

## Analytics: Principals & Applications Homework 3

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### **Question 4.4: Atlanta Airline Data**

Mean and Standard Deviation of time difference between Arrival and scheduled time and Taxi – in time.

Formula used to calculate is AVERAGE for mean calculation and STDEV.S for standard deviation calculation.

	Time Difference	Taxi -in Time
Mean	4.918429003	11.60422961
Standard Deviation	54.90318745	5.495219432

To calculate Z score, I used the STANDARDIZE function and pass in the Mean and Standard deviation. Since this is a 300 row data set, I have copied few rows after and pasted here after computing z score

Time Difference (Minutes)	Taxi-in Time (Minutes)	Z score (Time difference)	Z - Score ( Taxi-in time)
15	14	0.183624512	-1.019837274
-6	6	-0.198866942	-0.109955501
-9	11	-0.253508578	-0.473908211
-6	9	-0.198866942	0.253997208
5	13	0.001485724	-1.019837274
-22	6	-0.490289002	0.072020853
13	12	0.147196754	-0.109955501
20	11	0.274693906	-0.291931856
-2	10	-0.126011427	-0.473908211
-4	9	-0.162439185	-0.83786092
-9	7	-0.253508578	1.163878981
-2	18	-0.126011427	0.253997208
15	13	0.183624512	-0.655884565
-9	8	-0.253508578	-0.109955501
-17	11	-0.399219609	-0.83786092

-1	7	-0.107797548	-0.83786092
47	7	0.766468632	-0.291931856
0	10	-0.08958367	-0.473908211
-1	9	-0.107797548	-0.473908211
-5	9	-0.180653063	-0.83786092
1	7	-0.071369791	0.799926272
5	16	0.001485724	-0.655884565
-19	8	-0.435647366	0.799926272
14	16	0.165410633	-0.83786092

#### Question 4.22: Cell Phone Survey

1. Pivot table of average signal strength by carrier

Row Labels	Average of Signal strength
AT&T	3.461538462
Other	2.666666667
Sprint	2.8
T-mobile	3
Verizon	3.8
(blank)	
<b>Grand Total</b>	<b>3.307692308</b>

2. Average value of dollar by carrier and usage

Average of Value for the Dollar	Column Labels					
Row Labels	Average	High	Low	Very high	(blank)	Grand Total
						3.23076923
AT&T	3.5	4	2.5	3		1
Other	2.833333333		4	3		3
Sprint	4.666666667			5		4.8
T-mobile	4		4			4
Verizon	2.666666667		3	4		3.5
(blank)						
<b>Grand Total</b>	<b>3.391304348</b>	<b>4</b>	<b>3.2</b>	<b>3.45454545</b>	<b>5</b>	<b>3.42307692</b>
						<b>3</b>

3. Variance of carrier and perception by carrier and gender

Note that there is a divide by zero error for T mobile

Var of Customer Service				
Column Labels				
Row Labels	F	M	(blank)	Grand Total
AT&T	0.696428571	1.124183007		0.986153846
Other	0	0.952380952		0.777777778
Sprint	0	0.333333333		0.2
T-mobile	#DIV/0!	#DIV/0!		0.5
Verizon	0.8	1.3		1.333333333
(blank)				
<b>Grand Total</b>	<b>0.761437908</b>	<b>0.970588235</b>		<b>0.926093514</b>

### Question 4.31: Auto Survey

Descriptive Statistics tools – Have used the AVERAGE, STDEV, SQRT, VAR, SKEW, KURT, MIN, MAX, SUM, COUNT

	Vehicle Age	Mileage	MPG
Mean	8.206521739	100914.5217	29.07826087
Standard Error	1.01892325	13212.00666	1.846018646
Median	9	105628	28.7
Mode	7	#N/A	20
Standard Deviation	4.88658424	63362.55804	8.853194417
Variance	23.87870553	4014813761	78.37905138
Kurtosis	-1.2872732	-1.27265438	-0.42041306
Skewness	-0.28885737	-0.06669528	0.102299843
Range	14.75	201834	33.7
Minimum	0.25	3454	12
Maximum	15	205288	45.7
Sum	188.75	2321034	668.8
Count	23	23	23

Pivot Table - Average miles/gallon for each type of vehicle

Row Labels	Average of MPG
Large SUV	18.1
Mid-size	33.52
Minivan	16
Small	33.37272727
Small SUV	21.96666667
(blank)	
<b>Grand Total</b>	<b>29.07826087</b>

