

Section 6 – 3C:

Finding the Z value (Z score)  
given the area (in yellow) to the left of a Z value

Example 1

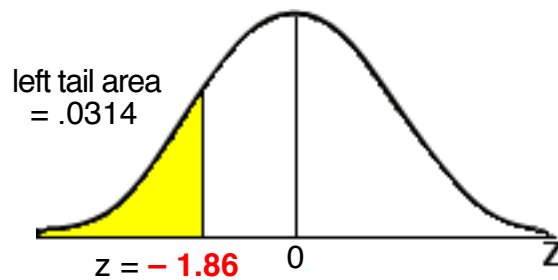
Find the Z Value if the area to the left of the Z score is .0314

Find a number in the body of the table (in yellow) as close to .0314 as possible.

The number at the intersection of the **-1.8** row and the **0.06** column is **0.0314**

Negative Z Scores										
Standard Normal (Z) Distribution: Cumulative Area to the LEFT of Z										
Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
<b>-1.8</b>	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	

This means that the Z score with a left tail area of .0314 is  $Z = -1.86$



## Finding the Z value (Z score) given the area to the left of a Z value

### Example 2

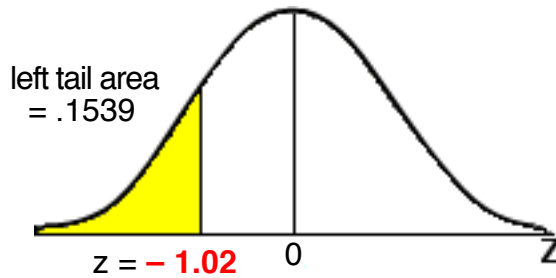
Find the Z Value if the area to the left of the Z score is .1539

Find a number in the body of the table (in yellow) as close to .1539 as possible.

The number at the intersection of the **-1.0** row and the **0.02** column is **0.1539**

Negative Z Scores										
Standard Normal (Z) Distribution: Cumulative Area to the LEFT of Z										
Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
-1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379

This means that the Z score with a left tail area of .1539 is  $Z = -1.02$



## Finding the Z value (Z score) given the area to the left of a Z value

### Example 3

Find the Z Value if the area to the left of the Z score is .01

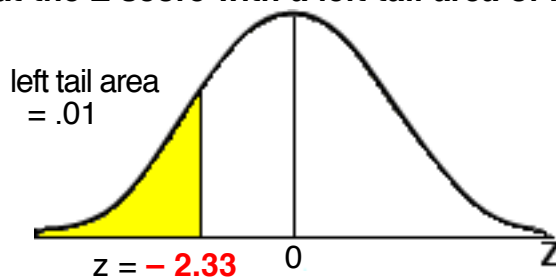
Find a number in the body of the table (in yellow) as close to .01 as possible

The number at the intersection of the **-2.3** row and the **0.03** column is **0.0099**

which is as close to .01 as possible

Negative Z Scores										
Standard Normal (Z) Distribution: Cumulative Area to the LEFT of Z										
Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
-2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084

This means that the Z score with a left tail area of .01 is  $Z = -2.33$



### Example 4

Find the Z Value if the area to the **left** of the Z score is .9845

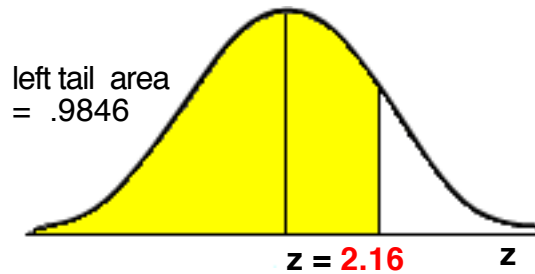
Find a number in the body of the table as close to .9845 as possible (in yellow)

The number at the intersection of the **2.1** row and the **0.06** column is **0.9846**

**which is as close to .9845 as possible**

Positive Z Scores										
Standard Normal (Z) Distribution: Cumulative Area to the LEFT of Z										
Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857

This means that the Z score with a left tail area of .9845 is **Z = 2.16**



## Finding the Z value (Z score) given the area to the right of a Z value

### Example 5

Find the Z Value if the area to the right of the Z score is .3520

The Z Tables only give areas to the left of a Z value.

