

Predicting Restaurant tips using Predictive Analytics

Data Cleaning and Preparation

sex	smoker	day	time	size	total_bill	tip
Female	No	Sun	Dinner	2	16.99	1.01
Male	No	Sun	Dinner	3	10.34	1.66
Male	No	Sun	Dinner	3	21.01	3.5
Male	No	Sun	Dinner	2	23.68	3.31
Female	No	Sun	Dinner	4	24.59	3.61
Male	No	Sun	Dinner	4	25.29	4.71
Male	No	Sun	Dinner	2	8.77	2
Male	No	Sun	Dinner	4	26.88	3.12
Male	No	Sun	Dinner	2	15.04	1.96
Male	No	Sun	Dinner	2	14.78	3.23
Male	No	Sun	Dinner	2	10.27	1.71
Female	No	Sun	Dinner	4	35.26	5
Male	No	Sun	Dinner	2	15.42	1.57
Male	No	Sun	Dinner	4	18.43	3
Female	No	Sun	Dinner	2	14.83	3.02
Male	No	Sun	Dinner	2	21.58	3.92
Female	No	Sun	Dinner	3	10.33	1.67
Male	No	Sun	Dinner	3	16.29	3.71
Female	No	Sun	Dinner	3	16.97	3.5
Male	No	Sat	Dinner	3	20.65	3.35
Male	No	Sat	Dinner	2	17.92	4.08
Female	No	Sat	Dinner	2	20.29	2.75
Female	No	Sat	Dinner	2	15.77	2.23
Male	No	Sat	Dinner	4	39.42	7.58
Male	No	Sat	Dinner	2	19.82	3.18
Male	No	Sat	Dinner	4	17.81	2.34
Male	No	Sat	Dinner	2	13.37	2
Male	No	Sat	Dinner	2	12.69	2
Male	No	Sat	Dinner	2	21.7	4.3
Female	No	Sat	Dinner	2	19.65	3
Male	No	Sat	Dinner	2	9.55	1.45
Male	No	Sat	Dinner	2	17.82	1.75
Female	No	Thur	Dinner	2	18.78	3

sex	sex
smoker	Indicates if the customer is a smoker or not
day	Day of the restaurant visit
time	Indicates whether the tip was for lunch or dinner
size	Number of members dining
total bill	Bill amount in USD
tip	Tip amount in USD

Check for missing values using COUNTIF function

	Checklist	Found
Sex	Female	OK
	Male	OK
<blank>		Missing
Smoker	No	OK
	Yes	OK
<blank>		Missing
day	Wed	Missing
	Thur	OK
	Fri	OK
	Sat	OK
	Sun	OK
time	Dinner	OK
	Lunch	OK
<blank>		Missing
size		Missing
total bill		Missing
tip		Missing
There are no missing values.		

To check for duplicate values using Conditional Formatting

1 duplicate value found and removed

sex	smoker	day	time	size	total_bill	tip
Female	No	Sun	Dinner	2	16.99	1.01
Male	No	Sun	Dinner	3	10.34	1.66
Male	No	Sun	Dinner	3	21.01	3.5
Male	No	Sun	Dinner	2	23.68	3.31
Female	No	Sun	Dinner	4	24.59	3.61
Male	No	Sun	Dinner	4	25.29	4.71
Male	No	Sun	Dinner	2	8.77	2
Male	No	Sun	Dinner	4	26.88	3.12
Male	No	Sun	Dinner	2	15.04	1.96
Male	No	Sun	Dinner	2	14.78	3.23
Male	No	Sun	Dinner	2	10.27	1.71
Female	No	Sun	Dinner	4	35.26	5
Male	No	Sun	Dinner	2	15.42	1.57
Male	No	Sun	Dinner	4	18.43	3
Female	No	Sun	Dinner	2	14.83	3.02
Male	No	Sun	Dinner	2	21.58	3.92
Female	No	Sun	Dinner	3	10.33	1.67
Male	No	Sun	Dinner	3	16.29	3.71
Female	No	Sun	Dinner	3	16.97	3.5
Male	No	Sat	Dinner	3	29.03	5.92
Female	Yes	Sat	Dinner	2	27.18	2
Male	Yes	Sat	Dinner	2	22.67	2
Male	No	Sat	Dinner	2	17.82	1.75
Female	No	Thur	Dinner	2	18.78	3

