251y0011 10/11/00

ECO251 QBA1
FIRST HOUR EXAM
OCTOBER 7, 2000

Name ____KEY_____
SECTION MWF 10 11 TR 11 12:30

Part I. Multiple Choice (10 points)

1.(D7-1) The major contribution of inferential statistics is that it
a. Allows us to take population information and make statements about samples.
b. Gives us a description of data contained in a sample.
c. Gives us a description of data contained in a population.
*d. Allows us to take sample information and make statements about the population.
e. None of the above.

2.(S-3) Debit balances owed in a retail store are an example of
a. Ordinal data.
b. Nominal data.
c. Interval data.
*d. Ratio data.
e. None of the above.

3. A used automobile dealer lists cars in the following classes. A - 100,000 miles or more on the odometer, B - less than 100,000 miles on the odometer, C - Diesel. Are these three categories
a. Mutually exclusive?
*b. Collectively exhaustive?
c. Both mutually exclusive and collectively exhaustive?
d. Neither mutually exclusive or collectively exhaustive?
e. Can't tell with the information given.

4. (D7-9)If a distribution is skewed to the right, we can say that it is likely that
*a. Mean > median > mode
b. Median > mean > mode
c. Mode > median > mean
d. Mode > mean > median
e. Mode = mean = median (Most people got this backwards - make a diagram!)

5. A graph that connects points, each of which represents the frequency (f) is called a
a. Histogram
b. Ogive
*c. Frequency Polygon
d. Pie chart
e. None of the above

Part II. Compute an appropriate answer, showing your work (except in a)) (15 Points maximum - if you do more than 15 points, only your right answers will be counted.):

a) Fill in the following table (3)

Class	f	f_{rel}	F
50-59.99		.12	
60-69.99	4		
70-79.99			12
80-89.99	6		
90-99.99	7		
Total	25		

Solution:

Class	f	f_{rel}	F
50-59.99	3	.12	3
60-69.99	4	.16	7
70-79.99	5	.20	12
80-89.99	6	.24	18
90-99.99	7	.28	25
Total	25	1.00	

Note that $n = 25$.

b) Assume that we have sold 1000 life insurance policies in amounts between \$5200 and \$9800. If this data is to be presented in eight classes, what intervals would you use? Explain your reasoning using the appropriate formula and make a table showing the class intervals you would actually use. (3)

Solution: $\frac{9800 - 5200}{8} = 575$ so use 600. This is only a suggestion. Any number somewhat above 575 will work.

Class	From	To
A	5200	5799.99
B	5800	6399.99
C	6400	6999.99
D	7000	7599.99
E	7600	8199.99
F	8200	8799.99
G	8800	9399.99
H	9400	9999.99

c) (S-30)If a population of 1000 items with an unknown distribution has a mean of 12 and a standard deviation of 1.2, what is the approximate minimum number of items that must be (i) between 6 and 18? (ii) What is the maximum that can be above 18? (3)

Solution: (i) If we use the formula $k = z = \frac{x - \mu}{\sigma}$, we find that $\frac{6 - 12}{1.2} = -5$ and $\frac{18 - 12}{1.2} = 5$. According to the Chebyshef inequality, the minimum fraction of the data that must be between $\mu \pm 5\sigma$ is $1 - \frac{1}{k^2} = 1 - \frac{1}{25} = 24/25$. $24/25$ of 1000 is 960. (ii) The answer is the opposite to the answer to (i). There are about 1000 - 960 = 40 items left over. All of these could be above 18.

d) Do c) again assuming that the distribution is unimodal and symmetric.(2)
Solution: Since the Empirical Rule says that almost all points must be between $\mu \pm 3\sigma$, we would expect almost all of the 1000 points to be between 6 and 18 since these points are $\mu \pm 5\sigma$, and we would be quite surprised if even one point is above 18.

e) For the numbers 11.1, 13.2, 15.1 and 12.7, compute the i) Root-mean-square ii) Harmonic mean, iii) Geometric mean (2 each)
Solution: Note that $\sum x = 52.1$. This is not used in any of the following calculations and there is

no reason why you should have computed it!
(i) The Root-Mean-Square.

$$\bar{x}_{rms}^2 = \frac{1}{n}\sum x^2 = \frac{1}{4}\left(11.1^2 + 13.2^2 + 15.1^2 + 12.7^2\right) = \frac{1}{4}(123.21 + 174.24 + 228.01 + 161.29) = \frac{1}{4}686.75$$

$= 171.6875$. So $\bar{x}_{rms} = \sqrt{\frac{1}{n}\sum x^2} = \sqrt{171.6825} = 13.103$.

(ii) The Harmonic Mean.

$$\frac{1}{\bar{x}_h} = \frac{1}{n}\sum \frac{1}{x} = \frac{1}{4}\left[\frac{1}{11.1} + \frac{1}{13.2} + \frac{1}{15.1} + \frac{1}{12.7}\right] = \frac{1}{4}(0.090090 + 0.075758 + 0.066225 + 0.078740)$$

$= \frac{1}{4}(0.310813) = 0.077703$. So $\bar{x}_h = \frac{1}{\frac{1}{n}\sum \frac{1}{x}} = \frac{1}{0.077703} = 12.8947$.

(iii) The Geometric Mean.

$$\bar{x}_g = \left[x_1 \cdot x_2 \cdot x_3 \cdots\cdots x_n\right]^{\frac{1}{n}} = \sqrt[n]{\prod x} = \sqrt[4]{(11.1)(13.2)(15.1)(12.7)} = \sqrt[4]{28098.1404} = (28098.1404)^{1/4}$$

$= (28098.1404)^{0.25} = 12.9470$.

Or

$$\ln(\bar{x}_g) = \frac{1}{n}\sum(\ln(x)) = \frac{1}{4}(\ln(11.1) + \ln(13.2) + \ln(15.1) + \ln(12.7)) = \frac{1}{4}(2.40695 + 2.58022 + 2.71469 +$$

$= \frac{1}{4}(10.24346) = 2.56086$. So $\bar{x}_g = e^{2.56086} = 12.9470$. I got the last result by putting 2.56086 into the calculator and pressing 'inverse' and then 'ln x.'

Or

$$\log(\bar{x}_g) = \frac{1}{n}\sum(\log(x)) = \frac{1}{4}(\log(11.1) + \log(13.2) + \log(15.1) + \log(12.7)) =$$

$$= \frac{1}{4}(1.04532 + 1.12057 + 1.17898 + 1.10380) = \frac{1}{4}(4.44868) = 1.11217 \text{. So}$$

$\bar{x}_g = 10^{1.11217} = 12.9470$. I got the last result by putting 1.11217 into the calculator and pressing 'inverse' and then 'log x.'

Notice that the original numbers and all the means are between 11.1 and 15.1. In spite of everything that I said, there are many of you who think that: (i) You can find a sum of squares by summing numbers and squaring the sum; (ii) You can find the sum of $\frac{1}{x}$ by adding up the numbers and taking the reciprocal; (iii) You can find an n^{th} by dividing by n. I can only recommend a remedial math class (unless, of course, you want to try listening in class and checking out the homework very carefully.)