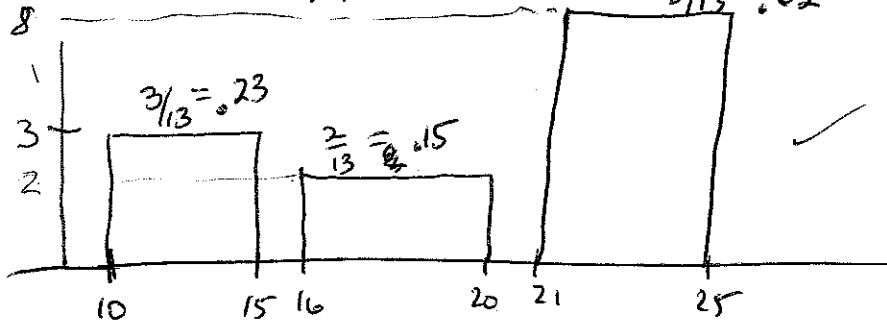


# Answers

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 groupings from the following data: 10, 13, 15, 17, 19, 22, 23, 23, 23, 24, 24, 25, 25



- b) Jamie has taken 3 tests and has an 90 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.)

$$\frac{3 \times 90 + 100}{4} = \frac{370}{4} = 92.5 \quad \checkmark$$

- c. Times for a 100-yard race for children were uniformly scattered between 11 and 15 seconds, with mean of 13 seconds. Estimate the standard deviation.

Deviations range from 0 to 2.  $\checkmark$  std. dev  $\approx 1$ .

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 <sup>2</sup>	x <sup>2</sup> f
0	15	0	0	0
1	30	30	1	30
2	10	20	4	40
3	7	21	9	63
n = 62		71		133

$$s^2 = \frac{133 - \frac{71^2}{62}}{61} = .86$$

$$s = \sqrt{.86} = .93$$

$$\bar{x} = 71/62 = 1.15$$

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

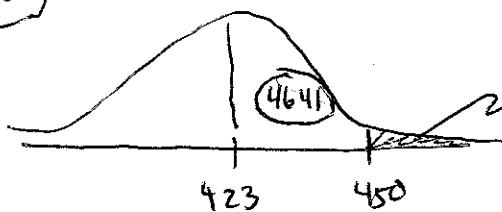
$$\left. \begin{aligned} 1.15 + .93 &= 2.08 \\ 1.15 - .93 &= .22 \end{aligned} \right\} \text{ only the 1's and 2's are in this range.}$$

$$\frac{40}{62} = .645 = 64.5\%$$

3. Mary plans to play RED at the roulette table in the local casino  $n=900$  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  $P(x > 450)$ ?  $\mu=np$   $\sigma=\sqrt{np(1-p)}$

$$\mu = .47 \cdot 900 = 423$$

$$\sigma = \sqrt{900 \cdot .47 \cdot .53} \approx 15$$



$$.5 - .4641 = .0359$$

$$= 3.6\%$$

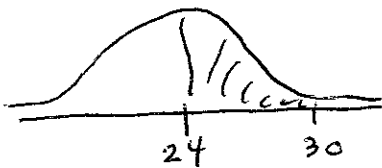
$$P(x > 450) = 3.6\%$$

$$Z = \frac{450 - 423}{15} = \frac{27}{15} = 1.80$$

$$P = .4641$$

4. A person taking aspirin for a headache usually has to wait about 24 minutes for relief. Suppose the mean waiting time is 24 minutes and the standard deviation is 5 minutes.

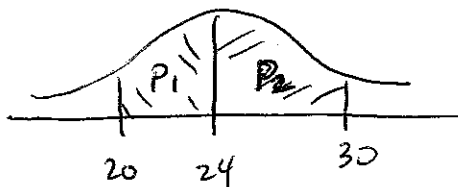
a. What is the probability that you have to wait between 24 and 30 minutes?



$$Z = \frac{6}{5} = 1.20$$

$$P = .3849$$

b. What is the probability you have to wait between 20 and 30 minutes?



Z for  $x=20$  is

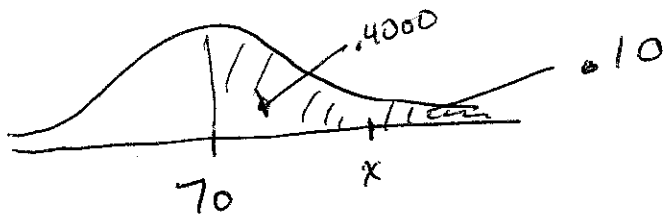
$$\frac{24-20}{5} = \frac{4}{5} = .8$$

$$P_1 = .2881$$

$$P_2 = .3849 \text{ (from above)}$$

$$P = .2881 + .3849 = .6730$$

BONUS: The grades of an entrance exam were normally distributed with a mean of 70 and a standard deviation of 9. A program accepts only the top 10%. What score do you need to qualify?



$z$  for  $p = .4000$  is

$$z = 1.28$$

$$X = 70 + 1.28 \cdot 9$$

$$= 81.5$$

5. a. 900 randomly chosen African-American high school students in the US were asked whether they became aware of racial issues before the age of 8. 776 said yes. Find the margin of error for this study and report the results using the MOE. Use a 90% confidence level.

$$\alpha = 90\% = .90$$

$$\alpha/2 = .4500$$

$$z = 1.64$$

$$MOE = \frac{1.64}{2\sqrt{900}} = \frac{1.64}{60} = .027 = 2.7\%$$

$$p = \frac{776}{900} \approx 86\%$$

We are 90% confident that  $86\% \pm 2.7\%$  of all US African-American high school students became aware of racial issues before age 8.