Week #10

- Give an example of two variables which would have a correlation of close to 1
- Give an example of two variables which would have a correlation of close to -1
- Give an example of two variables which would have a correlation of close to 0
- Draw a a relationship which cannot be accurately described by Pearson's r
- Why doesn't correlation imply causation? Does causation imply correlation?
- Why does $df = n - 2$?
- Rank each set of scores as though you were calculating Spearman's rho:

4, 0, 4, 9, 3
3, 5, 3, 6, 3

Pearson's r

$\bar{X} = \Sigma(X_i)/n$
$df = n - 1$
$SP = \Sigma[(X_i - \bar{X})(Y_i - \bar{Y})]$
$SS_X = \Sigma[(X_i - \bar{X})^2]$
$SS_Y = \Sigma[(Y_i - \bar{Y})^2]$
$r_{XY} = SP/\sqrt{SS_X \times SS_Y}$

Critical r values

	α		
$(n-2)$	0.2	0.1	0.05
2	0.8	0.9	0.95
3	0.69	0.81	0.88
4	0.61	0.73	0.81

Question #1

Calculate r_{XY} and test H_0: $\rho_{XY} = 0$ at $\alpha = 0.2$.

X_i	Y_i	$X_i - \bar{X}$	$Y_i - \bar{Y}$	$(X_i - \bar{X})^2$	$(Y_i - \bar{Y})^2$	$(X_i - \bar{X})(Y_i - \bar{Y})$
4	9	-0	2	0	6	-1
5	8	0	2	0	2	1
7	5	2	-2	6	2	-4
2	4	-2	-2	6	6	6

$\bar{X} = 4.5$
$\bar{Y} = 6.5$
$SS_X = 13$
$SS_Y = 17$

$SP = 2$
$r_{XY} = 2/\sqrt{13 \times 17} = 0.13$
$r_{\text{crit}} = \pm 0.8$
Fail to reject because $0.8 > 0.13 > -0.8$

Question #2

Calculate r_{XY} and test H_0: $\rho_{XY} = 0$ at $\alpha = 0.1$.

X_i	Y_i	$X_i - \bar{X}$	$Y_i - \bar{Y}$	$(X_i - \bar{X})^2$	$(Y_i - \bar{Y})^2$	$(X_i - \bar{X})(Y_i - \bar{Y})$
7	9	2	4	4	16	8
5	2	0	-3	0	9	-0
2	6	-3	1	9	1	-3
6	3	1	-2	1	4	-2

$\bar{X} = 5$
$\bar{Y} = 5$
$SS_X = 14$
$SS_Y = 30$

$SP = 3$
$r_{XY} = 3/\sqrt{14 \times 30} = 0.15$
$r_{\text{crit}} = \pm 0.9$
Fail to reject because $0.9 > 0.15 > -0.9$

Question #3

Calculate r_{XY} and test H_0: $\rho_{XY} = 0$ at $\alpha = 0.1$.

X_i	Y_i
8	6
4	1
3	3
9	4

Question #4

Calculate r_{XY} and test H_0: $\rho_{XY} = 0$ at $\alpha = 0.2$.

X_i	Y_i
1	7
3	8
2	9
5	1
7	4

Question #5

Calculate r_{XY} and test H_0: $\rho_{XY} = 0$ at $\alpha = 0.2$.

X_i	Y_i
7	7
8	5
2	6
1	9

Question #6

Calculate r_{XY} and test H_0: $\rho_{XY} = 0$ at $\alpha = 0.1$.

X_i	Y_i
9	9
3	7
8	4
5	1
6	8

Question #7

Calculate r_{XY} and test H_0: $\rho_{XY} = 0$ at $\alpha = 0.2$.

X_i	Y_i
4	9
1	2
8	4
2	8
9	6
6	7

Question #8

Calculate r_{XY} and test H_0: $\rho_{XY} = 0$ at $\alpha = 0.2$.

X_i	Y_i
2	3
7	8
5	6
9	4
4	9

Question #9

Calculate r_{XY} and test H_0: $\rho_{XY} = 0$ at $\alpha = 0.1$.

X_i	Y_i
1	2
2	4
8	3
3	5

Question #10

Calculate r_{XY} and test H_0: $\rho_{XY} = 0$ at $\alpha = 0.1$.

X_i	Y_i
3	3
4	9
5	5
1	8
2	4