

Practice Exam 1
Multiple Choice

1. A concert hall has 2000 seats. There are 1200 seats on the main floor and 800 in the balcony. 40% of those in the balcony buy a souvenir program. 50% of those on the main floor buy a souvenir program. At a certain performance all seats are occupied. If an audience member is selected at random, what is the probability that a program was purchased?
 - (A) 22.5%
 - (B) 44%
 - (C) 45%
 - (D) 46%
 - (E) 92%

2. Researchers conducted a 23 year study among 10,125 government employees in a certain country. All were men over the age of 40, and eventually 369 died of strokes. Participants were surveyed at the beginning about their perception of family problems. Among the 9000 who reported a happy personal life, 3.5% died from strokes. Among the 1125 those who reported serious problems in their personal life, the death rate from strokes was 4.8%. What is the p-value of the appropriate test to see if there is a relationship between personal happiness and death from strokes?
 - (A) 0.028
 - (B) 0.031
 - (C) 0.042
 - (D) 0.062
 - (E) 0.083

3. A car dealer in a large city wants to estimate the proportion of pickup trucks compared to all vehicles. He decides to take several random samples of size 100 from the parking lot at a baseball stadium using the numbers that are already assigned to each stall. Which of the following is NOT a correct statement?
 - (A) Because of sampling variability each sample could produce a different proportion
 - (B) The margin of error for a 90% confidence interval is independent of the number of trucks in the parking lot.
 - (C) The sample may be biased since baseball fans may not have the same preferences as the general population.
 - (D) If a particular numbered stall selected at random does not have a truck, it is acceptable to continue examining stalls to the left until a stall with a truck is found.
 - (E) It is improper to select the first 100 stalls closest to the main gate, since those owners are likely to have reserved parking which is an indication of income levels.

4. The mean score for a round of golf by Tiger Woods during the 1999 and 2000 seasons was 68.04 with a standard deviation of 2.4. Assuming that scores his scores remain independent and normally distributed, what is the probability that he will shoot two consecutive scores of 66 or less in the future?
- (A) 0.04
 - (B) 0.08
 - (C) 0.11
 - (D) 0.20
 - (E) 0.39
5. A spinner has an equal chance of landing on any one of the numbers 1-10. A student spins the spinner 100 times and finds the total of the numbers. This is repeated 150 times. The results of each trial are plotted in a histogram. Which of the following best describes the shape of the histogram?
- (A) Approximately normally distributed with a mean of 550.
 - (B) Binomially distributed with a mean of 550.
 - (C) Uniformly distributed with a mean of 550.
 - (D) Continuously distributed with a mean of 550.
 - (E) Cannot be determined since the mean of the sample was not computed.
6. Doctors believed that patients who received heart pacemakers seemed to snore less. Among 40 randomly selected patients with a pacemaker, 12 snored. Among 60 randomly selected patients without a pacemaker, 25 snored. Which of the following statements is NOT correct?
- I. The evidence supports the theory at the 10% level
 - II. The 95% confidence interval for the difference between the proportion of those who snore in the two groups is (-0.31, 0.07)
 - III. Since the confidence interval contains 0, there is a significant difference between the two proportions.
- (A) I Only
 - (B) II Only
 - (C) III only
 - (D) I and III
 - (E) I, II, and III are incorrect

7. A strength coach wants to determine if there is a relationship between the weight of an individual and how much weight they can lift. The data was collected and analyzed using a statistical software program. The output is shown below.

TotalWeightLifted	StudentWeight		Total
	Under 150	Over 150	
Under 200	44 40.0 0.40	43 47.0 0.34	87 87.0 0.00
Over 200	25 29.0 0.55	38 34.0 0.47	63 63.0 0.00
Total	69 69.0	81 81.0	150 150.0

The number of rows with at least one missing value is 0

Chi-Square Statistics Section

Chi-square	1.745200
Degrees of Freedom	1.0000
Probability level	0.18641
Phi	.107864
Cramer's V	.107864
Kappa's t value	1.32106
McNemar's Probability Level	.029049

Based on the information, which of the following is a correct statement?

