# 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)

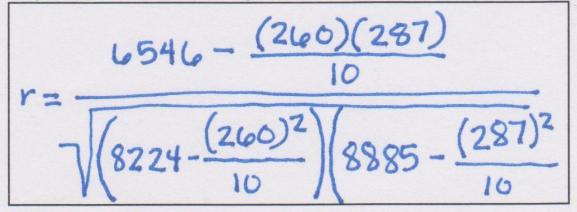
#### TODAY

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

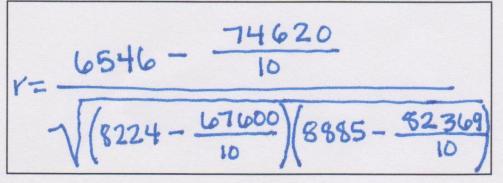
Here's what we'll do to learn about correlations...

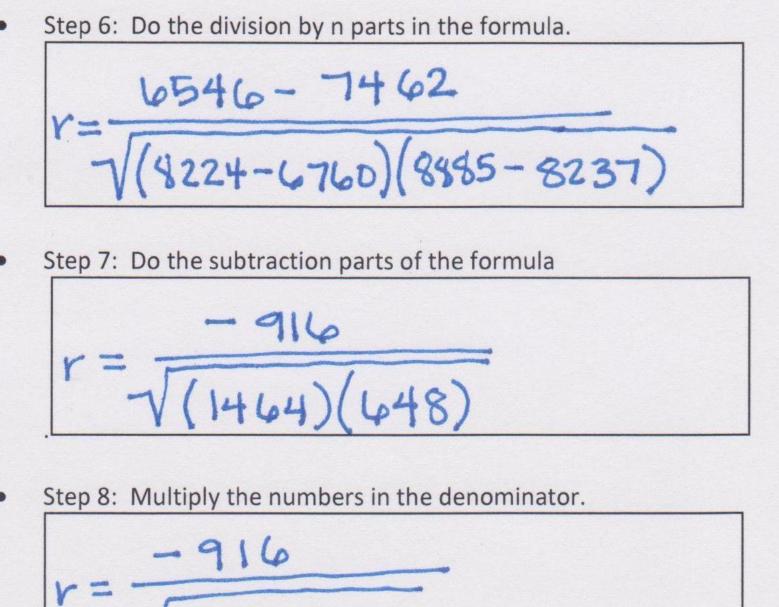
| X              | X <sup>2</sup>    | Y               | $Y^2$               | XY                 |
|----------------|-------------------|-----------------|---------------------|--------------------|
| 5              | 25                | 45              | 2025                | 225                |
| 15             | 2.2.5             | 32              | 1024                | 480                |
| 18             | 324               | 37              | 1369                | 666                |
| 20             | 400               | 33              | 1089                | 660                |
| 25             | 425               | 24              | 576                 | 600                |
| 25             | 625               | 29              | 841                 | 725                |
| 30             | 900               | 26              | 676                 | 780                |
| 34             | 1156              | 22              | 484                 | 748                |
| 38             | 1444              | 24              | 516                 | 912                |
| 50             | 2500              | 15              | 225                 | 750                |
| ∑X= <b>260</b> | $\sum X^2 = 8224$ | ∑Y= <b>2%</b> 1 | $\Sigma Y^2 = 8875$ | $\Sigma XY = 6546$ |

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



• Step 5: Multiply the  $(\Sigma X)(\Sigma Y)$  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).