If we are given an area to the right then we must find the remaining area that is to the left of the Z value and then look that area up in the Z table.

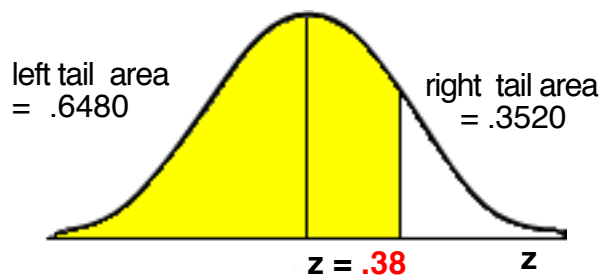
If the area to the right of the Z score is .3520 then the area to the left of the Z score is  $1 - .3520 = .6480$

Find a number in the body of the table as close to .6480 as possible (in yellow)

The number at the intersection of the **0.3** row and the **0.08** column is **0.6480**

Positive Z Scores										
Standard Normal (Z) Distribution: Cumulative Area to the LEFT of Z										
Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517

This means that the Z score with a left tail area of .6480 and a right tail area of .3520 is  $Z = .38$



## Finding the Z value (Z score) given the area to the right of a Z value

### Example 6

Find the Z Value if the area to the right of the Z score is .8185

The Z Table only gives areas to the left of a Z value.

If we are given an area to the right then we must find the remaining area that is to the left of the Z value and then look that area up in the Z table.

If the area to the right of the Z score is .8185 then the area to the left of the Z score is  $1 - .8185 = .1815$

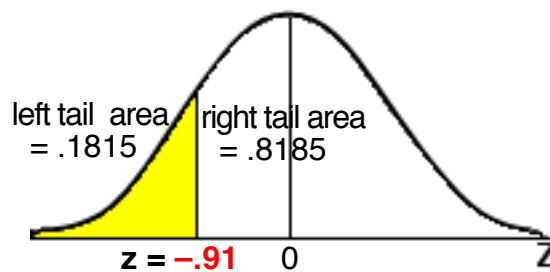
Find a number in the body of the table as close to .1815 as possible (in yellow)

The number at the intersection of the **-0.9** row and the **0.01** column is **0.1814**

which is as close to .1815 as possible

Negative Z Scores										
Standard Normal (Z) Distribution: Cumulative Area to the LEFT of Z										
Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
-0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611

This means that the Z score with a left tail area of .1815 and a right tail area of .8185 is  $Z = -.91$



## Finding the Z value (Z score) given the area to the right of a Z value

### Example 7

Find the Z Value if the area to the right of the Z score is .9500

The Z Tables only give areas to the left of a Z value.

If we are given an area to the right of a z value then we must find the remaining area that is to the left of the Z value and then look that area up in the Z table

If the area to the right of the Z score is .9500 then the area to the left of the Z score is  $1 - .9500 = .0500$

Find a number in the body of the table as close to .05 as possible (in yellow)

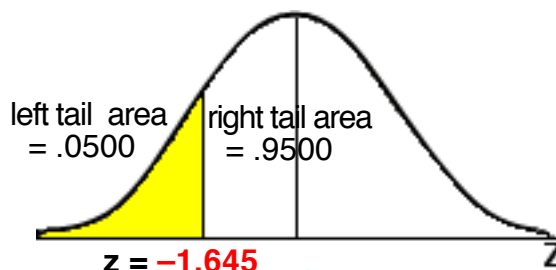
The body of the table has a 0.0505 and a 0.0495 which are equally close to .0500

but

The cells at the bottom of the table says for an area of 0.0500 use  $Z = -1.645$

Negative Z Scores										
Standard Normal (Z) Distribution: Cumulative Area to the LEFT of Z										
Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
-1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
Z scores of -3.5 or less use .0001					AREA	Z Score		AREA	Z Score	
					0.0500	-1.645		0.0050	-2.575	

This means that the Z score with a left tail area of .0500 and a right tail area of .9500 is  $Z = -1.645$



### Example 8

Find the Z score that separates the **bottom 60%** of the Z Distribution from the upper 40% of the Z Distribution