- (A) Since the value of the χ^2 statistic is so small, there is a strong relationship between the weight of an individual and the weight they can lift.
- (B) Since the value of the χ^2 statistic is so small, there is no evidence of a relationship between the weight of an individual and the weight they can lift.
- (C) The correlation coefficient of a linear regression equation would be less than 0.20.
- (D) The P-value of this test is 0.18641 which indicates no significant relationship between the weight of an individual and the weight they can lift.
- (E) The P-value of this test is 0.029049 which indicates a very strong relationship between the weight of an individual and the weight they can lift.

8. The following is a stem and leaf plot for the number of defective chips in a batch of 300 chips for two different machines.

Machine A		Machine B
	1	1
99888	1	57778899
44333322222	2	001124444
88887776666665555	2	66777889
1100	3	00001123
	3	6688
	4	0
	4	
	5	1

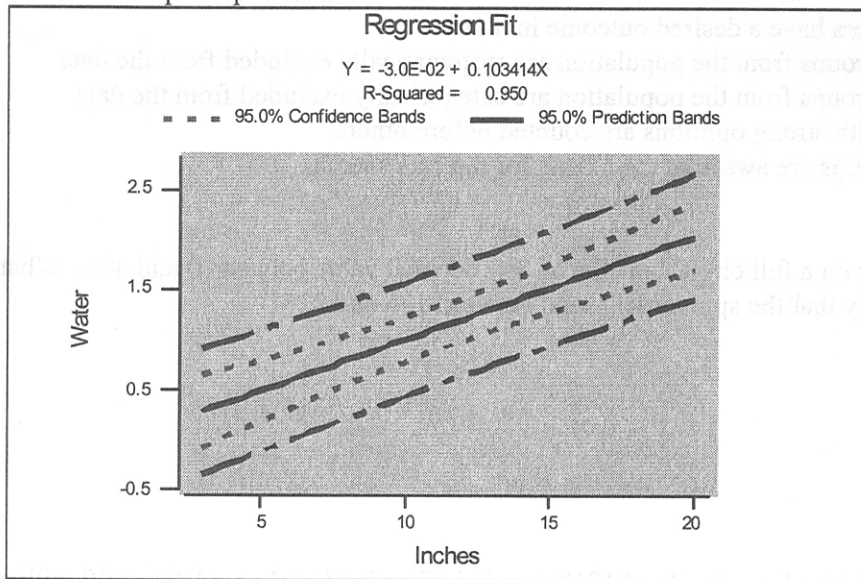
2|1 means 21

Based on the plot which of the following statements is True?

- I. The output from Machine B has more variability than that of Machine A
 II. The mean from Machine A is greater than the mean from Machine B.
 III. The data from Machine A has less skewness than from Machine B
- (A) I only
 (B) II only
 (C) III only
 (D) I and III only
 (E) All statements are true
9. An author wrote a book that advocated the playing of classical music to little children. The author cited a study that reported that students who choose to play a musical instrument score an average of 51 points higher on the Scholastic Aptitude Test than students who do not play an instrument. Which of the following statements is *not* correct?
- I. There is a relationship between playing instruments and receiving a higher score on the SAT.
 II. The study was observational rather than an experiment.
 III. Playing a musical instrument will cause a student to score higher on the SAT
 IV. The study was a matched pairs study.
- (A) I and II
 (B) II and III
 (C) I and IV
 (D) II and IV
 (E) III and IV

