Exercise-10

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Task 1

```
csv_data = read.csv("fastfood.csv")
```

```
single_vector = c(t(as.matrix(csv_data)))

f1 = c("Item1", "Item2", "Item3") #first factors
f2 = c("East", "West") #second factors
k1 = length(f1)
k2 = length(f2)
n = 4 #observations per treatment

tm1 = gl(k1, 1, n*k1*k2, factor(f1))
tm2 = gl(k2, n*k1, n*k1*k2, factor(f2))

av = aov(single_vector ~ tm1 * tm2)

summary(av)
```

```
##             Df Sum Sq Mean Sq F value   Pr(>F)
## tm1          2  385.1   192.5   9.554  0.00149 **
## tm2          1  715.0   715.0  35.481 1.23e-05 ***
## tm1:tm2      2  234.1   117.0   5.808  0.01132 *
## Residuals   18  362.8    20.2
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

From the above summary, since the p-value (0.00149) for the menu items is less than the .05 significance level, we reject the null hypothesis that the mean sales volume of the new menu items are all equal.

Moreover, the p-value(1.2e-05) for the east-west coasts comparison is also less than the .05 significance level. It shows there is a difference in overall sales volume between the coasts.

Finally, the last p-value of 0.01132 (< 0.05) indicates that there is a possible interaction between the menu item and coast location factors, i.e., customers from different coastal regions have different tastes.

Reference: http://www.r-tutor.com/elementary-statistics/analysis-variance/factorial-design