The Z score that separates the **bottom 60%** of the Z distribution from the upper 40% of the Z distribution is the Z score that has an **area to the left of the Z score of 60% or .60**

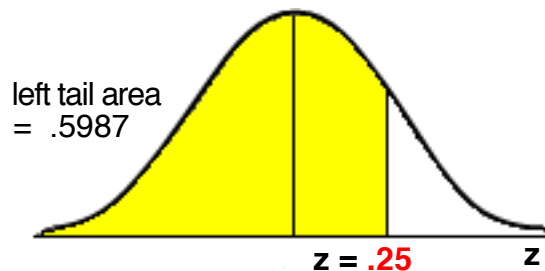
Find the Z Value if the **area to the left of the Z score is .60**

Find a number in the body of the table as close to .60 as possible (in yellow)

The area to the left of  $z = .25$  is .5987 **which is as close to .60 as possible**

This means that the Z score with a left tail area of .60 is  $Z = .25$

Positive Z Scores										
Standard Normal (Z) Distribution: Cumulative Area to the LEFT of Z										
Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141



The Z score with a left tail area as close as possible to .60 is  $Z = .25$

The Z score that separates the **bottom 60%** of the Z Distribution from the upper 40% of the Z Distribution is .25

The number that has 60% of the data below it is called

The 60<sup>th</sup> percentile or  $P_{60}$

so

The 60<sup>th</sup> percentile or  $P_{60} = .25$

### Example 9

Finding the 10<sup>th</sup> percentile or  $P_{10}$  for a Z distribution

The 10<sup>th</sup> percentile for a Z distribution is the Z score that separates the **bottom 10%** of the Z distribution from the upper 90% of the Z distribution. Find a Z score that has .10 in the left tail

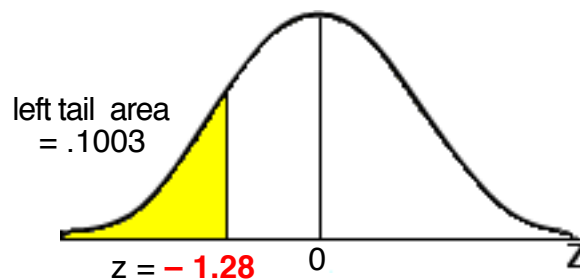
Find the Z Value if the area to the **left** of the Z score is .10

Find a number in the body of the table as close to .10 as possible (in yellow)

The area to the left of  $z = -1.28$  is .1003 **which is as close to .10 as possible**

This means that the Z score with a left tail area of .10 is  $Z = -1.28$

Negative Z Scores										
Standard Normal (Z) Distribution: Cumulative Area to the LEFT of Z										
Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
-1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985



The Z score with a left tail area as close as possible to .10 is  $Z = -1.28$

The 10<sup>th</sup> percentile or  $P_{10}$  for a Z distribution is  $-1.28$

### Example 10

Finding the 80<sup>th</sup> percentile or  $P_{80}$  for a Z distribution

The 80<sup>th</sup> percentile for a Z distribution is the Z score that separates the **bottom 80%** of the Z distribution from the upper 20% of the Z distribution. Find a Z score that has .80 in the left tail

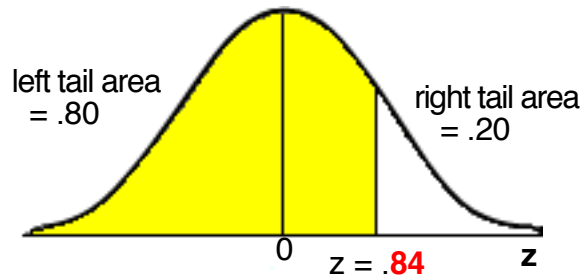
Find the Z Value if the area to the **left** of the Z score is .80

Find an number in the body of the table as close to .80 as possible (in yellow)

The area to the left of  $z = .84$  is .7995 **which is as close to .80 as possible**

This means that the Z score with a left tail area of .80 is  $Z = .84$

Negative Z Scores										
Standard Normal (Z) Distribution: Cumulative Area to the LEFT of Z										
Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133



The Z score with a left tail area as close as possible to .80 is  $Z = .84$

The 80<sup>th</sup> percentile or  $P_{80}$  for a Z distribution is .84