4.1.

a. P(Male) = # males / Total = 678/1,336 = 0.5075

b. P(20-40) = # 20-40/Total = 630/1,336 = 0.4716

c. P(20-40 and Male) = 340/1,336 = 0.2545

d. $P(<20|Males) = \frac{\# < 20}{\# Males} = \frac{168}{678} = 0.2478$

$P(<20|Females) = \frac{\# < 20}{\# Females} = \frac{208}{658} = 0.3161$

Gender and age are not independent.

4.8.

Type of Ad	Occurrences
Help Wanted Ad	204
Real Estate Ad	520
Other Ad	306
Total	**1,030**

a. P(help wanted ad) = number of help wanted ads/total number of ads.
There are 204+520+306 = 1,030 total newspaper ads. Of this total 204 are help wanted ads. Thus, the probability of a help wanted ad being selected is 204/1,030 = 0.1981.

b. Relative frequency

c. Yes. Since the newspaper is choosing only one ad, it is impossible for them to select a help wanted ad and another ad. Since the occurrence of a help wanted ad being chosen precludes any other ad from being chosen, the events are mutually exclusive.

4.14.

Students can use Excel’s pivot table features to group the data in order to be able to answer the questions.

a. P(Definitely Will or Probably Will) = (21+20)/62 = 0.6613

	Stay Again				
	Definitely Will	Probably Will	May or May Not	Probably Will Not	Grand Total
Total	21	20	18	3	62

b. P(Business Trip) = 27/62 = 0.4355

	Business Trip	Pleasure Trip	Combination	Grand Total
Total	27	26	9	62

c. P(Previous Stay) = 18/62 = 0.2903

	First Stay	Previous Stay	Grand Total
Total	44	18	62

d. P(business trip and better rating) = 13/62 = 0.2097

	Hotel Rating				
Type of Trip	No Response	Better	Same	Worse	Grand Total
Business Trip	11	13	2	1	27
Pleasure Trip	19	6	1		26
Combination	3	5	1		9
Grand Total	33	24	4	1	62

4.18.

a. There are 27 possible elementary events during the 3- 30 minute time slots determined as follows:

Slot 1		Slot 2		Slots 3		
3 stations	x	3 stations	x	3 stations	=	27

In order to have all three stations represented, there are 3 possibilities during the first time slot. Once the station for that slot is selected, there are two choices for the second slot. Finally, there will be one choice for the final slot. This, the number of ways this event can happen is 3 x 2 x 1 = 6. Thus, the probability of all three stations being represented is 6/27 = 0.2222

b. Given that the person will watches the same station for at least two programs, the probability that he or she will watch all three on the same station is 1/3 since there are 9 ways out of the original 27 that at least two stations will be same. Out of these 9, there are three ways that all three will be the same. Thus the probability is 3/9 = 1/3 = 0.3333

4.35.

There are a total of 6 companies.

a. P(Ace) = 1/6 = 0.1667

b. P(Win1 and Win2) = (1/6)(1/6) = 0.0278

c. P(Lose1 and Lose2) = (5/6)(5/6) = 0.6944

d. P(Win1 and Lose2) + P(Lose1 and Win2) = (1/6)(5/6) + (5/6)(1/6) = 0.2778

e. P(Win1 and Lose2) + P(Lose1 and Win2) + P(Win1 and Win2) = 0.1389 + 0.1389 + 0.0278 = 0.3056 or 1 – P(Lose 1 and Lose 2) = 1 – 0.6944 = 0.3056

4-38.

Student can use Excel's pivot table feature to answer this question.

a. P(both business) = (27/62)(26/61) = 0.1856

Type of Trip	Total
Business	27
Pleasure	26
Combination	9
Grand Total	62

b. P(business or hotel problem) = 27/62 + 14/62 – 10/62 = 31/62 = 0.50

	Any Problems		
Type of Trip	Problems	No Problems	Grand Total
Business	10	17	27
Pleasure	3	23	26
Combination	1	8	9
Grand Total	14	48	62

c. P(business and in-state area code) = 2/62 = 0.0323

	Phone			
Type of Trip	No Response	In-State	Out-State	Grand Total
Business	3	2	22	27
Pleasure	9	2	15	26
Combination	1	1	7	9
Grand Total	13	5	44	62

d. If they are independent 22/62 which equals 0.3548 should equal (52/62)(27/62) which equals (0.8387)(0.4355) = 0.3653 since they are not equal they are not independent

	Attentive			
Type of Trip	No Response	Pass	Fail	Grand Total
Business	1	22	4	27
Pleasure	1	22	3	26
Combination		8	1	9
Grand Total	2	52	8	62

4.46.

