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%**





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

Confidence Interval

SAT Scores ---- μ = 500, σ = 100

Assume a sample:

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

C.I. = Sample Mean $\pm Z \times (?)$

where Z = z value for selected confidence level

(usually 95% or 99%)

and (?) is the Standard Error of the Mean

Confidence Level = 99%

Half above, half below the mean

¹/₂ of 99% is **0.4950**



7	Area Between	7	Area Between Mean and Z	7.	Area Between Mean and Z	F Z	Area Between Mean and Z
2	0.0000	0.50	0 1015	1.00	0.3413	1.50	0.4332
0.00	0.0000	0.50	0.1915	1.00	0.3438	1.51	0.4345
0.01	0.0040	0.51	0.1985	1.01	0.3461	1.52	0.4357
0.02	0.0080	0.52	0.2019	1.02	0.3485	1.53	0.4370
0.03	0.0120	0.53	0.2019	1.04	0.3508	1.54	0.4382
0.04	0.0100	0.51	0.2088	1.05	0 3531	1.55	0.4394
0.05	0.0199	0.55	0.2000	1.05	0.3554	1.56	0.4406
0.06	0.0239	0.50	0.2123	1.00	0.3577	1.57	0.4418
J.07	0.0279	0.57	0.2190	1.07	0.3599	1.58	0.4429
1.00 1.00	0.0319	0.50	0.2224	1.09	0.3621	1.59	0.4441
0.09	0.0009	0.60	0.2257	1 10	0 3643	1 60	0.4452
0.10	0.0398	0.60	0.2237	1 11	0.3665	1.61	0.4463
J.11	0.0438	0.01	0.2291	1.11	0.3686	1.62	0.4474
0.12	0.0478	0.02	0.2357	1 13	0.3708	1.63	0.4484
0.15	0.0517	0.63	0.2389	1 14	0.3729	1.64	0.4495
0.14	0.0557	0.04	0.2009	1 15	0 3749	1 65	0 4505
0.15	0.0596	0.65	0.2422	1.15	0.3770	1.66	0.4515
0.16	0.0636	0.60	0.2434	1.10	0.3790	1.67	0.4525
0.17	0.0675	0.67	0.2400	1 18	0.3810	1.68	0.4535
0.10	0.0714	0.08	0.2549	1 19	0.3830	1.69	0.4545
0.19	0.0755	0.07	0.2019	1.20	0.3849	1 70	0 4554
0.20	0.0793	0.70	0.2580	1.20	0.3869	1 71	0 4564
0.21	0.0832	0.71	0.2011	1.21	0.3888	1 72	0.4573
0.22	0.08/1	0.72	0.2042	1.22	0.3907	1 73	0 4582
0.23	0.0910	0.73	0.2073	1.23	0.3925	1.74	0.4591
0.24	0.0948	0.74	0.2704	1.27	0.3044	1 75	0.4599
0.25	0.0987	0.75	0.2734	1.20	0.3944	1.75	0.4608
0.26	0.1026	0.76	0.2704	1.20	0.3980	1 77	0.4616
0.27	0.1064	0.77	0.2794	1.27	0.3907	1 78	0.4625
0.28	3 0.1103	0.78	0.2023	1.20	0.4015	1 79	0.4633
0.29) 0.1141	0.79	0.2652	1.20	0.4022	1.00	0.4641
0.30) 0.1179	0.80	0.2881	1.30	0.4032	1.00	0.4649
0.31	0.1217	0.81	0.2910	1.31	0.4049	1.01	0.4656
0.32	2 0.1255	0.82	0.2939	1.32	0.4080	1.82	0.4664
0.33	3 0.1293	0.83	0.2967	1.33	0.4082	1.83	0.4671
0.34	4 0.1331	0.84	0.2995	1.04	0.4099	1.01	0.1678
0.3	5 0.1368	0.85	0.3023	1.35	0.4115	1.00	0.4078
0.30	6 0.1406	0.86	0.3051	1.30	0.4131	1.80	0.4693
0.3	7 0.1443	0.87	0.3078	1.37	0.4147	1.07	0.4699
0.3	8 0.1480	0.88	0.3106	1.38	0.4162	1.00	0.4000
0.3	9 0.1517	0.89	0.3133	1.39	0.4177	1.00	0.4712
0.4	0 0.1554	0.90	0.3159	1.40	0.4192	1.90	0.4713
0.4	1 0.1591	0.91	0.3186	1.41	0.4207	1.91	0.4719
0.4	2 0.1628	0.92	0.3212	1.42	0.4222	1.92	0.4720
0.4	3 0.1664	0.93	0.3238	1.43	0.4236	1.93	0.4732
0.4	4 0.1700	0.94	0.3264	1.44	0.4251	1.94	0.4738
0.4	5 0.1736	0.95	0.3289	1.45	0.4265	1.95	0.4744
0.4	6 0.1772	0.96	0.3315	1.46	0.4279	1.96	0.4750
0.4	7 0.1808	0.97	0.3340	1.47	0.4292	1.97	0.4756
0.4	.8 0.1844	0.98	8 0.3365	1.48	0.4306	1.98	0.4761
0.4	9 0.1879	0.99	9 0.3389	1.49	0.4319	1.99	0.4767

