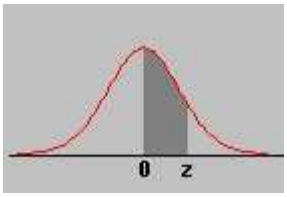
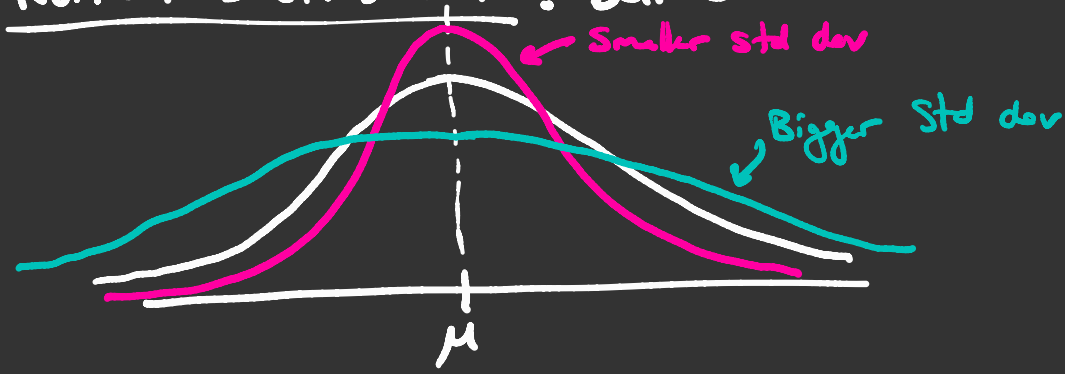
Standard Normal (Z) Table
Area between 0 and z



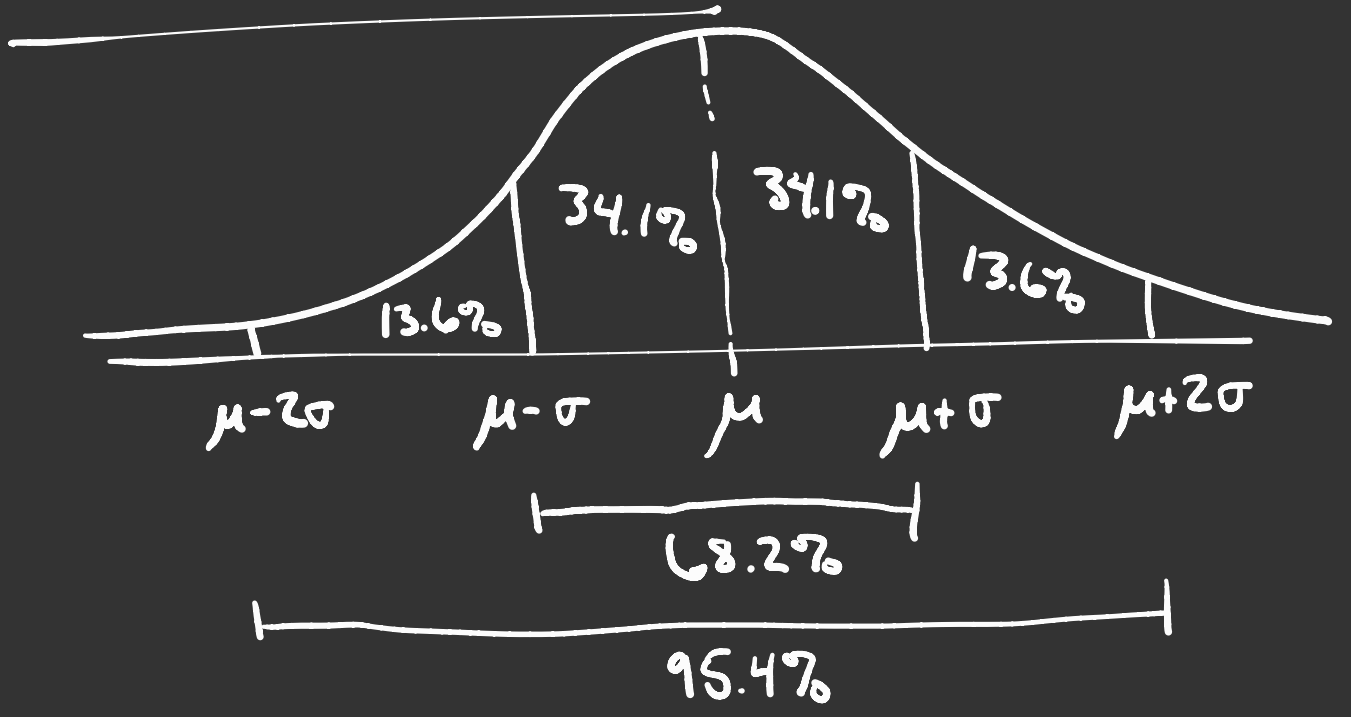
	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990

