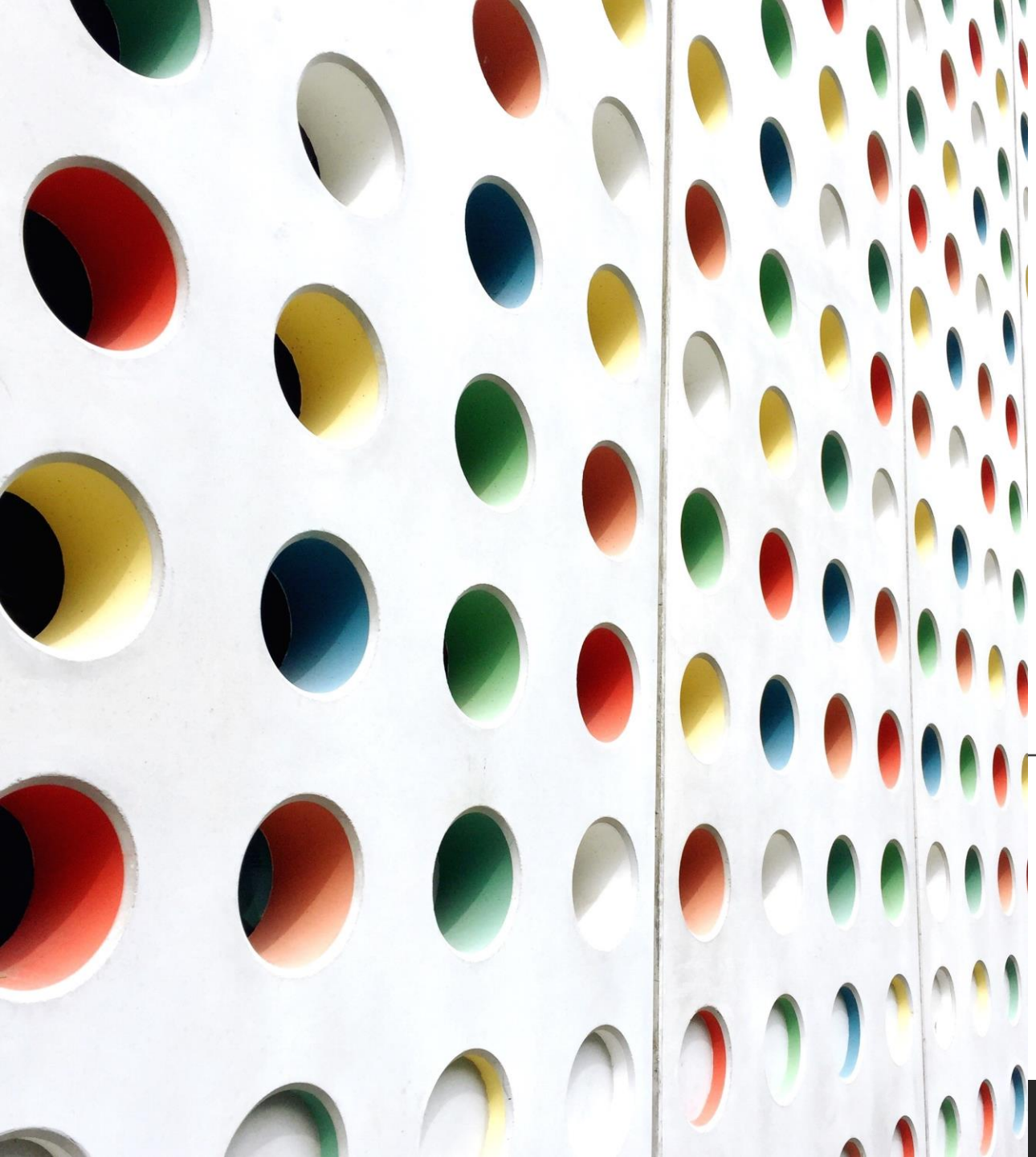
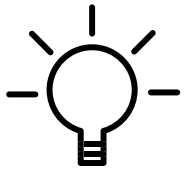


