Lab #8: Exam 2 Review Key

1) a. PR is the percent of the distribution falling at or below the given score.

$$PR = \frac{n_w(X-L)+in_b}{Ni} * 100$$

b. Percentile Point is a score which a certain proportion of the distribution falls at or below.

$$X = L + \left(\frac{P(N)-n_b}{n_w}\right)i$$

2) a.

X	**?**
est	24-26
P	.92
L	23.5
N	30
n_b	25
n_w	3
i	3

$$X = L + \left(\frac{P(N)-n_b}{n_w}\right)i$$
$$X = 23.5 + \left(\frac{.92(30)-25}{3}\right)3$$
$$X = 23.5 + \left(\frac{27.6-25}{3}\right)3$$
$$X = 23.5 + \left(\frac{2.6}{3}\right)3$$
$$X = 23.5 + (.8667)3$$
$$X = 23.5 + 2.6 = 26.1$$

b.

PR	**?**
est int	6-8
X	6
L	5.5
n_b	6
n_w	8
i	3
N	30

$$PR = \frac{n_w(X-L)+in_b}{Ni} * 100$$
$$PR = \frac{8(6-5.5)+3\times 6}{30\times 3} * 100$$
$$PR = \frac{8(.5)+18}{90} * 100$$
$$PR = \frac{4+18}{90} * 100 = \frac{22}{90} * 100$$
$$PR = .2444 * 100 = 24.44$$

c. **IQR** = (X at Q_3) – (X at Q_1) and **SIQR** = IQR/2

	Q_1	Q_3
P	.25	.75
Int	6-8	18-20
L	5.5	17.5
N	30	30
n_b	6	21
n_w	8	2
i	3	3

Q_1

$$X = L + \left(\frac{P(N) - n_b}{n_w}\right)i$$

$$X = 5.5 + \left(\frac{.25(30) - 6}{8}\right)3$$

$$X = 5.5 + \left(\frac{7.5 - 6}{8}\right)3$$

$$X = 5.5 + \left(\frac{1.5}{8}\right)3$$

$$X = 5.5 + (.1875)3$$

$$X = 5.5 + .5625 = 6.0625$$

Q_3

$$X = L + \left(\frac{P(N) - n_b}{n_w}\right)i$$

$$X = 17.5 + \left(\frac{.75(30) - 21}{2}\right)3$$

$$X = 17.5 + \left(\frac{22.5 - 21}{2}\right)3$$

$$X = 17.5 + \left(\frac{1.5}{2}\right)3$$

$$X = 17.5 + (.75)3$$

$$X = 17.5 + 2.25 = 19.75$$

Thus, the IQR=19.75 – 6.06 = 13.69 and the SIQR=13.69/2 = 6.84

3) Using Z scores, we can see that she did better on the science section of the ACT.

	Science	**Read Comp.**
X	27	28
Mean	22	20
SD	2	4
$z = \frac{X - \bar{X}}{s}$	$z = \frac{27 - 22}{2}$	$z = \frac{28 - 20}{4}$
	$z = \frac{5}{2} = 2.5$	$z = \frac{8}{4} = 2$

4) Using the computational formula. It is less work and is potentially more accurate.

X	**X^2**
1	1
1	1
1	1
1	1
2	4
3	9
4	16
5	25
6	36
6	36
$\sum X = 30$	**$\sum X^2 = 130$**
N=10	

$$\bar{X} = \frac{\sum X}{N} = \frac{30}{10} = 3.0$$

M_d = 2.5 is average of two middle scores.
Mode = 1 (has a freq of 4)

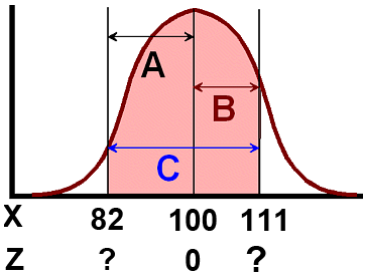
$R = X_h - X_l + 1 = 6 - 1 + 1 = 6$

$$s^2 = \frac{N\sum X^2 - \left(\sum X\right)^2}{N(N-1)} = \frac{10 \times 130 - (30)^2}{10(10-1)}$$

$$s^2 = \frac{1300 - 900}{10(9)} = \frac{400}{90} = 4.444$$

$$s = \sqrt{s^2} = \sqrt{4.444} = 2.108$$

5) a.



