**Solved Problem 15-1**

Higgins Plumbing and Heating maintains a stock of 30-gallon hot water heaters that it sells to home-owners and installs for them. Owner Jerry Higgins likes the idea of having a large supply on hand to meet customer demand, but he also recognizes that it is expensive to do so. He examines hot water heater over the past 50 weeks and notes the following:

|  |  |
| --- | --- |
| Hot Water Heater Sales | Number of Weeks This Number was Sold |
| 4 | 6 |
| 5 | 5 |
| 6 | 9 |
| 7 | 12 |
| 8 | 8 |
| 9 | 7 |
| 10 | 3 |
|  | Total 50 |

a. If Higgins maintains a constant supply of 8 hot water heaters in any given week, how many times will he be out of stock during a 20-week simulation? We use random numbers from the seventh column of Table 15.5, beginning with the random digits 10.

b. What is the average number of sales per week (including stockouts) over the 20-week period?

c. Using an analytic nonsimulation technique, what is the expected number of sales per week? How does this compare with the answer in part (b)?

**Solution**

Because the variable of interest is the number of sales per week, a fixed time increment model should be used.

|  |  |  |
| --- | --- | --- |
| **Heater Sales** | **Probability** | **Random Number Interval** |
| 4 | 0.12 | 01 to 12 |
| 5 | 0.10 | 13 to 22 |
| 6 | 0.18 | 23 to 40 |
| 7 | 0.24 | 41 to 64 |
| 8 | 0.16 | 65 to 80 |
| 9 | 0.14 | 81 to 94 |
| 10 | 0.06 | 95 to 00 |
|  | 1.00 |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Week** | **Random Number** | **Simulated Sales** | **Week** | **Random Number** | **Simulated sales** |
| 1 | 10 | 4 | 11 | 08 | 4 |
| 2 | 24 | 6 | 12 | 48 | 7 |
| 3 | 03 | 4 | 13 | 66 | 8 |
| 4 | 32 | 6 | 14 | 97 | 10 |
| 5 | 23 | 6 | 15 | 03 | 4 |
| 6 | 59 | 7 | 16 | 96 | 10 |
| 7 | 95 | 10 | 17 | 46 | 7 |
| 8 | 34 | 6 | 18 | 74 | 8 |
| 9 | 34 | 6 | 19 | 77 | 8 |
| 10 | 51 | 7 | 20 | 44 | 7 |

With a supply of 8 heaters, Higgins will be out of stock three times during the 20-week period (in weeks 7, 14, and 16).

b.Average sales by simulation = total sales = 135 = 6.75 per week.

 20 weeks 20

c. Using expected values,

E (sales) = 0.12(4 heaters) + 0.10(5) + 0.18(6) + 0.24(7)

+ 0.16(8) + 0.14(9) + 0.06(10)

= 6.88 heaters

With a longer simulation, these two approaches will lead to even closer values.