

Chapter 11, Estimation of Absolute Performance  
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Exercise Question No. 10:  
A store selling Mother's Day cards must decide 6 months in advance on the number of cards to stock. Reordering is not allowed. Cards cost \$0.45 and sell for \$1.25. Any cards not sold by Mother's Day go on sale for \$0.50 for 2 weeks. However, sales of the remaining cards is probabilistic in nature according to the following distribution:  
32% of the time, all cards remaining get sold.  
40% of the time, 80% of all cards remaining are sold.  
28% of the time, 60% of all cards remaining are sold.  
Any cards left after 2 weeks are sold for \$0.25. The card-shop owner is not sure how many cards can be sold, but thinks it is somewhere (i.e., uniformly distributed) between 200 and 400. Suppose that the card-shop owner decides to order 300 cards. Estimate the expected total profit with an error of at most \$5.00. [Hint: Make ten initial replications. Use these data to estimate the total sample size needed. Each replication consists of one Mother's Day.]  
Solution:  
Calculate the Average Profit = [Sum of all profit]/[Total number of replications]  
 $E = \text{Check for Error of } \pm \$5.00.$   
 $s$  =Standard deviation of profit.  
Determine required sample size (n):

$$n = \left( z \cdot \frac{s}{E} \right)^2$$

$z$ : confidence level (e.g., 1.96 for 95% confidence).  
 $s$ : standard deviation of the profits.  
 $E$ : desired margin of error (\$5.00).

Calculate the Average Profit	=	184	<input type="text"/>
Check for Error of +- \$5.00, standard deviation of Profit	=	205	<input type="text" value="Check for Error of ±\$5.00, standard deviation s"/>
Required Sample Size (n)	=	6467	<input type="text" value="← – Number of simulations required to achieve the desired accuracy."/>

Week 2										
Replication	Random #	Demand range (200 to 400) fixed	Demand (D)	Sold at \$1.25	Unsold Cards	Sold at \$0.50	Leftover Cards	Revenue (\$)	Cost(\$)	Profit(\$)
1	0.087	400	35	35	265	265	0	43	135	-92
2	0.470	400	188	188	112	90	22	486	135	351
3	0.002	400	1	1	299	299	0	1	135	-134
4	0.248	400	99	99	201	201	0	124	135	-11
5	0.133	400	53	53	247	247	0	67	135	-68
6	0.386	400	155	155	145	116	29	616	135	481
7	0.270	400	108	108	192	192	0	135	135	0
8	0.494	400	198	198	102	82	20	457	135	322
9	0.188	400	75	75	225	225	0	94	135	-41
10	0.369	400	148	148	152	122	30	649	135	514
11	0.681	400	272	272	28	22	6	356	135	221
12	0.748	400	299	299	1	0	0	374	135	239
13	0.066	400	26	26	274	274	0	33	135	-102
14	0.945	400	378	300	0	0	0	375	135	240
15	0.614	400	246	246	54	44	11	366	135	231
16	0.847	400	339	300	0	0	0	375	135	240
17	0.549	400	220	220	80	64	16	404	135	269
18	0.573	400	229	229	71	56	14	386	135	251
19	0.925	400	370	300	0	0	0	375	135	240
20	0.376	400	150	150	150	120	30	636	135	501
21	0.204	400	82	82	218	218	0	102	135	-33
22	0.415	400	166	166	134	107	27	566	135	431