Math 1040 Final Exam Form A   Introduction to Statistics   Fall Semester 2010

Instructor_________________________   Name_________________________

Time Limit: 120 minutes

Any calculator is okay. Necessary tables and formulas are attached to the back of the exam. All problems are weighted equally.

Computers, cell phones and hand-held devices other than calculators are not allowed. Students may not bring notes, formulas or tables into the exam.

This exam has two parts
- **Part I - Ten multiple choice questions**
- **Part II - Ten open ended questions**

INSTRUCTIONS PART I: Questions 1 - 10, Multiple Choice. Answer all TEN questions and circle the correct answer. It is not necessary to show work. There will be no partial credit awarded on this part of the exam.

1) A sample consists of every 35th worker from a group of 4000 workers. What sampling technique was used?

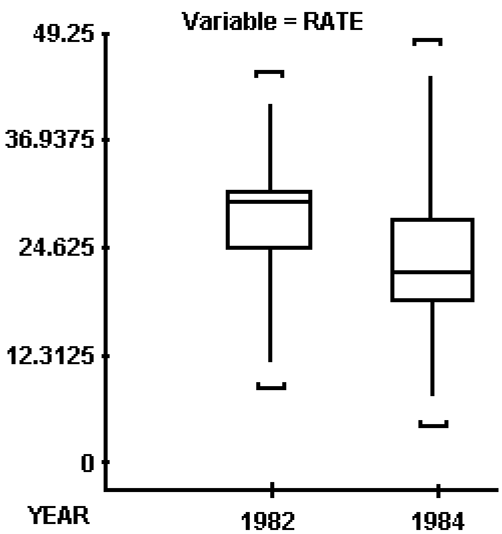
A) convenience
B) cluster
C) systematic
D) stratified
E) random

2) The amount of television viewed by today's youth is of primary concern to Parents Against Watching Television (PAWT). 300 parents of elementary school–aged children were asked to estimate the number of hours per week that their child watched television. The mean and the standard deviation for their responses were 16 and 4, respectively. PAWT constructed a stem–and–leaf display for the data that showed that the distribution of times was a bell–shaped distribution. Give an interval around the mean where you believe most (approximately 95%) of the television viewing times fell in the distribution.

A) less than 12 and more than 20 hours per week
B) between 12 and 20 hours per week
C) between 4 and 28 hours per week
D) between 8 and 24 hours per week

3) SAS was used to compare the high school dropout rates for the 50 states in 1982 and 1984. The box plots generated for these dropout rates are shown below.

Compare the center of the distributions and the variation of the distributions for the two years.



A) Dropout rates had a higher average with more variability in 1982 than in 1984.
B) Dropout rates had a higher average with less variability in 1982 than in 1984.
C) Dropout rates had a lower average with less variability in 1982 than in 1984.
D) Dropout rates had a lower average with more variability in 1982 than in 1984.

4) The table below describes the smoking habits of a group of asthma sufferers.

	Nonsmoker	Occasional smoker	Regular smoker	Heavy smoker	Total
Men	433	42	71	37	583
Women	326	47	78	39	490
Total	759	89	149	76	1073

If one of the 1073 people is randomly selected, find the probability that the person is a man or a heavy smoker.

A) 0.614
B) 0.487
C) 0.545
D) 0.580

5) An unprepared student makes random guesses for the ten true–false questions on a quiz. Find the probability that there is at least one correct answer.

A) $\frac{1}{10}$

B) $\frac{1,023}{1,024}$

C) $\frac{1}{1,024}$

D) $\frac{9}{10}$

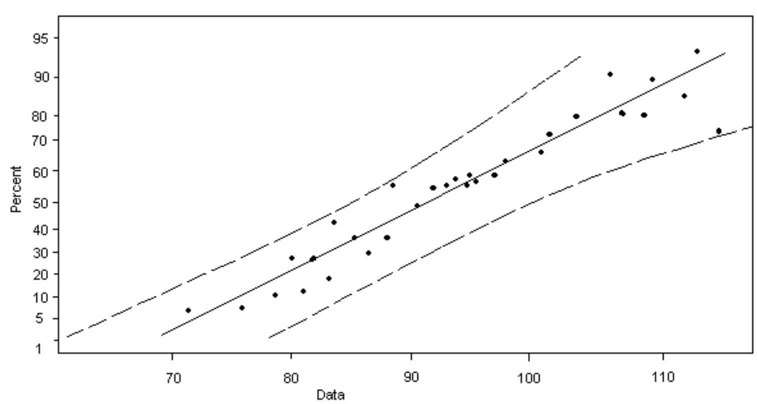
6) A contractor is considering a sale that promises a profit of $23,000 with a probability of 0.7 or a loss (due to bad weather, strikes, and such) of $13,000 with a probability of 0.3. What is the expected profit?

A) $12,200
B) $10,000
C) $16,100
D) $25,200

7) Find the z–scores for which 90% of the distribution's area lies between –z and z.

A) (–0.99, 0.99)
B) (–2.33, 2.33)
C) (–1.96, 1.96)
D) (–1.645, 1.645)

8) Determine whether the following normal probability plot indicates that the sample data could have come from a population that is normally distributed.



A) not normally distributed
B) normally distributed

9) The grade point averages for 10 randomly selected students in an algebra class with 125 students are listed below. What is the effect on the width of the confidence interval for the mean GPA if the sample size is increased to 20?

2.0 3.2 1.8 2.9 0.9 4.0 3.3 2.9 3.6 0.8

A) The width decreases.
B) It is impossible to tell without more information.
C) The width remains the same.
D) The width increases.

10) Construct a 95% confidence interval for the population mean, μ. Assume the population has a normal distribution. A sample of 25 randomly English majors has a mean test score of 81.5 with a standard deviation of 10.2.

A) (77.29, 85.71)
B) (87.12, 98.32)
C) (66.35, 69.89)
D) (77.50, 85.50)

INSTRUCTIONS PART II: Questions 11 - 20, Short Response. Answer all TEN questions carefully and completely, showing your work and clearly indicating your answer.

