Math 1040 Final Exam   **Introduction to Statistics**   **Fall Semester 2013**

Name _____   Instructor_____

Date _____   Section_____

_____

Time Limit: 120 minutes

Any calculator is okay. Necessary tables and formulas are attached to 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. Classify the variable for a survey of where students live which is categorized by postal zip codes.

    A. nominal   B. ordinal
    C. interval   D. ratio

2. The probability that a randomly selected 40-year-old male in the United States will have more than one credit card is 0.247. What is the probability that at least one of the three randomly selected US males 40 years of age will have more than one credit card?

    A. 0.015   B. 0.427
    C. 0.573   D.   0.985

3. Duffle's Family Bakery sells a 16 oz loaf of Country-Style French bread for $2.95. Of course not every loaf weighs exactly 16 oz, but the mean should be 16 oz with a standard deviation is 0.1 oz. For quality control random samples 100 loaves in each sample are taken, and among other things, the mean weights and standard deviations of the samples are calculated. What does the central limit theorem tell us about the sampling distribution of the mean weights?

   A. The shape of the sampling distribution of the mean weights is unknown because the shape of the distribution for the population of all weights is unknown, but the mean weight of the samples is 16 oz.
   B. The sampling distribution of the mean weights can be approximated by a normal distribution with a mean of 16 oz and a standard deviation of 0.01 oz.
   C. The sampling distribution of the mean weights is precisely a normal distribution with a mean of 16 oz and a standard deviation of 0.1 oz.
   D. The shape and mean weights of the sampling distribution is unknown because it's impossible to take all possible samples.

4. A study in the Mental Health Nursing course, NSG 2600, found a strong negative correlation between the number of siblings psych patients have and the amount of time they sleep.

   A. This shows that the more siblings a patient has causes her/him to sleep less.
   B. This shows that the fewer siblings a patient has causes her/him to sleep less.
   C. This shows that the fewer siblings a patient has causes her/him to sleep more.
   D. This doesn't show any causal relationship between the number of siblings a patient has and the amount of time s/he sleeps.

5. Based on data from a USA Today Snapshot, 72% of adults have security concerns about online banking. Find the probability that among 30 randomly selected adults, exactly 15 have security concerns.

   A. 0.500   B. 0.360
   C. 0.006   D. 0.001

6. Men's heights are normally distributed with a mean of 69.5 in. and standard deviation of 2.40 in. The mean height of NBA players is 77.9 in. with a standard deviation of 0.65 in. What percentage of adult men are taller than the average NBA player?

   A. 0.1%   B. 0.01%
   C. 0.001%   D. 0.0001%

7. The marketing department must estimate the percent of the website's current viewers who prefer a new website design. Use a 0.07 margin of error and to be 90% confident, how many randomly selected current viewers should be surveyed?

    A. 138   B. 196

    C. 139   D. 197

8. Our local grocery store employs cashiers, stock clerks, and deli personnel. The distribution according to marital status is shown in the table. If an employee is selected at random, what is the probability that s/he is either a cashier or not married?

	Married	Not Married
Cashier	12	10
Stock Clerk	7	11
Deli personnel	6	4

    A. 0.94

    B. 0.44

    C. 0.74

    D. 0.70

9. To estimate the number of words defined in the *Merriam-Webster Dictionary*, Bill randomly selected 20 different pages and then counted the number of words defined on each page. Identify which type of sampling he used.

    A. systematic   B. stratified

    C. random   D. cluster

10. With a short time remaining in the day, a FedEx driver has time to make deliveries at only three locations among the eight locations remaining. How many different routes are possible?

    A. 336   B. 56

    C. 512   D. 24

INSTRUCTIONS PART II: Questions 11 - 20, Written Response. Answer all ten questions carefully and completely, showing your work and clearly indicating your answer. Partial credit is available.

11. A sample of classroom enrollments (number of students per class) is shown in the adjacent table.

enrollment	frequency
0 – 9	3
10 – 19	12
20 – 29	38
30 – 39	57
40 – 49	62
50 – 59	48
60 – 69	15

a) Find the mean and write your answer using the appropriate notation.

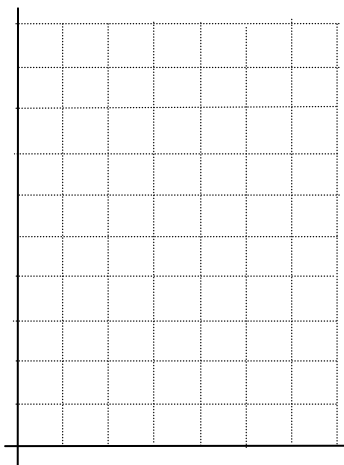b) Find the standard deviation and write your answer using the appropriate notation.