Pivot Table - average miles/gallon for each type of vehicle

Average of MPG	Column Labels			
Row Labels	New	Used	(blank)	Grand Total
Large SUV	21	15.2		18.1
Mid-size	37.3	27.85		33.52
Minivan	20	12		16
Small	32.06666667	34.94		33.37272727
Small SUV	24.9	20.5		21.96666667
(blank)				
<b>Grand Total</b>	<b>30.85</b>	<b>27.14545455</b>		<b>29.07826087</b>

Pivot Table - Average age for each type of new and used vehicle

Average of Vehicle Age	Column Labels			
Row Labels	New	Used	(blank)	Grand Total
Large SUV		7	14	10.5
Mid-size	0.5833333333		13.5	5.75
Minivan		9	14	11.5
Small	5.666666667		10.2	7.727272727
Small SUV		4	13.5	10.33333333
(blank)				
<b>Grand Total</b>	<b>4.645833333</b>	<b>12.09090909</b>		<b>8.206521739</b>

#### Question 4.38: Syringe Samples

Control limits

Average	Standard Deviation	LCL	UCL
4.9540	0.0058	4.9365	4.9714929
4.9420	0.0122	4.9053	4.9786811
4.9510	0.0177	4.8980	5.004033
4.9610	0.0160	4.9129	5.0090937
4.9570	0.0059	4.9393	4.9747482
4.9590	0.0080	4.9351	4.9829061
4.9520	0.0065	4.9324	4.9715576
4.9590	0.0083	4.9342	4.9838294
4.9540	0.0208	4.8915	5.016462
4.9540	0.0160	4.9060	5.0019531
4.9670	0.0065	4.9474	4.9865576
4.9590	0.0135	4.9186	4.9994166
4.9700	0.0045	4.9566	4.9834164
4.9630	0.0066	4.9433	4.9826723
4.9700	0.0085	4.9446	4.9953673

#### Question 5.4: Market research to determine ranked preferences of energy drinks

Outcomes

BRAND PREFERENCE	BRAND NAME
Brand 1	Monster
Brand 2	Red Bull
Brand 3	Rockstar

Probability that Red bull will be first choice =  $2/6 = 0.333333$

Probability that two respondents will choose red bull as first =  $2/6 * 2/6 = 0.11111$

#### Question 5.9: Market research to determine ranked preferences of energy drinks

Probabilities of status

Early – 0.185

On time – 0.556

Late – 0.093

Cancelled – 0.167

- b. Yes, these outcomes are mutually exclusive
- c. probability that a flight is early or on time – 0.741

**Question 5.14: Market research to determine ranked preferences of energy drinks**

- a. Marginal probabilities –  $P(\text{Book}) = 0.553$   
 $P(\text{DVD}) = 0.447$

- b. Probabilities of books based on regions

$$P(\text{Books in East}) = 0.571$$

$$P(\text{Books in north}) = 0.506$$

$$P(\text{Books in South}) = 0.626$$

$$P(\text{books in West}) = 0.526$$

**Question 5.22: Weekly demand**

$$\text{Expected value} = 1.3$$

$$\text{Variance} = 0.81$$

$$\text{Standard Deviation} = 0.9$$

**Question 5.33: Verify the function**

1.  $P(X < 8) = 0.60$  both from the figure and using formula
2.  $P(X > 7) = 0.70$  both from the figure and using formula
3.  $P(6 < x < 10) = 0.80$  both from the figure and using formula
4.  $P(8 < x < 11)$  - both from the figure and using formula

**Question 5.36: Auto mileage**

1.  $P(X < 30) = 0.039$
2.  $P(28 < X < 32) = 0.277$
3.  $P(X > 35) = 0.120$
4.  $P(X > 31) = 0.88$

**Question 5.39: Auto mileage**

1. If the actual mean of the process is 1.98, what fraction of parts will meet specifications?

$$P(x < 2.04) = 0.933$$

$$P(x < 1.96) = 0.309$$

62.4% meets the specifications

2. If the mean is adjusted to 2.00, what fraction of parts will meet specifications?

For this mean, 68.27 meets the specifications

3. How small must the standard deviation be to ensure that no more than 2% of parts are nonconforming, assuming the mean is 2.00?

In this case, 98.14 meets the specifications

#### **Question 5.42: Pizza delivery**

1. What is the probability that the delivery time will exceed 30 minutes?

$$P(X > 30) = 0.223$$

2. What proportion of deliveries will be completed within 20 minutes?

$$P(X < 20) = 0.632$$