CONFIDENCE INTERVAL

A die *(singular of dice)* has 6 sides

Probability of rolling a **5** is

1 /6 or **17%**

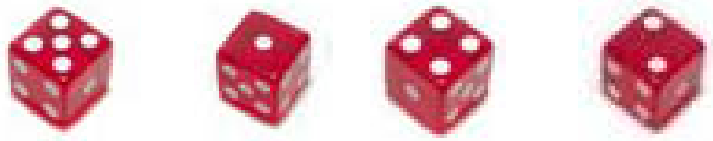
Probability of a **5** OR a **1** is

2 /6, or **33%**

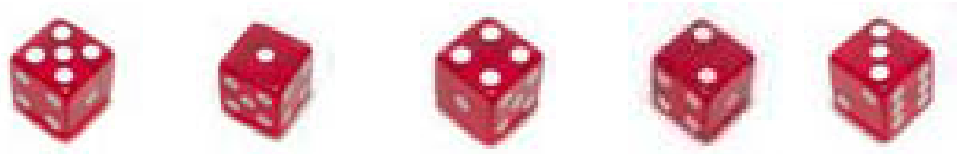
Prob of **5** or **1** or **4** is

3 /6, or **50%**

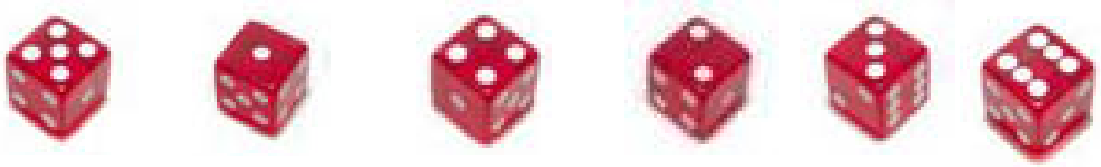
5 or **1** or **4** or **2** = **66%**



5/6 = **83%**



6/6 = **100%**



No. of Choices	Confidence Level
1	17%
2	33%
3	50%
4	67%
5	83%
6	100%

Confidence Interval

SAT Scores –-- $\mu = 500$, $\sigma = 100$

Assume a sample:

$n = 225$ $x = 606$ (N = 10,000 $\mu = ?$)

C.I. = Sample Mean ± Z ×(?)

where Z = z value for selected confidence level

(usually 95% or 99%)

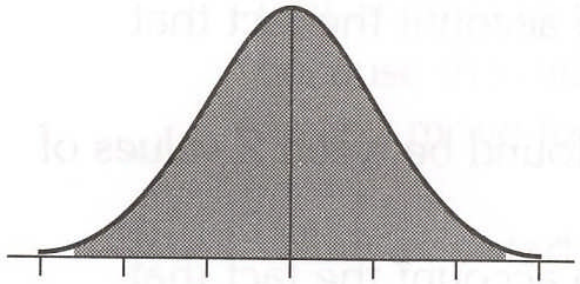
and (?) is the Standard Error of the Mean

