MATH 2300
Fall 2014 Final Exam

You have 150 minutes to complete this exam. Unless your exam proctor gives you alternative instructions, please observe the following:

- For the multiple choice questions, select the *best answer* and *write it clearly* in the space preceding the question number. There is *only one* correct answer for each question. If your instructor requires the multiple choice answers on another answer sheet (*e.g.* a Scantron), please place your answers there.
- For the non-multiple choice questions, provide your answers in the space provided and be sure to indicate your answers clearly where appropriate.

MULTIPLE CHOICE (40 Questions)

1. ______ A researcher randomly selects a sample of 100 students from the students enrolled at Texas Tech. She asks each student their age and calculates the mean age of the 100 students. It is 21.3 years. Based on this sample, she then estimates the mean age of all students enrolled at the college to be 21.3 years. In what way are descriptive statistics involved in this example? In what way are inferential statistics involved?
A) When calculating the mean age of the students in the sample, the researcher is using descriptive statistics. When estimating the mean age of all students at the college, the researcher is using inferential statistics.
B) When calculating the mean age of the students in the sample, the researcher is using inferential statistics. When estimating the mean age of all students at the college, the researcher is using descriptive statistics.

2. ______ George, a network engineer, ordered 700 CAT 5e Ethernet cables for use at his company's network. After receiving these cables, he decided to randomly test 210 of these cables before using them. He was alarmed to find out that 91% of these cables failed completely. He returned the entire lot to the manufacturer. When he tested the cables, what was George's sample?
A) 191 cables B) 700 cables C) 637 cables D) 210 cables

3. ______ The members of a board of directors have the following roles: president (P), vice president (V), secretary (S), treasurer (T), and fundraiser (F). Consider these board members to be a population of interest. List the 10 possible samples (without replacement) of size two from this population of five board members. "PS" would indicate president and secretary selected.
A) PP, PV, PS, PT, PF, VV, VS, VT, VF, SS
B) ST, SF, TP, TV, TS, TF, FP, FV, FS, FT
C) PV, PS, PT, PF, VP, VS, VT, VF, SP, SV
D) PV, PS, PT, PF, VS, VT, VF, ST, SF, TF

4. ______ What type of data is provided by the statement "Helen finished in the 8^{th} place in the ice dancing competition"?
A) Discrete B) Continuous C) Qualitative

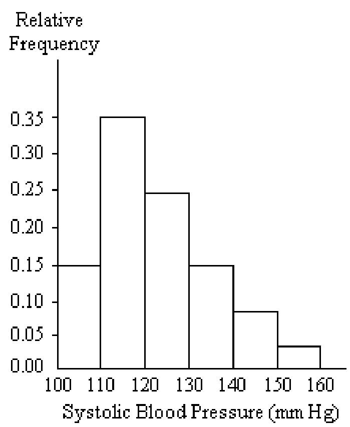
5. ______ The following table shows the average weight of offensive linemen for each given football team.

Team	Average Weight (pounds)
Gators	303.52
Lakers	326.78
Eagles	290.61
Pioneers	321.96
Lions	297.35

What kind of data is provided by the information in the second column?

A) Qualitative B) Quantitative

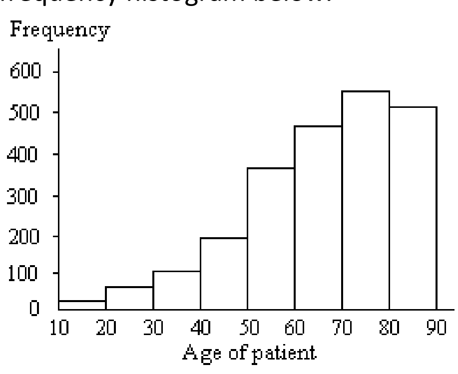
6. ______ A nurse measured the blood pressure of each person who visited her clinic. The following is a relative-frequency histogram for the systolic blood pressure (SBP) readings for those people aged between 25 and 40. (SBP was given to the nearest whole number.)



