

SIMULATION TO DEMONSTRATE THE MEANING OF CONFIDENCE

Consider a normal population with a mean of 10 and a standard deviation of 2. One hundred different experimenters do not know the value of the mean of this population. Each of these experimenters randomly samples $n = 50$ values from this population, and forms a 90% confidence interval to estimate the value of the population mean. Shown below is a StatCrunch simulation of the results of the 100 experimenters' 90% confidence intervals.

Experimenter	n	Sample Mean	Std. Err.	L. Limit	U. Limit
1	50	10.022	0.283	9.556	10.487
2	50	9.954	0.283	9.488	10.419
3	50	10.075	0.283	9.610	10.540
4	50	9.657	0.283	9.192	10.122
5	50	10.300	0.283	9.835	10.765
6	50	9.731	0.283	9.266	10.197
7	50	9.848	0.283	9.383	10.314
8	50	10.078	0.283	9.613	10.544
9	50	9.770	0.283	9.304	10.235
10	50	10.414	0.283	9.949	10.879
11	50	10.375	0.283	9.910	10.840
12	50	10.024	0.283	9.558	10.489
13	50	10.272	0.283	9.806	10.737
14	50	9.489	0.283	9.024	9.955
15	50	10.742	0.283	10.277	11.208
16	50	10.042	0.283	9.577	10.507
17	50	10.057	0.283	9.591	10.522
18	50	10.058	0.283	9.593	10.523
19	50	10.110	0.283	9.645	10.576
20	50	10.134	0.283	9.669	10.600
21	50	10.049	0.283	9.584	10.515
22	50	10.320	0.283	9.854	10.785
23	50	10.151	0.283	9.685	10.616
24	50	9.945	0.283	9.480	10.410
25	50	10.410	0.283	9.945	10.876
26	50	10.496	0.283	10.031	10.961
27	50	10.340	0.283	9.875	10.806
28	50	9.671	0.283	9.206	10.137
29	50	10.089	0.283	9.623	10.554
30	50	10.210	0.283	9.745	10.675
31	50	9.990	0.283	9.525	10.455
32	50	10.390	0.283	9.925	10.856
33	50	9.620	0.283	9.155	10.085
34	50	10.453	0.283	9.987	10.918
35	50	9.339	0.283	8.874	9.805
36	50	10.016	0.283	9.551	10.481
37	50	10.138	0.283	9.673	10.603
38	50	10.194	0.283	9.729	10.659
39	50	10.041	0.283	9.576	10.506
40	50	10.160	0.283	9.695	10.625
41	50	10.184	0.283	9.719	10.650
42	50	10.243	0.283	9.778	10.709
43	50	10.950	0.283	10.485	11.415
44	50	9.964	0.283	9.498	10.429
45	50	10.045	0.283	9.580	10.511
46	50	10.360	0.283	9.895	10.825
47	50	10.423	0.283	9.957	10.888
48	50	9.921	0.283	9.455	10.386
49	50	10.111	0.283	9.645	10.576
50	50	9.750	0.283	9.285	10.216

51	50	10.355	0.283	9.890	10.820
52	50	10.128	0.283	9.663	10.593
53	50	10.291	0.283	9.826	10.757
54	50	10.024	0.283	9.559	10.489
55	50	9.865	0.283	9.399	10.330
56	50	9.921	0.283	9.455	10.386
57	50	9.595	0.283	9.130	10.060
58	50	10.612	0.283	10.147	11.077
59	50	9.812	0.283	9.347	10.277
60	50	10.049	0.283	9.584	10.514
61	50	10.052	0.283	9.587	10.517
62	50	10.149	0.283	9.684	10.614
63	50	9.951	0.283	9.486	10.417
64	50	10.016	0.283	9.551	10.482
65	50	10.329	0.283	9.863	10.794
66	50	9.794	0.283	9.329	10.260
67	50	10.062	0.283	9.597	10.527
68	50	10.288	0.283	9.823	10.753
69	50	10.091	0.283	9.626	10.557
70	50	10.464	0.283	9.999	10.930
71	50	10.721	0.283	10.256	11.187
72	50	9.763	0.283	9.297	10.228
73	50	9.972	0.283	9.506	10.437
74	50	10.166	0.283	9.700	10.631
75	50	10.574	0.283	10.109	11.040
76	50	10.164	0.283	9.698	10.629
77	50	10.475	0.283	10.010	10.940
78	50	10.551	0.283	10.086	11.017
79	50	10.005	0.283	9.540	10.470
80	50	10.005	0.283	9.539	10.470
81	50	10.261	0.283	9.796	10.727
82	50	9.540	0.283	9.075	10.005
83	50	9.958	0.283	9.493	10.423
84	50	10.462	0.283	9.996	10.927
85	50	9.906	0.283	9.440	10.371
86	50	9.979	0.283	9.514	10.444
87	50	9.751	0.283	9.285	10.216
88	50	9.812	0.283	9.346	10.277
89	50	10.112	0.283	9.647	10.577
90	50	10.087	0.283	9.622	10.552
91	50	10.037	0.283	9.571	10.502
92	50	10.438	0.283	9.972	10.903
93	50	9.747	0.283	9.282	10.212
94	50	9.800	0.283	9.334	10.265
95	50	9.687	0.283	9.221	10.152
96	50	10.250	0.283	9.785	10.715
97	50	9.785	0.283	9.320	10.251
98	50	9.597	0.283	9.132	10.062
99	50	10.218	0.283	9.753	10.684
100	50	10.397	0.283	9.931	10.862

Did the 70th experimenter correctly estimate the value of the population mean? Explain.
How frequently does the 70th interval correctly estimate the population mean?

Did the 75th experimenter correctly estimate the value of the population mean? Explain.
How frequently does the 75th interval correctly estimate the population mean?

What percentage of the 100 intervals correctly estimated the value of the population mean?
Explain how this is related to “90% confidence”.