

Suggested Answers for WarmUps for Lesson 11

	Stoves	Refrigerators		
		0	1	2
	0	0.04	0.18	0.13
	1	0.12	0.05	0.09
2	0.17	0.14	0.08	

1.	Describe exactly how you would calculate the expected number of refrigerators sold daily, including all interim steps and appropriate numbers.																		
Answer	<ol style="list-style-type: none"> 1. Calculate the marginal probabilities of the different numbers of refrigerators sold by adding the joint probabilities in the three columns. Respectively the marginal probabilities are 0.33, 0.37 and 0.30. 2. Multiply each number of refrigerators sold by its marginal probability. These products are 0, 0.37, 0.60. 3. Sum these products to find the expected number of refrigerators, which is 0.97 refrigerators. 																		
2.	Describe exactly how you would calculate the expected variance of the number of stoves sold daily, including all interim steps and appropriate numbers.																		
Answer	<ol style="list-style-type: none"> 1. Calculate the marginal probabilities of the different numbers of stoves sold by adding the joint probabilities in the three columns. Respectively the marginal probabilities are 0.35, 0.26 and 0.39. 2. Multiply each number of stoves sold by its marginal probability. These products are 0, 0.26, 0.78. 3. Sum these products to find the expected number of stoves, which is 1.04 stoves. 4. Subtract the expected number of stoves from each number of stoves to get the deviations -1.04, -0.04 and 0.96. 5. Square the deviations and get 1.0816, 0.0016 and 0.9216. 6. Multiply the squared deviations by the marginal probabilities calculated above to get 0.37856, 0.000416 and 0.359424. 7. Sum the products from step 6 above to get the variance of 0.7384. 																		
3.	Suppose you wished to calculate the expected variance of the number of appliances (that is, stoves and refrigerators) sold daily. How would you tell if you needed a covariance term in your calculation? Describe how you would know. Would you need one?																		
Answer	<p>We would need an explicit covariance term (one that isn't zero) if the sales of stoves and refrigerators are not independent. We use the Independence rule to check. The table of products of the marginals is on the left and the original joint probabilities are on the right. The values are significantly different in every cell but one. We need a covariance term.</p> <table style="margin-left: auto; margin-right: auto;"> <tr> <td style="padding: 5px;">0.1155</td> <td style="padding: 5px;">0.1295</td> <td style="padding: 5px;">0.105</td> <td style="border: 1px solid black; padding: 5px;">0.04</td> <td style="border: 1px solid black; padding: 5px;">0.18</td> <td style="border: 1px solid black; padding: 5px;">0.13</td> </tr> <tr> <td style="padding: 5px;">0.0858</td> <td style="padding: 5px;">0.0962</td> <td style="padding: 5px;">0.078</td> <td style="border: 1px solid black; padding: 5px;">0.12</td> <td style="border: 1px solid black; padding: 5px;">0.05</td> <td style="border: 1px solid black; padding: 5px;">0.09</td> </tr> <tr> <td style="padding: 5px;">0.1287</td> <td style="padding: 5px;">0.1443</td> <td style="padding: 5px;">0.117</td> <td style="border: 1px solid black; padding: 5px;">0.17</td> <td style="border: 1px solid black; padding: 5px;">0.14</td> <td style="border: 1px solid black; padding: 5px;">0.08</td> </tr> </table>	0.1155	0.1295	0.105	0.04	0.18	0.13	0.0858	0.0962	0.078	0.12	0.05	0.09	0.1287	0.1443	0.117	0.17	0.14	0.08
0.1155	0.1295	0.105	0.04	0.18	0.13														
0.0858	0.0962	0.078	0.12	0.05	0.09														
0.1287	0.1443	0.117	0.17	0.14	0.08														
4.	<p>Max at Max's Marvelous Machines sells all kinds of appliances including DVD players. Max has found that the number of DVD players he will sell on any given day has this distribution.</p> <table style="margin-left: auto; margin-right: auto;"> <tr> <td style="border: 1px solid black; padding: 5px;"># DVD Players</td> <td style="border: 1px solid black; padding: 5px;">P(# DVD Players)</td> </tr> </table>	# DVD Players	P(# DVD Players)																
# DVD Players	P(# DVD Players)																		

	<table border="1"> <tbody> <tr> <td>0</td> <td>0.16807</td> </tr> <tr> <td>1</td> <td>0.36015</td> </tr> <tr> <td>2</td> <td>0.3087</td> </tr> <tr> <td>3</td> <td>0.1323</td> </tr> <tr> <td>4</td> <td>0.02835</td> </tr> <tr> <td>5</td> <td>0.00243</td> </tr> </tbody> </table>	0	0.16807	1	0.36015	2	0.3087	3	0.1323	4	0.02835	5	0.00243
0	0.16807												
1	0.36015												
2	0.3087												
3	0.1323												
4	0.02835												
5	0.00243												
	How many DVD players does Max expect to sell on any given day?												
Answer	Since this is a probability distribution, we would calculate his expected sales in the same way we calculated expected refrigerator sales, multiply the number of DVD players by the probability of that number being sold in one day, then summing the products. The expected number of DVD players sold per day is 1.5.												
5.	Max at Max's Marvelous Machines sells all kinds of appliances including DVD players. Max has found that the number of DVD players he will sell on any given day has this distribution. What is the variance of the number of DVD players Max expects to sell on any given day?												
Answer	We would calculate this number using the same method as we used in calculating the variance of sales of stoves. The variance in DVD player sales is 1.05												
6.	A particular binomial distribution has a probability of success of 0.30 and 5 trials. What are the expected value and variance of this distribution? How did you calculate your answers?												
Answer	Using the formulas for expected value ($n \cdot \pi$) and variance ($n \cdot \pi \cdot (1 - \pi)$) we get $0.30 \cdot 5 = 1.5$ and $0.30 \cdot 5 \cdot 0.70 = 1.05$												
7.	Compare your answers from question 6 to your answers from #4 and #5. Are they the same or different? Why?												
Answer	The answers are identical. The probabilities in problems 4 and 5 are binomial probabilities from a binomial with $\pi = 0.30$ and $n = 5$. They should be identical.												
8.	Suppose you were interested in knowing the proportion of the voting population that votes Democratic. Assuming that there are three possible party affiliations-- Democrat, Republican and Independent--how would you set up the problem if you selected 10 people and asked their party affiliation? Be very complete.												
Answer	This has all the markings of a binomial problem assuming the people in the group of 10 are selected randomly and that there is a sufficiently large number of people from whom the 10 were selected to be sure that the probability of success would not change. No probability of success is given but one could be estimated from a pilot study or 0.33 could be used. Success would be defined as "Votes Democratic." Failure would be anything else, specifically "Votes Independent" and "Votes Republican."												