11) Researchers investigating the impact of prenatal care on newborn health kept track of the mother's age, the number of weeks the pregnancy lasted, the type of birth (cesarean, induced, natural), the level of prenatal care the mother had (none, minimal, adequate), the birth weight and gender of the baby, and whether the baby exhibited health problems (none, minor, major).

Classify each variable as qualitative or quantitative and, for any quantitative variable, identify the units in which it was measured (or note that they were not provided).

variables *(list below)*	qualitative or quantitative	units

12) Twenty–four workers were surveyed about how long it takes them to travel to work each day. The data below are given in minutes.

20 35 42 52 65 20 60 49 24 37 23 24
22 20 41 25 28 27 50 47 58 30 32 48

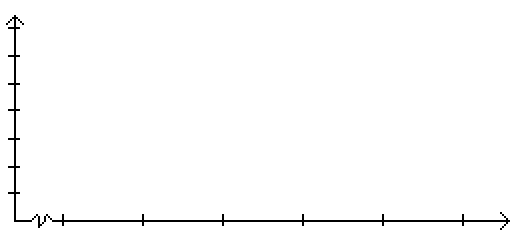
Use the data to create a sorted stem–and–leaf plot. Identify the shape of the distribution from your stem–and–leaf plot.

stem–and leaf plot:

shape of the distribution ______________________________

13) In a survey, 20 people were asked how many magazines they had purchased during the previous year. The results are shown below. Construct a histogram to represent the data. Use 4 classes with a class width of 10, and begin with a lower class limit of 1. Label the axes.

6 15 3 36 25 18 12 18 5 30
24 7 1 22 33 24 19 4 12 9



14) Ten students in a graduate program were randomly selected. The following data were obtained regarding their GPAs on entering the program versus their current GPAs.

Entering GPA	Current GPA
3.5	3.6
3.8	3.7
3.6	3.9
3.6	3.6
3.5	3.9
3.9	3.8
4.0	3.7
3.9	3.9
3.5	3.8
3.7	4.0

Use the given data to find the correlation coefficient and the equation of the regression line. Round the final values to three significant digits, if necessary.

correlation coefficient ______________________________

equation of regression line ______________________________

Use the equation to predict the current GPA if an entering GPA was 3.67. __________

According to the correlation coefficient, is this a good estimate? __________

15) How many 5–digit numbers can be formed using the digits 1, 2, 3, 4, 5, 6, 7 if repetition of digits is not allowed?

____

How many if repetition of digits is allowed? ____________________

16) According to government data, the probability that an adult never visited a museum is 15%. In a random survey of 10 adults, what is the probability that two or fewer never visited a museum? **USE THE BINOMIAL PROBABILITY FORMULA.** Round the final answer to three significant digits.

probability that two or fewer never visited a museum ________________________

17) Assume that women's heights are normally distributed with a mean of 63.6 inches and a standard deviation of 2.5 inches. If 90 women are randomly selected, find the probability that they have a mean height between 62.9 inches and 64.0 inches. Draw and label the distribution. Shade appropriate area.

probability that 90 women's mean height is between 62.9 and 64.0 inches ______________
(round to four significant digits)

18) A survey of 865 voters in one state reveals that 408 favor approval of an issue before the legislature. Find a point estimate for p, the population proportion of voters in the state who favor approval. Construct the 95% confidence interval for the true proportion of all voters in the state who favor approval. Round final answers to three decimal places.

point estimate ________________________________

confidence interval ____

19) Various temperature measurements are recorded at different times for a particular city. The mean of 23.5°C is obtained for 40 temperatures on different days. Assuming that $\sigma = 1.5°C$, test the claim that the population mean is 23°C using either the classical or p−value approach to hypothesis testing. Use a 0.05 significance level.

Are you using the Classical or P-Value approach?

Null Hypothesis:

Alternative Hypothesis:

Test Statistic:

Critical Value(s) or P-Value *(circle which of these you use)*:

Conclusion about the Null Hypothesis:

Conclusion addressing the original claim:

20) A recent study claimed that at least 15% of junior high students are overweight. In a sample of 160 students, 18 were found to be overweight. At $\alpha = 0.05$, test the claim. Show all of your steps.

Chapter 2 Organizing and Summarizing Data

- Relative frequency $= \dfrac{\text{frequency}}{\text{sum of all frequencies}}$
- Class midpoint: The sum of consecutive lower class limits divided by 2.

Chapter 3 Numerically Summarizing Data

- Population Mean: $\mu = \dfrac{\sum x_i}{N}$
- Sample Mean: $\bar{x} = \dfrac{\sum x_i}{n}$
- Range = Largest Data Value − Smallest Data Value
- Population Variance: $\sigma^2 = \dfrac{\sum(x_i - \mu)^2}{N} = \dfrac{\sum x_i^2 - \dfrac{(\sum x_i)^2}{N}}{N}$
- Sample Variance: $s^2 = \dfrac{\sum(x_i - \bar{x})^2}{n-1} = \dfrac{\sum x_i^2 - \dfrac{(\sum x_i)^2}{n}}{n-1}$
- Population Standard Deviation: $\sigma = \sqrt{\sigma^2}$
- Sample Standard Deviation: $s = \sqrt{s^2}$
- ***Empirical Rule:*** If the shape of the distribution is bell-shaped, then
  - Approximately 68% of the data lie within 1 standard deviation of the mean
  - Approximately 95% of the data lie within 2 standard deviations of the mean
  - Approximately 99.7% of the data lie within 3 standard deviations of the mean
- Population Mean from Grouped Data: $\mu = \dfrac{\sum x_i f_i}{\sum f_i}$
- Sample Mean from Grouped Data: $\bar{x} = \dfrac{\sum x_i f_i}{\sum f_i}$
- Weighted Mean: $\bar{x}_w = \dfrac{\sum w_i x_i}{\sum w_i}$
- Population Variance from Grouped Data:

$$\sigma^2 = \frac{\sum(x_i - \mu)^2 f_i}{\sum f_i} = \frac{\sum x_i^2 f_i - \dfrac{(\sum x_i f_i)^2}{\sum f_i}}{\sum f_i}$$