NORMAL DISTRIBUTION

LESSON 5: PROBABILITY NOTATIONS UNDER THE NORMAL CURVE



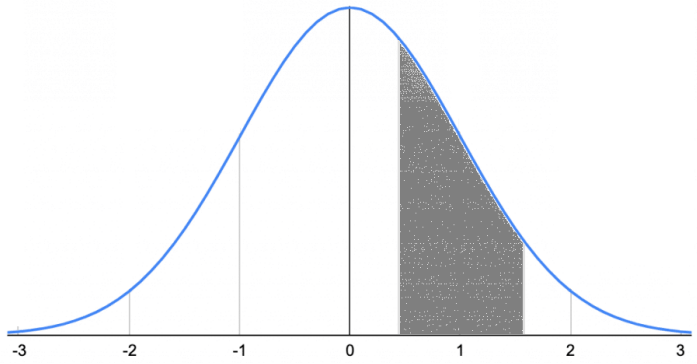
OBJECTIVES:

At the end of this lesson, the learners should be able to:

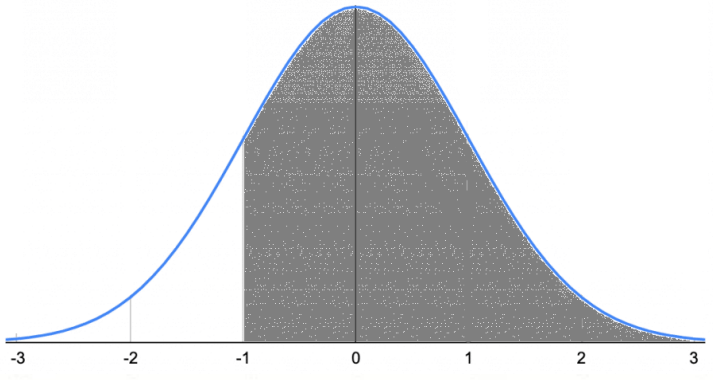
- Find the areas between paired z-scores;
- Find probabilities for the standard normal random variables z; and
- Express areas under the normal curve using probability notation.

Probability Notations Under the Normal Curve

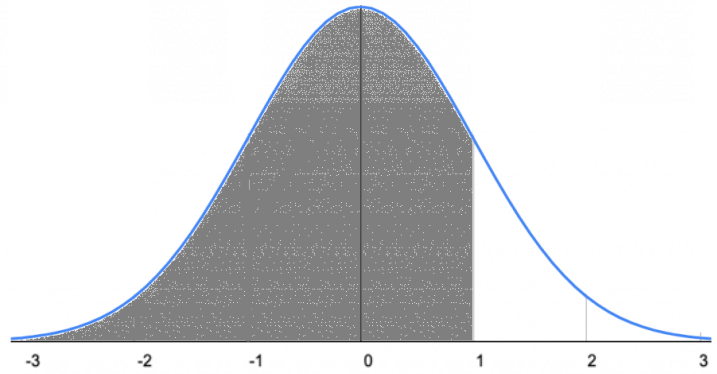
- $P(a < z < b)$ denotes the probability that z-score is between a and b.
- $P(z > a)$ denotes the probability that z-score is greater than a.
- $P(z < a)$ denotes the probability that z-score is less than a.