Given that 300 people were aged between 25 and 40, approximately how many had a SBP reading less than 130?

A) 225 B) 75 C) 90 D) 25

7. ______ The ages of a group of patients being treated at one hospital for osteoporosis are summarized in the frequency histogram below.



Identify the overall shape of the distribution.

A) Right skewed B) Left skewed C) Reverse J-shaped D) Bell-shaped

8. ______ The grocery expense for six families were (in $) 67.43, 69.68, 50.54, 58.42, 43.00, and 65.59. Compute the mean grocery bill.

A) $58.93 B) $70.93 C) $59.11 D) $88.67

Name: ______________________

9. ______ Christine is currently taking college astronomy. On the past seven quizzes, Christine got the following scores: 52, 15, 48, 27, 12, 42, 68. Find the sample standard deviation.

A) 12,494 B) 48 C) 20.6 D) 9956.6

10. _____ The amount of Jen's monthly phone bill has a roughly bell-shaped distribution with a mean of $57 and a standard deviation of $9. What percentage of her phone bills are between $30 and $84?

A) 99.99% B) 95% C) 68% D) 99.7%

11. _____ Determine the interquartile range of the following data:

2, 3, 6, 8, 9, 12, 15, 17, 17, 19, 23, 37

A) 7 B) 18 C) 10 D) 11

12. _____ The test scores of 14 students are listed below. Obtain the five-number summary of the data.

42 47 48 54 59 63 64 68 72 79 85 87 90 95

A) 42, 52.5, 68, 85.5, 95 B) 42, 52.5, 70, 85.5, 95

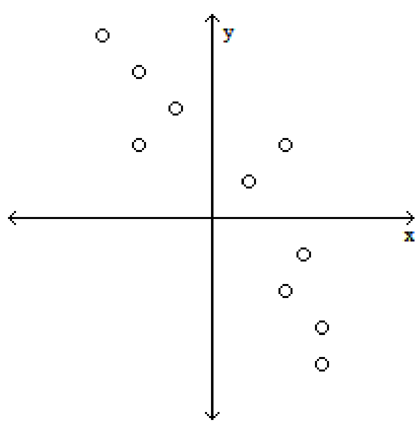
C) 42, 54, 66, 85, 95 D) 42, 54, 70, 87, 95

13. _____ A variable x has a mean, μ, of 22 and a standard deviation, σ, of 7. Determine the standardized version of x.

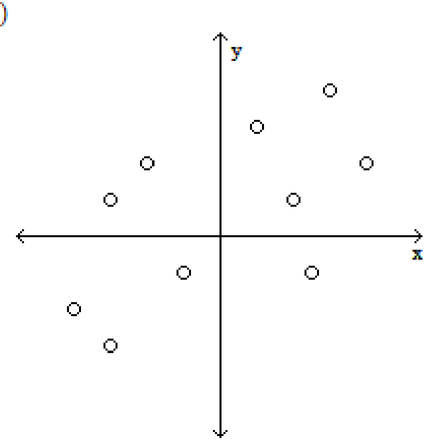
A) x = (z - 22) / 7 B) z = - 22 / 7 C) z = (x - 22) / 7 D) z = (x – 7) / 22

14. _____ Determine which scatterplot shows the strongest linear correlation.