The covariance is calculated using equation 4-17:

$$\sigma_{xy} = \sum [x_i - E(x)][y_j - E(y)]P(x_i y_j)$$

The expected values for x and y were computed in problem 4.45 as:

E(x) = 225 and E(y) = 415

Then the following calculations give the covariance:

x	P(x)	xP(x)	x - E(x)	y	P(y)	yP(y)	y - E(y)	[x - E(x)][y - E(y)]	P(xy)	[x - E(x)] E(y)]P(x
100	0.25	25	-125	500	0.25	125	85	(10,625.00)	0.10	(1,062.50)
200	0.40	80	-25	300	0.40	120	-115	2,875.00	0.50	1,437.50
300	0.20	60	75	400	0.20	80	-15	(1,125.00)	0.30	(337.50)
400	0.15	60	175	600	0.15	90	185	32,375.00	0.10	3,237.50
		225				415				3,275.00

The covariance is 3,275 The relationship between the two variables is positive

4-49.

a. To determine the probability you need to divide the number of days by the total of 200.

x	P(x)	xP(x)	x-E(x)	$[x-E(x)]^2$	$[x-E(x)]^2P(x)$
0	0.110	0.000	-2.885	8.3232	0.9156
1	0.100	0.100	-1.885	3.5532	0.3553
2	0.200	0.400	-0.885	0.7832	0.1566
3	0.275	0.825	0.115	0.0132	0.0036
4	0.140	0.560	1.115	1.2432	0.1741
5	0.100	0.500	2.115	4.4732	0.4473
6	0.025	0.150	3.115	9.7032	0.2426
7	0.050	0.350	4.115	16.9332	0.8467
		2.885			3.1418

a. E(x) = 2.885

b. 1.7725

d. The coefficient of variation is:

$$CV = \frac{\sigma}{\mu}(100) = \frac{\sigma_x}{E(x)}(100) = \frac{1.7725}{2.885}(100) = 61.44\%$$

e. Students need to look at the 3rd quartile. This is accomplished by determining the cumulative P(x). The 75th percentile would be between 3 and 4. Since you want at least 75% you should choose x=4 which means you would need 4(3) = 12 employees.

x	P(x)	Cum P(x)
0	0.110	0.110
1	0.100	0.210
2	0.200	0.410
3	0.275	0.685
4	0.140	0.825
5	0.100	0.925
6	0.025	0.950
7	0.050	1.000

4.63.

a. P(win) = 1/500 = 0.002

b. P(win) = 3/500 = 0.006

c. The probability assessment method used in a and b is the classical probability approach.

4.74.

a. Student can initially fill out this part of the joint probability distribution table.

	Ski	Not Ski	
Children not 8-16			0.25
Children 8-16			0.35
No Children			
	0.4		

P(A1 and B2) = P(A1|B2)P(B2) = 0.70(0.35) = 0.245

P(A1 and B1) = P(A1|B1)P(B1) = 0.30(0.25) = 0.075

	Ski	Not Ski	
Children not 8-16	0.075		0.25
Children 8-16	0.245		0.35
No Children			

0.4

Students can now fill in the rest of the table by using the knowledge that to ski or not ski must sum to 1 and that the children categories must sum to 1. The remaining probabilities inside the table must add to the outside probabilities.

	Ski	**Not Ski**	
Children not 8-16	0.075	0.175	0.25
Children 8-16	0.245	0.105	0.35
No Children	0.080	0.320	0.40
	0.400	0.600	1.00

b. P(Ski and Children not 8-16) = 0.075

c. P(not ski | Children 8-16) = 0.105/0.35 = 0.3

d. If the categories "skiing" and "family composition" are independent the product of the marginal probabilities should equal the joint probability. For example the probability of skiing times the probabilities of children not 8-16 should equal the joint probability of skiing and children not 8-16

Since .4(.25) ≠ .075; the events are not independent