- Sample Variance from Grouped Data:

$$s^2 = \frac{\sum(x_i - \mu)^2 f_i}{\left(\sum f_i\right) - 1} = \frac{\sum x_i^2 f_i - \dfrac{(\sum x_i f_i)^2}{\sum f_i}}{\sum f_i - 1}$$

- Population z-score: $z = \dfrac{x - \mu}{\sigma}$
- Sample z-score: $z = \dfrac{x - \bar{x}}{s}$
- Interquartile Range: IQR $= Q_3 - Q_1$
- Lower and Upper Fences: Lower fence $= Q_1 - 1.5(\text{IQR})$, Upper fence $= Q_3 + 1.5(\text{IQR})$
- Five-Number Summary

  Minimum, Q_1, M, Q_3, Maximum

Chapter 4 Describing the Relation between Two Variables

- Correlation Coefficient: $r = \dfrac{\sum\left(\dfrac{x_i - \bar{x}}{s_x}\right)\left(\dfrac{y_i - \bar{y}}{s_y}\right)}{n-1}$
- The equation of the least-squares regression line is $\hat{y} = b_1 x + b_0$, where $\hat{y}$ is the predicted value, $b_1 = r \cdot \dfrac{s_y}{s_x}$ is the slope, and $b_0 = \bar{y} - b_1\bar{x}$ is the intercept.
- Residual = observed y − predicted y = $y - \hat{y}$
- $R^2 = r^2$ for the least-squares regression model $\hat{y} = b_1 x + b_0$
- The coefficient of determination, R^2, measures the proportion of total variation in the response variable that is explained by the least-squares regression line.

Chapter 5 Probability

- Empirical Probability

$$P(E) \approx \frac{\text{frequency of } E}{\text{number of trials of experiment}}$$

- Classical Probability

$$P(E) = \frac{\text{number of ways that } E \text{ can occur}}{\text{number of possible outcomes}} = \frac{N(E)}{N(S)}$$

- Addition Rule for Disjoint Events

$$P(E \text{ or } F) = P(E) + P(F)$$

- Addition Rule for n Disjoint Events

$$P(E \text{ or } F \text{ or } G \text{ or} \cdots) = P(E) + P(F) + P(G) + \cdots$$

- General Addition Rule

$$P(E \text{ or } F) = P(E) + P(F) - P(E \text{ and } F)$$

- Complement Rule

$$P(E^c) = 1 - P(E)$$

- Multiplication Rule for Independent Events

$$P(E \text{ and } F) = P(E) \cdot P(F)$$

- Multiplication Rule for n Independent Events

$$P(E \text{ and } F \text{ and } G \cdots) = P(E) \cdot P(F) \cdot P(G) \cdot \cdots$$

- Conditional Probability Rule

$$P(F|E) = \frac{P(E \text{ and } F)}{P(E)} = \frac{N(E \text{ and } F)}{N(E)}$$

- General Multiplication Rule

$$P(E \text{ and } F) = P(E) \cdot P(F|E)$$

- Factorial

$$n! = n \cdot (n-1) \cdot (n-2) \cdot \cdots \cdot 3 \cdot 2 \cdot 1$$

- Permutation of n objects taken r at a time: ${}_nP_r = \frac{n!}{(n-r)!}$
- Combination of n objects taken r at a time:

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

- Permutations with Repetition:

$$\frac{n!}{n_1! \cdot n_2! \cdot \cdots \cdot n_k!}$$

Chapter 6 Discrete Probability Distributions

- Mean (Expected Value) of a Discrete Random Variable

$$\mu_X = \sum x \cdot P(x)$$

- Variance of a Discrete Random Variable

$$\sigma_X^2 = \sum (x - \mu)^2 \cdot P(x) = \sum x^2 P(x) - \mu_X^2$$

- Binomial Probability Distribution Function

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

- Mean and Standard Deviation of a Binomial Random Variable

$$\mu_X = np \qquad \sigma_X = \sqrt{np(1-p)}$$

- Poisson Probability Distribution Function

$$P(x) = \frac{(\lambda t)^x}{x!} e^{-\lambda t} \qquad x = 0, 1, 2, \ldots$$

- Mean and Standard Deviation of a Poisson Random Variable

$$\mu_X = \lambda t \qquad \sigma_X = \sqrt{\lambda t}$$

Chapter 7 The Normal Distribution

- Standardizing a Normal Random Variable

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

- Finding the Score: $x = \mu + z\sigma$

Chapter 8 Sampling Distributions

- Mean and Standard Deviation of the Sampling Distribution of $\bar{x}$

$$\mu_{\bar{x}} = \mu \quad \text{and} \quad \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$$

- Sample Proportion: $\hat{p} = \frac{x}{n}$
- Mean and Standard Deviation of the Sampling Distribution of $\hat{p}$

$$\mu_{\hat{p}} = p \text{ and } \sigma_{\hat{p}} = \sqrt{\frac{p(1-p)}{n}}$$

Chapter 9 Estimating the Value of a Parameter Using Confidence Intervals

Confidence Intervals

- A $(1-\alpha) \cdot 100\%$ confidence interval about μ with σ known is $\bar{x} \pm z_{\alpha/2} \cdot \frac{\sigma}{\sqrt{n}}$.
- A $(1-\alpha) \cdot 100\%$ confidence interval about μ with σ unknown is $\bar{x} \pm t_{\alpha/2} \cdot \frac{s}{\sqrt{n}}$. *Note*: $t_{\alpha/2}$ is computed using $n-1$ degrees of freedom.
- A $(1-\alpha) \cdot 100\%$ confidence interval about p is $\hat{p} \pm z_{\alpha/2} \cdot \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$.
- A $(1-\alpha) \cdot 100\%$ confidence interval about σ^2 is $\frac{(n-1)s^2}{\chi^2_{\alpha/2}} < \sigma^2 < \frac{(n-1)s^2}{\chi^2_{1-\alpha/2}}$.