10. Randomization is an important characteristic of a well-designed experiment in order to eliminate bias. Which of the following sources of bias is eliminated by randomization?
- (A) Researchers have a desired outcome in mind.
 - (B) Certain groups from the population are systematically excluded from the data.
 - (C) Certain groups from the population are categorically excluded from the data.
 - (D) People with strong opinions are counted before others.
 - (E) Some groups are aware of the reason for the data search.
11. A spinner on a full circle can take on any decimal value between 0 and 400. What is the probability that the spinner will land between 175 and 225?
- (A) 0.12
 - (B) 0.14
 - (C) 0.44
 - (D) 0.50
 - (E) 0.56
12. A poll of a random sample of 1068 people in Sweden (total population of 9 million) found that about 75% favored government supported health care. A similar poll of 1068 people from England (population 60 million) showed that about 75% favored government supported health care. Which of the following statements is TRUE?
- (A) Since the same number of people had the same opinions, the results are equally accurate.
 - (B) Since the Swedish poll represented a larger proportion of the population, it is more accurate.
 - (C) Since the population of England is larger, the English poll gives a better indication of the opinions of the people.
 - (D) No decision can be made since the confidence interval is not stated.
 - (E) No decision can be made since the populations are different and the standard deviations are unknown
13. According to the US Census, the proportion of adults in a certain county who owned their own home was 0.71. A SRS of 100 adults in a certain section of the county found 65 owned their homes. What is the probability of obtaining a sample of 100 adults in which 65 or fewer own their own homes, assuming that this section of the county has the same overall proportion of adults who own their homes as does the entire county?
- (A) 0
 - (B) 0.093
 - (C) 0.106
 - (D) 0.186
 - (E) 0.907

14. After a snowstorm in a large metropolitan area, meteorologists took a random sample of several locations and measured depth of the snow along with the water content. The results were summarized in a computer printout.



LINEAR REGRESSION ANALYSIS

The regression equation is

$$\text{Water} = -0.03039 + 0.10341 \cdot \text{Inches}$$

$$R \text{ SQR} = 0.95020$$

$$R = 0.97478$$

$$DF = 4$$

$$T = 8.610$$

$$P = \text{#####}$$

Unfortunately, the printer failed just as the P-value was being displayed. What is the P-value for the hypothesis test $H_0: \beta = 0$ vs. $H_1: \beta \neq 0$?

- (A) $P < 0.001$
- (B) $P = 0.001$
- (C) $P = 0.0304$
- (D) $P = 0.103$
- (E) $P = 0.950$

15. The monthly power usage in a rural area is given by $\hat{y} = 2.7 + 1.01x$ where \hat{y} is the number of kilowatts used and x represents the number of months since January 1, 2000 (Let January 2000 correspond to $x = 0$). What is the estimated monthly power usage for December 2002?

- (A) 5.73 kw
- (B) 25.93 kw
- (C) 26.94 kw
- (D) 38.05 kw
- (E) 39.06 kw

16. Eight people who suffer from hay fever volunteer to test a new medication that will relieve the symptoms. The names of the volunteers are

- | | |
|--------------|-------------|
| 1. Zavala | 5. Harris |
| 2. Liu | 6. Elifritz |
| 3. Lonnquist | 7. Klein |
| 4. McGarry | 8. Scott |

Four of the volunteers will receive the new medication while the other four will receive a placebo as part of a double blind experiment. Starting at the left of the list of random numbers below and reading from left to right, assign four people to be given the medication.

07119 97336 71048 08178 77233 13916 47564 81056 97025 85977 29372

The four people assigned are

- (A) Zavala, Liu, Lonnquist, Klein
- (B) Liu, Harris, Klein, Scott
- (C) Zavala, Lonnquist, Elifritz, Klein
- (D) Zavala, Lonnquist, Klein, Scott
- (E) Zavala, McGarry, Klein, Scott

17. A child is 40 inches tall which places her in the top 10% of all children of similar age. The mean height for such children is 38 inches. Based on this information, what is the standard deviation?