Sort the data according to the 'day' column

sex	smoker		day	time	size	total_bill	tip
Male	No		Thur	Lunch	4	27.2	4
Male	No		Thur	Lunch	2	22.76	3
Male	No		Thur	Lunch	2	17.29	2.71
Male	Yes		Thur	Lunch	2	19.44	3
Female	Yes		Thur	Lunch	3	16.47	3.23
Female	No		Thur	Dinner	2	18.78	3

Thur Count 61

Male	Yes		Fri	Dinner	2	28.97	3
Male	No		Fri	Dinner	2	22.49	3.5
Female	Yes		Fri	Dinner	2	5.75	1
Female	Yes		Fri	Dinner	2	16.32	4.3
Female	No		Fri	Dinner	2	22.75	3.25
Male	Yes		Fri	Dinner	4	40.17	4.73
Male	Yes		Fri	Dinner	2	27.28	4
Male	Yes		Fri	Dinner	2	12.03	1.5
Male	Yes		Fri	Dinner	2	21.01	3
Male	No		Fri	Dinner	2	12.46	1.5
Female	Yes		Fri	Dinner	2	11.35	2.5
Female	Yes		Fri	Dinner	2	15.38	3
Male	Yes		Fri	Lunch	2	12.16	2.2
Female	Yes		Fri	Lunch	2	13.42	3.48
Male	Yes		Fri	Lunch	1	8.58	1.92
Female	No		Fri	Lunch	3	15.98	3
Male	Yes		Fri	Lunch	2	13.42	1.58
Female	Yes		Fri	Lunch	2	16.27	2.5
Female	Yes		Fri	Lunch	2	10.09	2

Fri Count 19

Male	No		Sat	Dinner	3	20.65	3.35
Male	No		Sat	Dinner	2	17.92	4.08
Female	No		Sat	Dinner	2	20.29	2.75
Female	No		Sat	Dinner	2	15.77	2.23
Female	Yes		Sat	Dinner	2	27.18	2
Male	Yes		Sat	Dinner	2	22.67	2
Male	No		Sat	Dinner	2	17.82	1.75

Sat Count 87

Female	No		Sun	Dinner	2	16.99	1.01
Male	No		Sun	Dinner	3	10.34	1.66
Male	No		Sun	Dinner	3	21.01	3.5
Male	Yes		Sun	Dinner	3	23.1	4
Male	Yes		Sun	Dinner	2	15.69	1.5

Sun Count 76

Grand Count 243

Subtotal of Male and Female Customers

	sex	smoker	day	time	size	total_bill	tip			
Male Count	Male	No	Thur	Lunch	4	27.2	4			
	Male	No	Thur	Lunch	2	22.76	3			
	Male	No	Thur	Lunch	2	17.29	2.71			
	Male	Yes	Thur	Lunch	2	19.44	3			
	Male	No	Thur	Lunch	2	16.66	3.4			
	Male	Yes	Thur	Lunch	2	32.68	5			
	Male	No	Thur	Lunch	2	15.98	2.03			
	Male	No	Thur	Lunch	2	13.03	2			
	Male	No	Thur	Lunch	2	18.28	4			
	Male	Yes	Sun	Dinner	2	15.69	1.5			
	157							Average=	\$	3.09
Female Count	Female	No	Thur	Lunch	1	10.07	1.83			
	Female	No	Thur	Lunch	4	34.83	5.17			
	Female	No	Thur	Lunch	2	10.65	1.5			
	Female	No	Sun	Dinner	2	13.39	2.61			
	Female	No	Sun	Dinner	3	16.21	2			
	Female	Yes	Sun	Dinner	2	17.51	3			
	Female	Yes	Sun	Dinner	2	9.6	4			
	Female	Yes	Sun	Dinner	3	20.9	3.5			
	Female	Yes	Sun	Dinner	3	18.15	3.5			
	86							Average=	\$	2.84
	Grand Count	243								

Total number of Female Customers = 86  
Total number of Male Customers = 157  
Grand Total = 243

Average tip paid by Female Customers =\$ 2.84  
Average tip paid by Male Customers =\$ 3.09