$\sigma = 100$ $n = 225$ x = 606

Confidence Level = **99**%

Half above, half below the mean

½ of 99% is **0.4950**



Z	Area Between Mean and Z	Z	Area Between Mean and Z	Z	Area Between Mean and Z	Z	Area Between Mean and Z
0.00	0.0000	0.50	0.1915	1.00	0.3413	1.50	0.4332
0.01	0.0040	0.51	0.1950	1.01	0.3438	1.51	0.4345
0.02	0.0080	0.52	0.1985	1.02	0.3461	1.52	0.4357
0.03	0.0120	0.53	0.2019	1.03	0.3485	1.53	0.4370
0.04	0.0160	0.54	0.2054	1.04	0.3508	1.54	0.4382
0.05	0.0199	0.55	0.2088	1.05	0.3531	1.55	0.4394
0.06	0.0239	0.56	0.2123	1.06	0.3554	1.56	0.4406
0.07	0.0279	0.57	0.2157	1.07	0.3577	1.57	0.4418
0.08	0.0319	0.58	0.2190	1.08	0.3599	1.58	0.4429
0.09	0.0359	0.59	0.2224	1.09	0.3621	1.59	0.4441
0.10	0.0398	0.60	0.2257	1.10	0.3643	1.60	0.4452
0.11	0.0438	0.61	0.2291	1.11	0.3665	1.61	0.4463
0.12	0.0478	0.62	0.2324	1.12	0.3686	1.62	0.4474
0.13	0.0517	0.63	0.2357	1.13	0.3708	1.63	0.4484
0.14	0.0557	0.64	0.2389	1.14	0.3729	1.64	0.4495
0.15	0.0596	0.65	0.2422	1.15	0.3749	1.65	0.4505
0.16	0.0636	0.66	0.2454	1.16	0.3770	1.66	0.4515
0.17	0.0675	0.67	0.2486	1.17	0.3790	1.67	0.4525
0.18	0.0714	0.68	0.2517	1.18	0.3810	1.68	0.4535
0.19	0.0753	0.69	0.2549	1.19	0.3830	1.69	0.4545
0.20	0.0793	0.70	0.2580	1.20	0.3849	1.70	0.4554
0.21	0.0832	0.71	0.2611	1.21	0.3869	1.71	0.4564
0.22	0.0871	0.72	0.2642	1.22	0.3888	1.72	0.4573
0.23	0.0910	0.73	0.2673	1.23	0.3907	1.73	0.4582
0.24	0.0948	0.74	0.2704	1.24	0.3925	1.74	0.4591
0.25	0.0987	0.75	0.2734	1.25	0.3944	1.75	0.4599
0.26	0.1026	0.76	0.2764	1.26	0.3962	1.76	0.4608
0.27	0.1064	0.77	0.2794	1.27	0.3980	1.77	0.4616
0.28	0.1103	0.78	0.2823	1.28	0.3997	1.78	0.4625
0.29	0.1141	0.79	0.2852	1.29	0.4015	1.79	0.4633
0.30	0.1179	0.80	0.2881	1.30	0.4032	1.80	0.4641
0.31	0.1217	0.81	0.2910	1.31	0.4049	1.81	0.4649
0.32	0.1255	0.82	0.2939	1.32	0.4066	1.82	0.4656
0.33	0.1293	0.83	0.2967	1.33	0.4082	1.83	0.4664
0.34	0.1331	0.84	0.2995	1.34	0.4099	1.84	0.4671
0.35	0.1368	0.85	0.3023	1.35	0.4115	1.85	0.4678
0.36	0.1406	0.86	0.3051	1.36	0.4131	1.86	0.4686
0.37	0.1443	0.87	0.3078	1.37	0.4147	1.87	0.4693
0.38	0.1480	0.88	0.3106	1.38	0.4162	1.88	0.4699
0.39	0.1517	0.89	0.3133	1.39	0.4177	1.89	0.4706
0.40	0.1554	0.90	0.3159	1.40	0.4192	1.90	0.4713
0.41	0.1591	0.91	0.3186	1.41	0.4207	1.91	0.4719
0.42	0.1628	0.92	0.3212	1.42	0.4222	1.92	0.4726
0.43	0.1664	0.93	0.3238	1.43	0.4236	1.93	0.4732
0.44	0.1700	0.94	0.3264	1.44	0.4251	1.94	0.4738
0.45	0.1736	0.95	0.3289	1.45	0.4265	1.95	0.4744
0.46	0.1772	0.96	0.3315	1.46	0.4279	1.96	0.4750
0.47	0.1808	0.97	0.3340	1.47	0.4292	1.97	0.4756
0.48	0.1844	0.98	0.3365	1.48	0.4306	1.98	0.4761
0.49	0.1879	0.99	0.3389	1.49	0.4319	1.99	0.4767

