

# **Final Exam Handout**

**Applied Managerial Statistics  
GM 533**

**Please print this document for use on the Final Exam. You must have this handout available during the exam. Refer to it as indicated in the final exam questions.**

**I suggest that you have an outline of important items prepared prior to starting the final exam. This will let you find important items faster than looking through your textbook.**

**If you have questions, please let me know.**

**Table 1A Below**

Manufacturer	Sales (in Millions)
Bosch-Siemens	\$ 2,200
Electrolux	\$ 5,100
General Electric	\$ 4,350
Philips	\$ 2,000
Maytag	\$ 1,580
Whirlpool	\$ 3,950
Matsushita Electric	\$ 4,180
<b>Total</b>	\$ 23,360

**Table 1C Below**

Manufacturer	Sales (in Millions)
Bosch-Siemens	\$ 3,200
Electrolux	\$ 2,100
General Electric	\$ 6,350
Philips	\$ 1,800
Maytag	\$ 2,480
Whirlpool	\$ 8,950
Matsushita Electric	\$ 2,180
<b>Total</b>	\$ 27,060

**Table 1B Below**

Manufacturer	Sales (in Millions)
Bosch-Siemens	\$ 1,200
Electrolux	\$ 3,100
General Electric	\$ 4,350
Philips	\$ 2,000
Maytag	\$ 6,380
Whirlpool	\$ 3,950
Matsushita Electric	\$ 4,180
<b>Total</b>	\$ 25,160

**Table 2A Below**

Descriptive statistics

<i>Miles per Gallon</i>	
Count	18
Mean	36.350
sample variance	3.037
sample standard deviation	1.743
Minimum	33
Maximum	38.2
Range	5.2
Skewness	-0.735
Kurtosis	-0.739
coefficient of variation (CV)	4.79%
1st quartile	35.225
Median	36.500
3rd quartile	37.800
interquartile range	2.575
Mode	37.800

**Table 2A Continued**

Stem and Leaf plot for *Miles per Gallon*

stem unit = 1

leaf unit = 0.1

Frequency	Stem	Leaf
2	33	0 2
2	34	2 3
2	35	1 6
4	36	3 4 5 5
5	37	6 8 8 8 9
<u>3</u>	38	0 1 2
18		

**Table 2B Below**

Descriptive statistics

<i>Miles per Gallon</i>	
Count	18
Mean	32.889
sample variance	8.035
sample standard deviation	2.835
Minimum	29.1
maximum	39.2
range	10.1
skewness	0.789
kurtosis	-0.095
coefficient of variation (CV)	8.62%
1st quartile	30.600
median	32.300
3rd quartile	34.500
interquartile range	3.900
Mode	30.200

Stem and Leaf plot for *Miles per Gallon*  
stem unit = 1  
leaf unit = 0.1

Frequency	Stem	Leaf
2	29	1 8
3	30	2 2 4
3	31	2 5 8
3	32	3 3 5
1	33	2
2	34	5 5
1	35	3
1	36	5
1	37	5
0	38	
<u>1</u>	39	2
18		

**Table 2C Below**

Descriptive statistics

<i>Miles per Gallon</i>	
Count	18
Mean	33.539
sample variance	2.625
sample standard deviation	1.620
Minimum	30.2
Maximum	36.5
range	6.3
skewness	-0.277
kurtosis	-0.143
coefficient of variation (CV)	4.83%
1st quartile	32.500
median	33.750
3rd quartile	34.575
interquartile range	2.075
mode	#N/A

Stem and Leaf plot for *Miles per Gallon*  
stem unit = 1  
leaf unit = 0.1

Frequency	Stem	Leaf
1	30	2
2	31	2 5
3	32	3 4 8
5	33	2 3 7 8 9
4	34	1 5 6 8
2	35	3 6
<u>1</u>	36	5
18		

**Table 3A Below**

	East	South	Midwest	West	Totals
Hospitalization	75	128	29	52	284
Physician's Visit	233	514	104	251	1102
Outpatient Treatment	100	326	65	99	590
<b>Totals</b>	408	968	198	402	1976