Sample Size

- To estimate the population mean with a margin of error E at a $(1-\alpha) \cdot 100\%$ level of confidence: $n = \left(\frac{z_{\alpha/2} \cdot \sigma}{E}\right)^2$ rounded up to the next integer.
- To estimate the population proportion with a margin of error E at a $(1-\alpha) \cdot 100\%$ level of confidence: $n = \hat{p}(1-\hat{p})\left(\frac{z_{\alpha/2}}{E}\right)^2$ rounded up to the next integer, where $\hat{p}$ is a prior estimate of the population proportion, or $n = 0.25\left(\frac{z_{\alpha/2}}{E}\right)^2$ rounded up to the next integer when no prior estimate of p is available.

CHAPTER 10 Testing Claims Regarding a Parameter

Test Statistics

- $z_0 = \dfrac{\bar{x} - \mu_0}{\sigma / \sqrt{n}}$ single mean, σ known
- $t_0 = \dfrac{\bar{x} - \mu_0}{s / \sqrt{n}}$ single mean, σ unknown
- $z_0 = \dfrac{\hat{p} - p_0}{\sqrt{\dfrac{p_0(1 - p_0)}{n}}}$
- $\chi_0^2 = \dfrac{(n-1)s^2}{\sigma_0^2}$

CHAPTER 11 Inferences on Two Samples

- Test Statistic for Matched-Pairs data

$$t_0 = \frac{\bar{d} - \mu_d}{s_d / \sqrt{n}}$$

where $\bar{d}$ is the mean and s_d is the standard deviation of the differenced data.

- Confidence Interval for Matched-Pairs data:

$$\bar{d} \pm t_{\alpha/2} \cdot \frac{s_d}{\sqrt{n}}$$

Note: $t_{\alpha/2}$ is found using $n - 1$ degrees of freedom.

- Test Statistic Comparing Two Means (Independent Sampling):

$$t_0 = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\dfrac{s_1^2}{n_1} + \dfrac{s_2^2}{n_2}}}$$

- Confidence Interval for the Difference of Two Means (Independent Samples):

$$(\bar{x}_1 - \bar{x}_2) \pm t_{\alpha/2}\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$$

Note: $t_{\alpha/2}$ is found using the smaller of $n_1 - 1$ or $n_2 - 1$ degrees of freedom.

- Test Statistic Comparing Two Population Proportions

$$z_0 = \frac{\hat{p}_1 - \hat{p}_2 - (p_1 - p_2)}{\sqrt{\hat{p}(1 - \hat{p})}\sqrt{\dfrac{1}{n_1} + \dfrac{1}{n_2}}} \quad \text{where } \hat{p} = \frac{x_1 + x_2}{n_1 + n_2}.$$

- Confidence Interval for the Difference of Two Proportions

$$(\hat{p}_1 - \hat{p}_2) \pm z_{\alpha/2}\sqrt{\frac{\hat{p}_1(1 - \hat{p}_1)}{n_1} + \frac{\hat{p}_2(1 - \hat{p}_2)}{n_2}}$$

- Test Statistic for Comparing Two Population Standard Deviations

$$F_0 = \frac{s_1^2}{s_2^2}$$

- Finding a Critical F for the Left Tail

$$F_{1-\alpha, n_1 - 1, n_2 - 1} = \frac{1}{F_{\alpha, n_2 - 1, n_1 - 1}}$$

CHAPTER 12 Inference on Categorical Data

- Expected Counts (when testing for goodness of fit)

$$E_i = \mu_i = np_i \quad \text{for} \quad i = 1, 2, \ldots, k$$

- Expected Frequencies (when testing for independence or homogeneity of proportions)

$$\text{Expected frequency} = \frac{(\text{row total})(\text{column total})}{\text{table total}}$$

- Chi-Square Test Statistic

$$\chi_0^2 = \sum \frac{(\text{observed} - \text{expected})^2}{\text{expected}} = \sum \frac{(O_i - E_i)^2}{E_i}$$

$$i = 1, 2, \ldots, k$$

All $E_i \geq 1$ and no more than 20% less than 5.

CHAPTER 13 Comparing Three or More Means

- Test Statistic for One-Way ANOVA

$$F = \frac{\text{Mean square due to treatment}}{\text{Mean square due to error}} = \frac{\text{MST}}{\text{MSE}}$$

where

$$\text{MST} = \frac{n_1(\bar{x}_1 - \bar{x})^2 + n_2(\bar{x}_2 - \bar{x})^2 + \cdots + n_k(\bar{x}_k - \bar{x})^2}{k - 1}$$

$$\text{MSE} = \frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2 + \cdots + (n_k - 1)s_k^2}{n - k}$$

- Test Statistic for Tukey's Test after One-Way ANOVA

$$q = \frac{(\bar{x}_2 - \bar{x}_1) - (\mu_2 - \mu_1)}{\sqrt{\dfrac{s^2}{2} \cdot \left(\dfrac{1}{n_1} + \dfrac{1}{n_2}\right)}} = \frac{\bar{x}_2 - \bar{x}_1}{\sqrt{\dfrac{s^2}{2} \cdot \left(\dfrac{1}{n_1} + \dfrac{1}{n_2}\right)}}$$

Table I

Random Numbers

Row Number	01–05	06–10	11–15	16–20	21–25	26–30	31–35	36–40	41–45	46–50
01	89392	23212	74483	36590	25956	36544	68518	40805	09980	00467
02	61458	17639	96252	95649	73727	33912	72896	66218	52341	97141
03	11452	74197	81962	48443	90360	26480	73231	37740	26628	44690
04	27575	04429	31308	02241	01698	19191	18948	78871	36030	23980
05	36829	59109	88976	46845	28329	47460	88944	08264	00843	84592
06	81902	93458	42161	26099	09419	89073	82849	09160	61845	40906
07	59761	55212	33360	68751	86737	79743	85262	31887	37879	17525
08	46827	25906	64708	20307	78423	15910	86548	08763	47050	18513
09	24040	66449	32353	83668	13874	86741	81312	54185	78824	00718
10	98144	96372	50277	15571	82261	66628	31457	00377	63423	55141
11	14228	17930	30118	00438	49666	65189	62869	31304	17117	71489
12	55366	51057	90065	14791	62426	02957	85518	28822	30588	32798
13	96101	30646	35526	90389	73634	79304	96635	06626	94683	16696
14	38152	55474	30153	26525	83647	31988	82182	98377	33802	80471
15	85007	18416	24661	95581	45868	15662	28906	36392	07617	50248
16	85544	15890	80011	18160	33468	84106	40603	01315	74664	20553
17	10446	20699	98370	17684	16932	80449	92654	02084	19985	59321
18	67237	45509	17638	65115	29757	80705	82686	48565	72612	61760
19	23026	89817	05403	82209	30573	47501	00135	33955	50250	72592
20	67411	58542	18678	46491	13219	84084	27783	34508	55158	78742