Z	Area Between Mean and Z	Z	Area Between Mean and Z	Z	Area Between Mean and Z	Z	Area Between Mean and Z
2.00	0.4772	2.50	0.4938	3.00	0.4987	3.50	0.4998
2.01	0.4778	2.51	0.4940	3.01	0.4987	3.60	0.4998
2.02	0.4783	2.52	0.4941	3.02	0.4987	3.70	0.4999
2.03	0.4788	2.53	0.4943	3.03	0.4988	3.80	0.4999
2.04	0.4793	2.54	0.4945	3.04	0.4988	3.90	0.4999
2.05	0.4798	2.55	0.4946	3.05	0.4989		
2.06	0.4803	2.56	0.4948	3.06	0.4989		
2.07	0.4808	2.57	0.4949	3.07	0.4989		
2.08	0.4812	2.58	0.4951	3.08	0.4990		
2.09	0.4817	2.59	0.4952	3.09	0.4990		
2.10	0.4821	2.60	0.4953	3.10	0.4990		
2.11	0.4826	2.61	0.4955	3.11	0.4991		
2.12	0.4830	2.62	0.4956	3.12	0.4991		
2.13	0.4834	2.63	0.4957	3.13	0.4991		
2.14	0.4838	2.64	0.4959	3.14	0.4992		
2.15	0.4842	2.65	0.4960	3.15	0.4992		
2.16	0.4846	2.66	0.4961	3.16	0.4992		
2.17	0.4850	2.67	0.4962	3.17	0.4992		
2.18	0.4854	2.68	0.4963	3.18	0.4993		
2.19	0.4857	2.69	0.4964	3.19	0.4993		
2.20	0.4861	2.70	0.4965	3.20	0.4993		
2.21	0.4864	2.71	0.4966	3.21	0.4993		
2.22	0.4868	2.72	0.4967	3.22	0.4994		
2.23	0.4871	2.73	0.4968	3.23	0.4994		
2.24	0.4875	2.74	0.4969	3.24	0.4994		
2.25	0.4878	2.75	0.4970	3.25	0.4994		
2.26	0.4881	2.76	0.4971	3.26	0.4994		
2.27	0.4884	2.77	0.4972	3.27	0.4995		
2.28	0.4887	2.78	0.4973	3.28	0.4995		
2.29	0.4890	2.79	0.4974	3.29	0.4995		
2.30	0.4893	2.80	0.4974	3.30	0.4995		
2.31	0.4896	2.81	0.4975	3.31	0.4995		
2.32	0.4898	2.82	0.4976	3.32	0.4995		
2.33	0.4901	2.83	0.4977	3.33	0.4996		
2.34	0.4904	2.84	0.4977	3.34	0.4996		
2.35	0.4906	2.85	0.4978	3.35	0.4996		
2.36	0.4909	2.86	0.4979	3.36	0.4996		
2.37	0.4911	2.87	0.4979	3.37	0.4996		
2.38	0.4913	2.88	0.4980	3.38	0.4996		
2.39	0.4916	2.89	0.4981	3.39	0.4997		
2.40	0.4918	2.90	0.4981	3.40	0.4997		
2.41	0.4920	2.91	0.4982	3.41	0.4997		
2.42	0.4922	2.92	0.4982	3.42	0.4997		
2.43	0.4925	2.93	0.4983	3.43	0.4997		
2.44	0.4927	2.94	0.4984	3.44	0.4997		
2.45	0.4929	2.95	0.4984	3.45	0.4997		
2.46	0.4931	2.96	0.4985	3.46	0.4997		
2.47	0.4932	2.97	0.4985	3.47	0.4997		
2.48	0.4934	2.98	0.4986	3.48	0.4997		
2.49	0.4936	2.99	0.4986	3.49	0.4998		

