14-Clark Property Management is responsible for the maintenance, rental, and day-to-day operation of a large apartment complex on the east side of new orleans. George Clark is especially concerned about the cost projections for replacing air conditioner compressors. He would like to simulate the number of compressor failures each year over the next 20 years. Using data from a similar apartment building he manages in a New Orleans suburb, Clark establishes a table of relative frequency of failures during a year as shown in the following table:

Number of A.C. Compressor Failures	Probability (Relative Frequency)
0	0.06
1	0.13
2	0.25
3	0.28
4	0.20
5	0.07
6	0.01

He decides to simulate the 20-year period by selecting two-digit random numbers from the third column of Table 14.4, starting with the random number 50.

Conduct the simulation for Clark. Is it common to have three or more consecutive years of operation with two or fewer compressor failures per year?

<u>Solution</u>

1-compute cumulative probability and interval of random numbers

Numbers of failure	Probability	Cumulative Probability	Interval of random numbers
0	0.06	0.06	01 to 06
1	0.13	0.19	07 to 19
2	0.25	0.44	20 to 44
3	0.28	0.72	45 to 72
4	0.20	0.92	73 to 92
5	0.07	0.99	93 to 99
6	0.01	1.00	00

Years	Random number	Simulated failures during a year
1	50	3
2	28	2
3	68	3
4	36	2
5	90	4
6	62	3
7	27	2
8	50	3
9	18	1
10	36	2
11	61	3
12	21	2
13	36	2
14	01	0
15	14	1
16	81	4
17	87	4
18	72	3
19	80	4
20	46	3
		Total 20-year failure=51 **Average 20-year failure = 51/20 = 2.55**

15- The number of cars arriving per hour at Lundberg's Car Wash during the past 200 hours of operation is observed to be the following:

Number of cars arriving	Frequency
3 or fewer	0
4	20
5	30
6	50
7	60
8	40
9 or more	0
	Total=200

(a) Set up a probability and cumulative probability distribution for the variable of car arrivals.

(b) Establish random number intervals for the variable.

(c) Simulate 15 hours of car arrivals and compute the average number of arrivals per hour. Select the random numbers needed from the first column of Table 14.4, beginning with the digits 52.

Solution

(a)

Number of cars arriving	Frequency	probability	Cumulative probability	Interval of random number
3 or fewer	0	0/200=0.0	0.0	00
4	20	20/200=0.1	0.1	1 to 10
5	30	30/200=0.15	0.25	11 to 25
6	50	50/200=0.25	0.5	26 to 50
7	60	60/200=0.3	0.8	51 to 80
8	40	40/200=0.2	1.00	81 to 100
9 or more	0	0/200=0.0	1.00	100
	Total=200			

(b) and (c)

hours	Random number	Simulated Number of cars arriving during 15 hours
1	52	7
2	37	6
3	82	8
4	69	7
5	98	8
6	96	8
7	33	6
8	50	6
9	88	8
10	90	8
11	06	4

12	63	7
13	57	7
14	02	4
15	94	8
		Total number of 20-hour cars arrival = 102 **Average Number of cars arriving for 15 hours =102/15=6.8 car**

16- Compute the expected number of cars arriving in Problem 14-15 using the expected value formula. Compare this with the results obtained in the simulation.

Solution

Expected number of cars arriving

$$= \sum_{i=3}^{9 or more} (\text{Probability Number of cares arriving})(\text{number of care arrive})$$

= (0.0) (3) + (0.1) (4) + (0.15) (5) + (0.25) (6) + (0.3) (7) + (0.2) (8) +(.0) (9)

=0+.4+.75+1.5+2.1+1.6+0=6.35 car