

Mth 107
 Montgomery
 December 8, 2005

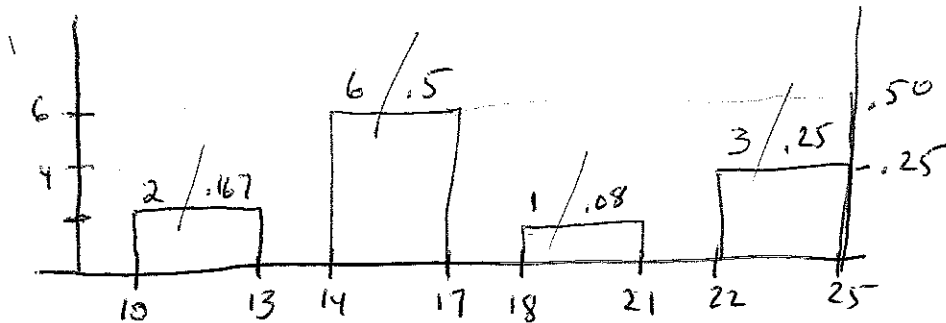
Answers

Test 4

Formulas: $s^2 = \frac{1}{n-1} \left[\sum fx^2 - \frac{(\sum fx)^2}{n} \right]$ $s = \sqrt{s^2}$

$MOE = \frac{z_{\alpha/2}}{2\sqrt{n}}$ $z = \frac{x - \mu}{\sigma}$ $x = \mu \pm z\sigma$

1. a) Construct a frequency and a relative frequency histogram with three equal groupings from the following data: 10, 13, 15, 15, 16, 16, 17, 17, 19, 22, 23, 25



b) Jamie has taken 3 tests and has an 80 average. She has one more test; if she gets a 100 on the test, what will her average be? (All the tests count the same amount toward her grade.)

$240 + 100 = 340$ $340/4 = 85$

c) Times for a 100-yard race for children were uniformly scattered between 12 and 20 seconds, with mean of 16 seconds. Estimate the standard deviation.

Range of deviations: 0-4
 std. dev. about 2

2. Freshmen math students were asked how many cups of coffee they drank while studying for the current test. A frequency chart for x = number of cups is below.

a) Find the mean and standard deviation.

x	f	xf	x ²	x ² f
0	15	0	0	0
1	7	7	1	7
2	20	40	4	80
3	10	30	9	90
n = 52		77		177

$s^2 = \frac{(177 - \frac{77^2}{52})}{51} = \frac{63}{51} = 1.23$

$s = \sqrt{s^2} = 1.11$

$\bar{x} = \frac{77}{52} = 1.48$

b) Find the proportion of the sample data that lies within one standard deviation from the mean.

Range 1.48 ± 1.11

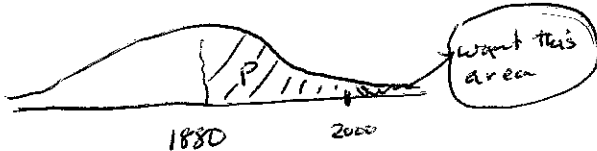
$0.37 \rightarrow 2.59$

All the 1's + 2's: $\frac{27}{52} = 0.52$ 52%

3. Mary plans to play RED at the roulette table in the local casino $n = 4000$ times during the year. The probability that she will win on any one spin of the wheel is $p = .47$. What is the probability that she will win more than she will lose? That is, what is $p(x > 2000)$? $\mu = np$ $\sigma = \sqrt{np(1-p)}$

$$\mu = .47 \times 4000 = 1880$$

$$\sigma = \sqrt{4000 \cdot .47 \cdot .53} = 31.6$$



$$z = \frac{x - \mu}{\sigma} = \frac{2000 - 1880}{31.6} = 3.8$$

The largest z in the table is

$z = 3.09$, which gives

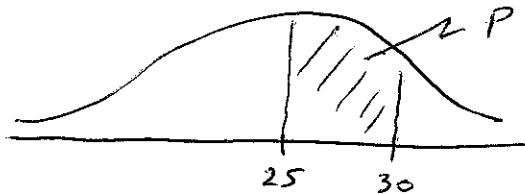
$$p = .4990$$

$$.5 - .4990 = .001$$

Thus $p(x > 2000)$ is much less than .001!

4. A person taking aspirin for a headache usually has to wait about 25 minutes for relief. Suppose the mean waiting time is 25 minutes and the standard deviation is 6 minutes.

a. What is the probability that you have to wait between 25 and 30 minutes?



$$z = \frac{30 - 25}{6} = \frac{5}{6} = 0.83$$

$$p = .2967$$

b. What is the probability you have to wait between 20 and 40 minutes?



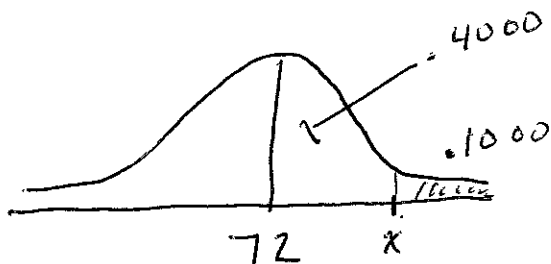
For $x = 40$,

$$z = \frac{40 - 25}{6} = \frac{15}{6} = 2.50$$

$$p = .4938$$

$$\begin{array}{r} .2967 \\ .4938 \\ \hline .7905 = p(20 < x < 40) \end{array}$$

BONUS: The grades of an entrance exam were normally distributed with a mean of 72 and a standard deviation of 12. A program accepts only the top 10%. What score do you need to qualify?



$$p = .4000$$

$$z = 1.28$$

$$x = 72 + (1.28) \cdot 12 = 87.36$$

$$\underline{\underline{x = 87}}$$

5. 440 randomly chosen African-American high school students in the US were asked whether they became aware of racial issues before the age of 8. 405 said yes. Find the margin of error for this study and report the results using the MOE. Use a 90% confidence level.

$$p = \frac{405}{440} = 92\%$$

$$\alpha = 90, \quad \alpha/2 = .4500 \quad z = 1.65$$

$$MOE = \frac{1.65}{2\sqrt{440}} = .039 = 3.9\%$$

We are 90% confident that 92% \pm 3.9% of all ^{US} African American HS students became aware of racial issues before the age of 8.