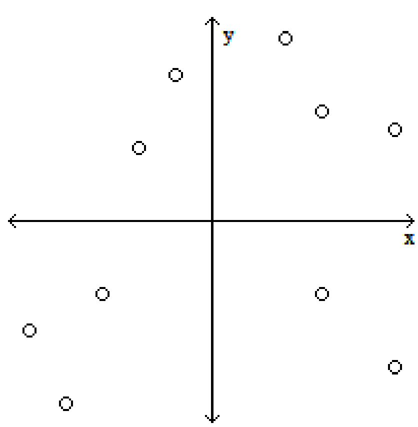
A)



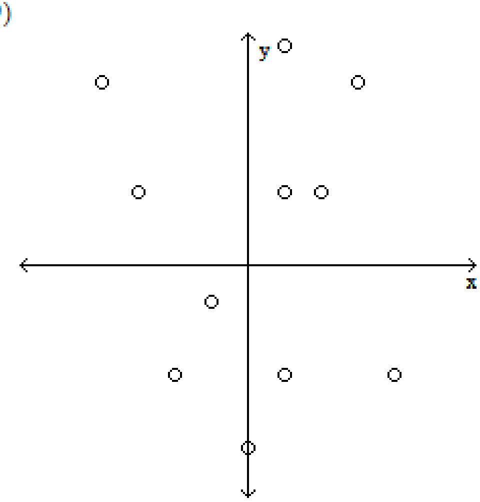
B)



C)



D)



Name: ______________________

15. _____ If two balanced die are rolled, the possible outcomes can be represented as follows:

(1,1) (2,1) (3,1) (4,1) (5,1) (6,1)
(1,2) (2,2) (3,2) (4,2) (5,2) (6,2)
(1,3) (2,3) (3,3) (4,3) (5,3) (6,3)
(1,4) (2,4) (3,4) (4,4) (5,4) (6,4)
(1,5) (2,5) (3,5) (4,5) (5,5) (6,5)
(1,6) (2,6) (3,6) (4,6) (5,6) (6,6)

Determine the probability that the <u>sum</u> of the dice is 3 <u>or</u> 9.

A) 5/36 B) 2/9 C) 7/36 D) 1/6

16. _____ When a quarter is tossed four times, 16 outcomes are possible.

HHHH HHHT HHTH HHTT HTHH HTHT HTTH HTTT
THHH THHT THTH THTT TTHH TTHT TTTH TTTT

Here, for example, HTTH represents the outcome that the first toss is heads, the next two tosses are tails, and the fourth toss is heads. The events A and B are defined as follows:

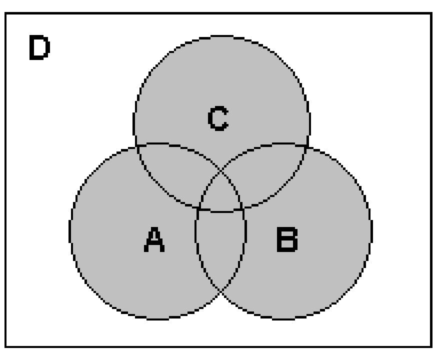
A = event exactly two of the four tosses result in tails
B = event the first and last tosses are the same.

List the outcomes that comprise the event (A&B).

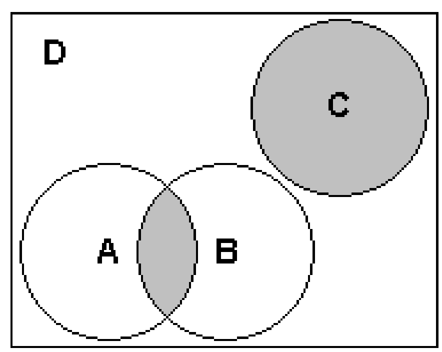
A) HHHH, HHTH, HTHH, HTTH, THHT, THTT, TTHT, TTTT
B) HHTT, HTHT, HTTH, THHT, THTH, TTHH
C) HHHH, HHTH, HHTT, HTHH, HTHT, HTTH, THHT, THTH, THTT, TTHH, TTHT, TTTT
D) HTTH, THHT

17. _____ From a finite sample, events A and B are non-mutually exclusive; however, event C is exclusive of events A and B. Shade the collection "(A & B) or C".