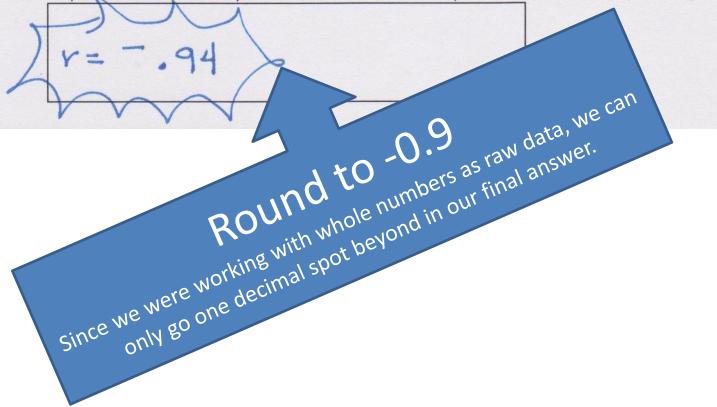




• Step 9: Take the square root of the denominator.

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

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



## **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

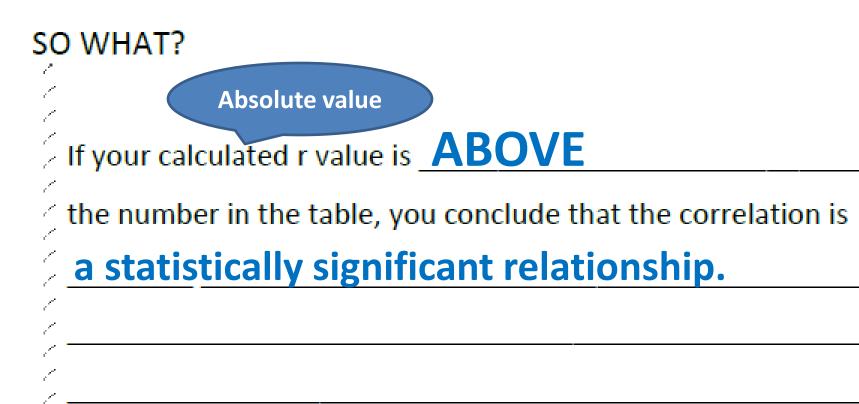
### Statistical Conclusions from R Student guide pages 46-47 Pearson's R Critical Values

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

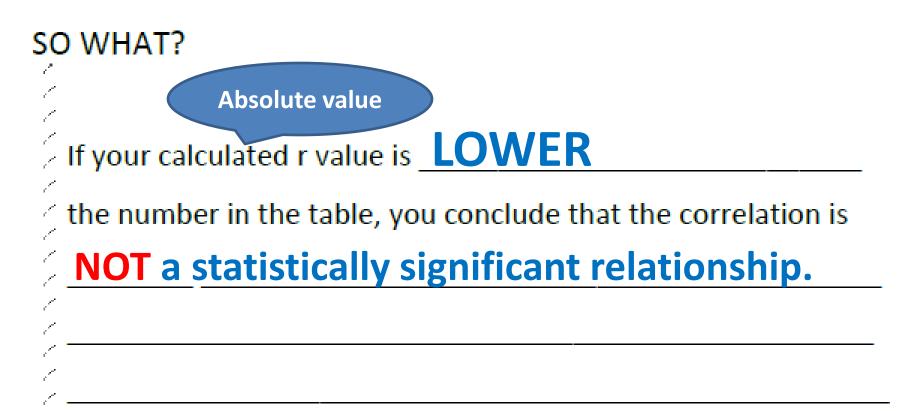
| de sta  | Values of <i>r</i> for the .05 and .01 Levels of Significance |       |         |      |      |  |
|---------|---|-------|---------|------|------|--|
| df(N-2) | .05   | .01   | df(N-2) | .05  | .01  |  |
| 1       | .997  | 1.000 | 31      | .344 | .442 |  |
| 2       | .950  | .990  | 32      | .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*



## **Statistical Conclusions from R** *Student guide pages 46-47*



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 = <b>.</b> 87 | n = 4  | degrees of freedom? 2 | Significant? | Νο  |
| r = .83         | n = 6  | degrees of freedom? 4 | Significant? | Yes |
| r = .10         | n = 11 | degrees of freedom? 9 | Significant? | Νο  |
| r = .72         | n = 8  | degrees of freedom? 6 | Significant? | Yes |