# Subtotal of Count of Lunch and Dinner

sex	smoker	day		time	size	total_bill	tip
Male	No	Thur		Lunch	4	27.2	4
Male	No	Thur		Lunch	2	22.76	3
Male	No	Thur		Lunch	2	17.29	2.71
Male	Yes	Thur		Lunch	2	19.44	3
Male	No	Thur		Lunch	2	16.66	3.4
Female	No	Thur		Lunch	1	10.07	1.83
Male	Yes	Fri		Lunch	2	13.42	1.58
Female	Yes	Fri		Lunch	2	16.27	2.5
Female	Yes	Fri		Lunch	2	10.09	2

Lunch Count 67

Average= \$ 2.74

Female	No	Sun		Dinner	2	16.99	1.01
Male	No	Sun		Dinner	3	10.34	1.66
Male	Yes	Sat		Dinner	2	22.67	2
Male	No	Sat		Dinner	2	17.82	1.75
Female	No	Thur		Dinner	2	18.78	3

Dinner Count 176

Average= \$ 3.10

Grand Count 243

Count of Lunch = 67  
Count of Dinner = 176  
Grand Total = 243  
  
Average tip paid during Lunch = \$ 2.74  
Average tip paid during Dinner = \$ 3.10

## Subtotal of Count of size

sex	smoker	day	time		size	total_bill	tip
Female	No	Sun	Dinner		1	16.99	1.01
Male	No	Sun	Dinner		1	10.34	1.66
Male	No	Sun	Dinner		1	21.01	3.5
Male	No	Sun	Dinner		1	23.68	3.31

**1 Count** 4

Female	No	Sun	Dinner		2	24.59	3.61
Female	No	Sun	Dinner		2	25	3.75
Female	No	Sun	Dinner		2	13.39	2.61

**2 Count** 155

Male	No	Sun	Dinner		3	16.49	2
Male	No	Sun	Dinner		3	21.5	3.5
Male	Yes	Thur	Lunch		3	16.58	4
Male	No	Thur	Lunch		3	7.56	1.44
Male	Yes	Thur	Lunch		3	10.34	2

**3 Count** 38

Female	Yes	Thur	Lunch		4	43.11	5
Female	Yes	Thur	Lunch		4	13	2
Male	Yes	Thur	Lunch		4	13.51	2
Male	Yes	Sat	Dinner		4	15.69	3
Male	No	Sat	Dinner		4	11.61	3.39
Male	No	Sat	Dinner		4	10.77	1.47
Male	Yes	Sat	Dinner		4	15.53	3

**4 Count** 37

Male	No	Sat	Dinner		5	10.07	1.25
Male	Yes	Sat	Dinner		5	12.6	1
Male	Yes	Sat	Dinner		5	32.83	1.17
Female	No	Sat	Dinner		5	35.83	4.67
Male	No	Sat	Dinner		5	29.03	5.92

**5 Count** 5

Female	Yes	Sat	Dinner		6	27.18	2
Male	Yes	Sat	Dinner		6	22.67	2
Male	No	Sat	Dinner		6	17.82	1.75
Female	No	Thur	Dinner		6	18.78	3

**6 Count** 4

**Grand Count** 243

Count of 1member dining = 4  
Count of 2 members dining = 155  
Count of 3 members dining = 38  
Count of 4 members dining = 37  
Count of 5 members dining = 5  
Count of 6 members dining = 4

Grand Total = 243

## Subtotal of Days

sex	smoker		day	time	size	total_bill	tip
Male	No		Thur	Lunch	4	27.2	4
Male	No		Thur	Lunch	2	22.76	3
Male	No		Thur	Lunch	2	17.29	2.71
Male	Yes		Thur	Lunch	2	19.44	3
Male	No		Thur	Lunch	2	16.66	3.4
Female	No		Thur	Lunch	1	10.07	1.83
Female	Yes		Thur	Lunch	3	16.47	3.23
Female	No		Thur	Dinner	2	18.78	3

**Thur Count** 61

Average= \$ 2.78

Male	Yes		Fri	Dinner	2	28.97	3
Male	No		Fri	Dinner	2	22.49	3.5
Female	Yes		Fri	Dinner	2	5.75	1
Female	Yes		Fri	Dinner	2	16.32	4.3
Female	No		Fri	Dinner	2	22.75	3.25
Male	Yes		Fri	Dinner	4	40.17	4.73
Male	Yes		Fri	Dinner	2	27.28	4
Male	Yes		Fri	Dinner	2	12.03	1.5
Male	Yes		Fri	Dinner	2	21.01	3
Male	No		Fri	Dinner	2	12.46	1.5
Female	Yes		Fri	Dinner	2	11.35	2.5
Female	Yes		Fri	Dinner	2	15.38	3
Male	Yes		Fri	Lunch	2	12.16	2.2
Female	Yes		Fri	Lunch	2	13.42	3.48
Male	Yes		Fri	Lunch	1	8.58	1.92
Female	No		Fri	Lunch	3	15.98	3
Male	Yes		Fri	Lunch	2	13.42	1.58
Female	Yes		Fri	Lunch	2	16.27	2.5
Female	Yes		Fri	Lunch	2	10.09	2