Normal Distribution : Bell Curve



Unusual Property: Normal Distributions are determined entirely by μ and σ.

Area under normal curve



Example: ACT English Test. $\mu = 17.8$ $\sigma = 5.5$ Normally distributed

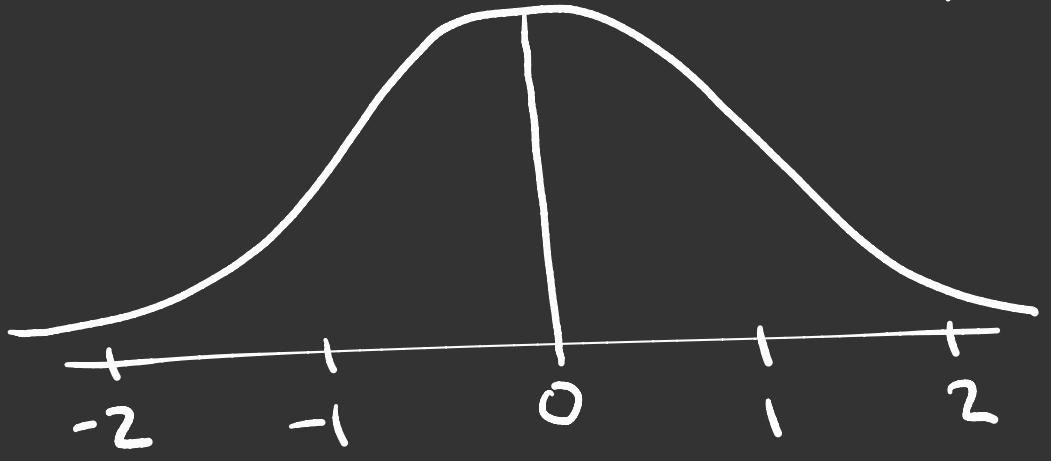
$\mu + \sigma = 17.8 + 5.5 = 23.3$

$\mu - \sigma = 17.8 - 5.5 = 12.3$

$\longrightarrow$ 68.2% of students scored between 12.3 and 23.3.

$P(\text{student scores between } 12.3 \text{ and } 23.3) = 0.682$

Example: Standard normal curve. $\mu = 0$ $\sigma = 1$

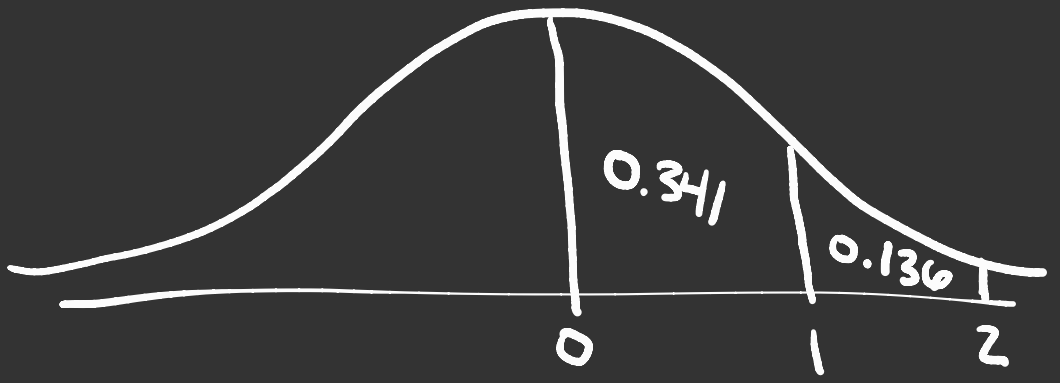


To find probabilities for normal distributions, we'll always come back to the standard normal curve, by computing z-scores