7	Area Between	7	Area Between	7	Area Between	7	Area Between
2	Mean and Z	2	Mean and Z	2	Mean and Z	2	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	313	0.4991		
2.14	0.4838	2.64	0.4959	3 14	0.4992		
2 1 5	0 4842	2 65	0.4960	3 15	0.4002		
2 16	0.4846	2.05	0.4900	3.15	0.4992		
217	0.4850	2.00	0.4901	2.17	0.4992		
2.17	0.4854	2.07	0.4902	3.17	0.4992		
2.10	0.4857	2.00	0.4903	3.10	0.4993		
2.10	0.4007	2.0)	0.4904	3.19	0.4995		
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		CARD IN CO.
2.26	0.4881	2.76	0.4971	3.26	0.4994		protection of the
2.27	0.4884	2.77	0.4972	3.27	0.4995		Lotte of the
2.28	0.4887	2.78	0.4973	3.28	0.4995		A STATE OF
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		A CONTRACTOR OF
2.32	0.4898	2.82	0.4976	3.32	0.4995		CONCERCION OF
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		The second second second
2.37	0.4911	2.87	0.4979	3.37	0.4996		200.00
2.38	0.4913	2.88	0.4980	3.38	0.4996		and the second second
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		COLUMN AND
2.43	0.4925	2.93	0.4983	3.43	0 4997		
2.44	0.4927	2.94	0.4984	3.44	0 4997		
45	0 4020	2 05	0.1091	3 15	0.4007		
46	0.4931	2.95	0.4985	3 16	0.4997		
247	0.4932	2.90	0.4900	3.40	0.4997		
48	0 4934	2.97	0.4985	3/12	0.4997		
2 49	0.4936	2.90	0.4900	2.40	0.4997		
	0.4730	2.99	0.4980	3.49	0.4998		ALCELU - ST

	Z	Area Between Mean and Z	Ζ	Area Between Mean and Z	Ζ	Area Between Mean and Z	Ζ	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	0.4788	2.52	0.4941	3.02	0.4987	3.70	0.4999		
	2.04	0.4793	2.54	0.4945	3.03	0.4988	3.00	0.4999		
	2.05	0.4798	2.55	0.4946	3.05	0.4989	0.70	0.4999		
	2.06	0.4803	2.56	0.4948	0.00	0.1909		2 2		
	2.07	0.4808	2.57	0.4949						
	2.08	0.4812	2.58	0.4951	Half of $99\% =$					
	2.09	0.4817	2.59	0.4952	`					
	2.10	0.4821	2.60	0.4953)	0.49	50	0		
	2.11	0.4826	2.61	0.4955		••••				
	2.12	0.4830	2.62	0.4956	(Correspon	de ta	n 🖹		
	2.13	0.4834	2.63	0.4957		Jonespon	U 3 II	5		
-	2.14	0.4838	2.64	0.4959		7 - 2 5	•	3		
	2.15	0.4842	2.65	0.4960		Z = 2.50	•			
	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	2.13	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				
	2.20	0.4881	2.76	0.4971	3.26	0.4994				
	2.27	0.4004	2.11	0.4972	3.27	0.4995				
	2.29	0.4890	2.70	0.4973	3.20	0.4995				
	2.20	0.4893	2.0	0.4074	2 20	0.4995		1		
	2.30	0.4896	2.00	0.4974	3.30	0.4995				
	2.32	0.4898	2.82	0.4976	3.32	0.4995				
	2.33	0.4901	2.83	0 4977	3.32	0.4995				
	2.34	0.4904	2.84	0.4977	3.34	0.4996				