- (A) 0.20 inches
- (B) 0.31 inches
- (C) 0.65 inches
- (D) 1.21 inches
- (E) 1.56 inches

18. A study was done to compare the effectiveness of two different groups of teachers. 15 different measures were used. In all cases the mean scores of an SRS of the students of the teachers from Group A were higher than the mean scores of an SRS of the students of the teachers in group B. The report of the study stated that in 2 of the 15 measurements the sample size was too small to verify that the difference was statistically significant. This is an illustration of

- (A) Good replication
- (B) Placebo effect
- (C) Low power
- (D) Stratified sampling
- (E) Marginal frequency

19. Traffic engineers studied the traffic patterns of two busy intersections on opposite sides of town at rush hour. At the first intersection, the average number of cars waiting to turn left was 17 with a standard deviation of 4 cars. At the second intersection, there are 25 cars waiting to make a left turn with a standard deviation of 7 cars. The report combined the mean number of car at both intersections. Assuming the data are independent, the standard deviation of the sum is
- (A) $\sqrt{11}$ cars
 - (B) $\sqrt{33}$ cars
 - (C) 8 cars
 - (D) $\sqrt{65}$ cars
 - (E) 11 cars
20. A newspaper wants to know public opinion of a town regarding the construction of a new library in a downtown location. It is decided that 48 people will be surveyed using a simple random sample. Which of the following will produce a simple random sample.
- (A) Record the opinion the first 48 people who visits the newspaper's web site
 - (B) Survey every fourth person who enters the current library until 48 people have responded.
 - (C) Randomly select 48 people from the city phone directory.
 - (D) Randomly select 12 people from each of the northwest, northeast, southwest, and southeast sections of the city.
 - (E) Number the residents using the latest census data. Use a random number generator to pick 48 people.
21. Suppose the probability that a softball player gets a hit in any single at-bat is .300. Assuming that her chance of getting a hit is independent, what is the probability that she will not get a hit until her fourth at bat in a game?
- (A) 0.0081
 - (B) 0.1029
 - (C) 0.3430
 - (D) 0.4116
 - (E) 0.7599
22. Which of the following statements is FALSE?
- (A) The power of a hypothesis test increases as α increases.
 - (B) The power of a hypothesis test does not depend on the sample size.
 - (C) β is a measure of the probability of a Type II error.
 - (D) The power of a hypothesis test is a measure of the ability of the test to detect a difference between the estimated value and the true value of a parameter.
 - (E) As the α -level increases, the β -level of a hypothesis test decreases.

23. The state Employment Service of a certain state certifies the typing speed of applicants. Suppose typing speeds are approximately normally distributed with a mean of 55 words per minute with a standard deviation of 4 words per minute. If Kim scores at the 95th percentile, then her typing speed is closest to
- (A) 47 wpm
 - (B) 50 wpm
 - (C) 59 wpm
 - (D) 62 wpm
 - (E) 67 wpm
24. A new dietary supplement was given to a volunteer group of 25 people who were at least 50 pounds overweight. 18 people from the group lost at least 20 pounds. What should we conclude about the effectiveness of the diet?
- (A) The diet was effective in 72% of the cases.
 - (B) The mean weight loss was more than 20 pounds.
 - (C) Nothing, since the 25 people were not an SRS.
 - (D) Nothing, since there was no control group that received a placebo.
 - (E) Nothing, since the group knew they were using the diet.
25. A pharmaceutical company develops a new medication to lower a person's cholesterol. The advertisement for the new drug cites the results of an experiment comparing the drug with a placebo stating the level had been lowered by an average of 13.2 mg/l with a P-value < 0.01 . Which of the following best explains the meaning of P-value?
- (A) 1% of the people did better with the placebo than with the drug.
 - (B) Only 1% of the people experienced side effects.
 - (C) The probability is less than 1% of obtaining a difference in the mean cholesterol levels between those taking the placebo and the those taking the medication is as large or larger than 13.2 mg/l if the means for the placebo and medication groups were equal.
 - (D) All but 1% of the people on the drug experienced a drop of 13.2 mg/l.
 - (E) The difference between the two groups was not significant.
26. A linear regression was conducted on the following data points. A(1,11), B(3, 7), C(5, 2), D(7, 1), E(9, -2). The residual for which point has the largest absolute value?
- (A) A
 - (B) B
 - (C) C
 - (D) D
 - (E) E

27. An alumni association of a major university finds that 30% of their members attained advanced degrees, 50% attained a bachelor's degree and 20% did not graduate. The mean income of a graduate with an advanced degree is \$75,000, the mean income of a graduate with a bachelor's degree is \$54,000, and the mean income of a non-graduate is \$36,000. From past results, alumni members donate 5% of their income to the university. If 50 members of the alumni association are randomly selected, what is the expected total donation?