**Fri Count** 19

Average= \$ 2.73

Male	No		Sat	Dinner	3	20.65	3.35
Male	No		Sat	Dinner	2	17.92	4.08
Female	Yes		Sat	Dinner	2	27.18	2
Male	Yes		Sat	Dinner	2	22.67	2
Male	No		Sat	Dinner	2	17.82	1.75

**Sat Count** 87

Average= \$ 2.99

Female	No		Sun	Dinner	2	16.99	1.01
Male	No		Sun	Dinner	3	10.34	1.66
Female	Yes		Sun	Dinner	3	18.15	3.5
Male	Yes		Sun	Dinner	3	23.1	4
Male	Yes		Sun	Dinner	2	15.69	1.5

**Sun Count** 76

Average= \$ 3.26

**Grand Count** 243

No. of Customers on Thursday = 61  
 No. of Customers on Friday = 19  
 No. of Customers on Saturday = 87  
 No. of Customers on Sunday = 76

Grand Total = 243

## Subtotal of Smokers and Non-smokers

sex		smoker	day	time	size	total_bill	tip
Female		No	Sun	Dinner	2	16.99	1.01
Male		No	Sun	Dinner	3	10.34	1.66
Male		No	Sun	Dinner	3	21.01	3.5
Male		No	Sun	Dinner	2	23.68	3.31
Female		No	Sun	Dinner	4	24.59	3.61
Male		No	Sat	Dinner	2	17.82	1.75
Female		No	Thur	Dinner	2	18.78	3

**No Count** 151

Average= \$ 2.99

Male		Yes	Sat	Dinner	4	38.01	3
Male		Yes	Sat	Dinner	2	11.24	1.76
Male		Yes	Sat	Dinner	2	32.83	1.17
Female		Yes	Sat	Dinner	2	27.18	2
Male		Yes	Sat	Dinner	2	22.67	2

**Yes Count** 92

Average= \$ 3.02

**Grand Count** 243

No. of Smokers = 92  
No. of Non Smokers = 151  
Grand Total = 243



## Observations

sex	smoker	day	time	size	total_bill	tip
Female	No	Sun	Dinner	2	16.99	1.01
Male	No	Sun	Dinner	3	10.34	1.66
Male	No	Sun	Dinner	3	21.01	3.5
Male	No	Sun	Dinner	2	23.68	3.31
Female	No	Sun	Dinner	4	24.59	3.61
Male	No	Sun	Dinner	4	25.29	4.71
Male	No	Sun	Dinner	2	8.77	2
Male	No	Sun	Dinner	4	26.88	3.12
Male	No	Sun	Dinner	2	15.04	1.96
Male	No	Sun	Dinner	2	14.78	3.23
Male	No	Sun	Dinner	2	10.27	1.71
Female	No	Sun	Dinner	4	35.26	5
Male	No	Sun	Dinner	2	15.42	1.57
Male	No	Sun	Dinner	4	18.43	3
Female	No	Sun	Dinner	2	14.83	3.02
Male	No	Sun	Dinner	2	21.58	3.92
Female	No	Sun	Dinner	3	10.33	1.67
Male	No	Sun	Dinner	3	16.29	3.71
Female	No	Sun	Dinner	3	16.97	3.5
Male	No	Sat	Dinner	3	20.65	3.35
Male	No	Sat	Dinner	2	17.92	4.08
Female	No	Sat	Dinner	2	20.29	2.75
Female	No	Sat	Dinner	2	15.77	2.23
Male	No	Sat	Dinner	4	39.42	7.58
Male	No	Sat	Dinner	2	19.82	3.18
Male	No	Sat	Dinner	4	17.81	2.34
Male	No	Sat	Dinner	2	13.37	2
Male	No	Sat	Dinner	2	12.69	2
Male	Yes	Sat	Dinner	2	22.67	2
Male	No	Sat	Dinner	2	17.82	1.75
Female	No	Thur	Dinner	2	18.78	3

