Correlations

Here's what we'll do to learn about correlations…

YESTERDAY

1. ~~Statistics review BILL question~~
2. ~~Article reading and BILL questions~~
3. ~~Student guide reading about correlations (p. 41)~~
4. ~~Examples 1-3 (p. 42)~~
5. ~~BILL examples~~

HOME FUN LAST NIGHT

1. ~~Calculate correlation coefficient (p. 41-45)~~

TODAY

1. Statistical conclusions from r (p. 46-47)
2. Correlations and Cancer practice problem

X	X^2	Y	Y^2	XY
5	25	45	2025	225
15	225	32	1024	480
18	324	37	1369	666
20	400	33	1089	660
25	625	24	576	600
25	625	29	841	725
30	900	26	676	780
34	1156	22	484	748
38	1444	24	576	912
50	2500	15	225	750
$\sum X=$ 260	$\sum X^2=$ 9224	$\sum Y=$ 287	$\sum Y^2=$ 8885	$\sum XY=$ 6546

- Step 4: Enter the numbers you have calculated in the spaces where they should go in the formula.

$$r = \frac{6546 - \frac{(260)(287)}{10}}{\sqrt{\left(8224 - \frac{(260)^2}{10}\right)\left(8885 - \frac{(287)^2}{10}\right)}}$$

- Step 5: Multiply the (ΣX)(ΣY) in the numerator (the top part of the formula) and do the squaring to $(\Sigma X)^2$ and $(\Sigma Y)^2$ in the denominator (the bottom part of the formula).

$$r = \frac{6546 - \frac{74620}{10}}{\sqrt{\left(8224 - \frac{67600}{10}\right)\left(8885 - \frac{82369}{10}\right)}}$$

- Step 6: Do the division by n parts in the formula.

$$r = \frac{6546 - 7462}{\sqrt{(8224 - 6760)(8485 - 8237)}}$$

- Step 7: Do the subtraction parts of the formula

$$r = \frac{-916}{\sqrt{(1464)(648)}}$$

- Step 8: Multiply the numbers in the denominator.

$$r = \frac{-916}{\sqrt{948672}}$$

- Step 9: Take the square root of the denominator.

$$r = \frac{-916}{974}$$

- Step 10: Take the last step and divide the numerator by the denominator and you will get the Correlation Coefficient!

$r = -.94$

Round to -0.9

Since we were working with whole numbers as raw data, we can only go one decimal spot beyond in our final answer.

Statistical Conclusions from R

Student guide pages 46-47

Making Statistical Inferences from Pearson's r.

How do you determine whether or not your correlation is simply a chance occurrence or if it really is true of the population? You will need three things in order to determine whether you can infer that the relationship you found in your sample also is true (in other words, "is generalizable" in the larger population:

1. The Correlation Coefficient that you calculated
2. Something called the **"degrees of freedom" which is simply the number of pairs of data in your sample minus 2.**

DF = 10 pairs – 2 = **8**

Statistical Conclusions from R

Student guide pages 46-47

Pearson's R Critical Values

Just like the T-test, we'll always use the 0.05 level of significance

Values of *r* for the .05 and .01 Levels of Significance

df(*N* − 2)	.05	.01	*df*(*N* − 2)	.05	.01
1	.997	1.000	31	.344	.442
2	.950	.990	32	.339	.436
3	.878	.959	33	.334	.430
4	.812	.917	34	.329	.424
5	.755	.875	35	.325	.418
6	.707	.834	36	.320	.413
7	.666	.798	37	.316	.408
8	.632	.765	38	.312	.403
9	.602	.735	39	.308	.398
10	.576	.708	40	.304	.393
11	.553	.684	41	.301	.389
12	.533	.661	42	.297	.384

Critical r = **.632**

Statistical Conclusions from R

Student guide pages 46-47

SO WHAT?

Absolute value

If your calculated r value is ABOVE

the number in the table, you conclude that the correlation is

a statistically significant relationship.

Statistical Conclusions from R

Student guide pages 46-47

SO WHAT?

Absolute value

If your calculated r value is **LOWER** ____________

the number in the table, you conclude that the correlation is

NOT a statistically significant relationship.

____

____

Just to make sure that you are getting the idea here, try a few examples.

$r = .43$	$n = 9$	degrees of freedom? 7	Significant? No
$r = .87$	$n = 4$	degrees of freedom? 2	Significant? No
$r = .83$	$n = 6$	degrees of freedom? 4	Significant? Yes
$r = .10$	$n = 11$	degrees of freedom? 9	Significant? No
$r = .72$	$n = 8$	degrees of freedom? 6	Significant? Yes