- (A) \$2,750
- (B) \$2,835
- (C) \$137,500
- (D) \$135,000
- (E) \$141,750

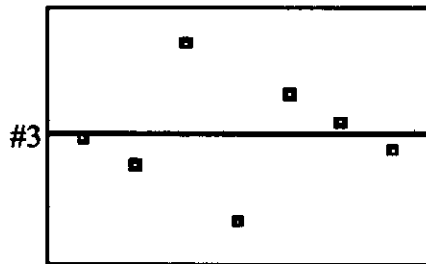
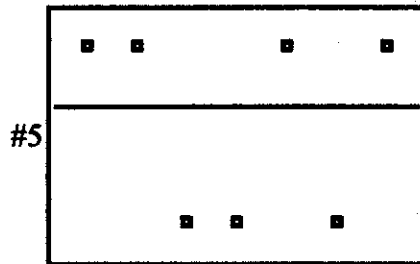
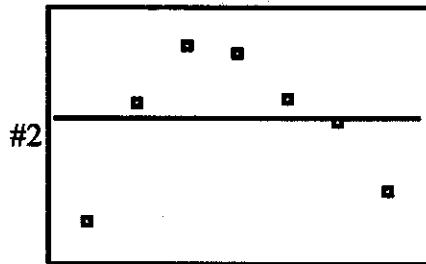
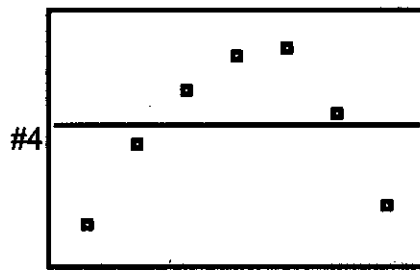
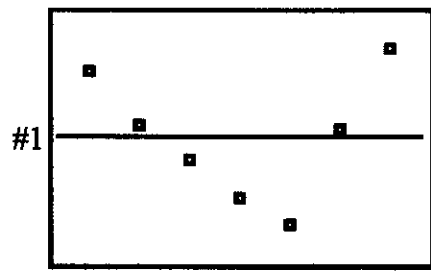
28. In order to determine the dexterity or handedness of people, 10 people were asked to roll a die with one hand and make a tally mark with the other hand for 60 seconds. Then the subjects were asked to use the other hand. The hand that each person used first was decided by chance. The number of tally marks made by each subject is shown in the table below.

Subject	1	2	3	4	5	6	7	8	9	10
Right hand	42	36	50	42	32	41	40	37	38	47
Left hand	45	49	31	41	44	53	36	48	52	33

One measure of handedness is the difference between the number of marks made by each hand. What is the P-Value for the appropriate hypothesis test?

- (A) -0.910
- (B) 0.376
- (C) 0.493
- (D) 0.715
- (E) 0.754

29. A researcher made a scatter plot from some previously collected data. The data was clearly non-linear in shape. The researcher then tried a variety of transformations on the data in an attempt to linearize the results. The residual plot for each transformation is shown below.



Which of the transformations was best at linearizing the data?

