

Problem 3

An important quality characteristic used by the manufacturers of ABC asphalt shingles is the amount of moisture the shingles contain when they are packaged. Customers may feel that they have purchased a product lacking in quality if they find moisture and wet shingles inside the packaging. In some cases, excessive moisture can cause the granules attached to the shingles for texture and coloring purposes to fall off the shingles resulting in appearance problems. To monitor the amount of moisture present, the company conducts moisture tests. A shingle is weighed and then dried. The shingle is then reweighed, and based on the amount of moisture taken out of the product, the pounds of moisture per 100 square feet are calculated. The company would like to show that the mean moisture content is less than 0.35 pounds per 100 square feet.

The file ([A & B shingles.csv](#)) includes 36 measurements (in pounds per 100 square feet) for A shingles and 31 for B shingles.

3.1 Do you think there is evidence that means moisture contents in both types of shingles are within the permissible limits? State your conclusions clearly showing all steps.

For the A shingles, the null and alternative hypothesis to test whether the population mean moisture content is less than 0.35 pound per 100 square feet is given:

H_0 : The population mean moisture content is less than 0.35 pound per 100 square feet

$H_0 \leq 0.35$

H_1 : The population mean moisture content is more than 0.35 pound per 100 square feet

$H_1 > 0.35$

For the B shingles, the null and alternative hypothesis to test whether the population mean moisture content is less than 0.35 pound per 100 square feet is given:

H_0 : The population mean moisture content is less than 0.35 pound per 100 square feet

$H_0 \leq 0.35$

H_1 : The population mean moisture content is more than 0.35 pound per 100 square feet

$H_1 > 0.35$

A Shingles:

The T statistic is: -1.4735046253382782

The corresponding pvalue is : 0.07477633144907513

The p value is calculated and it is found that it is 0.0748. Since p value > 0.05, **do not reject H_0** .

Therefore the population mean moisture content is **less** than 0.35 pound per 100 square feet for sample A shingles.

B Shingles:

The T statistic is: -3.1003313069986995

The corresponding pvalue is : 0.0020904774003191826

The p value is calculated and it is found that it is 0.0021. Since p value < 0.05, **reject H_0** .

The population mean moisture content is **more** than 0.35 pound per 100 square feet for sample B shingles.

3.2 Do you think that the population mean for shingles A and B are equal? Form the hypothesis and conduct the test of the hypothesis. What assumption do you need to check before the test for equality of means is performed?

H_0 : The population mean for shingles A is equal to the population mean of shingles B

$\mu(A) = \mu(B)$

H_1 : The population mean for shingles A is not equal to the population mean of shingles B

$\mu(A) \neq \mu(B)$

Alpha = 0.05

The T statistic is: 1.2896282719661123

The corresponding pvalue is : 0.2017496571835306

The p value is calculated and it is found that it is 0.2017. Since p value > 0.05, **do not reject H_0** .

We can conclude that population mean for shingles A and the population mean for shingles B are **equal** when running a two-sample t-test.