

Solutions - Quiz ON1

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SET YOUR WORKING DIRECTORY!

```
setwd("C:/Users/1/Dropbox/00 - Working Folder/Teaching/DPH112/2019-2020/Week ON1")
```

Solutions

1. Given the following $Cov(X, Y) = 3.31$, $\sigma_X^2 = 4.59$, $\sigma_Y^2 = 6.63$, and $n = 16$.

```
COV.XY <- 3.31; VAR.X <- 4.59; VAR.Y <- 6.63; N = 16
```

- i) Calculate $Cor(X, Y)$.

```
COR.XY <- COV.XY / (sqrt(VAR.X) * sqrt(VAR.Y))  
COR.XY
```

```
## [1] 0.6000188
```

- ii) Calculate the t statistic and the degrees of freedom.

```
T.XY <- COR.XY * sqrt((N - 2)/(1 - COR.XY^2))  
T.XY
```

```
## [1] 2.806381
```

```
DF.XY <- N-2  
DF.XY
```

```
## [1] 14
```

- iii) Calculate the p-value.

```
dt(T.XY, DF.XY)
```

```
## [1] 0.01378466
```

- iv) Interpret the p-value without recourse to claims of statistical significance.

If we assume that there is no relationship between X and Y , we would still observe a correlation coefficient of 0.60 or greater on repeated sampling with a probability of about 1.4%.

2. The correlation coefficient between the weights of 120 identical twins is 0.78. Report a p-value. Interpret this p-value without recourse to claims of statistical significance.

```
T.TWIN <- 0.78 * sqrt((120-2)/(1-0.78^2))  
DF.TWIN <- N - 2  
dt(T.TWIN, DF.TWIN)
```

```
## [1] 9.445135e-10
```

If we assume that there were no relationship between the weights of twin pairs, we would observe a correlation of at least 78% on repeated sampling with a probability of about 9.4 in 10 billion.

3. Describe the error in these conclusions

- i) Given: There is a significant linear correlation between personal income and years of education.
Conclusion: More education causes a person's income to rise.

The relationship measured by the correlation model is not causal.

- ii) Given: Subjects take a test of verbal skills and a test of manual dexterity, and those pairs of scores result in a linear correlation coefficient very close to 0. Conclusion: Scores on the two tests are not related in any way.

The possibility of a non-linear relationship is not discounted.

THE END