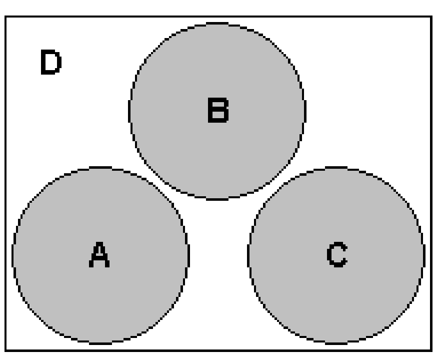
A)



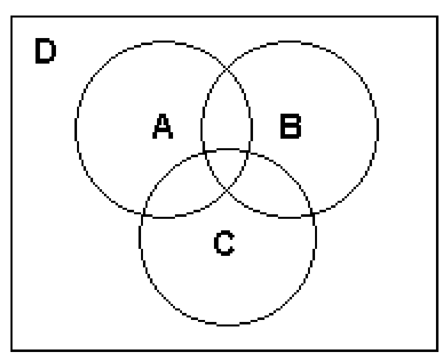
B)



C)

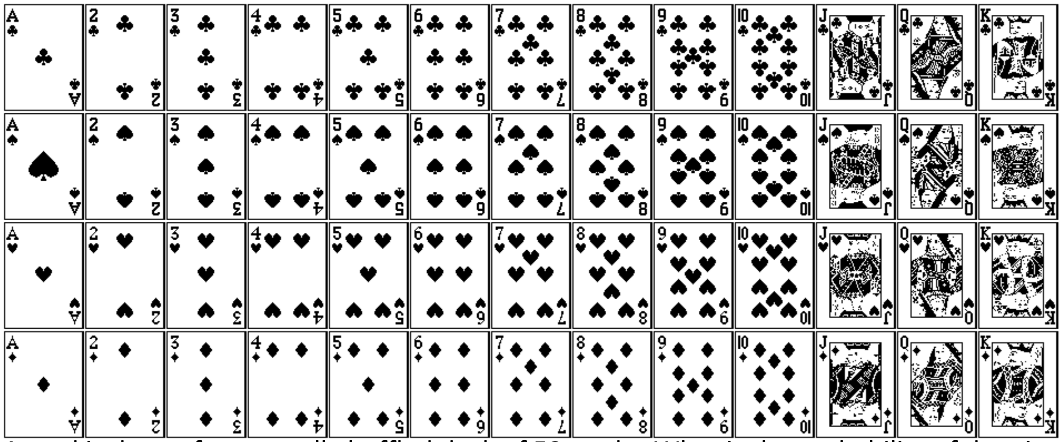


D)



A standard deck of 52 playing cards is represented in the following:

Ace 2 3 4 5 6 7 8 9 10 ---- Face Cards ----



Clubs

Spades

Hearts

Diamonds

18. _____ A card is drawn from a well-shuffled deck of 52 cards. What is the probability of drawing an Ace or 7?

A) 13/2 B) 8 C) 2/13 D) 4/13

19. _____ If you pick a card at random from a well-shuffled deck, what is the probability that you get a face card or a spade?

A) 9/26 B) 1/22 C) 11/26 D) 25/52

20. _____ The table below shows the soft drink preference of people in three age groups:

	Cola	Root Beer	Lemon-Lime
Under 21	40	25	20
21-40	35	20	30
Over 40	20	30	35

If one of the 255 subjects is randomly selected, find the probability that the person is over 40 and drinks cola.

A) 4/19 B) 4/51 C) 4/17 D) None are correct

21. _____ If two balanced die are rolled, the possible outcomes can be represented as follows:

(1,1) (2,1) (3,1) (4,1) (5,1) (6,1)
(1,2) (2,2) (3,2) (4,2) (5,2) (6,2)
(1,3) (2,3) (3,3) (4,3) (5,3) (6,3)
(1,4) (2,4) (3,4) (4,4) (5,4) (6,4)
(1,5) (2,5) (3,5) (4,5) (5,5) (6,5)
(1,6) (2,6) (3,6) (4,6) (5,6) (6,6)

Let X denote the <u>smaller of the two numbers</u>. If both dice come up the same number, then X equals that common value. Find the probability distribution of X.