- (A) #1
- (B) #2
- (C) #3
- (D) #4
- (E) #5

30. A spring is used to propel a toy rocket. In a sample of 10 toy rockets, the mean distance traveled is 32.7 inches with a standard deviation of 4.3 inches. A stem plot reveals no evidence of non-normality. What is the 98% confidence interval for the true mean of the distance traveled?
- (A) 32.7 ± 3.16
 (B) 32.7 ± 3.21
 (C) 32.7 ± 3.26
 (D) 32.7 ± 3.76
 (E) 32.7 ± 3.84
31. A student is assigned a project in a statistics class. The student uses the Internet to find the data from the 2000 Census that lists the population for each state in the United States and computes the 90% confidence interval for the mean population of each state. The student's statistics teacher marks the answer wrong. Which of the following is the reason the student's answer is incorrect?
- (A) The data does not represent a true random sample.
 (B) Since the data is highly skewed it violates the rules of thumb to construct a confidence interval.
 (C) A confidence interval should never be constructed when population data is known.
 (D) The degrees of freedom is unknown.
 (E) Using mean from each state to compute the overall mean is improper.
32. A survey of 259 families was made to determine if their vacation habits. The two way table below shows the number of families by location (rural, suburban, urban) and length of most recent vacation (1 - 7 days, 8 or more).

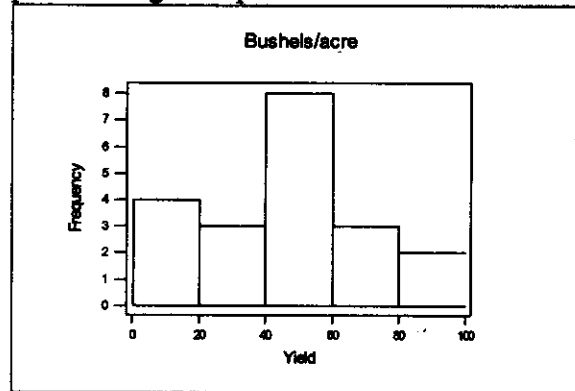
	Rural	Suburban	Urban	Total
1-7 days	80	39	37	156
8 or more days	52	32	19	103
Total	132	71	56	259

What is the probability that a randomly selected family was suburban given that they spent 8 or more days on vacation?

- (A) 0.12
 (B) 0.31
 (C) 0.45
 (D) 0.50
 (E) 28.24

33. A large bakery has a many different products for sale. Suppose that 70% of all customers of the bakery order donuts, 50% order cinnamon rolls, and 40% order both. If a customer is randomly selected, what is the probability that she ordered neither donuts nor cinnamon rolls?
- (A) 14%
 - (B) 20%
 - (C) 35%
 - (D) 48%
 - (E) 60%
34. A group of eight people work on the fifth floor of a building. They all decide they want to lose weight by increasing their physical activity. Four of them decide to walk up the five flights of stairs each work day. The other four decide to walk down the five flights at the end of the day. They weigh themselves each Monday morning and report their weight to their supervisor. This is an example of
- (A) an experiment since they are divided into two equal groups.
 - (B) an observational study since the supervisor didn't decide which group walked up the stairs.
 - (C) block design since there are two treatments.
 - (D) a survey since the people volunteered to report their weight each week.
 - (E) an explanatory variable since they both increase their physical activity.

35. The histogram represents the yield (in bushels/acre) of 20 apple orchards in the northwest. The class intervals are equal. The right endpoint is included but the left endpoint is not.



What proportion of orchards exceeded 60 bushels/acre?

- (A) 0.03
- (B) 0.05
- (C) 0.15
- (D) 0.25
- (E) 0.60

36. An advertisement for a diet supplement, Looze-Now, claims that it is scientifically proven that Looze-Now will help people lose an average of 14.8 pounds in 30 days. The article further explains that a double blind test was done to compare Looze-Now with a control group. The mean weight loss of people on Looze-Now was 14.8 pounds with a standard deviation of 11.2 pounds. The mean weight loss of people in the control group was 15.1 pounds with a standard deviation 12.5 pounds. Which of the following statements is true?

- (A) Looze-Now caused people to lose weight.
- (B) The least amount of weight lost among the Looze-Now group was 3.6 pounds.
- (C) The weight loss among the Looze-Now sample was likely due to a placebo effect.
- (D) The experiment wasn't really double blind, since the people could tell if they were losing weight.
- (E) Anyone who takes Looze-Now will experience a weight loss.