$P(a < z < b)$



$P(z > a)$



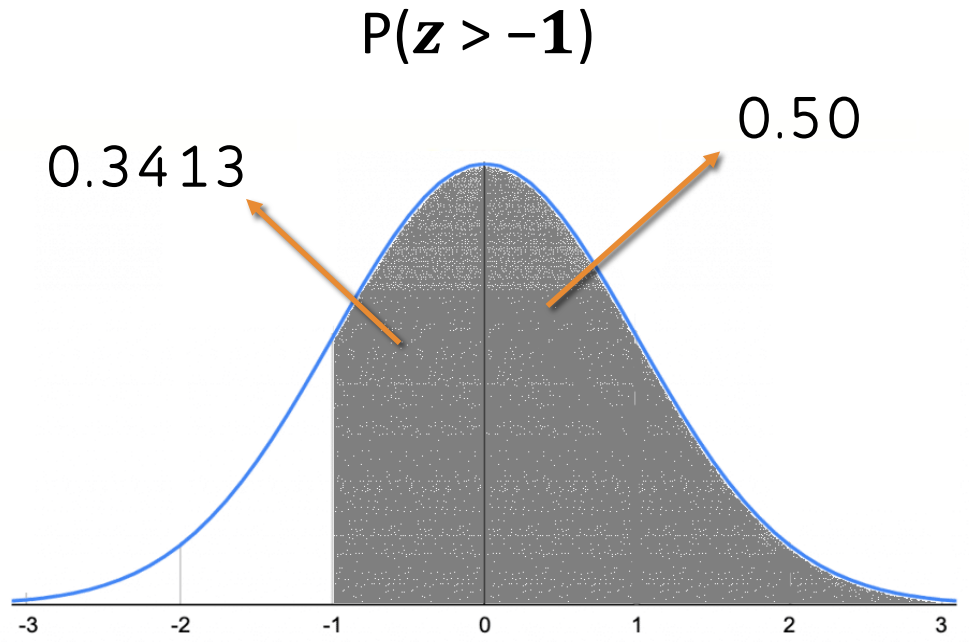
$P(z < a)$

Steps in Determining Areas Under the Normal Curve

1. Draw a normal curve.
2. Locate the given z-value or values at the baseline.
3. Draw a vertical line through the z-value.
4. Shade the required region.
5. Consult the z-table to find the areas that correspond to the given z-value or values.
6. Examine the graph and use probability notation to form an equation showing an appropriate operation to get the required area.
7. Make a statement indicating the required area.

EXAMPLE:

1: Find the proportion of the area above $z = -1$.



$z = 1 = 0.3413$

P(z >-1) = 0.3413 + 0.5
= 0.8413

Or
84.13%

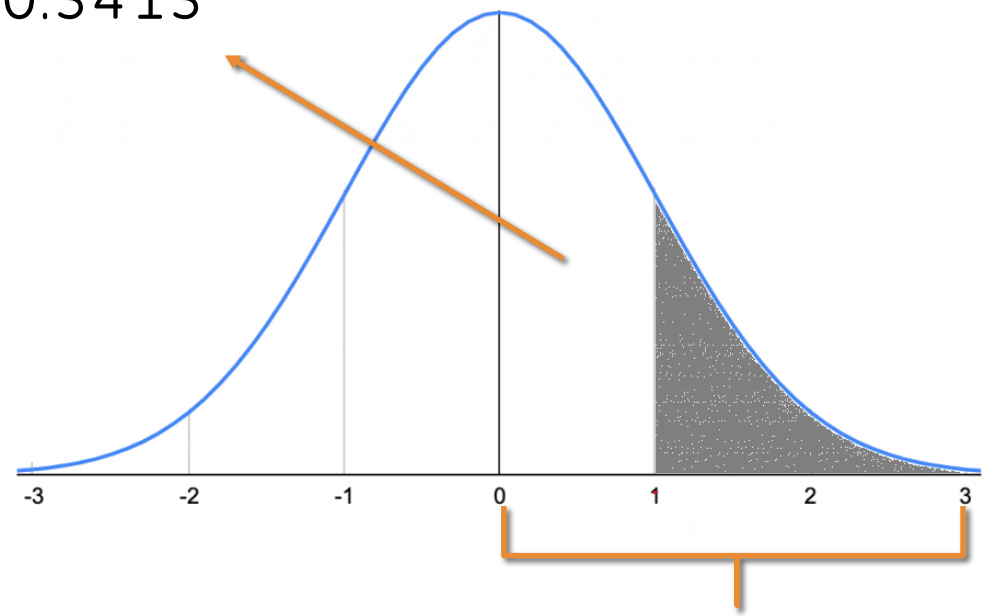
Z- table

The proportion of the area above $z = -1$ is $\mathbf{0.8413}$.

Example 2: Find the proportion of the area greater than $z = 1$.