Table II

Critical Values for Correlation Coefficient

n		n		n		n	
3	0.997	10	0.632	17	0.482	24	0.404
4	0.950	11	0.602	18	0.468	25	0.396
5	0.878	12	0.576	19	0.456	26	0.388
6	0.811	13	0.553	20	0.444	27	0.381
7	0.754	14	0.532	21	0.433	28	0.374
8	0.707	15	0.514	22	0.423	29	0.367
9	0.666	16	0.497	23	0.413	30	0.361

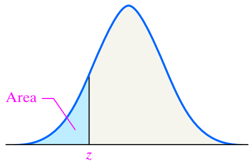


Table V

Standard Normal Distribution

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
−3.4	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002
−3.3	0.0005	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003
−3.2	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
−3.1	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
−3.0	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010
−2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
−2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
−2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
−2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
−2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
−2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
−2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
−2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
−2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
−2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
−1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
−1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
−1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
−1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
−1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
−1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
−1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
−1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
−1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
−1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
−0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
−0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
−0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
−0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
−0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
−0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
−0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
−0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
−0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
−0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998

Confidence Interval Critical Values, $z_{\alpha/2}$

Level of Confidence	Critical Value, $z_{\alpha/2}$
0.90 or 90%	1.645
0.95 or 95%	1.96
0.98 or 98%	2.33
0.99 or 99%	2.575

Hypothesis Testing Critical Values

Level of Significance, α	Left Tailed	Right Tailed	Two-Tailed
0.10	−1.28	1.28	±1.645
0.05	−1.645	1.645	±1.96
0.01	−2.33	2.33	±2.575

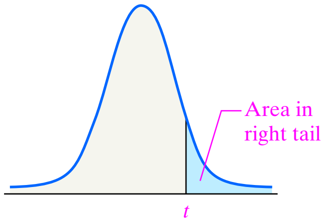


Table VI

t-Distribution

Area in Right Tail

df	0.25	0.20	0.15	0.10	0.05	0.025	0.02	0.01	0.005	0.0025	0.001	0.0005
1	1.000	1.376	1.963	3.078	6.314	12.706	15.894	31.821	63.657	127.321	318.309	636.619
2	0.816	1.061	1.386	1.886	2.920	4.303	4.849	6.965	9.925	14.089	22.327	31.599
3	0.765	0.978	1.250	1.638	2.353	3.182	3.482	4.541	5.841	7.453	10.215	12.924
4	0.741	0.941	1.190	1.533	2.132	2.776	2.999	3.747	4.604	5.598	7.173	8.610
5	0.727	0.920	1.156	1.476	2.015	2.571	2.757	3.365	4.032	4.773	5.893	6.869
6	0.718	0.906	1.134	1.440	1.943	2.447	2.612	3.143	3.707	4.317	5.208	5.959
7	0.711	0.896	1.119	1.415	1.895	2.365	2.517	2.998	3.499	4.029	4.785	5.408
8	0.706	0.889	1.108	1.397	1.860	2.306	2.449	2.896	3.355	3.833	4.501	5.041
9	0.703	0.883	1.100	1.383	1.833	2.262	2.398	2.821	3.250	3.690	4.297	4.781
10	0.700	0.879	1.093	1.372	1.812	2.228	2.359	2.764	3.169	3.581	4.144	4.587
11	0.697	0.876	1.088	1.363	1.796	2.201	2.328	2.718	3.106	3.497	4.025	4.437
12	0.695	0.873	1.083	1.356	1.782	2.179	2.303	2.681	3.055	3.428	3.930	4.318
13	0.694	0.870	1.079	1.350	1.771	2.160	2.282	2.650	3.012	3.372	3.852	4.221
14	0.692	0.868	1.076	1.345	1.761	2.145	2.264	2.624	2.977	3.326	3.787	4.140
15	0.691	0.866	1.074	1.341	1.753	2.131	2.249	2.602	2.947	3.286	3.733	4.073
16	0.690	0.865	1.071	1.337	1.746	2.120	2.235	2.583	2.921	3.252	3.686	4.015
17	0.689	0.863	1.069	1.333	1.740	2.110	2.224	2.567	2.898	3.222	3.646	3.965
18	0.688	0.862	1.067	1.330	1.734	2.101	2.214	2.552	2.878	3.197	3.610	3.922
19	0.688	0.861	1.066	1.328	1.729	2.093	2.205	2.539	2.861	3.174	3.579	3.883
20	0.687	0.860	1.064	1.325	1.725	2.086	2.197	2.528	2.845	3.153	3.552	3.850
21	0.686	0.859	1.063	1.323	1.721	2.080	2.189	2.518	2.831	3.135	3.527	3.819
22	0.686	0.858	1.061	1.321	1.717	2.074	2.183	2.508	2.819	3.119	3.505	3.792
23	0.685	0.858	1.060	1.319	1.714	2.069	2.177	2.500	2.807	3.104	3.485	3.768
24	0.685	0.857	1.059	1.318	1.711	2.064	2.172	2.492	2.797	3.091	3.467	3.745
25	0.684	0.856	1.058	1.316	1.708	2.060	2.167	2.485	2.787	3.078	3.450	3.725
26	0.684	0.856	1.058	1.315	1.706	2.056	2.162	2.479	2.779	3.067	3.435	3.707
27	0.684	0.855	1.057	1.314	1.703	2.052	2.158	2.473	2.771	3.057	3.421	3.690
28	0.683	0.855	1.056	1.313	1.701	2.048	2.154	2.467	2.763	3.047	3.408	3.674
29	0.683	0.854	1.055	1.311	1.699	2.045	2.150	2.462	2.756	3.038	3.396	3.659
30	0.683	0.854	1.055	1.310	1.697	2.042	2.147	2.457	2.750	3.030	3.385	3.646
31	0.682	0.853	1.054	1.309	1.696	2.040	2.144	2.453	2.744	3.022	3.375	3.633
32	0.682	0.853	1.054	1.309	1.694	2.037	2.141	2.449	2.738	3.015	3.365	3.622
33	0.682	0.853	1.053	1.308	1.692	2.035	2.138	2.445	2.733	3.008	3.356	3.611
34	0.682	0.852	1.052	1.307	1.691	2.032	2.136	2.441	2.728	3.002	3.348	3.601
35	0.682	0.852	1.052	1.306	1.690	2.030	2.133	2.438	2.724	2.996	3.340	3.591
36	0.681	0.852	1.052	1.306	1.688	2.028	2.131	2.434	2.719	2.990	3.333	3.582
37	0.681	0.851	1.051	1.305	1.687	2.026	2.129	2.431	2.715	2.985	3.326	3.574
38	0.681	0.851	1.051	1.304	1.686	2.024	2.127	2.429	2.712	2.980	3.319	3.566
39	0.681	0.851	1.050	1.304	1.685	2.023	2.125	2.426	2.708	2.976	3.313	3.558
40	0.681	0.851	1.050	1.303	1.684	2.021	2.123	2.423	2.704	2.971	3.307	3.551
50	0.679	0.849	1.047	1.299	1.676	2.009	2.109	2.403	2.678	2.937	3.261	3.496
60	0.679	0.848	1.045	1.296	1.671	2.000	2.099	2.390	2.660	2.915	3.232	3.460
70	0.678	0.847	1.044	1.294	1.667	1.994	2.093	2.381	2.648	2.899	3.211	3.435
80	0.678	0.846	1.043	1.292	1.664	1.990	2.088	2.374	2.639	2.887	3.195	3.416
90	0.677	0.846	1.042	1.291	1.662	1.987	2.084	2.368	2.632	2.878	3.183	3.402
100	0.677	0.845	1.042	1.290	1.660	1.984	2.081	2.364	2.626	2.871	3.174	3.390
1000	0.675	0.842	1.037	1.282	1.646	1.962	2.056	2.330	2.581	2.813	3.098	3.300
z	0.674	0.842	1.036	1.282	1.645	1.960	2.054	2.326	2.576	2.807	3.090	3.291