		Total tip amount		Count	Average
sex	Female	\$ 244.51		86	\$ 3.09
	Male	\$ 485.07		157	\$ 2.84
day	Thur	\$ 169.83		61	\$ 2.78
	Fri	\$ 51.96		19	\$ 2.73
	Sat	\$ 260.40		87	\$ 2.99
	Sun	\$ 247.39		76	\$ 3.26
time	Dinner	\$ 546.07		176	\$ 3.10
	Lunch	\$ 183.51		67	\$ 2.74
smoker	No	\$ 451.77		151	\$ 2.99
	Yes	\$ 277.81		92	\$ 3.02
size	1	\$ 5.75	1	4	
	2	\$ 399.83	2	154	
	3	\$ 127.28	3	37	
	4	\$ 153.01	4	37	
	5	\$ 20.14	5	5	
	6	\$ 20.90	6	4	
	7	\$ -			

**Female** Customers have paid more tips than **Male** Customers.

On an average, the tips are more on a **Sunday**.

Number of diners for **Dinner** is more than that of Lunch, but more tips are paid during **Lunch**.

**Smokers** have paid more tips than **Non Smokers**.

**2** member diners have paid more tips than any other size.

Here **tip** is the dependent variable and the rest of the variables, ie, **sex, smoker, day, time, size** and **total\_bill** are the independent variables.

Of these, **sex, smoker, day** and **time** are categorical variables.

### Encoding the Categorical Variables using IF conditions

sex	smoker	day	time
Female	No	Sun	Dinner
Male	No	Sun	Dinner
Male	No	Sun	Dinner
Male	No	Sun	Dinner
Female	No	Sun	Dinner
Male	No	Sun	Dinner
Male	No	Sun	Dinner
Male	No	Sun	Dinner
Male	No	Sun	Dinner
Male	No	Sun	Dinner
Female	No	Sun	Dinner
Male	No	Sun	Dinner
Male	No	Sun	Dinner
Female	No	Sun	Dinner
Male	No	Sun	Dinner
Female	No	Sun	Dinner
Male	No	Sun	Dinner
Female	No	Sun	Dinner
Male	No	Sat	Dinner
Male	Yes	Sat	Dinner
Male	Yes	Sat	Dinner
Female	No	Sat	Dinner
Male	No	Sat	Dinner
Female	Yes	Sat	Dinner
Male	Yes	Sat	Dinner
Male	No	Sat	Dinner
Female	No	Thur	Dinner

Numeric sex	Numeric smoker	day				Numeric time	size	total_bill	tip
		Thur	Fri	Sat	Sun				
1	0	0	0	0	1	1	2	16.99	1.01
0	0	0	0	0	1	1	3	10.34	1.66
0	0	0	0	0	1	1	3	21.01	3.5
0	0	0	0	0	1	1	2	23.68	3.31
1	0	0	0	0	1	1	4	24.59	3.61
0	0	0	0	0	1	1	4	25.29	4.71
0	0	0	0	0	1	1	2	8.77	2
0	0	0	0	0	1	1	4	26.88	3.12
0	0	0	0	0	1	1	2	15.04	1.96
0	0	0	0	0	1	1	2	14.78	3.23
0	0	0	0	0	1	1	2	10.27	1.71
1	0	0	0	0	1	1	4	35.26	5
0	0	0	0	0	1	1	2	15.42	1.57
0	0	0	0	0	1	1	4	18.43	3
1	0	0	0	0	1	1	2	14.83	3.02
0	0	0	0	0	1	1	2	21.58	3.92
1	0	0	0	0	1	1	3	10.33	1.67
0	0	0	0	0	1	1	3	16.29	3.71
1	0	0	0	0	1	1	3	16.97	3.5
0	0	0	0	0	1	0	2	10.07	1.25
0	1	0	0	0	1	0	2	12.6	1
0	1	0	0	0	1	0	2	32.83	1.17
1	0	0	0	0	1	0	3	35.83	4.67
0	0	0	0	0	1	0	3	29.03	5.92
1	1	0	0	0	1	0	2	27.18	2
0	1	0	0	0	1	0	2	22.67	2
0	0	0	0	0	1	0	2	17.82	1.75
1	0	1	0	0	0	1	2	18.78	3

In this dataset, we have a dependent variable, '**tips**', and more than one independent variable. Hence, we can build a model to predict the Restaurant tips using **Multiple Linear Regression**.