**Table 3B Below**

	East	South	Midwest	West	Totals
Hospitalization	55	328	29	52	464
Physician's Visit	233	514	204	251	1202
Outpatient Treatment	100	526	65	102	793
<b>Totals</b>	388	1368	298	405	2459

**Table 3C Below**

	East	South	Midwest	West	Totals
Hospitalization	102	98	39	62	301
Physician's Visit	263	514	120	351	1248
Outpatient Treatment	100	226	65	99	490
<b>Totals</b>	465	838	224	512	2039

**Table 4A Below**

Binomial Distribution

10 n

0.4 p

$X$	$p(X)$	<i>cumulative probability</i>
0	0.00605	0.00605
1	0.04031	0.04636
2	0.12093	0.16729
3	0.21499	0.38228
4	0.25082	0.63310
5	0.20066	0.83376
6	0.11148	0.94524
7	0.04247	0.98771
8	0.01062	0.99832
9	0.00157	0.99990
10	0.00010	1.00000
	1.00000	

**Table 4B Below**

Binomial distribution

10 n

0.5 p

$X$	$p(X)$	<i>cumulative probability</i>
0	0.00098	0.00098
1	0.00977	0.01074
2	0.04395	0.05469
3	0.11719	0.17188
4	0.20508	0.37695
5	0.24609	0.62305
6	0.20508	0.82813
7	0.11719	0.94531
8	0.04395	0.98926
9	0.00977	0.99902
10	0.00098	1.00000
	1.00000	

**Table 4C Below**

Binomial distribution

10 n  
0.7 p

<i>X</i>	<i>p(X)</i>	<i>cumulative probability</i>
0	0.00001	0.00001
1	0.00014	0.00014
2	0.00145	0.00159
3	0.00900	0.01059
4	0.03676	0.04735
5	0.10292	0.15027
6	0.20012	0.35039
7	0.26683	0.61722
8	0.23347	0.85069
9	0.12106	0.97175
10	0.02825	1.00000
	1.00000	

**Table 5A Below**

normal distribution

p(lower)	p(upper)	z	x	mean	std.dev
.0042	.9958	-2.64	10	15.8	2.2
.9719	.0281	1.91	20	15.8	2.2
.1016	.8984	-1.27	13	15.8	2.2
.8413	.1587	1.00	18	15.8	2.2

**Table 5B Below**

normal distribution

p(lower)	p(upper)	z	x	mean	std.dev
.0042	.9958	-2.64	10	15.8	2.2
.9719	.0281	1.91	20	15.8	2.2
.1016	.8984	-1.27	13	15.8	2.2
.8413	.1587	1.00	18	15.8	2.2

**Table 5C Below**

normal distribution

p(lower)	p(upper)	z	x	mean	std.dev
.0042	.9958	-2.64	10	15.8	2.2
.9719	.0281	1.91	20	15.8	2.2
.1016	.8984	-1.27	13	15.8	2.2
.8413	.1587	1.00	18	15.8	2.2

**Table 6A Below**

normal distribution

p(lower)	p(upper)	z	x	mean	std.dev
.9000	.1000	1.28	50.75	42.8	6.2
.7500	.2500	0.67	46.98	42.8	6.2
.8000	.2000	0.84	48.02	42.8	6.2
.1000	.9000	-1.28	34.85	42.8	6.2
.2500	.7500	-0.67	38.62	42.8	6.2
.2000	.8000	-0.84	37.58	42.8	6.2

**Table 6B Below**

normal distribution

p(lower)	p(upper)	z	x	mean	std.dev
.9000	.1000	1.28	50.75	42.8	6.2
.7500	.2500	0.67	46.98	42.8	6.2
.8000	.2000	0.84	48.02	42.8	6.2
.1000	.9000	-1.28	34.85	42.8	6.2
.2500	.7500	-0.67	38.62	42.8	6.2
.2000	.8000	-0.84	37.58	42.8	6.2