Recall: The value X has a z-score of $z = \frac{X - \mu}{\sigma}$

Example: $\mu = 25 \quad \sigma = 2 \quad x = 27$

$$z = \frac{x - \mu}{\sigma} = \frac{27 - 25}{2} = 1$$



$P(25 \leq X \leq 27)$

$=$

$P(0 \leq z \leq 1)$

$=$

0.341

$P(27 \leq x \leq 29) = P(1 \leq z \leq 2) = 0.136$

What if we get weird z-scores?

Refer to z-score table in back of book

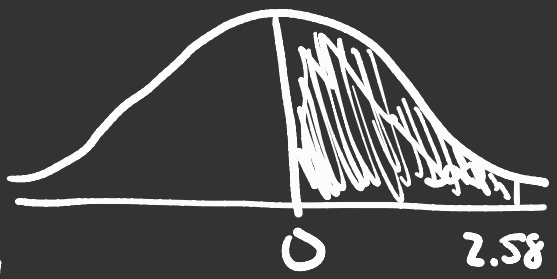
Example: Find fraction of area, A, between the mean and the z-scores.

a) $z = 0.75 \longrightarrow A = 0.2734$

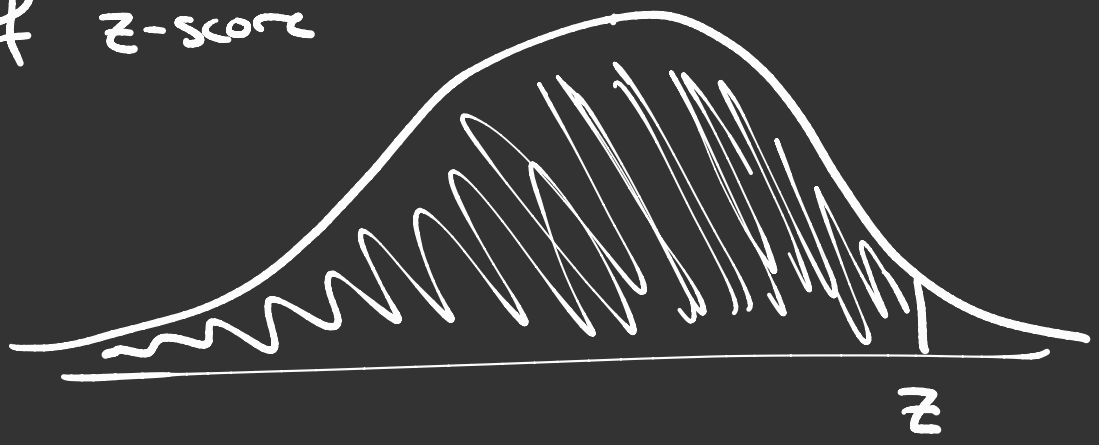
b) $z = 2.58 \longrightarrow A = 0.4951$