A)

x	P(X=x)
1	11/36
2	1/4
3	7/36
4	5/36
5	1/12
6	1/36

B)

x	P(X=x)
1	5/18
2	2/9
3	1/6
4	1/9
5	1/18
6	0

C)

x	P(X=x)
1	1/6
2	1/6
3	1/6
4	1/6
5	1/6
6	1/6

D)

x	P(X=x)
1	5/18
2	1/4
3	7/36
4	5/36
5	1/9
6	1/36

22. _____ There are only 8 chairs in our whole house. Whenever there is a party some people have nowhere to sit. The number of people at our parties (call it the random variable X) changes with each party. Past records show that the probability distribution of X is shown in the following table. Find the probability that everyone will have a place to sit at our next party.

x	5	6	7	8	9	10	>10
P(X=x)	0.05	0.05	0.20	0.15	0.15	0.10	0.30

A) 0.05 B) 0.45 C) 0.15 D) 0.55

23. _____ For a continuous random variable, the area under the density curve that lies to the right of 12 is 0.405. What percentage of all possible observations of the variable are at most 12?
A) 40.5% B) 34.5% C) 65.5% D) 59.5%

24. _____ The amount of time that customers wait in line during peak hours at one bank is normally distributed with a mean of 14 minutes and a standard deviation of 3 minutes. The percentage of time that the waiting time exceeds 12 minutes is equal to the area under the standard normal curve that lies to the ___ of ___.
A) left, 0.54 B) right, -0.67 C) right, 0.67 D) left, -0.67

25. _____ Find the area under the standard normal curve that lies between -0.73 and 2.27.
A) 0.2211 B) 1.54 C) 0.7557 D) 0.4884

26. _____ Find the z-score having area 0.86 to its right under the standard normal curve; that is, find $z_{0.86}$.
A) 0.8051 B) -1.08 C) 1.08 D) 0.5557

27. _____ The lengths of human pregnancies are normally distributed with mean of 268 days and a standard deviation of 15 days. What is the probability that a pregnancy lasts at least 300 days?
A) 0.0166 B) 0.4834 C) 0.0179 D) 0.9834

28. _____ The incomes of trainees at a local mill are normally distributed with a mean of $1,100 and a standard deviation $150. What percentage of trainees earn less than $900 a month?
A) 90.82% B) 35.31% C) 40.82% D) 9.18%

29. _____ What generally happens to the sampling distribution of the sample mean as the sample size is decreased?
A) It becomes more tightly concentrated around the population mean.
B) It becomes less tightly concentrated around the population mean.
C) It is unaffected.

30. _____ The mean and the standard deviation of a sampled population are, respectively, 83.6 and 5.5. n = 256. Find the mean and standard deviation of the sample mean $\bar{x}$.
A) $\mu_{\bar{x}} = 0.3;\ \sigma_{\bar{x}} = 83.6$ B) $\mu_{\bar{x}} = 83.6;\ \sigma_{\bar{x}} = 0.3$
C) $\mu_{\bar{x}} = 30.7;\ \sigma_{\bar{x}} = 1.1$ D) $\mu_{\bar{x}} = 5.5;\ \sigma_{\bar{x}} = 0.3$

31. _____ Let x represent the number that shows up when a balanced die is rolled. Then x is a random variable with a mean of 3.5 and a standard deviation of 1.71. Let $\bar{x}$ denote the mean of the numbers obtained when the die is rolled 40 times. Determine the sampling distribution of $\bar{x}$.
A) Approximately normal, mean = 3.5, standard deviation = 0.27
B) Exactly normal, mean = 3.5, standard deviation = 0.04
C) Approximately normal, mean = 3.5, standard deviation = 1.71
D) Exactly normal, mean = 3.5, standard deviation = 0.27