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Multiple Linear Regression

Mathematical equation to predict the tips :-  $y = b_0 + b_1(x_1) + b_2(x_2) + b_3(x_3) + \dots + b_i(x_i)$

Root Mean Square Error =  $\text{SQRT}((\text{SUM}(\text{Predicted value} - \text{Actual Value})^2)/\text{No. of samples})$

Root Mean Square Error = 1.007142035 A lower RMSE value indicates that the model is able to best fit the dataset.

Coefficients				0.034292520	-0.0832481257	-0.037029	0.120123	0.096903	-0.0678684	0.176090	0.0944199				
sex	smoker	day	time	Num sex	Num smoker	Thur	Fri	Sun	Num time	size	total_bill	tip	Predicted tip	Difference	
Female	No	Sun	Dinner	1	0	0	0	1	1	2	16.99	1.01	2.736491637	1.72649163	
Male	No	Sun	Dinner	0	0	0	0	1	1	3	10.34	1.66	2.25039633	0.59039632	
Male	No	Sun	Dinner	0	0	0	0	1	1	3	21.01	3.5	3.257857395	-0.24214260	
Male	No	Sun	Dinner	0	0	0	0	1	1	2	23.68	3.31	3.333868707	0.02386870	
Female	No	Sun	Dinner	1	0	0	0	1	1	4	24.59	3.61	3.806263407	0.19626340	
Male	No	Sun	Dinner	0	0	0	0	1	1	4	25.29	4.71	3.838064865	-0.87193513	
Male	No	Sun	Dinner	0	0	0	0	1	1	2	8.77	2	1.926066975	-0.07393302	
Male	No	Sun	Dinner	0	0	0	0	1	1	4	26.88	3.12	3.988192615	0.86819261	
Male	No	Sun	Dinner	0	0	0	0	1	1	2	15.04	1.96	2.518080178	0.55808017	
Male	No	Sun	Dinner	0	0	0	0	1	1	2	14.78	3.23	2.493530986	-0.73646901	
Male	No	Sun	Dinner	0	0	0	0	1	1	2	10.27	1.71	2.067696928	0.35769692	
Female	No	Sun	Dinner	1	0	0	0	1	1	4	35.26	5	4.813724473	-0.18627552	
Male	No	Sun	Dinner	0	0	0	0	1	1	2	15.42	1.57	2.553959766	0.98395976	
Male	No	Sun	Dinner	0	0	0	0	1	1	4	18.43	3	3.19034388	0.19034388	
Female	No	Sun	Dinner	1	0	0	0	1	1	2	14.83	3.02	2.532544505	-0.48745549	
Male	No	Sun	Dinner	0	0	0	0	1	1	2	21.58	3.92	3.135586773	-0.78441322	
Female	No	Sun	Dinner	1	0	0	0	1	1	3	10.33	1.67	2.28374465	0.61374465	
Male	No	Sun	Dinner	0	0	0	0	1	1	3	16.29	3.71	2.812195143	-0.89780485	
Female	No	Sun	Dinner	1	0	0	0	1	1	3	16.97	3.5	2.910693242	-0.58930675	
Male	No	Sat	Dinner	0	0	0	0	0	1	3	20.65	3.35	3.126962452	-0.22303754	
Male	No	Sat	Dinner	0	0	0	0	0	1	2	17.92	4.08	2.693105933	-1.38689406	
Female	No	Sat	Dinner	1	0	0	0	0	1	2	20.29	2.75	2.951173779	0.20117377	
Female	No	Sat	Dinner	1	0	0	0	0	1	2	15.77	2.23	2.524395521	0.29439552	
Male	No	Sat	Dinner	0	0	0	0	0	1	4	39.42	7.58	5.075315268	-2.50468473	
Male	No	Sat	Dinner	0	0	0	0	0	1	2	19.82	3.18	2.872503874	-0.30749612	
Male	No	Sat	Dinner	0	0	0	0	0	1	4	17.81	2.34	3.034899745	0.69489974	
Male	No	Sat	Dinner	0	0	0	0	0	1	2	13.37	2	2.263495076	0.26349507	
Male	No	Sat	Dinner	0	0	0	0	0	1	2	12.69	2	2.199289497	0.19928949	
Male	No	Sat	Dinner	0	0	0	0	0	1	2	21.7	4.3	3.050013415	-1.24998658	
