

7.2 Selecting a Sample

(41)

1 Selecting a Sample from a finite Population:

- A simple random sample of size n from a finite population of size N is a sample selected such that each possible sample of size n has the same probability of being selected.
- The number of different simple random samples of size n that can be selected from a finite population of size N is

$$\binom{N}{n} = \frac{N!}{n!(N-n)!}$$

- For example: $N=2500$ and $n=30$. The number of different simple random samples of size 30 is $\binom{2500}{30} = \frac{2500!}{30!(2500-30)!} \approx 2.75 \times 10^{69}$

- To select a simple random from the finite population of managers:

1. we construct a frame by assigning each manager a number:

1, 2, 3, ..., 2500

2. We refer to the table of random numbers: Table 7.1 page 260.

3. We start the selection of random numbers anywhere in the table and move systematically. We will use the first row and move from left to right.

4. Since the last number is 2500, has four digits, we select four digit numbers from the table.

5. If the selection is repeated, we ignore it. If the selection is greater than 2500, we ignore it.

The four digit random numbers are:

6327

x

5998

x

7174

x

5110

x

1514

✓

... until the simple random sample of 30 manager has been obtained.

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Once an element has been included in the sample, it is removed from the population and cannot be selected a second time. Sampling without replacement otherwise, with replacement.

once an element has been included in the sample, it is returned to the population. A previously selected element can be selected again and in the sample more than once. Sampling with replacement

TABLE 7.1 RANDOM NUMBERS

63271	59986	71744	51102	15141	80714	58683	93108	13554	79945
88547	09896	95436	79115	08303	01041	20030	63754	08459	28364
55957	57243	83865	09911	19761	66535	40102	26646	60147	15702
46276	87453	44790	67122	45573	84358	21625	16999	13385	22782
55363	07449	34835	15290	76616	67191	12777	21861	68689	03263
69393	92785	49902	58447	42048	30378	87618	26933	40640	16281
13186	29431	88190	04588	38733	81290	89541	70290	40113	08243
17726	28652	56836	78351	47327	18518	92222	55201	27340	10493
36520	64465	05550	30157	82242	29520	69753	72602	23756	54935
81628	36100	39254	56835	37636	02421	98063	89641	64953	99337
84649	48968	75215	75498	49539	74240	03466	49292	36401	45525
63291	11618	12613	75055	43915	26488	41116	64531	56827	30825
70502	53225	03655	05915	37140	57051	48393	91322	25653	06543
06426	24771	59935	49801	11082	66762	94477	02494	88215	27191
20711	55609	29430	70165	45406	78484	31639	52009	18873	96927
41990	70538	77191	25860	55204	73417	83920	69468	74972	38712
72452	36618	76298	26678	89334	33938	95567	29380	75906	91807
37042	40318	57099	10528	09925	89773	41335	96244	29002	46453
53766	52875	15987	46962	67342	77592	57651	95508	80033	69828
90585	58955	53122	16025	84299	53310	67380	84249	25348	04332
32001	96293	37203	64516	51530	37069	40261	61374	05815	06714
62606	64324	46354	72157	67248	20135	49804	09226	64419	29457
10078	28073	85389	50324	14500	15562	64165	06125	71353	77669
91561	46145	24177	15294	10061	98124	75732	00815	83452	97355
13991	08112	53959	79607	52244	63303	10413	63839	74762	50289

2 Selecting a Sample from a Process "infinite Population"

- If the frame of a population can not be constructed, then we can not use simple random sample. For example:

→ Sampling from a very large population in which it is impossible to identify all the elements of the population.

→ Sampling from process in which the sampled population is conceptually infinite. For example:

→ To select a sample of the elements generated by a production process: The manufacturer produced a sample of 120 new tires to estimate the mean useful life for the population of new tires.

→ The production of each unit "tire" is independent of the production of the others.

→ Hence, we select a random sample by selecting any n units produced while the process is operating properly.

Example (Q2 page 262) Assume a finite population has 350 elements. Using the last three digits of the random numbers:

98601 73022 83448 02147 34229 27553 84147 93289 14789

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determine the first four elements that will be selected for the simple random sample.

x ✓ x ✓ ✓ x repeated x its over x

022, 147, 229, 289