Math 1040 Final Exam Form A   Introduction to Statistics   Fall Semester 2010

Instructor_______________________   Name KEY

Time Limit: 120 minutes

Any calculator is okay. Necessary tables and formulas are attached to the back of the exam. All problems are weighted equally.

Computers, cell phones and hand-held devices other than calculators are not allowed. Students may not bring notes, formulas or tables into the exam.

This exam has two parts

Part I - Ten multiple choice questions

Part II - Ten open ended questions

INSTRUCTIONS PART I: Questions 1 - 10, Multiple Choice. Answer all TEN questions and circle the correct answer. It is not necessary to show work. There will be no partial credit awarded on this part of the exam.

1) A sample consists of every 35th worker from a group of 4000 workers. What sampling technique was used?

A) convenience
B) cluster
C) systematic
D) stratified
E) random

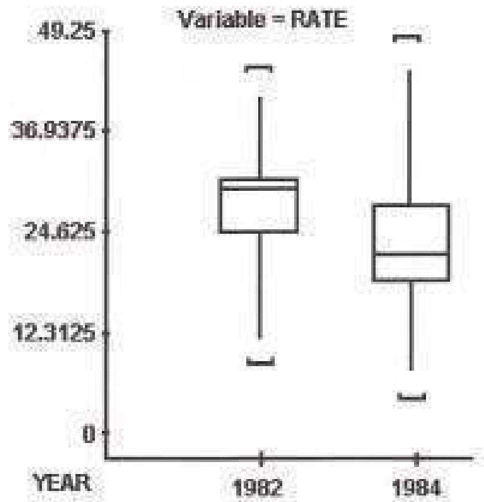
2) The amount of television viewed by today's youth is of primary concern to Parents Against Watching Television (PAWT). 300 parents of elementary school-aged children were asked to estimate the number of hours per week that their child watched television. The mean and the standard deviation for their responses were 16 and 4, respectively. PAWT constructed a stem-and-leaf display for the data that showed that the distribution of times was a bell-shaped distribution. Give an interval around the mean where you believe most (approximately 95%) of the television viewing times fell in the distribution.

A) less than 12 and more than 20 hours per week
B) between 12 and 20 hours per week
C) between 4 and 28 hours per week
D) between 8 and 24 hours per week

$\bar{x} = 16$
$s = 4$
95% between $\bar{x} - 2s$ and $\bar{x} + 2s$
$= 16 - 2(4) = 8$
$= 16 + 2(4) = 24$

3) SAS was used to compare the high school dropout rates for the 50 states in 1982 and 1984. The box plots generated for these dropout rates are shown below.

Compare the center of the distributions and the variation of the distributions for the two years.



A) Dropout rates had a higher average with more variability in 1982 than in 1984.
B) Dropout rates had a higher average with less variability in 1982 than in 1984.
C) Dropout rates had a lower average with less variability in 1982 than in 1984.
D) Dropout rates had a lower average with more variability in 1982 than in 1984.

4) The table below describes the smoking habits of a group of asthma sufferers.

	Nonsmoker	Occasional smoker	Regular smoker	Heavy smoker	Total
Men	433	42	71	37	583
Women	326	47	78	39	490
Total	759	89	149	76	1073

If one of the 1073 people is randomly selected, find the probability that the person is a man or a heavy smoker.

