is normally distributed with mean 77 minutes and standard deviation 11 minutes. Find the probability that it will take between 74 and 80 minutes to complete the test.

More Normal Distribution

Part a: Let Z be the standard normal random variable. Calculate the following.

1. $P(Z < 2.4) =$

2. $P(Z > -1.9) =$

3. Find c such that $P(Z > c) = 0.98$

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More Normal Distribution

Part b: Let X be a normal random variable with a mean of 47 and a standard deviation of 3. Calculate the following.

1. $P(X < 50.4) =$

2. $P(43.5 < X < 50.4) =$

3. Find x such that $P(X < x) = 0.74$

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Sampling Distribution of $\bar{X}$

1. Suppose a random sample of 70 measurements is selected from a population with a mean of 35 and a variance of 300. Determine the mean and standard error of $\bar{x}$.

2. A random sample of 1024 12-ounce cans of fruit nectar is drawn from among all cans produced in a run. Prior experience has shown that the distribution of the contents has a mean of 12 ounces and a standard deviation of 0.12 ounce. What is the probability that the mean contents of the 1024 sample cans is less than 11.994 ounces?

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Sampling Distribution of $\hat{p}$

1. In a large population, 67% of the households have cable tv. A simple random sample of 256 households is to be contacted and the sample proportion computed. What is the mean and standard deviation (standard error) of the sampling distribution of the sample proportions?

2. What is the probability that the sampling distribution of sample porportions is less than 73%?

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LSLR

Given the following data:

x	5	5	11	12	15	19
y	24	28	30	42	26	44

1. Determine the LSRL for the given data.

2. Determine the correlation coefficient for the data.

3. Find the residual value for X = 11.

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Two-Way Table

The following two-way table describes the preferences in movies and fast food restaurants for a random sample of 100 people.

	McDonalds	Taco Bell	Wendy's
Iron Man	20	12	8
Dispicable Me	12	7	9
Harry Potter	6	14	12

1. What percent of people in the sample like the movie Dispicable Me?

2. What percent of the Dispicable Me lovers also like McDonald's?

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Confidence Intervals

1. A random sample of 64 observations produced a mean value of 73 and standard deviation of 6.5. Determine a 90% confidence interval for the population mean μ.

2. A random sample of 121 observations produced a sample proportion 35%. Determine an approximate 95% confidence interval for the population proportion.

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Which Test?

Identify the most appropriate test to use for the following situations.

1. A national computer retailer believes that the average sales are greater for salespersons with a college degree. A random sample of 14 salespersons with a degree had an average weekly sale of $3542 last year, while 17 salespersons without a college degree averaged $3301 in weekly sales. The standard deviations were $468 and $642 respectively. Is there evidence to support the retailer's belief?

2. Quart cartons of milk should contain at least 32 ounces. A sample of 22 cartons was taken and amount of milk in ounces was recorded. We would like to determine if there is sufficient evidence exist to conclude the mean amount of milk in cartons is less than 32 ounces?

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Which Test?

Identify the most appropriate test to use for the following situations.

1. In a experiment on relaxation techniques, subject's brain signals were measured before and after the relaxation exercises. We wish to determine if the relaxation exercise slowed the brain waves.

2. A private and a public university are located in the same city. For the private university, 1046 alumni were surveyed and 653 said that they attended at least one class reunion. For the public university, 791 out of 1327 sampled alumni claimed they have attended at least one class reunion. Is the difference in the sample proportions statistically significant?

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Hypothesis Tests

A national computer retailer believes that the average sales are greater for salespersons with a college degree. A random sample of 35 salespersons with a degree had an average weekly sale of $3666 last year, while 32 salespersons without a college degree averaged $3344 in weekly sales. The standard deviations were $468 and $642 respectively. Is there evidence at the 5% level to support the retailer's belief?

1. Determine the null and alternative hypothesis.

2. Calculate the test statistic for this test.

3. Determine the p-value.

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Matched Pair Test

In a experiment on relaxation techniques, subject's brain signals were measured before and after the relaxation exercises with the following results:

Person	1	2	3	4	5
Before	32	38	65	50	30
After	25	35	56	52	24

Is there sufficient evidence to suggest that the relaxation exercise slowed the brain waves? Assume the population is normally distributed.

1. Calculate the test statistic for this test.

2. Determine the p-value.

3. Give the decision to Reject H_0 or Fail to Reject H_0.

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Chi-Square Test

The Blue Diamond Company advertises that their nut mix contains (by weight) 40% cashews, 15% Brazil nuts, 20% almonds and only 25% peanuts. The truth-in-advertising investigators took a random sample (of size 20 lbs) of the nut mix and found the distribution to be as follows: 6 lbs of Cashews, 3 lbs of Brazil nuts, 5 lbs of Almonds and 6 lbs of Peanuts. At the 0.01 level of significance, is the claim made by Blue Diamond true?

1. Calculate the test statistic for this test.

2. Determine the p-value.

3. Give the decision to Reject H_0 or Fail to Reject H_0.

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