

## Classroom Example of Correlation

### Computational Formula

Subject #	$X_1$ (Time_1)	$X_2$ (Time_2)	$X_1^2$ (Time_1)	$X_2^2$ (Time_2)	$X_1X_2$
1	1	2	1	4	2
2	2	1	4	1	2
3	3	3	9	9	9
$\Sigma$	6	6	14	14	13

$$r_{xx'} = \frac{\sum X_1X_2 - \frac{(\sum X_1)(\sum X_2)}{n}}{\sqrt{\sum X_1^2 - \frac{(\sum X_1)^2}{n}} \sqrt{\sum X_2^2 - \frac{(\sum X_2)^2}{n}}} = \frac{13 - \frac{(6)(6)}{3}}{\sqrt{14 - \frac{(6)^2}{3}} \sqrt{14 - \frac{(6)^2}{3}}} = \frac{13 - \frac{36}{3}}{\sqrt{14 - \frac{(6)^2}{3}} \sqrt{14 - \frac{(6)^2}{3}}} = \frac{13 - 12}{\sqrt{14 - \frac{(6)^2}{3}} \sqrt{14 - \frac{(6)^2}{3}}} = \frac{1}{\sqrt{14 - \frac{(6)^2}{3}} \sqrt{14 - \frac{(6)^2}{3}}}$$

$$\frac{1}{\sqrt{14 - \frac{36}{3}} \sqrt{14 - \frac{(6)^2}{3}}} = \frac{1}{\sqrt{14 - 12} \sqrt{14 - \frac{(6)^2}{3}}} = \frac{1}{\sqrt{2} \sqrt{14 - \frac{(6)^2}{3}}} = \frac{1}{(1.4142) \sqrt{14 - \frac{(6)^2}{3}}} = \frac{1}{(1.4142) \sqrt{14 - \frac{36}{3}}} = \frac{1}{(1.4142) \sqrt{14 - 12}} = \frac{1}{(1.4142) \sqrt{2}} = \frac{1}{(1.4142)(1.4142)}$$

$$\frac{1}{2} = .50$$

Definitional formula (Mean Deviation Formula)

Subject #	$X_1$ (Time_1)	$X_2$ (Time_2)	$X_1 - \text{Mean1}$	$(X_1 - \text{Mean1})^2$	$X_2 - \text{Mean2}$	$(X_2 - \text{Mean2})^2$	$(X_1 - \text{Mean1})(X_2 - \text{Mean2})$
1	1	2	-1	1	0	0	0
2	2	1	0	0	-1	1	0
3	3	3	1	1	1	1	1
$\Sigma$	6	6		2		2	1
Mean	2	2					

$$r_{xx'} = \frac{\sum (X_1 - \bar{X}_1)(X_2 - \bar{X}_2)}{\sqrt{\sum (X_1 - \bar{X}_1)^2} \sqrt{\sum (X_2 - \bar{X}_2)^2}} = \frac{1}{\sqrt{2}\sqrt{2}} = \frac{1}{(1.4142)(1.4142)} = \frac{1}{2} = .50$$