$P(z > 1)$

0.3413



0.50

$z = 1 \quad = 0.3413$

$P(z > 1) = 0.50 - 0.3413$

$= 0.1587$

Or

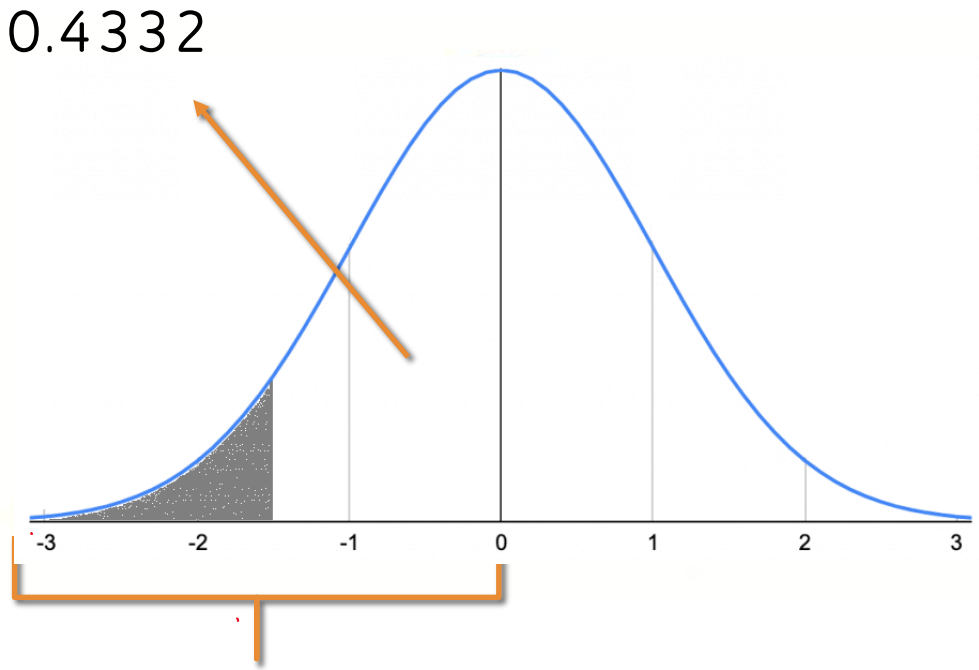
15.87%

The proportion of the area greater than $z = 1$ is 0.1587.

Z- table

Example 3: Find the proportion of the area less than $z = -1.5$.

$P(z < -1.5)$



$z = -1.5 = 0.4332$

$P(z < -1.5) = 0.50 - 0.4332$

$= 0.0668$

Or

6.68%

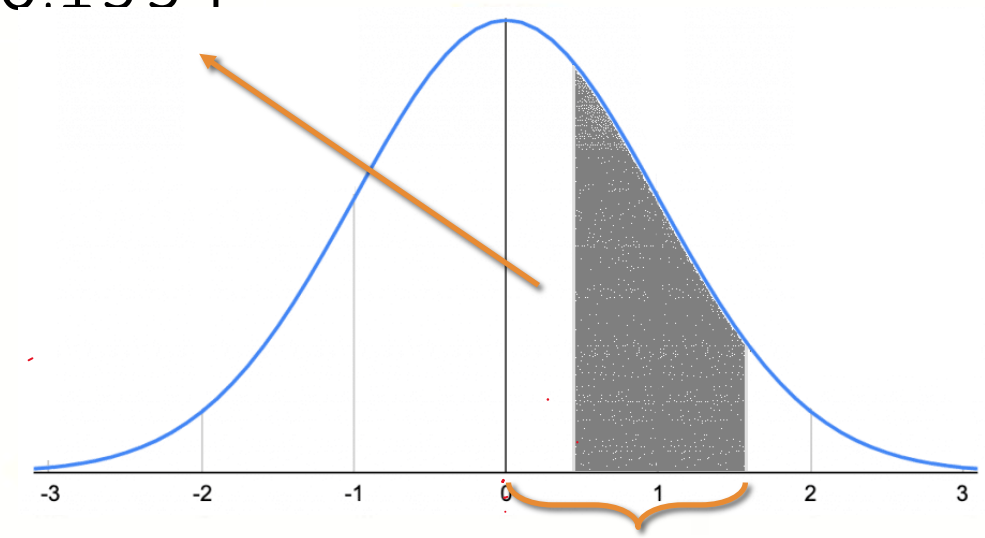
The proportion of the area less than $z = -1.5$ is 0.0668.

Z-table

Example 4: Find the proportion of the area between $z = 0.4$ and $z = 1.58$.

$P(0.4 < z < 1.58)$

0.1554



0.4429

$z = 0.4 \quad = 0.1554$

$z = 1.58 \quad = 0.4429$

$P(0.4 < z < 1.58) = 0.4429 - 0.1554$

$= 0.2875$

Or

28.75%

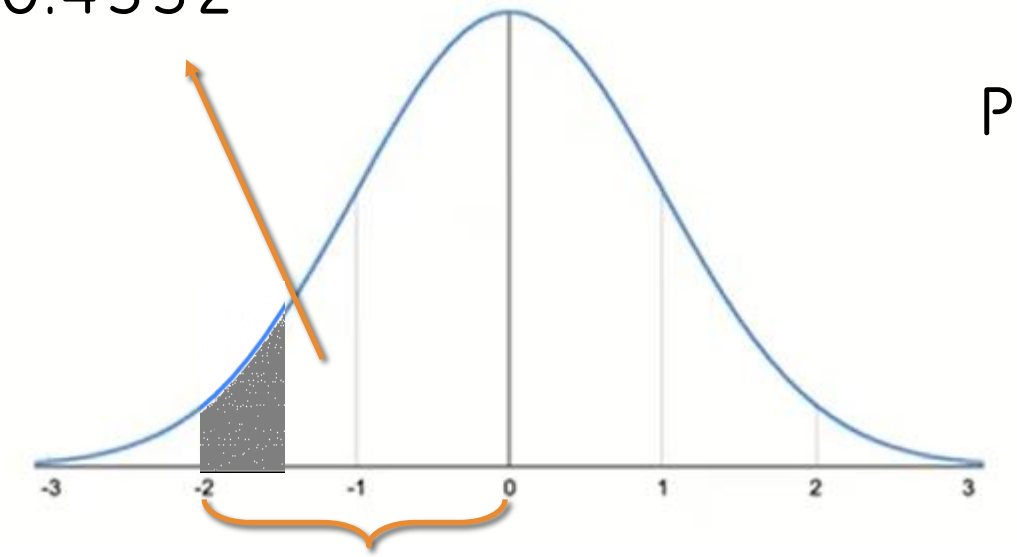
The proportion of the area between $z = 0.4$ and $z = 1.58$ is 0.2875.