Z=2.58

Z	Area Between Mean and Z	Z	Area Between Mean and Z	Z	Area Between Mean and Z	Z	Area Between Mean and Z
2.00	0.4772	2.50	0.4938	3.00	0.4987	3.50	0.4998
2.01	0.4778	2.51	0.4940	3.01	0.4987	3.60	0.4998
2.02	0.4783	2.52	0.4941	3.02	0.4987	3.70	0.4999
2.03	0.4788	2.53	0.4943	3.03	0.4988	3.80	0.4999
2.04	0.4793	2.54	0.4945	3.04	0.4988	3.90	0.4999
2.05	0.4798	2.55	0.4946	3.05	0.4989		
2.06	0.4803	2.56	0.4948				
2.07	0.4808	2.57	0.4949				
2.08	0.4812	2.58	0.4951				
2.09	0.4817	2.59	0.4952				
2.10	0.4821	2.60	0.4953				
2.11	0.4826	2.61	0.4955				
2.12	0.4830	2.62	0.4956				
2.13	0.4834	2.63	0.4957				
2.14	0.4838	2.64	0.4959				
2.15	0.4842	2.65	0.4960				
2.16	0.4846	2.66	0.4961	3.16	0.4992		
2.17	0.4850	2.67	0.4962	3.17	0.4992		
2.18	0.4854	2.68	0.4963	3.18	0.4993		
2.19	0.4857	2.69	0.4964	3.19	0.4993		
2.20	0.4861	2.70	0.4965	3.20	0.4993		
2.21	0.4864	2.71	0.4966	3.21	0.4993		
2.22	0.4868	2.72	0.4967	3.22	0.4994		
2.23	0.4871	2.73	0.4968	3.23	0.4994		
2.24	0.4875	2.74	0.4969	3.24	0.4994		
2.25	0.4878	2.75	0.4970	3.25	0.4994		
2.26	0.4881	2.76	0.4971	3.26	0.4994		
2.27	0.4884	2.77	0.4972	3.27	0.4995		
2.28	0.4887	2.78	0.4973	3.28	0.4995		
2.29	0.4890	2.79	0.4974	3.29	0.4995		
2.30	0.4893	2.80	0.4974	3.30	0.4995		
2.31	0.4896	2.81	0.4975	3.31	0.4995		
2.32	0.4898	2.82	0.4976	3.32	0.4995		
2.33	0.4901	2.83	0.4977	3.33	0.4996		
2.34	0.4904	2.84	0.4977	3.34	0.4996		

Half of 99% =

0.4950

Corresponds to

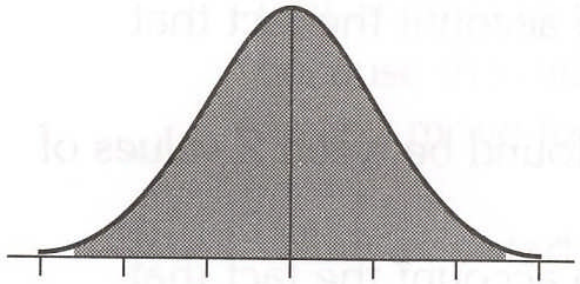
z = 2.58

$\sigma = 100$ $n = 225$ $x = 606$

Confidence Level = **99**%

Half above, half below the mean

½ of 99% is **0.4950**



Z = 2.58 (for 99%)

$$\textbf{C.I.} = \text{Sample Mean} \pm \textbf{Z} \times (\sigma/\sqrt{n})$$

$$\textbf{C.I. = 606 ± (2.58 x (}100/\sqrt{225}\textbf{)}$$

$$\textbf{C.I. = 606 ± 17.21}$$

C.I. = 606 ± 17 (*rounded to whole number*)

C.I. = 589 to 623

Translation: *99 times out of 100 our results would contain the mean of the population*

