

## The application of the 95% Confidence interval with ISAT and IMAGE

Confidence intervals are commonly applied in many fields using statistical analyses. The most commonly seen usage of confidence intervals is within political polls. In the case of a political poll, an organization like Gallup attempts to estimate the percentage of adults of voting age who support a particular Candidate, Barak Obama or Hillary Clinton. It would be far too expensive and time consuming to poll all adults of voting age, so the polling organization might contact 1000 people, typically at random (but often not – the subject for a different discussion). Based on the sample, the organization might report that the percentage supporting a particular candidate is some percentage, plus or minus some other percentage points. For example, imagine that 415 of 1000 voters reported that they would vote for Obama if the election were held tomorrow. This is 41.5% of voters polled. The purpose of polling voters is to predict the results of an election, but because only 1000 people were polled, how likely is it that based on this poll that Obama will win the election?

Enter the confidence interval; because of the work of statisticians we know how likely it is that a different sample of potential voters would yield a similar result. Here is how it works, the more people who are polled, the more likely the results will be similar to what would happen if the election were held today. In addition, the closer the obtained percentage is to the extremes (i.e., 1 or 99%) the greater the confidence. The formula to calculate the confidence interval is straightforward, except for the Z index which is obtained from statistical tables representing the area under a normal curve. Specifically the formula is:

Obtained Percent minus the Z-value times the square root of the Obtained Percent times 1 minus the Obtained Percent divided by the number of people polled

$$p - 1.96 * \sqrt{(p*1-p) / N}$$

$$46.5\% - 1.96 * \sqrt{(46.5\% * 100\% - 46.5\%) / 1000}$$

$$46.5\% - 1.96 * \sqrt{(.248) / 1000}$$

$$=3.09\%$$

The solution is roughly equivalent to the polling organization reporting, "...we are 95 percent confident that the actual percentage of people who would vote as the poll indicated lies between 43.4 percent and 49.6 percent. Confidence intervals "automatically" account for proficiency rates based on smaller samples of students being less precise than rates based on a larger number of students. While the computation of confidence intervals is well-established in statistical literature, most educators would prefer not to have to compute the confidence intervals for each subgroup size.

In the state of Illinois the 95% confidence interval is calculated based on one side of the normal curve (i.e., a one – tail test), the difference in this case is that the resulting Z-value is approximately 1.64 (rather than the 2 tail version 1.96). This is based on the idea that schools are not interested in potentially how low a percentage might be, rather, schools want to know if they "made it" over the bar. The tables that follow are estimates of the required number (and percentage of students) to meet the expectations for the NCLB ladder from the 2006-07 requirement of 47.5% to 92% required in 2011. This file is intended as an explanation and not a planning guide. If you have questions feel free to email me (below).

Thank you,

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The application of the 95% Confidence interval with ISAT and IMAGE (i.e., the number and percentage required to meet standards for 47.5%).

Sub Group size	Aprox. # Required to Meet	Required percentage meeting	Sub Group size	Aprox. # Required to Meet	Required percentage meeting
3	1	0.2%	220	93	42.0%
5	1	10.9%	225	95	42.0%
10	3	21.6%	230	97	42.1%
15	4	26.4%	235	100	42.2%
20	6	29.2%	240	102	42.2%
25	8	31.1%	245	104	42.3%
30	10	32.5%	250	106	42.3%
35	12	33.7%	255	109	42.4%
40	14	34.6%	260	111	42.4%
45	16	35.3%	265	113	42.5%
50	18	35.9%	270	115	42.5%
55	21	36.5%	275	118	42.6%
60	23	36.9%	280	120	42.6%
65	25	37.3%	285	122	42.6%
70	27	37.7%	290	124	42.7%
75	29	38.0%	295	127	42.7%
80	31	38.3%	300	129	42.8%
85	33	38.6%	500	220	43.8%
90	35	38.9%	1000	450	44.9%
95	38	39.1%	5000	2318	46.3%
100	40	39.3%	10000	4669	46.7%
105	42	39.5%	20000	9385	46.9%
110	44	39.7%	30000	14109	47.0%
115	46	39.9%	40000	18837	47.1%
120	49	40.0%	50000	23567	47.1%
125	51	40.2%	60000	28300	47.2%
130	53	40.3%	70000	33034	47.2%
135	55	40.5%	80000	37769	47.2%
140	57	40.6%	90000	42505	47.2%
145	60	40.7%	100000	47242	47.2%
150	62	40.8%	1100000	521642	47.4%
155	64	40.9%			
160	66	41.0%			
165	68	41.1%			
170	71	41.2%			
175	73	41.3%			
180	75	41.4%			
185	77	41.5%			
190	79	41.6%			
195	82	41.6%			
200	84	41.7%			
205	86	41.8%			
210	88	41.8%			
215	91	41.9%			

The application of the 95% Confidence interval with ISAT and IMAGE  
(i.e., the number and percentage required to meet standards for 55%).