Z=2.58



Translation: <u>99</u> times out of <u>100</u> our results would contain the mean of the population

Confidence Interval: 588 – 623 Confidence Level: 99%

Confidence Level = 95%

Half above, half below the mean

1/2 of 95% is **0.4750**



0.16 0.17 0.18 0.19	0.0636 0.0675 0.0714 0.0753	0.66 0.67 0.68 0.69	0.2454 0.2486 0.2517 0.2549	1.16 1.17 1.18 1.19	0.3770 0.3790 0.3810 0.3830	1.66 1.67 1.68 1.69	0.4515 0.4525 0.4535 0.4545	
0.20 0.21 0.22 0.23 0.24	0.0793 0.0832 0.0871 0.0910 0.0948	0.70 0.71 0.72 0.73 0.74	0.2580 0.2611 0.2642 0.2673 0.2704	1.20 1.21 1.22 1.23 1.24	0.3849 0.3869 0.3888 0.3907 0.3925	1.70 1.71 1.72 1.73 1.74	0.4554 0.4564 0.4573 0.4582 0.4591	
0.25 0.26 0.27 0.28 0.29	0.0987 0.1026 0.1064 0.1103 0.1141	0.75 0.76 0.77 0.78 0.79	0.2734 0.2764 0.2794 0.2823 0.2852	1.25 1.26 1.27 1.28 1.29	0.3944 0.3962 0.3980 0.3997 0.4015	1.75 1.76 1.77 1.78 1.79	$0.4599 \\ 0.4608 \\ 0.4616 \\ 0.4625 \\ 0.4633$	
0.30 0.31 0.32 0.33	0.1179 0.1217 0.1255 0.1293	0.80 0.81 0.82 0.83	0.2881 0.2910 0.2939 0.2967 0.2995	1.30 1.31 1.32 1.33 1.34	0.4032 0.4049 0.4066 0.4082 0.4099	1.80 1.81 1.82 1.83 1.84	0.4641 0.4649 0.4656 0.4664 0.4671	
0.34 0.35 0.36 0.37 0.38	$\begin{array}{c} 0.1351 \\ 0.1368 \\ 0.1406 \\ 0.1443 \\ 0.1480 \\ 0.1517 \end{array}$	0.85 0.86 0.87 0.88	0.3023 0.3051 0.3078 0.3106	1.35 1.36 1.37 1.38	$\begin{array}{c} 0.4115\\ 0.4131\\ 0.4147\\ 0.4162\\ 0.4177\end{array}$	1.85 1.86 1.87 1.88 1.89	0.4678 0.4686 0.4693 0.4699 0.4706	Half of 95% = 0.4750
0.39 0.40 0.41 0.42 0.43	$\begin{array}{c} 0.1517 \\ 0.1554 \\ 0.1591 \\ 0.1628 \\ 0.1664 \end{array}$	0.99 0.91 0.92 0.93	0.3159 0.3186 0.3212 0.3238	1.40	0.4192	1.90 1.91 1.92 1.93	0.4713 0.4719 0.4726 0.4732 0.4738	Corresponds to z=1.96
0.44 0.45 0.46 0.47 0.48 0.49	0.1700 0.1736 0.1772 0.1808 0.1844 0.1879	0.94 0.95 0.96 0.97 0.98 0.99	$\begin{array}{c} 0.3264 \\ 0.3289 \\ 0.3315 \\ 0.3340 \\ 0.3365 \\ 0.3389 \end{array}$	-	Z =	1.94 1.95 1.96 1.97 1.98 1.99	0.4738 0.4744 0.4750 0.4756 0.4761 0.4767	