Female	No	Sat	Dinner	1	0	0	0	0	1	2	19.65	3	2.890745	-0.10925500	
Male	No	Sat	Dinner	0	0	0	0	0	1	2	9.55	1.45	1.902810796	0.45281079	
Male	No	Sat	Dinner	0	0	0	0	0	1	4	18.35	2.5	3.085886528	0.58588652	
Female	No	Sat	Dinner	1	0	0	0	0	1	2	15.06	3	2.457357343	-0.54264265	
Female	No	Sat	Dinner	1	0	0	0	0	1	4	20.69	2.45	3.341121775	0.89121775	
Male	No	Sat	Dinner	0	0	0	0	0	1	2	17.78	3.27	2.679887138	-0.59011286	
Male	No	Sat	Dinner	0	0	0	0	0	1	3	24.06	3.6	3.448934545	-0.15106545	
Male	No	Sat	Dinner	0	0	0	0	0	1	3	16.31	2	2.717179788	0.71717978	
Female	No	Sat	Dinner	1	0	0	0	0	1	3	16.93	3.07	2.810012689	-0.25998731	
Male	No	Sat	Dinner	0	0	0	0	0	1	3	18.69	2.31	2.941899313	0.63189931	
Male	No	Sat	Dinner	0	0	0	0	0	1	3	31.27	5	4.129702519	-0.87029748	
Male	No	Sat	Dinner	0	0	0	0	0	1	3	16.04	2.24	2.691686396	0.45168639	
Male	No	Sun	Dinner	0	0	0	0	1	1	2	17.46	2.54	2.746576502	0.20657650	
Male	No	Sun	Dinner	0	0	0	0	1	1	2	13.94	3.06	2.414218213	-0.64578178	
Male	No	Sun	Dinner	0	0	0	0	1	1	2	9.68	1.32	2.011989146	0.69198914	
Male	No	Sun	Dinner	0	0	0	0	1	1	4	30.4	5.6	4.320550905	-1.27944909	
Male	No	Sun	Dinner	0	0	0	0	1	1	2	18.29	3	2.824945076	-0.17505492	
Male	No	Sun	Dinner	0	0	0	0	1	1	2	22.23	5	3.196959753	-1.80340424	
Male	No	Sun	Dinner	0	0	0	0	1	1	4	32.4	6	4.509390842	-1.49060915	
Male	No	Sun	Dinner	0	0	0	0	1	1	3	28.55	2.05	3.969783959	1.91978395	
Male	No	Sun	Dinner	0	0	0	0	1	1	2	18.04	3	2.801340084	-0.19865991	
Male	No	Sun	Dinner	0	0	0	0	1	1	2	12.54	2.5	2.282030257	-0.21796974	
Female	No	Sun	Dinner	1	0	0	0	1	1	2	10.29	2.6	2.103877847	-0.49612215	
Female	No	Sun	Dinner	1	0	0	0	1	1	4	34.81	5.2	4.771235487	-0.42876451	
Male	No	Sun	Dinner	0	0	0	0	1	1	2	9.94	1.56	2.036538338	0.47653833	
Male	No	Sun	Dinner	0	0	0	0	1	1	4	25.56	4.34	3.863558257	-0.47644174	
Male	No	Sun	Dinner	0	0	0	0	1	1	2	19.49	3.51	2.938249039	-0.57175096	
Male	Yes	Sat	Dinner	0	1	0	0	0	1	4	38.01	3	4.858934986	1.85893498	
Female	No	Sat	Dinner	1	0	0	0	0	1	2	26.41	1.5	3.529023988	2.02902398	
Male	Yes	Sat	Dinner	0	1	0	0	0	1	2	11.24	1.76	1.979132417	0.21913241	
Male	No	Sat	Dinner	0	0	0	0	0	1	4	48.27	6.73	5.91093199	-0.81906801	
Male	Yes	Sat	Dinner	0	1	0	0	0	1	2	20.29	3.21	2.833633133	-0.37636686	
Male	Yes	Sat	Dinner	0	1	0	0	0	1	2	13.81	2	2.221791736	0.22179173	
Male	Yes	Sat	Dinner	0	1	0	0	0	1	2	11.02	1.98	1.958360024	-0.02163997	
Male	Yes	Sat	Dinner	0	1	0	0	0	1	4	18.29	3.76	2.996973204	-0.76302679	
Male	No	Sat	Dinner	0	0	0	0	0	1	3	17.59	2.64	2.838037348	0.19803734	
Male	No	Sat	Dinner	0	0	0	0	0	1	3	20.08	3.15	3.07314307	-0.07685693	
Female	No	Sat	Dinner	1	0	0	0	0	1	2	16.45	2.47	2.5886011	0.11860109	
Female	Yes	Sat	Dinner	1	1	0	0	0	1	1	3.07	1	1.065923789	0.06592378	