Sub Group size	Aprox. # Required to Meet	Required percentage meeting	Sub Group size	Aprox. # Required to Meet	Required percentage meeting
3	1	7.9%	220	109	49.5%
5	1	18.5%	225	112	49.6%
10	3	29.2%	230	115	49.6%
15	6	33.9%	235	117	49.7%
20	8	36.8%	240	120	49.7%
25	10	38.7%	245	122	49.8%
30	13	40.1%	250	125	49.8%
35	15	41.2%	255	128	49.9%
40	17	42.1%	260	130	49.9%
45	20	42.8%	265	133	50.0%
50	22	43.5%	270	136	50.0%
55	25	44.0%	275	138	50.1%
60	27	44.5%	280	141	50.1%
65	30	44.9%	285	143	50.2%
70	32	45.2%	290	146	50.2%
75	35	45.6%	295	149	50.2%
80	37	45.9%	300	151	50.3%
85	40	46.2%	500	257	51.4%
90	42	46.4%	1000	525	52.4%
95	45	46.6%	5000	2693	53.8%
100	47	46.8%	10000	5419	54.2%
105	50	47.0%	20000	10885	54.4%
110	52	47.2%	30000	16359	54.5%
115	55	47.4%	40000	21837	54.6%
120	58	47.6%	50000	27318	54.6%
125	60	47.7%	60000	32801	54.7%
130	63	47.8%	70000	38285	54.7%
135	65	48.0%	80000	43770	54.7%
140	68	48.1%	90000	49256	54.7%
145	70	48.2%	100000	54742	54.7%
150	73	48.3%	1100000	604145	54.9%
155	76	48.4%			
160	78	48.5%			
165	81	48.6%			
170	83	48.7%			
175	86	48.8%			
180	89	48.9%			
185	91	49.0%			
190	94	49.1%			
195	96	49.2%			
200	99	49.2%			
205	102	49.3%			
210	104	49.4%			
215	107	49.4%			

The application of the 95% Confidence interval with ISAT and IMAGE (i.e., the number and percentage required to meet standards for 62.5%).

Sub Group size	Aprox. # Required to Meet	Required percentage meeting	Sub Group size	Aprox. # Required to Meet	Required percentage meeting
3	1	16.7%	220	126	57.1%
5	2	27.0%	225	129	57.2%
10	4	37.4%	230	132	57.3%
15	7	42.0%	235	135	57.3%
20	9	44.7%	240	138	57.4%
25	12	46.6%	245	141	57.4%
30	15	48.0%	250	144	57.5%
35	18	49.1%	255	147	57.5%
40	20	49.9%	260	150	57.6%
45	23	50.7%	265	153	57.6%
50	26	51.3%	270	156	57.7%
55	29	51.8%	275	159	57.7%
60	32	52.3%	280	162	57.8%
65	35	52.7%	285	165	57.8%
70	38	53.0%	290	168	57.8%
75	40	53.3%	295	171	57.9%
80	43	53.6%	300	174	57.9%
85	46	53.9%	500	295	58.9%
90	49	54.1%	1000	600	60.0%
95	52	54.4%	5000	3069	61.4%
100	55	54.6%	10000	6171	61.7%
105	58	54.8%	20000	12388	61.9%
110	61	54.9%	30000	18613	62.0%
115	64	55.1%	40000	24842	62.1%
120	67	55.3%	50000	31073	62.1%
125	70	55.4%	60000	37306	62.2%
130	73	55.5%	70000	43540	62.2%
135	76	55.7%	80000	49776	62.2%
140	79	55.8%	90000	56012	62.2%
145	82	55.9%	100000	62249	62.2%
150	85	56.0%	1100000	686668	62.4%
155	87	56.1%			
160	90	56.2%			
165	93	56.3%			
170	96	56.4%			
175	99	56.5%			
180	102	56.6%			
185	105	56.7%			
190	108	56.7%			
195	111	56.8%			
200	114	56.9%			
205	117	57.0%			
210	120	57.0%			
215	123	57.1%			

The application of the 95% Confidence interval with ISAT and IMAGE  
 (i.e., the number and percentage required to meet standards for 70%).