Z- table

Example 5: Find the proportion of the area between $z = -2$ and $z = -1.5$.

$P(-2 < z < -1.5)$

0.4332



0.4772

$z = -2 \quad = 0.4772$

$z = -1.5 \quad = 0.4332$

$P(-2 < z < -1.5) = 0.4772 - 0.4332$

$= 0.0440$

Or

4.40%

The proportion of the area between $z = -2$ and $z = -1.5$ is 0.0440

Z- table

TRY THIS!!!

1. Find the proportion of the area between $z = 0.98$ and $z = 2.58$.

2. Find the proportion of the area between $z = -1.32$ and $z = 2.37$.

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
3.1	0.4990	0.4991	0.4991	0.4991	0.4992	0.4992	0.4992	0.4992	0.4993	0.4993
3.2	0.4993	0.4993	0.4994	0.4994	0.4994	0.4994	0.4994	0.4995	0.4995	0.4995
3.3	0.4995	0.4995	0.4995	0.4996	0.4996	0.4996	0.4996	0.4996	0.4996	0.4997
3.4	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4998
3.5	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998
3.6	0.4998	0.4998	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.7	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.8	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.9	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000

1.

2.

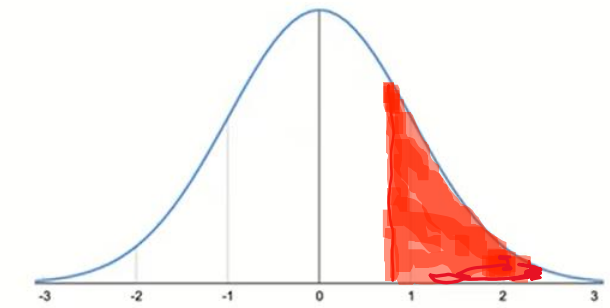
3.

4.

5.

TRY THIS!!!

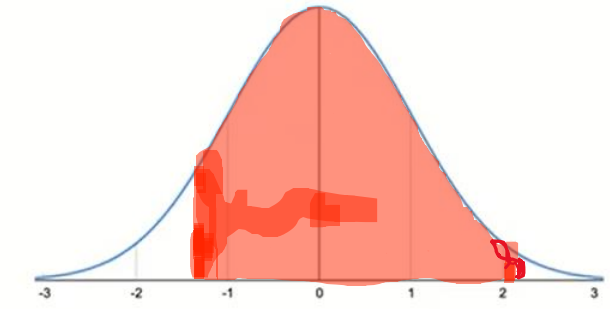
1. Find the proportion of the area between $z = 0.98$ and $z = 2.58$.



Z = 0.98 correspond to 0.3365
Z = 2.58 correspond to 0.4951
P(0.98 < z < 2.58) = 0.4951 – 0.3365
= 0.1586 or 15.86%

The proportion of the area between z = 0.98 and z = 2.58 is 0.1586 or 15.86%

2. Find the proportion of the area between $z = -1.32$ and $z = 2.37$.



Z = -1.32 correspond to 0.4066
Z = 2.37 correspond to 0.4911
P(-1.32 < z < 2.37) = 0.4066 + 0.4911
= 0.8977 or 89.77%

The proportion of the area between z = -1.32 and z = 2.37 is 0.8977 or 89.77%


Very
Good

ACTIVITY #4

A. Determine each of the following areas and show these graphically. Use probability notation in your final answer.

1. Above $z = 1.46$
2. Below $z = -0.58$
3. Between $z = -0.78$ and $z = -1.95$
4. Between $z = 0.76$ and $z = 2.88$
5. Between $z = -0.92$ and $z = 1.75$


Thank You