12. The adjacent data show the number of US representatives for eastern states and the District of Columbia.

AL	7	ME	2	OH	16
CT	5	MD	8	PA	18
DE	1	MA	9	RI	2
DC	1	MI	14	SC	7
FL	27	MS	4	TN	9
GA	14	NH	2	VT	1
IL	18	NJ	12	VA	11
IN	9	NY	27	WV	3
KY	6	NC	13	WI	8

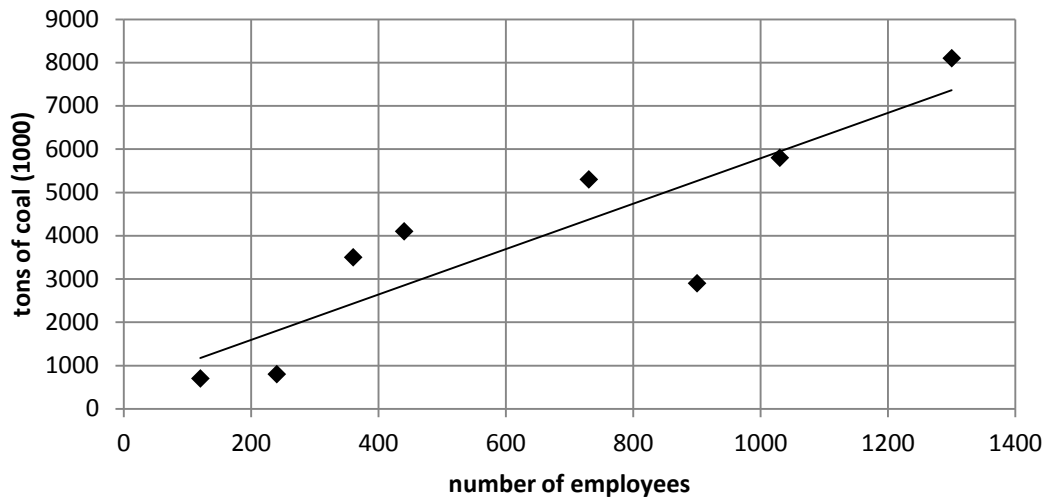a) Make a frequency distribution with the first class having a lower class limit of 0 and a class width of 5.

b) Use the frequency distribution above to construct a histogram.

County	Number of employees	Tons of Coal (1000)
Luzerne	440	4100
Carbon	730	5300
Northumberland	1030	5800
Dauphin	120	700
Columbia	240	800
Lackawanna	1300	8100
Wyoming	360	3500
Schuylkill	900	2900

13. The adjacent data name the coal producing counties in Northeastern Pennsylvania. It shows the number of employees working in coal production in that county and gives the number (in thousands) of tons of bituminous coal produced. The scatter plot for this data is given below.

Coal Production

a) Find the value of the linear correlation coefficient r.

b) Find the critical value of r using $\alpha = 0.05$, and determine whether there is significant evidence to support the claim of a linear correlation between the two variables.

c) Find the regression equation.

d) The mean number of employees is 640, and the mean number of thousands of tons of coal produced is 3900. Find the best predicted amount of coal produced from a county if there are 500 employees working in coal production.

14. The table at the right shows the responses people gave when asked, "What contributes most to your happiness?" Determine whether this is a probability distribution. If it is, find the mean and standard deviation. If it's not, identify a requirement that is not satisfied.

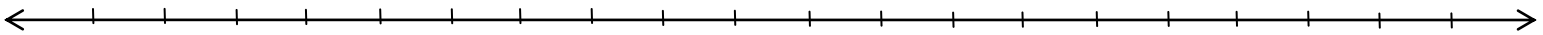|	Prob.
Family/ Partner	0.77
Friends	0.15
Work/ Studies	0.08
Leisure	0.08
Music	0.06
Sports	0.04

15. The ages (in years) of a random selection of race car drivers are given at the right (based on data reported in *USA Today*, July 15, 2010). For this sample data *the mean is 33.6 years* and *the standard deviation is 7.67 years*. Use a 0.05 significance level to test the claim that the mean age of all race car drivers is greater than 30. Assume that the population of drivers' ages is normally distributed.

32	32	33
33	41	29
38	32	33
23	27	45
52	29	25

a. What hypotheses are necessary for the test?

b. What is the test statistic?

c. Find the critical value or the *P*-value?

d. What is the conclusion about the hypotheses? Explain.

e. What is the conclusion about the claim?

16. Grand Valley Hospital is concerned about the high turnover of nurses. A survey was done to determine how many months nurses had been in their present positions. The results are shown at the right.

2	12	24
5	16	30
7	16	31
8	19	36
8	20	41
12	22	52

    a. Give the 5-number summary for the data.

    b. Construct the boxplot.

17. At Burnt Mesa Pueblo in New Mexico, the method of tree ring dating gave the following years A.D. for an archaeological excavation. Assume that this data came from a normally distributed population; construct a 90% confidence interval estimate of the mean year (rounded to nearest year) for the logs at the site.

1125	1205	1217
1306	1187	1250
1231	1194	1162

18. In a Harris poll of 315 human resource professionals, 80% said that the appearance of a job applicant is most important for a good first impression. Use a 0.01 significance level to test the claim that more than three-fourths of all human resource professionals say that the appearance of a job applicant is most important for a good first impression. Find the test statistic and use either the *P*-value method or the critical value method to test H_0. State the conclusion for the hypothesis and the claim.