Confidence Interval: 588 – 623

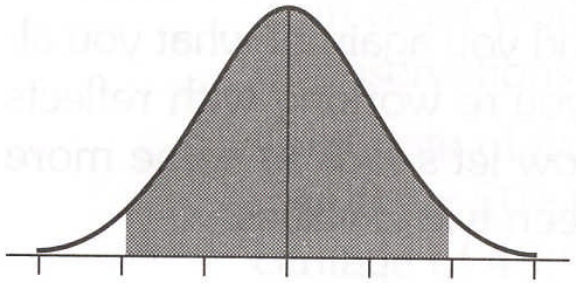
Confidence Level: 99%

$\sigma = 100$ $n = 225$ x = 606

Confidence Level = **95**%

Half above, half below the mean

½ of 95% is **0.4750**



0.16	0.0636	0.66	0.2454	1.16	0.3770	1.66	0.4515
0.17	0.0675	0.67	0.2486	1.17	0.3790	1.67	0.4525
0.18	0.0714	0.68	0.2517	1.18	0.3810	1.68	0.4535
0.19	0.0753	0.69	0.2549	1.19	0.3830	1.69	0.4545
0.20	0.0793	0.70	0.2580	1.20	0.3849	1.70	0.4554
0.21	0.0832	0.71	0.2611	1.21	0.3869	1.71	0.4564
0.22	0.0871	0.72	0.2642	1.22	0.3888	1.72	0.4573
0.23	0.0910	0.73	0.2673	1.23	0.3907	1.73	0.4582
0.24	0.0948	0.74	0.2704	1.24	0.3925	1.74	0.4591
0.25	0.0987	0.75	0.2734	1.25	0.3944	1.75	0.4599
0.26	0.1026	0.76	0.2764	1.26	0.3962	1.76	0.4608
0.27	0.1064	0.77	0.2794	1.27	0.3980	1.77	0.4616
0.28	0.1103	0.78	0.2823	1.28	0.3997	1.78	0.4625
0.29	0.1141	0.79	0.2852	1.29	0.4015	1.79	0.4633
0.30	0.1179	0.80	0.2881	1.30	0.4032	1.80	0.4641
0.31	0.1217	0.81	0.2910	1.31	0.4049	1.81	0.4649
0.32	0.1255	0.82	0.2939	1.32	0.4066	1.82	0.4656
0.33	0.1293	0.83	0.2967	1.33	0.4082	1.83	0.4664
0.34	0.1331	0.84	0.2995	1.34	0.4099	1.84	0.4671
0.35	0.1368	0.85	0.3023	1.35	0.4115	1.85	0.4678
0.36	0.1406	0.86	0.3051	1.36	0.4131	1.86	0.4686
0.37	0.1443	0.87	0.3078	1.37	0.4147	1.87	0.4693
0.38	0.1480	0.88	0.3106	1.38	0.4162	1.88	0.4699
0.39	0.1517	0.89	0.3133	1.39	0.4177	1.89	0.4706
0.40	0.1554	0.90	0.3159	1.40	0.4192	1.90	0.4713
0.41	0.1591	0.91	0.3186			1.91	0.4719
0.42	0.1628	0.92	0.3212			1.92	0.4726
0.43	0.1664	0.93	0.3238			1.93	0.4732
0.44	0.1700	0.94	0.3264			1.94	0.4738
0.45	0.1736	0.95	0.3289			1.95	0.4744
0.46	0.1772	0.96	0.3315			1.96	0.4750
0.47	0.1808	0.97	0.3340			1.97	0.4756
0.48	0.1844	0.98	0.3365			1.98	0.4761
0.49	0.1879	0.99	0.3389			1.99	0.4767

Z =

Half of 95% = 0.4750

Corresponds to

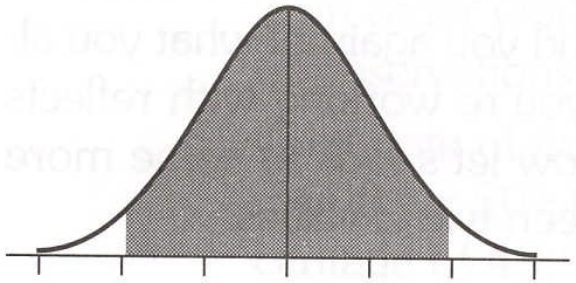
z=1.96

$\sigma = 100$ $n = 225$ x = 606

Confidence Level = **95**%

Half above, half below the mean

½ of 95% is **0.4750**



Z = 1.96 (for 95%)

$$\textbf{C.I.} = \text{Sample Mean} \pm \textbf{Z} \times (\sigma/\sqrt{n})$$

$$\textbf{C.I. = 606 ± (1.96 x (}100/\sqrt{225}\textbf{)}$$

$$\textbf{C.I. = 606 ± 1.96 *6.67}$$

C.I. = 606 ± 13 (*rounded to whole number*)