A) 0.614
B) 0.487
C) 0.545
D) 0.580

P(man or heavy smoker)

$$= \frac{583 + 39}{1073}$$

$$\approx 0.580$$

5) An unprepared student makes random guesses for the ten true-false questions on a quiz. Find the probability that there is at least one correct answer.

A) $\frac{1}{10}$

B) $\frac{1,023}{1,024}$

C) $\frac{1}{1,024}$

D) $\frac{9}{10}$

P(at least one correct)
$= 1 - P(\text{none correct})$
$= 1 - (\frac{1}{2})^{10}$
$= 1 - \frac{1}{1024}$
$= \frac{1023}{1024}$

6) A contractor is considering a sale that promises a profit of \$23,000 with a probability of 0.7 or a loss (due to bad weather, strikes, and such) of \$13,000 with a probability of 0.3. What is the expected profit?

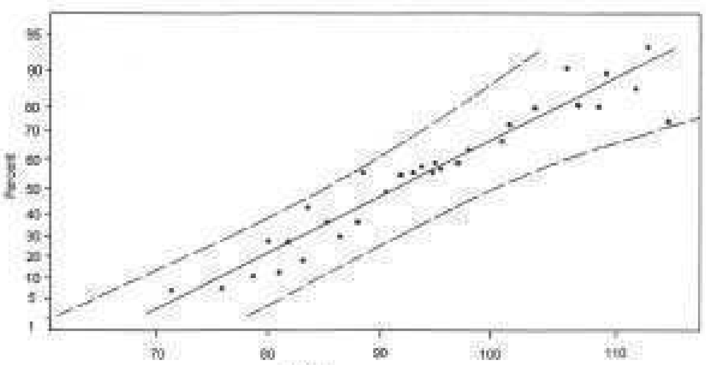
A) \$12,200
B) \$10,000
C) \$16,100
D) \$25,200

expected profit = (0.7)(\$23,000) + (0.3)(-\$13,000)
= \$12,200

7) Find the z-scores for which 90% of the distribution's area lies between -z and z.

A) (-0.99, 0.99)
B) (-2.33, 2.33)
C) (-1.96, 1.96)
D) (-1.645, 1.645)

8) Determine whether the following normal probability plot indicates that the sample data could have come from a population that is normally distributed.



A) not normally distributed
B) normally distributed

9) The grade point averages for 10 randomly selected students in an algebra class with 125 students are listed below. What is the effect on the width of the confidence interval if the sample size is increased to 20?

2.0 3.2 1.8 2.9 0.9 4.0 3.3 2.9 3.6 0.8

A) The width decreases.
B) It is impossible to tell without more information.
C) The width remains the same.
D) The width increases.

10) Construct a 95% confidence interval for the population mean, μ. Assume the population has a normal distribution. A sample of 25 randomly English majors has a mean test score of 81.5 with a standard deviation of 10.2.

$n = 25$ 95%
$\bar{x} = 81.5$, $s = 10.2$

A) (77.29, 85.71)
B) (87.12, 98.32)
C) (66.35, 69.89)
D) (77.50, 85.50)

$\bar{x} \pm t_{\alpha/2} \cdot \frac{s}{\sqrt{n}}$
$= 81.5 \pm 2.064 \cdot \frac{10.2}{\sqrt{25}}$
(77.29, 85.71)

INSTRUCTIONS PART II: Questions 11 - 20, Short Response. Answer all TEN questions carefully and completely, showing your work and clearly indicating your answer.

11) Researchers investigating the impact of prenatal care on newborn health kept track of the mother's age, the number of weeks the pregnancy lasted, the type of birth (cesarean, induced, natural), the level of prenatal care the mother had (none, minimal, adequate), the birth weight and gender of the baby, and whether the baby exhibited health problems (none, minor, major).

Classify each variable as qualitative or quantitative and, for any quantitative variable, identify the units in which it was measured (or note that they were not provided).

variables *(list below)*	qualitative or quantitative	units
mother's age	quantitative	not provided (probably years)
length of pregnancy	quantitative	weeks
type of birth	qualitative	
level of prenatal care	qualitative	
birth weight of baby	quantitative	not provided (probably lbs and ounces)
gender of baby	qualitative	
baby's health problems	qualitative	

12) Twenty–four workers were surveyed about how long it takes them to travel to work each day. The data below are given in minutes.

20 35 42 52 65 20 60 49 24 37 23 24
22 20 41 25 28 27 50 47 58 30 32 48

Use the data to create a sorted stem–and–leaf plot. Identify the shape of the distribution from your stem–and–leaf plot.

stem–and leaf plot:

2 | 0 0 4 3 4 2 0 5 8 7
3 | 5 7 0 2
4 | 2 9 1 7 8
5 | 2 0 8
6 | 5 0

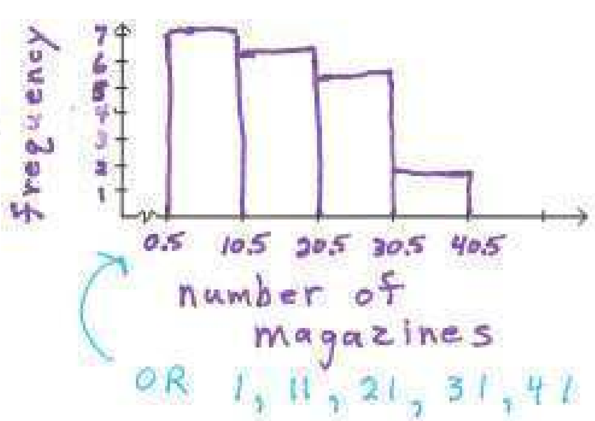
→

2 | 0 0 0 2 3 4 4 5 7 8
3 | 0 2 5 7
4 | 1 2 7 8 9
5 | 0 2 8
6 | 0 5

shape of the distribution skewed right

13) In a survey, 20 people were asked how many magazines they had purchased during the previous year. The results are shown below. Construct a histogram to represent the data. Use 4 classes with a class width of 10, and begin with a lower class limit of 1. Label the axes.