**Table 6C Below**

normal distribution

p(lower)	p(upper)	z	x	mean	std.dev
.9000	.1000	1.28	50.75	42.8	6.2
.7500	.2500	0.67	46.98	42.8	6.2
.8000	.2000	0.84	48.02	42.8	6.2
.1000	.9000	-1.28	34.85	42.8	6.2
.2500	.7500	-0.67	38.62	42.8	6.2
.2000	.8000	-0.84	37.58	42.8	6.2

**Table 7A Below**

Confidence interval - proportion

99% confidence level  
0.06 proportion  
200 n  
2.576 z  
0.043 half-width  
0.103 upper confidence limit  
0.017 lower confidence limit

**Table 7B Below**

Confidence interval - proportion

99% confidence level  
 0.08 proportion  
 200 N  
 2.576 Z  
 0.048 half-width  
 0.123 upper confidence limit  
 0.027 lower confidence limit

**Table 7C Below**

Confidence interval - proportion

99% confidence level  
 0.11 proportion  
 200 N  
 2.576 Z  
 0.057 half-width  
 0.167 upper confidence limit  
 0.053 lower confidence limit

**Table 8A Below**

Confidence interval - mean

95% confidence level  
 2120 mean  
 320 std. dev.  
 16 N  
 2.131 T (df = 15)  
 170.516 half-width  
 2290.516 upper confidence limit  
 1949.484 lower confidence limit

**Table 9A Below**

Hypothesis test for proportion vs hypothesized value

<i>Observed</i>	<i>Hypothesized</i>	
0.54	0.6	p (as decimal)
108/200	120/200	p (as fraction)
108.	120.	X
200	200	n
	0.0346	std. error
	-1.73	z
	.0416	p-value (one-tailed, lower)

**Table 8B Below**

Confidence interval - mean

95% confidence level  
 2360 mean  
 365 std. dev.  
 20 N  
 2.093 t (df = 19)  
 170.825 half-width  
 2530.825 upper confidence limit  
 2189.175 lower confidence limit

**Table 8C Below**

Confidence interval - mean

95% confidence level  
 1750 mean  
 265 std. dev.  
 18 n  
 2.110 t (df = 17)  
 131.781 half-width  
 1881.781 upper confidence limit  
 1618.219 lower confidence limit

### Table 9B Below

Hypothesis test for proportion vs hypothesized value

<i>Observed</i>	<i>Hypothesized</i>	
0.42	0.5	p (as decimal)
84/200	100/200	p (as fraction)
84.	100.	X
200	200	N
	0.0354	std. error
	-2.26	Z
	.0118	p-value (one-tailed, lower)

### Table 9C Below

Hypothesis test for proportion vs hypothesized value

<i>Observed</i>	<i>Hypothesized</i>	
0.695	0.75	p (as decimal)
139/200	150/200	p (as fraction)
139.	150.	X
200	200	n
	0.0306	std. error
	-1.80	z
	.0362	p-value (one-tailed, lower)

### Table 10A Below

Hypothesis Test:  
Mean vs. Hypothesized Value

7.000 hypothesized value  
6.800 mean Photos  
0.580 std. dev.  
0.083 std. error  
49 n

-2.41 z  
.0079 p-value (one-tailed, lower)

### Table 10B Below

Hypothesis Test:  
Mean vs. Hypothesized Value

6.000 hypothesized value  
5.500 mean Photos  
0.410 std. dev.  
0.069 std. error  
35 n

-7.21 z  
2.70E-13 p-value (one-tailed, lower)

### Table 10C Below

Hypothesis Test:  
Mean vs. Hypothesized Value

8.000 hypothesized value  
7.700 mean Photos  
0.650 std. dev.  
0.107 std. error  
37 n

-2.81 z  
.0025 p-value (one-tailed, lower)

### Table 11A Below

Regression Analysis

r<sup>2</sup> 0.996 n 14  
r 0.998 k 1  
Std. Error 21.097 Dep. Var. **Labor Cost**

#### ANOVA table

Source	SS	df	MS	F	p-value
Regression	1,349,259.6337	1	1,349,259.6337	3031.35	8.49E-16
Residual	5,341.2234	12	445.1020		
Total	1,354,600.8571	13			