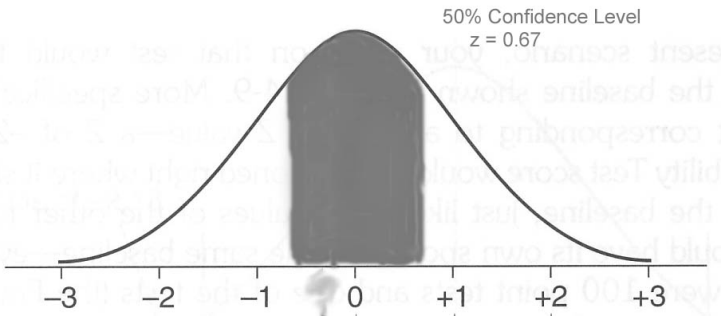
C.I. = 593 to 619

$\sigma = 100$ $n = 225$ x = 606

Confidence Level = **50**%

Half above, half below the mean

½ of 50% is **0.2500**



Z	Area Between Mean and Z	Z	Area Between Mean and Z	Z	Area Between Mean and Z	Z	Area Between Mean and Z
0.00	0.0000	0.50	0.1915	1.00	0.3413	1.50	0.4332
0.01	0.0040	0.51	0.1950	1.01	0.3438	1.51	0.4345
0.02	0.0080	0.52	0.1985				
0.03	0.0120	0.53	0.2019				
0.04	0.0160	0.54	0.2054				
0.05	0.0199	0.55	0.2088				
0.06	0.0239	0.56	0.2123				
0.07	0.0279	0.57	0.2157				
0.08	0.0319	0.58	0.2190				
0.09	0.0359	0.59	0.2224				
0.10	0.0398	0.60	0.2257				
0.11	0.0438	0.61	0.2291				
0.12	0.0478	0.62	0.2324				
0.13	0.0517	0.63	0.2357				
0.14	0.0557	0.64	0.2389				
0.15	0.0596	0.65	0.2422	1.15		1.65	0.4505
0.16	0.0636	0.66	0.2454		0.3770	1.66	0.4515
0.17	0.0675	0.67	0.2486	1.17	0.3790	1.67	0.4525
0.18	0.0714	0.68	0.2517	1.18	0.3810	1.68	0.4535
0.19	0.0753	0.69	0.2549	1.19	0.3830	1.69	0.4545
		.70	0.2580	1.20	0.3849	1.70	0.4554
		.71	0.2611	1.21	0.3869	1.71	0.4564
		.72	0.2642	1.22	0.3888	1.72	0.4573
		.73	0.2673	1.23	0.3907	1.73	0.4582
		.74	0.2704	1.24	0.3925	1.74	0.4591
		.75	0.2734	1.25	0.3944	1.75	0.4599
		0.76	0.2764	1.26	0.3962	1.76	0.4608
0.27	0.1064	0.77	0.2794	1.27	0.3980	1.77	0.4616
0.28	0.1103	0.78	0.2823	1.28	0.3997	1.78	0.4625
0.29	0.1141	0.79	0.2852	1.29	0.4015	1.79	0.4633
0.30	0.1179	0.80	0.2881	1.30	0.4032	1.80	0.4641
0.31	0.1217	0.81	0.2910	1.31	0.4049	1.81	0.4649

0.2500 is about halfway between these values (.2486 and .2517)

So z value is about halfway between 0.67 and 0.68 (=0.675)

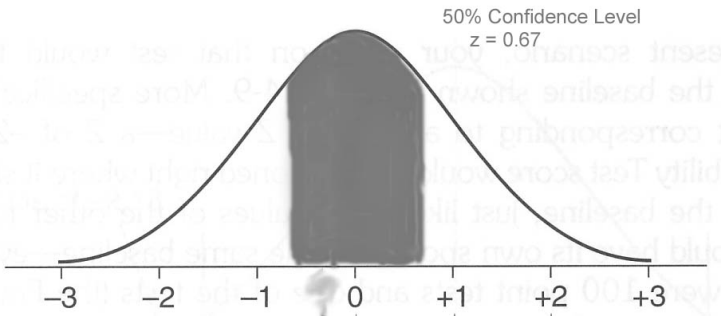
Z is between 0.67 & 0.68

$\sigma = 100$ $n = 225$ x = 606

Confidence Level = **50**%

Half above, half below the mean

½ of 50% is **0.2500**



Z = 0.675 (for 50%)