CORRELATION															
	Num sex	Num smoker	Thur	Fri	Sat	Sun	Num time	size	total_bill	tip					
Num sex	1														
Num smoker	-0.00993018796	1													
Thur	0.1867955394	-0.1388207104	1												
Fri	0.07294999557	0.246708512	-0.168609	1											
Sat	-0.05008511976	0.1603662604	-0.432341	-0.2174954212	1										
Sun	-0.1651549543	-0.1788612226	-0.390551	-0.1964723102	-0.5037857601	1									
Num time	-0.1981286232	0.06391123078	-0.917075	-0.0604156182	0.4607638459	0.41622640	1								
size	-0.08324801674	-0.1305644114	-0.068834	-0.1430329987	-0.0430404113	0.19171283	0.100045303	1							
total_bill	-0.1413497437	0.09013610189	-0.133758	-0.0872011770	0.05270271238	0.12109649	0.179231853	0.5975889311	1						
tip	-0.0852739752	0.00976274999	-0.091433	-0.0563981765	-0.00501589731	0.12336039	0.117596390	0.4884003947	0.674997	1					

SUMMARY OUTPUT									
Regression Statistics									
Multiple R	0.6848562711								
R Square	0.469028112								
Adjusted R Square	0.4466017227								
Standard Error	1.026327417								
Observations	243								
ANOVA									
	df	SS	MS	F	Significance F				
Regression	9	217.7283915	24.192043	25.8376622	0				
Residual	234	246.4834242	1.0533475						
Total	243	464.2118156							
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%	
Intercept	0.6797587711	0.2418404924	2.810773	0.0053609580	0.2032958441	1.15622169	0.203295844	1.156221698	
Num sex	0.03429252036	0.1421987717	0.241159	0.8096430262	-0.2458609076	0.31444594	-0.245860907	0.3144459484	
Num smoker	-0.08324812579	0.1477206007	-0.563551	0.5735992323	-0.3742804053	0.20778415	-0.374280405	0.2077841537	
Thur	0	0	65535	#NUM!	0	0	0	0	
Fri	0.1571533629	0.3950228829	0.397833	#NUM!	-0.6211024087	0.93540913	-0.621102408	0.9354091346	
Sat	0.03702972344	0.4719376254	0.078463	0.9375266777	-0.8927599084	0.96681935	-0.892759908	0.9668193555	
Sun	0.1339334779	0.4728725125	0.283233	0.7772480328	-0.7976980251	1.06556498	-0.797698025	1.065564981	
Num time	-0.06786840753	0.4455290287	-0.152332	0.8790562094	-0.9456290463	0.80989223	-0.945629046	0.8098922312	
size	0.1760900041	0.08971235685	1.962828	0.0508508428	-0.00065712248	0.35283713	-0.000657122	0.3528371308	
total_bill	0.094411996864	0.00962679706	9.8080356	0	0.07545369934	0.11338623	0.075453699	0.113386238	

Male	No	Sat	Dinner
Male	Yes	Sat	Dinner
Male	No	Sat	Dinner
Female	Yes	Sat	Dinner
Male	Yes	Sat	Dinner
Male	No	Sat	Dinner
Female	No	Thur	Dinner

0	0	0	0	0	1	2	20.23	2.01	2.911216061	0.901216061
0	1	0	0	0	1	2	15.01	2.09	2.335095699	0.245095699
0	0	0	0	0	1	3	29.03	5.92	3.918201789	-2.00179821
1	1	0	0	0	1	2	27.18	2	3.518479238	1.518479238
0	1	0	0	0	1	2	22.67	2	3.058352659	1.058352659
0	0	0	0	0	1	2	17.82	1.75	2.683663937	0.933663937
1	0	1	0	0	1	2	18.78	3	2.771569903	-0.22843009