#### Regression output

variables	coefficients	std. error	t (df=12)	p-value	confidence interval	
					95% lower	95% upper
Intercept	4.2768	11.0779	0.386	.7062	-19.8600	28.4135
Batch Size	10.4257	0.1894	55.058	8.49E-16	10.0131	10.8383

#### Predicted values for: Labor Cost

Batch Size	Predicted	95% Confidence Interval		95% Prediction Interval		Leverage
		lower	upper	lower	upper	
100	1,046.848	1,022.964	1,070.731	995.046	1,098.650	0.270

### Table 11B Below

Regression Analysis

r<sup>2</sup> 0.994 n 14  
r 0.997 k 1  
Std. Error 20.490 Dep. Var. **Labor Cost**





### Table 12A Below

Regression Analysis

R <sup>2</sup>	0.908		
Adjusted R <sup>2</sup>		n	16
R	0.953	k	3
Std. Error	0.305	Dep. Var.	y

ANOVA  
table

Source	SS	df	MS	F	p-value
Regression	10.9730	3	3.6577	39.33	1.74E-06
Residual	1.1159	12	0.0930		
Total	12.0889	15			

Regression output

variables	coefficients	std. error	t (df=12)	p-value	confidence interval	
					95% lower	95% upper
Intercept	8.1495	0.8180	9.963	3.73E-07	6.3672	9.9318
x1	-2.1505	0.2493	-8.627	1.72E-06	-2.6936	-1.6074
x2	1.4409	0.1872	7.696	5.58E-06	1.0330	1.8488
x3	0.4008	0.0903	4.439	.0008	0.2041	0.5976

Predicted values for: y

x1	x2	x3	Predicted	95% Confidence Interval		95% Prediction Interval		Leverage
				lower	upper	lower	upper	
3.7	3.9	6.5	8.41737	8.22645	8.60829	7.72606	9.10869	0.083

### Table 12B Below

Regression Analysis

R <sup>2</sup>	0.937		
Adjusted R <sup>2</sup>		n	16
R	0.968	k	3
Std. Error	0.412	Dep. Var.	y

ANOVA  
table

Source	SS	df	MS	F	p-value
Regression	30.1593	3	10.0531	59.22	1.83E-07
Residual	2.0373	12	0.1698		
Total	32.1966	15			

Regression output					confidence interval	
variables	coefficients	std. error	t (df=12)	p-value	95% lower	95% upper
Intercept	4.8483	1.1053	4.387	.0009	2.4401	7.2564
x1	-3.6440	0.3368	-10.819	1.52E-07	-4.3779	-2.9102
x2	3.1699	0.2530	12.531	2.98E-08	2.6187	3.7210
x3	0.3589	0.1220	2.941	.0123	0.0930	0.6247

Predicted values for: y								
			95% Confidence Interval			95% Prediction Interval		
x1	x2	x3	Predicted	lower	upper	lower	upper	Leverage
3.7	3.9	6.5	6.06048	5.80251	6.31844	5.12640	6.99455	0.083

### Table 12C Below

#### Regression Analysis

R <sup>2</sup>	0.961		
Adjusted R <sup>2</sup>	0.951	n	16
R	0.980	k	3
Std. Error	0.313	Dep. Var.	y

#### ANOVA table

Source	SS	df	MS	F	p-value
Regression	28.6519	3	9.5506	97.27	1.09E-08
Residual	1.1783	12	0.0982		
Total	29.8302	15			

Regression output					confidence interval	
variables	coefficients	std. error	t (df=12)	p-value	95% lower	95% upper
Intercept	2.3146	0.8405	2.754	.0175	0.4833	4.1460
x1	-1.8520	0.2561	-7.231	1.04E-05	-2.4101	-1.2940
x2	1.1198	0.1924	5.821	.0001	0.7007	1.5390
x3	1.1981	0.0928	12.913	2.13E-08	0.9960	1.4003

Predicted values for: y								
			95% Confidence Interval			95% Prediction Interval		
x1	x2	x3	Predicted	lower	upper	lower	upper	Leverage
3.7	3.9	6.5	7.617234	7.421054	7.813414	6.906875	8.327594	0.083