6 15 3 36 25 18 12 18 5 30
24 7 1 22 33 24 19 4 12 9



#magazines	Frequency
1-10	7
11-20	6
21-30	5
31-40	2

14) Ten students in a graduate program were randomly selected. The following data were obtained regarding their GPAs on entering the program versus their current GPAs.

Entering GPA	Current GPA
3.5	3.6
3.8	3.7
3.6	3.9
3.6	3.6
3.5	3.9
3.9	3.8
4.0	3.7
3.9	3.9
3.5	3.8
3.7	4.0

(used calculator)

Use the given data to find the correlation coefficient and the equation of the regression line. Round the final values to three significant digits, if necessary.

correlation coefficient $r = 0.0430$

equation of regression line $\hat{y} = 0.0313X + 3.67$

Use the equation to predict the current GPA if an entering GPA was 3.67. 3.8

According to the correlation coefficient, is this a good estimate? no

$\hat{y} = 0.0313(3.67) + 3.67 = 3.7849$

15) How many 5–digit numbers can be formed using the digits 1, 2, 3, 4, 5, 6, 7 if repetition of digits is not allowed? 2520

$7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 = 2520$

OR

${}_7P_5 = 2520$

How many if repetition of digits is allowed? 16,807

$7 \cdot 7 \cdot 7 \cdot 7 \cdot 7 = 7^5$

$= 16{,}807$

16) According to government data, the probability that an adult never visited a museum is 15%. In a random survey of 10 adults, what is the probability that two or fewer never visited a museum? **USE THE BINOMIAL PROBABILITY FORMULA.** Round the final answer to three significant digits. $p = .15 \quad 1-p = .85 \quad n = 10$

$$P(x \le 2) = P(x=0) + P(x=1) + P(x=2)$$
$$= {}_{10}C_0(.15)^0(.85)^{10} + {}_{10}C_1(.15)^1(.85)^9 + {}_{10}C_2(.15)^2(.85)^8$$
$$= (1)(1)(.85)^{10} + (10)(.15)(.85)^9 + {}_{10}C_2(.15)^2(.85)^8$$
$$\approx 0.820$$

Must show above steps to get credit!

probability that two or fewer never visited a museum ___0.820___

17) Assume that women's heights are normally distributed with a mean of 63.6 inches and a standard deviation of 2.5 inches. If 90 women are randomly selected, find the probability that they have a mean height between 62.9 inches and 64.0 inches. Draw and label the distribution. Shade appropriate area.

$n = 90$

Grade sketch!

$$P(62.9 < \bar{x} < 64.0)$$
$$= P\left(\frac{62.9-63.6}{\frac{2.5}{\sqrt{90}}} < z < \frac{64-63.6}{\frac{2.5}{\sqrt{90}}}\right)$$
$$= P(-2.66 < z < 1.52)$$
$$= .9357 - .0039$$
$$= 0.9318$$

probability that 90 women's mean height is between 62.9 and 64.0 inches ___0.9318___
(round to four significant digits)

OR 0.9315 ← by calculator

18) A survey of 865 voters in one state reveals that 408 favor approval of an issue before the legislature. Find a point estimate for p, the population proportion of voters in the state who favor approval. Construct the 95% confidence interval for the true proportion of all voters in the state who favor approval. Round final answers to three decimal places.

$n = 865 \quad \hat{p} = \frac{408}{865} \quad z_{\alpha/2} = 1.96$

$E = z_{\alpha/2}\sqrt{\frac{\hat{p}(1-\hat{p})}{n}} = 1.96\sqrt{\frac{\frac{408}{865}\left(1-\frac{408}{865}\right)}{865}} \approx 0.0332675$

$\hat{p} - E < p < \hat{p} + E$

$\frac{408}{865} - 0.0332675 < p < \frac{408}{865} + 0.0332675$

$0.438 < p < 0.505$

point estimate $\hat{p} = \frac{408}{865} \approx 0.472$

confidence interval $0.438 < p < 0.505$

19) Various temperature measurements are recorded at different times for a particular city. The mean of 23.5°C is obtained for 40 temperatures on 40 different days. Assuming that $\sigma = 1.5$°C, test the claim that the population mean is 23°C using either the classical or p-value approach to hypothesis testing. Use a 0.05 significance level.

Are you using the Classical or P-Value approach?

Null Hypothesis: $H_0: \mu = 23°$ (claim)

Alternative Hypothesis: $H_1: \mu \neq 23°$

Test Statistic:

$$z_0 = \frac{(23.5 - 23)}{1.5/\sqrt{40}}$$

$z_0 = 2.11$

Critical Value(s) or P-Value *(circle which of these you use):*

C.V.

Critical Values: ±1.96

OR

P-Value

2(.0174) = .0348

P-Value: 0.0348

Conclusion about the Null Hypothesis:

Reject H_0

Conclusion addressing the original claim:

Evidence suggests that the population mean is not 23°C.

20) A recent study claimed that at least 15% of junior high students are overweight. In a sample of 160 students, 18 were found to be overweight. At $\alpha = 0.05$, test the claim. Show all of your steps.

$n = 160 \quad X = 18 \quad \alpha = 0.05$

Claim: $p \geq .15$

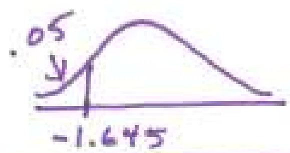
$H_0: p = .15$ claim

$H_1: p < .15$

Test Statistic:

$$z_0 = \frac{\frac{18}{160} - .15}{\sqrt{\frac{(.15)(.85)}{160}}} \; ; \; z_0 = -1.33$$

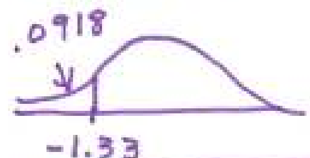
Critical Value



C.V. = −1.645

OR

P-Value



P-Value = 0.0918

Fail to reject H_0

There is not sufficient evidence to reject the claim that at least 15% of junior high students are overweight.