Sub Group size	Aprox. # Required to Meet	Required percentage meeting	Sub Group size	Aprox. # Required to Meet	Required percentage meeting
3	1	26.6%	220	143	64.9%
5	2	36.4%	225	147	65.0%
10	5	46.2%	230	150	65.0%
15	8	50.6%	235	153	65.1%
20	11	53.2%	240	157	65.1%
25	14	55.0%	245	160	65.2%
30	17	56.3%	250	164	65.2%
35	21	57.3%	255	167	65.3%
40	24	58.1%	260	170	65.3%
45	27	58.8%	265	174	65.4%
50	30	59.4%	270	177	65.4%
55	33	59.9%	275	181	65.5%
60	37	60.3%	280	184	65.5%
65	40	60.7%	285	187	65.5%
70	43	61.0%	290	191	65.6%
75	46	61.3%	295	194	65.6%
80	50	61.6%	300	197	65.7%
85	53	61.8%	500	334	66.6%
90	56	62.1%	1000	677	67.6%
95	60	62.3%	5000	3447	68.9%
100	63	62.5%	10000	6925	69.2%
105	66	62.7%	20000	13894	69.5%
110	70	62.8%	30000	20870	69.6%
115	73	63.0%	40000	27850	69.6%
120	76	63.1%	50000	34832	69.7%
125	80	63.3%	60000	41816	69.7%
130	83	63.4%	70000	48802	69.7%
135	86	63.5%	80000	55788	69.7%
140	90	63.6%	90000	62775	69.7%
145	93	63.8%	100000	69763	69.8%
150	96	63.9%	1100000	769212	69.9%
155	100	64.0%			
160	103	64.1%			
165	106	64.1%			
170	110	64.2%			
175	113	64.3%			
180	116	64.4%			
185	120	64.5%			
190	123	64.5%			
195	127	64.6%			
200	130	64.7%			
205	133	64.8%			
210	137	64.8%			
215	140	64.9%			

The application of the 95% Confidence interval with ISAT and IMAGE  
(i.e., the number and percentage required to meet standards for 77.5%).

Sub Group size	Aprox. # Required to Meet	Required percentage meeting	Sub Group size	Aprox. # Required to Meet	Required percentage meeting
3	2	38.0%	220	161	72.9%
5	3	46.9%	225	165	72.9%
10	6	55.8%	230	168	73.0%
15	9	59.8%	235	172	73.0%
20	13	62.2%	240	176	73.1%
25	16	63.8%	245	180	73.1%
30	20	65.0%	250	183	73.2%
35	24	65.9%	255	187	73.2%
40	27	66.7%	260	191	73.3%
45	31	67.3%	265	195	73.3%
50	34	67.8%	270	198	73.3%
55	38	68.3%	275	202	73.4%
60	42	68.7%	280	206	73.4%
65	45	69.0%	285	210	73.4%
70	49	69.3%	290	214	73.5%
75	53	69.6%	295	217	73.5%
80	56	69.8%	300	221	73.5%
85	60	70.1%	500	373	74.4%
90	64	70.3%	1000	754	75.3%
95	67	70.5%	5000	3827	76.5%
100	71	70.7%	10000	7682	76.8%
105	75	70.8%	20000	15404	77.0%
110	79	71.0%	30000	23132	77.1%
115	82	71.1%	40000	30864	77.2%
120	86	71.2%	50000	38597	77.2%
125	90	71.4%	60000	46333	77.2%
130	93	71.5%	70000	54069	77.2%
135	97	71.6%	80000	61807	77.3%
140	101	71.7%	90000	69545	77.3%
145	105	71.8%	100000	77284	77.3%
150	108	71.9%	1100000	851782	77.4%
155	112	72.0%			
160	116	72.1%			
165	120	72.2%			
170	123	72.2%			
175	127	72.3%			
180	131	72.4%			
185	135	72.5%			
190	138	72.5%			
195	142	72.6%			
200	146	72.7%			
205	150	72.7%			
210	153	72.8%			
215	157	72.8%			

The application of the 95% Confidence interval with ISAT and IMAGE  
(i.e., the number and percentage required to meet standards for 85%).

