MAT 200 - Test 1 - Fall 2015

Instructor: Dr. Francesco Strazzullo **Name**_____

Instructions. Technology is allowed on this exam, without internet connectivity. Each problem is worth 10 points. When using technology describe which commands (or keys typed) you used. You might need some of the following formulas/facts, **if you do use one cite it**:

(a) $\ell = P\frac{n}{100}$ (b) $z_{\mathbf{x}} = \frac{x-\mu}{\sigma}$ (c) $M = \frac{L+R}{2}$

(d) $\sigma = \sqrt{\frac{\sum_{i=1}^{N}(x_i-\mu)^2}{N}}$ (e) $s = \sqrt{\frac{\sum_{i=1}^{n}(x_i-\bar{x})^2}{n-1}}$ (f) $s = \sqrt{\frac{n[\sum_{i=1}^{n} f_i(x_i)^2]-[\sum_{i=1}^{n} f_i x_i]^2}{n(n-1)}}$

(g) $K\&P = \{(1, 68\%), (2, 95\%), (3, 99.7\%)\}$ (h) $P(\mu - K\sigma \leq X \leq \mu + K\sigma) \geq 1 - \frac{1}{K^2}$, for $K > 1$

SHOW YOUR WORK NEATLY, PLEASE (no work, no credit).

1. Boiling points in degrees Celsius for various substances are an example of which type of data? (*Mark all that apply*)

A) Parameter

B) Qualitative

C) Quantitative

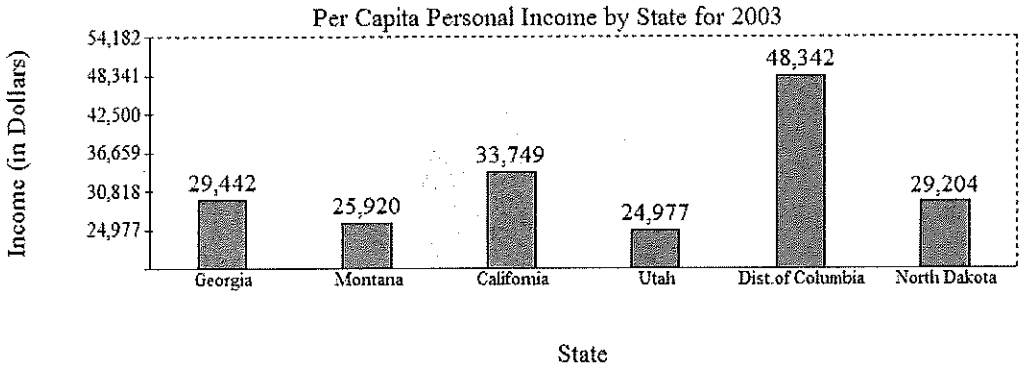
D) Inferential

E) Neither Discrete or Continuous

F) Discrete

G) Continuous

2. The following bar graph shows the per capita personal incomes for six states in 2003.



Use this bar graph to determine the following statistics (*round-off your answers to the nearest hundredth*).

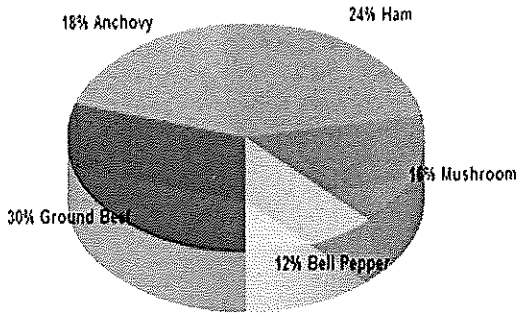
(a) The lowest per capita personal income for the six states shown. UTAH: $24,977

(b) The highest per capita personal income for the six states shown. DIST. COLUMBIA: $48,342

(c) The median per capita personal income for the six states shown. ENTER DATA IN L_1, THEN

[2ND] + [STAT] → MATH → #4(L_1): $29323

3. The Pizza Pie 'N Go sells about 1790 one-topping pizzas each month. The pie chart displays the most requested one-topping pizzas, by percentage, for one month.



Use this pie chart to determine the number of Mushroom pizzas sold during this month (*round-off your answers to the nearest integer*).

NOTE: IF YOU CAN'T READ THE PERCENT FOR MUSHROOM, YOU CAN RETRIVE IT USING THE OTHER ONES: $100 - 12 - 30 - 18 - 24 = 16$

MUSHROOM PIZZAS = $16\% \cdot 1790 = 286.4 \approx 286$

4. Calculate the (*a*) range, (*b*) population variance, and (*c*) population standard deviation for the following data set. Use the rounding rules for calculating the variance and standard deviation.

9, 8, 7, 7, 9, 6, 5, 9, 5, 37

ENTER DATA IN L1 THEN [STAT] → CALC → #1.
POPULATION MEANS WE USE σx, RETRIVE USING [VARS] → #5.

(a) RANGE = MAX X − MIN X = 37 − 5 = 32

(c) POP. STAND. DEV: $\sigma_x \approx 9.1$

(b) VARIANCE = $(\sigma x)^2 \approx 81.96 \approx 82$

→ ROUNDING RULE

5. Consider the following frequency table representing the distribution of heights in centimeters for a sample of 8-year-old boys.