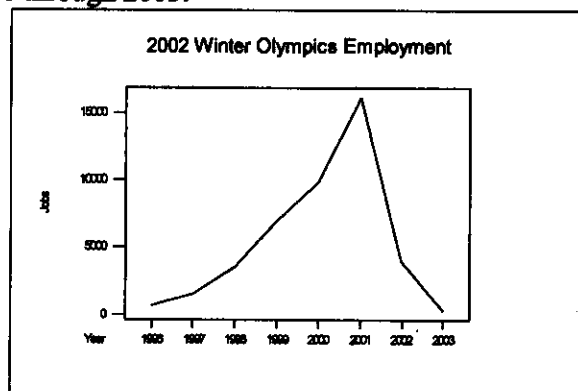
37. Automobile engineers checked the effect of a new automatic transmission on mileage. They selected 50 cars of the same make and model. They randomly chose 25 of the cars to use the old transmission while the other 25 cars received the new model of transmission. The mean of the first group was 23.4 mpg with $s = 3.4$ mpg. The mean of the second group was 25.1 mpg with $s = 3.2$ mpg. A hypothesis test on the difference between the means was conducted. Which of the following is an assumption that allowed for the hypothesis test?
- (A) The assignment of transmission was random.
 (B) The sampling distribution of the difference between the sample means is bimodal.
 (C) Since the data was random, no linear regression was possible.
 (D) The standard deviation of each group was different.
 (E) The difference between the means was within a standard deviation.
38. A study was done at a large mid-western university to determine if there was bias in the starting salaries of short people when compared to people of above average height. Since the mean height for women is different from the mean height for men, the researchers examined both men and women. Graduates were selected from 5 different majors. For each major a randomly selected woman at least 2 inches below the mean height for women was paired with a randomly selected woman who was at least 2 inches above the mean height. Five pairs were similar selected from males graduates from the same majors. The starting weekly salaries for each person in the pair was recorded and the difference (Tall Salary- Short Salary) computed. The results were summarized in the computer output below.

	N	MEAN	STDEV	SE MEAN	95 PERCENT C.I.
DIFF	10	420.000	473.286	149.666	(83.431, 758.574)

Based on the data, which of the following statements is correct?

- (A) A chi-squared test should have been done since there were two factors - height and gender.
 (B) Since the confidence interval did not contain 0, it is likely that the mean salary for tall people is greater than the mean salary for short people.
 (C) There is a 95% probability that the true mean difference in salaries lies between \$83.43 and \$758.57.
 (D) Since the confidence interval was above 0, it is likely that the mean salary for tall people is greater than the mean salary for short people.
 (E) A sample size of 10 is too small to draw any conclusion.

39. The following graph represents the number of paid employees related to the 2002 Winter Olympics from 1996 through 2003.



Which of the following statements are true?

- I. The data is skewed to the left.
 - II. The data is skewed to the right.
 - III. The mean number employed is about 5,000.
 - IV. The mean number is about 10,000.
- (A) I and III
 (B) II and III
 (C) I and IV
 (D) II and IV
 (E) None of the above are true.
40. In a study children were asked to indicate which emotion they associated with the color blue. The response and gender of the child are summarized in the table.

	Joy	Happiness	Love	Anger	Total
Male	28	20	40	18	106
Female	61	25	80	60	226
Total	89	45	120	78	332

We wish to test the claim H_0 : There is no relationship between gender and emotion vs. H_a : There is a relationship between gender and emotion. (Let $\alpha = 0.05$)

- (A) Reject H_0 : If $\chi^2 = 0.103$
- (B) Reject H_0 : If $\chi^2 = 6.17$
- (C) Reject H_0 : If $\chi^2 = 7.81$
- (D) Fail to reject H_0 : If $\chi^2 = 14.07$
- (E) Fail to reject H_0 : If $\chi^2 = 15.51$