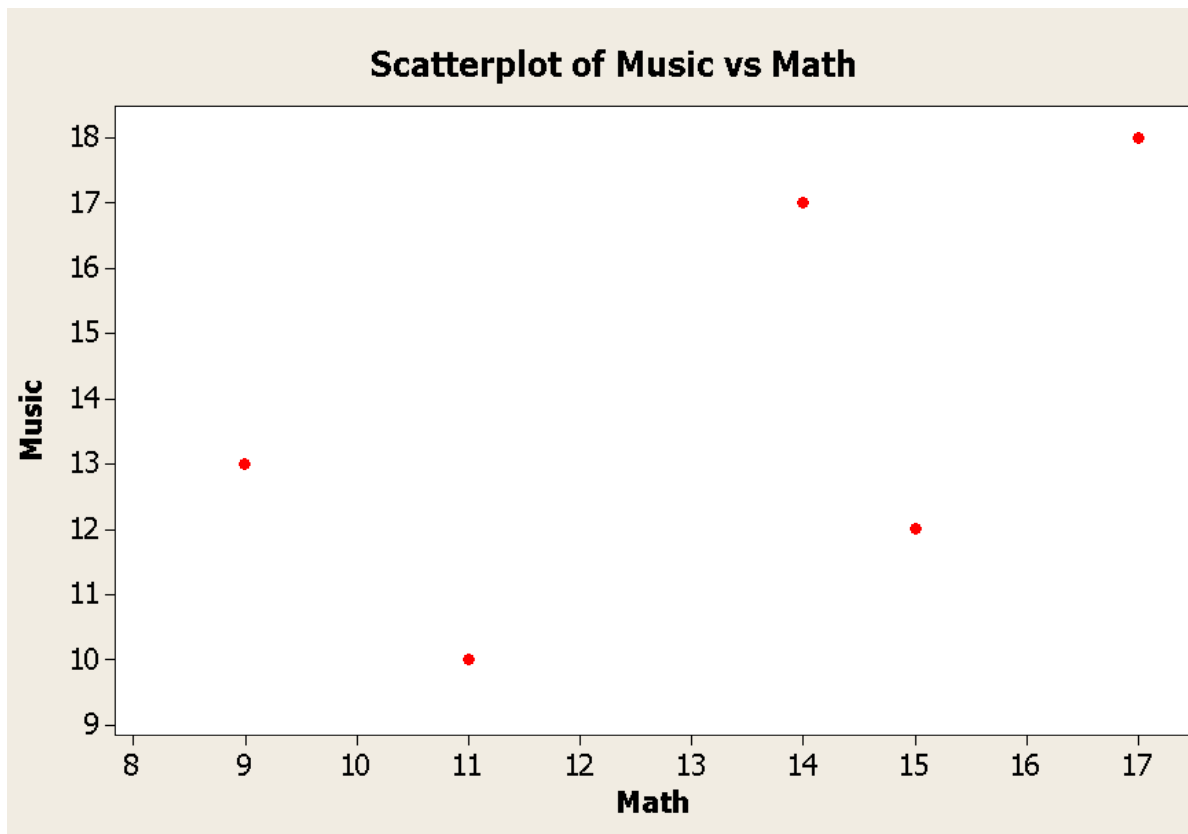


### Lab #7: Correlation Key

1)

Student	Music (X)	Math (Y)	XY	X <sup>2</sup>	Y <sup>2</sup>
A	10	11	110	100	121
B	13	9	117	169	81
C	18	17	306	324	289
D	12	15	180	144	225
E	17	14	238	289	196
<b>N=5</b>	<b>∑X=70</b>	<b>∑Y=66</b>	<b>∑XY=951</b>	<b>∑X<sup>2</sup>=1026</b>	<b>∑Y<sup>2</sup>=912</b>



Scatterplot suggests a moderate positive correlation.

