STATS 205: Homework Assignment 4

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Solution to Problem 1

```
allergics = c(1651.0, 1112.0, 102.4, 100.0, 67.6, 65.9, 64.7, 39.6, 31.0)
nonallergics = c(48.1, 48.0, 45.5, 41.7, 35.4, 34.3, 32.4, 29.1, 27.3, 18.9, 6.6, 5.2, 4.7)
allergics; nonallergics
```

```
## [1] 1651.0 1112.0  102.4  100.0   67.6   65.9   64.7   39.6   31.0
```

```
##  [1] 48.1 48.0 45.5 41.7 35.4 34.3 32.4 29.1 27.3 18.9  6.6  5.2  4.7
```

The null hypothesis is that allergic smokers have the same sputum histamine levels as nonallergic smokers. That is,

$$H_0 : p_a = p_n$$

The alternative hypothesis is that allergic smokers have higher sputum histamine levels than nonallergic smokers. That is,

$$H_0 : p_a > p_n$$

To test the null hypothesis against the alternative hypothesis, we will use the Mann-Whitney-Wilcoxin test, since the two samples are independent.

> Two data samples are independent if they come from distinct populations and the samples do not affect each other. – Mann-Whitney-Wilcoxon Test

```
wilcox.test(x = allergics, y = nonallergics, alternative = "greater")
```

```
##
##  Wilcoxon rank sum test
##
## data:  allergics and nonallergics
## W = 106, p-value = 0.000386
## alternative hypothesis: true location shift is greater than 0
```

The p-value is 0.000386, which is significant at the $\alpha = 0.05$ level. There is strong evidence that allergic smokers have higher sputum histamine levels than nonallergic smokers.

Solution to Problem 2