19. The speeds (mi/h), measured for northbound traffic on I-15 at 5600 South in Murray, UT, are given at the right. This random sample was obtained at 4:30 P.M. Sunday, May 5, 2013. For this sample data *the mean is 60.75 mi/h* and *the standard deviation is 4.09 mi/h*. Use this sample data to construct a 95% confidence interval estimate of the population standard deviation. Show work to get answer.

62	62	61
57	61	54
59	58	59
69	60	67

20. *USA Today* reports that 36% of all parolees become repeat offenders. If a social worker is counseling 5 parolees:

   a. Find the probability that none of the 5 will be repeat offenders.

   b. Of the 5 parolees, what is the mean number expected to be repeat offenders?

Answers:

|			
1.	A	6.	B
2.	C	7.	C
3.	B	8.	C
4.	D	9.	D
5.	C	10.	A

11.   a. $\bar{x}$ = 40.1 students per class,   b. s = 13.5 students per class   (2 points "$\bar{x}$ ", 2 points "s", 3 points each value)
(if student chooses midpoint between lower bounds, $\bar{x}$ = 40.6 students per class, and s = 13.5 students per class)

12.   a.

number of Reps	frequency
0 – 4	8
5 – 9	9
10 -14	5
15 -19	3
20 -24	0
25 -30	2

(2 points each: categories, frequencies, titles, scales, bars)

b.   **Eastern States' Representatives**
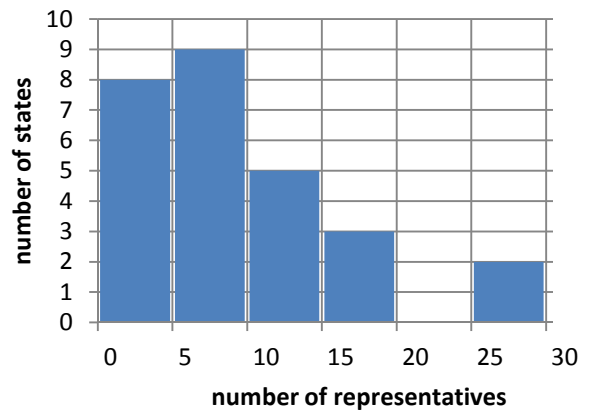
13.   a. r = 0.8676   (2 points)   b. critical value r = ± 0.707 so a linear correlleation existes becacuse r >
critical value   (2 points)m, c. $\hat{y}$ = 5.243x + 544.778 (3 points)   d. 3,166 thousand tons of coal (3 points)

14.   <u>Not</u> a probability distribution (4 points) because the responses are not values of a numerical
random variable, or because the sum of the probablies is not 1.00 (6 points).

15.   a. H_0: μ = 30 yr H_1: μ > 30 yr   b. test stat: t = 1.818   c. critical value: t = 1.761, P-value = 0.0453
d. reject H_0 because test stat > critical value, or because P-value < 0.05   e. There is evidence to
support the claim that the mean age of race car drivers is more than 30 years.   (2 points each part)

16.   a. 2, 8, 17.5, 30, 52 (5 points)
b.
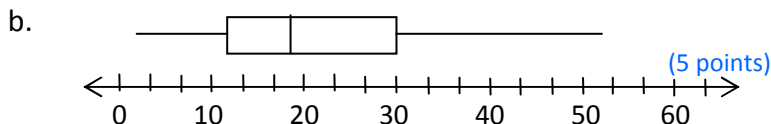
(5 points)

17. (1176, 1241) (10 points)

18. H_0: p = 0.75, H_1: p > 0.75 (2 points), test statistic z = 2.05 (2 points), P-value = 0.0202 or CV = 2.33 (2 points), do not reject H_0 (2 points), the results do not suggest that the more than three-fourths of human resource professionals say that appearance of a job applicant is most important for a good first impression (2 points)

19. df = 11 (1 point), x_L^2 = 3.816 (2 points), x_R^2 = 21.920 (2 points), 2.9 mi/h < σ < 6.9 mi/h (5 points),

20. a. 0.107 (5 points),   b. 1.8 (5 points),

Section	Test number		Section	Test number		Section	Test number
1-2			4-2			7-2	7 (#29)
1-3	1 (#30)		4-3	8 (#19)		7-3	17 (#21)
1-4	9 (#16)		4-4			7-4	19 (#14)
			4-5	2 (# 9)			
2-2	12 (#21)		4-6	10 (#12)		8-2	
2-3	12 (#11)					8-3	18.
2-4			5-2	14 (#13)		8-4	15 (#20)
			5-3	5 (#23)			
3-2	11 (#29)		5-4	20 (#11)		10-2	4(#3), 13(#13)
3-3	11 (#37)					10-3	13 (#13)
3-4	16 (#32)		6-2				
			6-3	6 (#21)			
			6-4				
			6-5	3 (# 1)			