$$r = \frac{N\sum XY - (\sum X)(\sum Y)}{\sqrt{(N\sum X^2 - (\sum X)^2)(N\sum Y^2 - (\sum Y)^2)}}$$

$$r = \frac{5 \times 951 - (70)(66)}{\sqrt{(5 \times 1026 - (70)^2)(5 \times 912 - (66)^2)}}$$

$$r = \frac{4755 - 4620}{\sqrt{(5130 - 4900)(4560 - 4356)}}$$

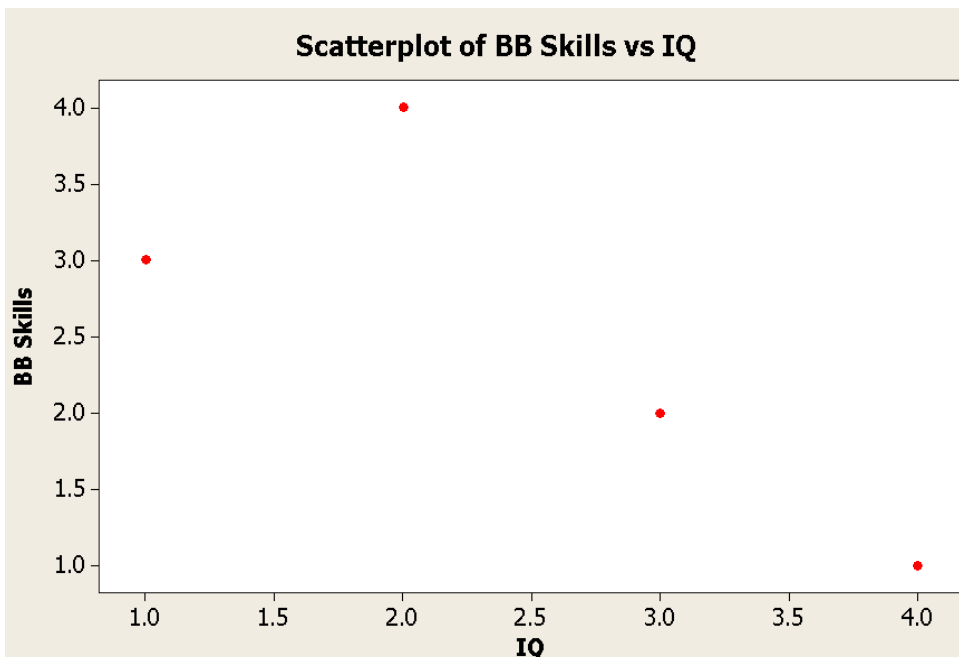
$$r = \frac{135}{\sqrt{(230)(204)}} = \frac{135}{\sqrt{46,920}}$$

$$r = \frac{135}{216.610} = .6232$$

Thus, there is a positive correlation between music and math ability. As one goes up, so does the other.

2)

Subject	BB Skills	IQ	IQ ranked	D	D <sup>2</sup>
A	1	50	4	-3	9
B	3	82	1	2	4
C	2	65	3	-1	1
D	4	78	2	2	4
<b>N=4</b>				<b>∑D=0</b>	<b>∑D<sup>2</sup>=18</b>



Scatterplot suggests a strong negative correlation.

$$r_s = 1 - \left[ \frac{6 \sum D^2}{N^3 - N} \right]$$

$$r_s = 1 - \left[ \frac{6 \times 18}{4^3 - 4} \right]$$

$$r_s = 1 - \left[ \frac{108}{64 - 4} \right]$$

$$r_s = 1 - \left[ \frac{108}{60} \right]$$

$$r_s = 1 - [1.8] = -.8$$

This is a negative or inverse relationship. As BB Skills go up, IQ goes down.

- 3) Positive Correlation = Variables change directly. As one variable goes up, the other does the same.  
Negative Correlation = Variables change inversely. As one variable goes up, the other goes down.  
No Correlation = No pattern. Change in one variable has little or nothing to do with change in another variable.
- 4) Pearson's r is used with metric data. Requires that both variables involved be normally distributed  
Spearman's rho is used when one or both of the variables are ordinal or when one or both of the metric variables are markedly skewed.