We want the area shown by C and can use the z table to determine A + B, but first we need to compute the two scores.

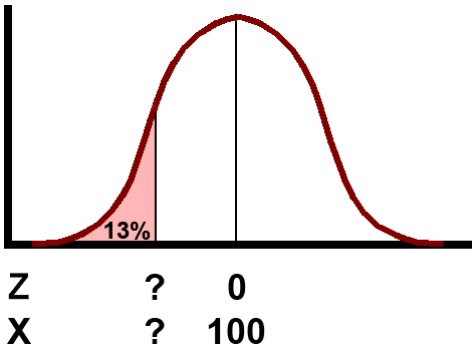
$$z_{82} = \frac{X - \bar{X}}{s} = \frac{82 - 100}{15} = \frac{-18}{15} = -1.2$$

$$z_{111} = \frac{X - \bar{X}}{s} = \frac{111 - 100}{15} = \frac{11}{15} = .73$$

A	.3849
+B	.2673
=C	.6522

Thus, 65% of the scores fell between a score of 82 and 111.
And .6522*50 = 32.61, thus we would expect about 33 people out of 50 to have an IQ that falls within that range.

b.



Need to get the z score in order to determine the test score. From the table, the Z score is -1.13, so

$$z = \frac{X - \bar{X}}{s}$$

$$-1.13 = \frac{X - 100}{15}$$

$$X - 100 = -1.13 \times 15$$

$$X = (-1.13 \times 15) + 100$$

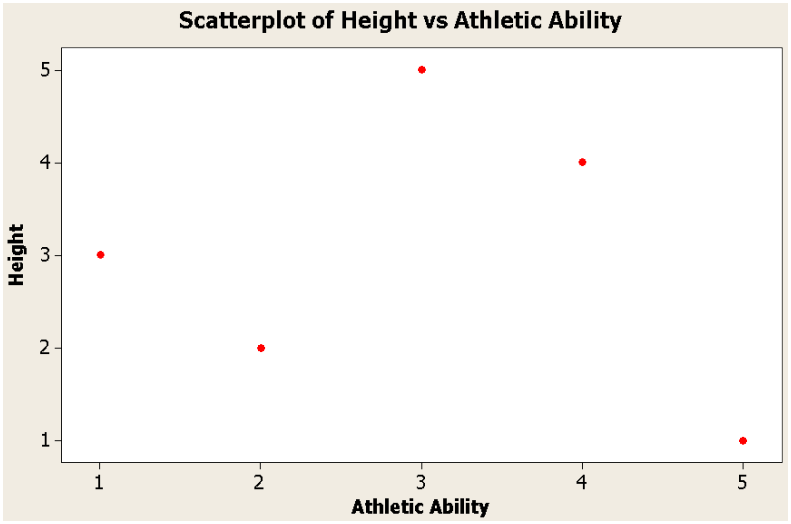
$$X = -16.95 + 100 = 83.05$$

Thus, 83.05 is the score at the 13th percentile point.

6) **a.** When a change in one variable is accompanied by a change in the other.
b. Expresses quantitatively the extent to which two variables are related.

7)

Person	Height (inches)	Height (ranked)	Athletic Ability	D	D^2
A	71	3	1 = best	2	4
B	62	5	3	2	4
C	74	1 = tallest	5	-4	16
D	69	4	4	0	0
E	72	2	2	0	0
N = 5				**$\sum D = 0$**	**$\sum D^2$**= 24



Scatterplot suggests weak negative correlation.

$$r_s = 1 - \left[\frac{6\sum D^2}{N^3 - N}\right] = 1 - \left[\frac{6 \times 24}{5^3 - 5}\right] = 1 - \left[\frac{144}{125 - 5}\right] = 1 - \left[\frac{144}{120}\right] = 1 - [1.2] = -.2$$

Thus, there is little if any correlation between these variables.

8) We compute reliabilities in order to determine whether different observations are in agreement. Inter-observer reliability looks at agreement between the observations of different people, while intra-observer reliability looks at the agreement of the observations of the same person (of the same behavior taken on more than one occasion).