32. _____ For a t-curve with df = 9, find the t-value having area 0.005 to its left.
A) 1.833 B) -3.250 C) -1.833 D) 3.250

33. _____ A savings and loan association needs information concerning the checking account balances of its local customers. A random sample of 14 accounts was checked and yielded a mean balance of \$664.14 and a standard deviation of \$297.29. Find a 90% confidence interval for the true mean checking account balance for local customers. Assume the population is normally distributed.
A) \$523.43 to \$804.85 B) \$493.71 to \$834.57 C) \$455.65 to \$872.63 D) \$492.52 to \$835.76

34. _____ At one school, the average amount of time that tenth-graders spend watching television each week is 21.6 hours. The principal introduces a campaign to encourage the students to watch less television. One year later, the principal wants to perform a hypothesis test to determine whether the average amount of time spent watching television per week has decreased. Determine the null and alternative hypothesis.
A) H_0: $\mu < 21.6$ hours, H_a: $\mu = 21.6$ hours B) H_0: $\mu < 21.6$ hours, H_a: $\mu > 21.6$ hours
C) H_0: $\mu = 21.6$ hours, H_a: $\mu < 21.6$ hours D) H_0: $\mu = 21.6$ hours, H_a: $\mu \leq 21.6$ hours

35. _____ In 2000, the mean math SAT score for students at one school was 478. Five years later, in 2005, a teacher performed a hypothesis test to determine whether the average math SAT score of students at the school had changed from the 2000 mean of 478. The hypotheses were:
H_0: $\mu = 478$, H_a: $\mu \neq 478$
where μ is the mean math SAT score in 2005 for students at the school.
Explain the meaning of a Type I error.
A) A Type I error would occur if, in fact, $\mu \neq 478$, and the results of the sampling lead to that conclusion.
B) A Type I error would occur if, in fact, $\mu = 478$, but the results of the sampling do not lead to rejection of that fact.
C) A Type I error would occur if, in fact, $\mu \neq 478$, but the results of the sampling fail to lead to that conclusion.
D) A Type I error would occur if, in fact, $\mu = 478$, but the results of the sampling lead to the conclusion that $\mu \neq 478$.

36. _____ For the given statistics, use a t-test to perform the required hypothesis test. Assume the population is normal and use the critical-value approach. $\bar{x} = 7.6, s = 2.3, n = 18$, H_0: $\mu = 10$, H_a: $\mu < 10$, $\alpha = 0.01$.
A) Test statistic: t = -4.43. Critical value: t = -2.552. Reject H_0. There is sufficient evidence to support the claim that the mean is less than 10.
B) Test statistic: t = -4.43. Critical value: t = -2.33. Do not reject H_0. There is not sufficient evidence to support the claim that the mean is less than 10.
C) Test statistic: t = -4.43. Critical value: t = -2.567. Reject H_0. There is sufficient evidence to support the claim that the mean is less than 10.
D) Test statistic: t = -4.43. Critical value: t = -2.33. Reject H_0. There is sufficient evidence to support the claim that the mean is less than 10.

37. _____ For the given statistics, use a t-test and calculate the p-value. Assume the population is normal.
$\bar{x} = 22.85, s = 9.2, n = 25$, H_0: $\mu = 26$, H_a: $\mu < 26$.
A) Test statistic: t = -1.71. P-value = 0.05.
B) Test statistic: t = 1.71. P-value = 0.95.
C) Test statistic: t = -1.71. P-value = 0.01.
D) Test statistic: t = 1.71. P-value = 0.99

38. _____ A researcher wants to perform a hypothesis test to determine whether the mean length of marriages in California (μ_1) differs from the mean length of marriages in Texas (μ_2). Determine the null and alternative hypotheses.