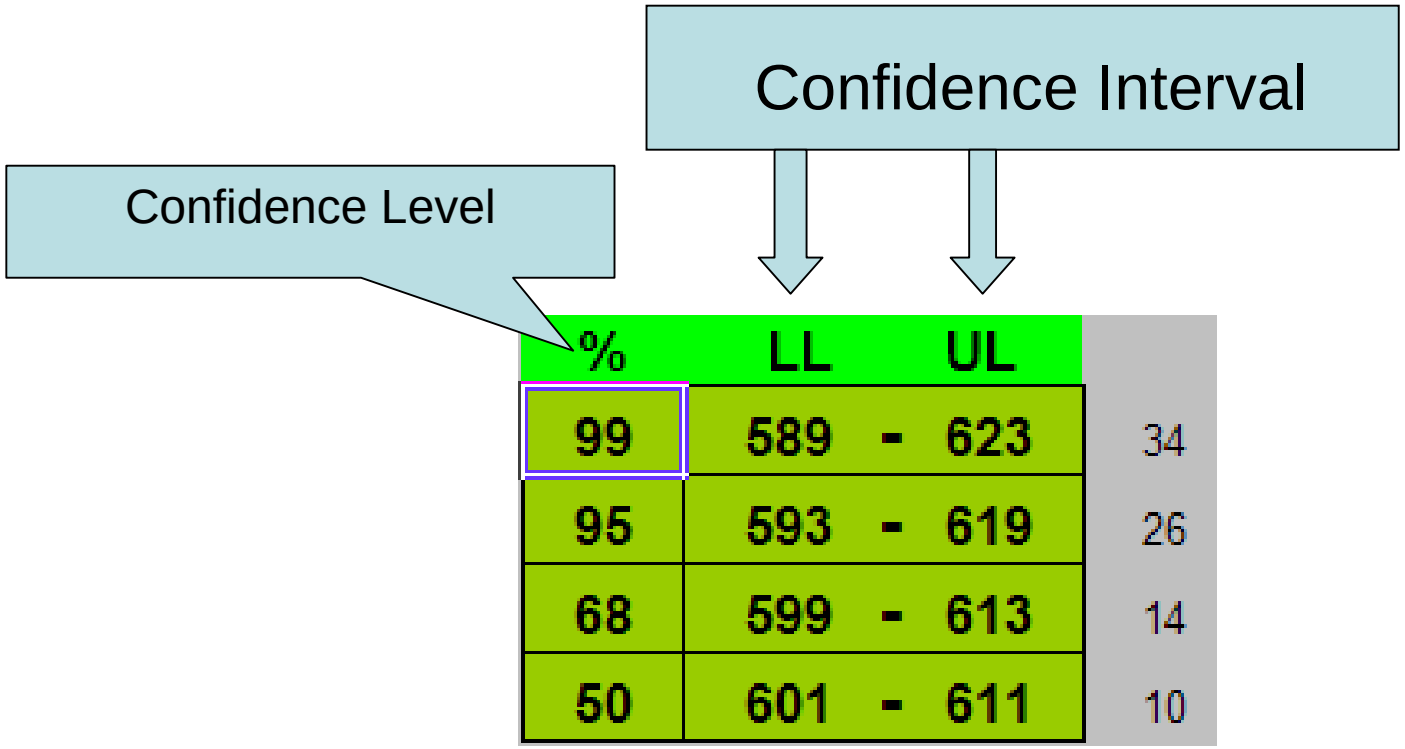
C.I. = Sample Mean ± **Z** ×($\sigma/\sqrt{n}$)

C.I. = 606 ± (0.675 x (100/$\sqrt{}$225) **)**

C.I. = 606 ± 0.675 *6.67

C.I. = 606 ± 5 (*rounded to whole number*)

C.I. = 601 to 611


Confidence Interval
Confidence Level
%
LL
UL
99
589 - 623
34
95
593 - 619
26
68
599 - 613
14
50
601 - 611
10