c) $z = -0.75 \longrightarrow A = 0.2734$

d) $z = -1.92 \longrightarrow A = 0.4726$

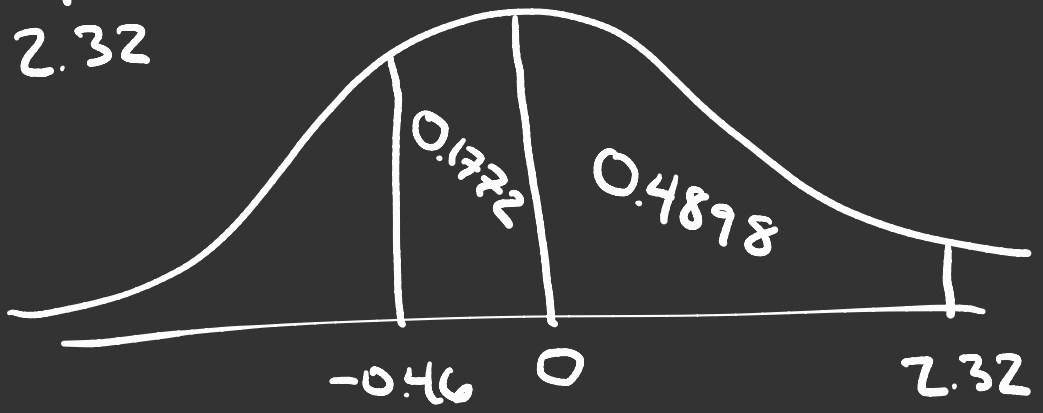


Warning: Most z-score tables give area to left of z-score



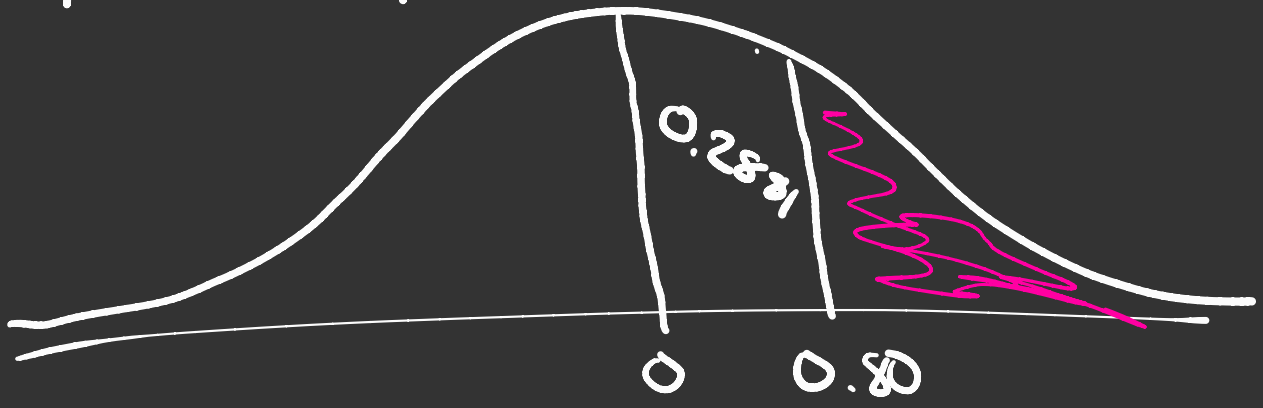
So make sure you know which you're using.

Example: Find area between $z = -0.46$ and $z = 2.32$



$$A = 0.1772 + 0.4898 = 0.6670 = P(-0.46 \leq z \leq 2.32)$$

Example: Find prob a score is above $z = 0.80$



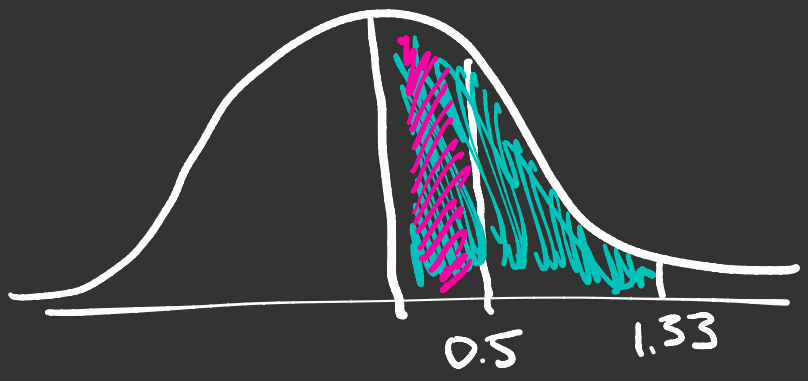
$A = 0.5 - 0.2881 = 0.2119 = P(z > 0.8)$

↑ Area to right of 0

Example: Normal Distribution has mean of 50 and std dev of 6. Find percentage of score between 53 and 58

$$x = 53 \rightsquigarrow z = \frac{53-50}{6} = 0.5$$

$$x = 58 \rightsquigarrow z = \frac{58-50}{6} = 1.33$$



$P(0 \leq z \leq 1.33) = 0.4082$

$P(0 \leq z \leq 0.5) = 0.1915$

$P(0.5 \leq z \leq 1.33) = 0.4082 - 0.1915$
$= 0.2167$