A) H_0: $\mu_1 \neq \mu_2$, H_a: $\mu_1 = \mu_2$
B) H_0: $\mu_1 = \mu_2$, H_a: $\mu_1 > \mu_2$
C) H_0: $\bar{x}_1 = \bar{x}_2$, H_a: $\bar{x}_1 \neq \bar{x}_2$
D) H_0: $\mu_1 = \mu_2$, H_a: $\mu_1 \neq \mu_2$

39. _____ For the given statistics, use an appropriate t-test to perform the two-tailed hypothesis test of equal means. Assume the populations are normal. Use $\alpha = 0.01$.

$\bar{x}_1 = 74.0, s_1 = 4.5, n_1 = 11, \bar{x}_2 = 64.0, s_2 = 5.1, n_2 = 9.$

A) Test statistic: t = 4.598
Critical values = +/- 2.921
Reject H_0

B) Test statistic: t = 2.646
Critical values = +/- 2.921
Do not reject H_0

C) Test statistic: t = 2.646
Critical values = +/- 2.845
Do not reject H_0

D) Test statistic: t = 4.598
Critical values = +/- 2.845
Reject H_0

40. _____ The number of successes and the sample size are given for a simple random sample from a population:
x = 86, n = 138
Find a 90% confidence interval for the population proportion.

A) 0.603 to 0.643 B) 0.543 to 0.703 C) 0.575 to 0.671 D) 0.555 to 0.691

SHORT ANSWER (10 Questions)

41. The finalists in an essay competition are Lisa (L), Melina (M), Ben (B), Danny (D), Eric (E), and Joan (J). Consider these finalists to be the population of interest. The possible samples (without replacement) of size two that can be obtained from this population of six finalists are as follows:
L,M L,B L,D L,E L,J M,B M,D M,E M,J B,D B,E B,J D,E D,J E,J
If a simple random sampling method is used to obtain a sample of two of the finalists, what are the chances of selecting Lisa <u>and</u> Danny?

42. The data below represent the results of a poll in which the following question was asked: "To what degree are you satisfied with your current health insurance?" Construct a pie-chart. Be sure it is well-labeled.

Very	13%
Somewhat	30%
Not at All	35%
No opinion	22%

43. Construct a bar graph for the <u>relative frequencies</u> given. Be sure it is well-labeled.

Blood Type	Frequency	Relative Frequency
O	22	0.44
A	19	0.38
B	6	0.12
AB	3	0.06

44. The data in the following table represent heights of students at a high school. Find and insert the value of the missing entry.

Height (cm)	Relative Frequency
142 - under 152	0.03
152 - under 162	0.21
162 - under 172	0.27
172 - under 182	0.28
182 - under 192	
192 - under 202	0.02

45. In ten trips to Las Vegas, a person had the following net gains (in $):
1235 2630 3446 3714 4569 4893 6071 6676 6934 8031
Find the median:

Name: _____________________

46. The following frequency distribution analyzes the scores on a math test. Find the probability that a score greater than 82 was achieved.

Scores	Number of Students
40-59	2
60-75	4
76-82	6
83-94	15
95-99	5

47. The volumes of soda in quart soda bottles are normally distributed with a mean of 32.3 oz and a standard deviation of 1.2 oz. What is the probability that the volume of soda in a randomly selected bottle will be less than 32 oz?

48. Weights of women in one age group are normally distributed with a standard deviation $\sigma = 14$ lb. A researcher wishes to estimate the mean weight of all women in this age group. Find how large a sample must be drawn in order to be 90% confident that the sample mean will not differ from the population mean by more than 3.0 lb.

(Show work):

49. Thirty randomly selected students took the Calculus I final. If the sample mean was 93 and the standard deviation was 13.3, construct a 99% confidence interval for the mean score of all Calculus I students.

(Show work):

50. The significance level of a hypothesis test is 0.10 and the calculated p-value is 0.13. Decide whether the null hypothesis should be rejected and explain your reasoning.