MIDPOINTS x_i	Heights in Centimeters	
	x_L Class x_R	Frequency
x_1 117.5	115.6 – 119.4	14
x_2 121.4	119.5 – 123.3	18
x_3 125.3	123.4 – 127.2	18
x_4 129.2	127.3 – 131.1	42
x_5 133.1	131.2 – 135.0	16

Using the rounding rules, complete the following tasks.
(*a*) Determine the lower class boundary for the fourth class (*cite the formula from page* 1).
(*b*) Determine the midpoint for the third class (*cite the formula from page* 1).
(*c*) Calculate the standard deviation and variance (*cite the formula from page* 1, *but use your calculator*).

(b) FORMULA (C): $x_i = \frac{x_{L_i} + x_{R_i}}{2} = \frac{123.4 + 127.2}{2} = \boxed{125.3}$ $\quad i = 3$

(a) FORMULA (C): UPPER BOUNDARY $= \frac{x_{R_4} + x_{L_5}}{2} = \frac{131.1 + 131.2}{2} = \boxed{131.15}$ ↑ NOT NEEDED

LOWER BOUNDARY $= \frac{x_{R_3} + x_{L_4}}{2} = \frac{127.2 + 127.3}{2} = \boxed{127.25}$

(c) FORMULA (J). CALCULATOR: ENTER MIDPOINTS x_1, x_2, x_3, x_4, x_5 IN L_1 AND FREQUENCIES IN L_2. THEN [STAT] → CALC → #1 L_1, L_2.

STANDARD DEVIATION $= S_x \approx \boxed{4.96}$ (ROUNDING RULE, ONE EXTRA DIGIT THAN MIDP.)

VARIANCE $= (S_x)^2 \approx \boxed{24.56}$ (WITH APPROXIMATION $(S_x)^2 \approx \{24.60\}$)

↑ USED THE TI, NOT THE APPROXIMATION: [VARS] → #5 → #3

6. Calculate the five-number summary of the data: 20, 19, 10, 20, 21, 9, 14, 24, 20, 6, 5, 22, 2, 22.

ENTER DATA IN L_1. [STAT] → CALC → #1

MIN X	Q_1	MED	Q_3	MAX X
2	9	19.5	21	24

7. Suppose that prices of recently sold homes in one neighborhood have a mean of \$215,000 with a standard deviation of \$7700. Using Chebyshev's Theorem, what is the minimum percentage of recently sold homes with prices between \$199,600 and \$230,400? Round your answer to 1 decimal place.

USE FORMULA (h). FIND IF SAME K (OR $\pm z$-SCORE, FORMULA (b))

$K_L = \frac{215000 - 199600}{7700} = 2$ (NOTE: $K_L = -z_{199600}$)

$K_R = \frac{230400 - 215000}{7700} = 2$

$\rightarrow K_L = K_R = 2 \rightarrow$ USE $K = 2$ IN FORMULA (h): $1 - \frac{1}{2^2} = \frac{4}{5} = 75\%$, THEN

AT LEAST 75% OF HOMES ARE SOLD WITHIN THE GIVEN PRICE RANGE [199,600, 230,400] DOLLARS.

8. Given the following data, find the diameter that represents the 53rd percentile (*cite the formula from page* 1, *but use your calculator*).

Diameters of Golf Balls				
1.64	1.59	1.30	1.51	1.41
1.64	1.59	1.47	1.61	1.68
1.56	1.32	1.64	1.41	1.49

NEED FORMULA (a) TO FIND THE LOCATION ℓ OF THE PERCENTILE P WITH: $P = 53$, $n = 15$ (# OF ENTRIES). THEN WE NEED TO SORT OUR DATA.

$\ell = 53 \frac{15}{100} = 7.95 \xrightarrow[\text{ABOVE}]{\text{ROUND}} \ell = 8 \rightarrow$ THE 8TH ENTRY $\rightarrow L_1(8) =$

TO SORT DATA IN L_1: STAT $\rightarrow$ #2 ON L_1

$= 1.56$ IS THE 53RD PERCENTILE

NOTE: THE APPROXIMATION METHOD SUGGESTS THAT THE 53RD PERCENTILE IS THE SAME AS THE MEDIAN)

9. Two cards are drawn without replacement from a standard deck of 52 playing cards. What is the probability of choosing a heart and then, without replacement, a spade? Write your answer as a fraction in lowest terms or a decimal number rounded to four decimal places.

$E = \{\text{DRAW HEART}\}$, $F = \{\text{DRAW SPADE}\}$ ARE DISJOINT EVENTS.

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

$n(S) = 52$, $n(S|E) = 51$, $n(E) = 13$, $n(F|E) = 13$

→ THEN $P(E \text{ AND } F) = \frac{13}{52} \cdot \frac{13}{51} = \frac{13}{204} \approx 0.0637 = 6.37\%$

10. Evaluate the expression ${}_{11}C_8$. $= \frac{11!}{8!(11-8)!}$

TYPE: 11 ; MATH → PRB → #3 ; 8 ; ENTER

${}_{11}C_8 = 165$