Confidence Level = 95% <u>Half above</u>, <u>half below</u> the mean $\frac{1}{2}$ of 95% is 0.4750 **Z** = 1.96 (for 95%) **C.I.** = Sample Mean ± **Z** ×($\sigma/\sqrt{-n}$) **C.I.** = 606 ± (1.96 × (100/ $\sqrt{-225}$))

 $C.I. = 606 \pm 1.96 * 6.67$

 $C.I. = 606 \pm 13$ (rounded to whole number)

C.I. = 593 to 619

Confidence Level = 50%

Half above, half below the mean

1/2 of 50% is **0.2500**



Z	Area Between Mean and Z	Ζ	Area Between Mean and Z	Ζ	Area Between Mean and Z	Ζ	Area Between Mean and Z	
0.00	0.0000 0.0040	0.50	0.1915 0.1950	1.00	0.3413 0.3438	1.50	0.4332 0.4345	
0.02	0.0080 0.0120 0.0160	0.52 0.53 0.54	0.1985 0.2019 0.2054	0.	. 2500 is at	bout l	nalfway be	tween these
0.05 0.06 0.07 0.08 0.09	0.0199 0.0239 0.0279 0.0319 0.0359	0.55 0.56 0.57 0.58 0.59	$\begin{array}{c} 0.2038\\ 0.2123\\ 0.2157\\ 0.2190\\ 0.2224 \end{array}$	Vá	alues (.248	36 an	id .2517)	
0.10 0.11 0.12 0.13 0.14	0.0398 0.0438 0.0478 0.0517 0.0557	0.60 0.61 0.62 0.63 0.64	0.2257 0.2291 0.2324 0.2357 0.2389	S 0.	o z value i .67 and 0.6	s abo 58 (out halfway =0.675)	/ between
0.15 0.16 0.17 0.18 0.19	0.0596 0.0636 0.0675 0.0714 0.0753	0.65 0.66 0.67 0.68 0.69	0.2422 0.2454 0.2486 0.2517 0.2549	1.15 1.17 1.18 1.19	0.3770 0.3790 0.3810 0.3830	1.65 1.66 1.67 1.68 1.69	$\begin{array}{c} 0.4505 \\ 0.4515 \\ 0.4525 \\ 0.4535 \\ 0.4545 \end{array}$	
	Z is Detween	.70 .71 .72 .73 .74	0.2580 0.2611 0.2642 0.2673 0.2704	1.20 1.21 1.22 1.23 1.24	0.3849 0.3869 0.3888 0.3907 0.3925	1.70 1.71 1.72 1.73 1.74	$\begin{array}{c} 0.4554 \\ 0.4564 \\ 0.4573 \\ 0.4582 \\ 0.4591 \end{array}$	
0.2	0.1020 7 0.1064 8 0.1103 9 0.1141 0 0.1179	.75 .76 0.77 0.78 0.79 0.80	0.2734 0.2764 0.2794 0.2823 0.2852 0.2881	1.25 1.26 1.27 1.28 1.29 1.30	50.394450.396270.398080.399790.401500.4032	1.75 1.76 1.77 1.78 1.79 1.80	0.4599 0.4608 0.4616 0.4625 0.4633 0.4641	
0.3	0.1217	0.81	0.2910	1.3	0.4049	1.81	0.4649	

Confidence Level = 50%

Half above, half below the mean

¹/₂ of 50% is **0.2500**



Z = 0.675 (for 50%)

C.I. = Sample Mean $\pm Z \times (\sigma/\sqrt{n})$ C.I. = 606 $\pm (0.675 \times (100/\sqrt{225}))$ C.I. = 606 $\pm 0.675 \times 6.67$ C.I. = 606 ± 5 (rounded to whole number)

C.I. = 601 to 611