Sub Group size	Aprox. # Required to Meet	Required percentage meeting	Sub Group size	Aprox. # Required to Meet	Required percentage meeting
3	2	51.2%	220	179	81.1%
5	3	58.8%	225	183	81.1%
10	7	66.5%	230	187	81.1%
15	11	69.9%	235	191	81.2%
20	15	71.9%	240	195	81.2%
25	19	73.3%	245	200	81.3%
30	23	74.3%	250	204	81.3%
35	27	75.1%	255	208	81.3%
40	31	75.7%	260	212	81.4%
45	35	76.3%	265	216	81.4%
50	39	76.7%	270	220	81.4%
55	43	77.1%	275	225	81.5%
60	47	77.4%	280	229	81.5%
65	51	77.7%	285	233	81.5%
70	55	78.0%	290	237	81.6%
75	59	78.2%	295	241	81.6%
80	63	78.5%	300	245	81.6%
85	67	78.6%	500	412	82.4%
90	71	78.8%	1000	832	83.1%
95	76	79.0%	5000	4209	84.2%
100	80	79.1%	10000	8442	84.4%
105	84	79.3%	20000	16918	84.6%
110	88	79.4%	30000	25399	84.7%
115	92	79.5%	40000	33883	84.7%
120	96	79.7%	50000	42370	84.7%
125	100	79.8%	60000	50857	84.8%
130	104	79.9%	70000	59346	84.8%
135	108	80.0%	80000	67835	84.8%
140	113	80.1%	90000	76325	84.8%
145	117	80.1%	100000	84815	84.8%
150	121	80.2%	1100000	934386	84.9%
155	125	80.3%			
160	129	80.4%			
165	133	80.4%			
170	137	80.5%			
175	142	80.6%			
180	146	80.6%			
185	150	80.7%			
190	154	80.8%			
195	158	80.8%			
200	162	80.9%			
205	166	80.9%			
210	171	81.0%			
215	175	81.0%			

The application of the 95% Confidence interval with ISAT and IMAGE  
(i.e., the number and percentage required to meet standards for 92.5%).

Sub Group size	Aprox. # Required to Meet	Required percentage meeting	Sub Group size	Aprox. # Required to Meet	Required percentage meeting
3	3	67.6%	220	198	89.6%
5	4	73.2%	225	202	89.6%
10	8	78.8%	230	207	89.7%
15	13	81.3%	235	211	89.7%
20	17	82.8%	240	216	89.7%
25	21	83.9%	245	220	89.7%
30	26	84.6%	250	225	89.8%
35	30	85.2%	255	229	89.8%
40	35	85.7%	260	234	89.8%
45	39	86.1%	265	239	89.8%
50	44	86.4%	270	243	89.9%
55	48	86.7%	275	248	89.9%
60	53	86.9%	280	252	89.9%
65	57	87.1%	285	257	89.9%
70	62	87.3%	290	261	90.0%
75	66	87.5%	295	266	90.0%
80	71	87.7%	300	271	90.0%
85	75	87.8%	500	453	90.6%
90	80	87.9%	1000	912	91.1%
95	84	88.1%	5000	4595	91.9%
100	89	88.2%	10000	9207	92.1%
105	93	88.3%	20000	18439	92.2%
110	98	88.4%	30000	27676	92.3%
115	102	88.5%	40000	36914	92.3%
120	107	88.6%	50000	46154	92.3%
125	111	88.6%	60000	55395	92.3%
130	116	88.7%	70000	64636	92.3%
135	120	88.8%	80000	73878	92.3%
140	125	88.8%	90000	83121	92.4%
145	129	88.9%	100000	92364	92.4%
150	134	89.0%	1100000	1017047	92.5%
155	138	89.0%			
160	143	89.1%			
165	148	89.1%			
170	152	89.2%			
175	157	89.2%			
180	161	89.3%			
185	166	89.3%			
190	170	89.4%			
195	175	89.4%			
200	179	89.4%			
205	184	89.5%			
210	188	89.5%			
215	193	89.6%			