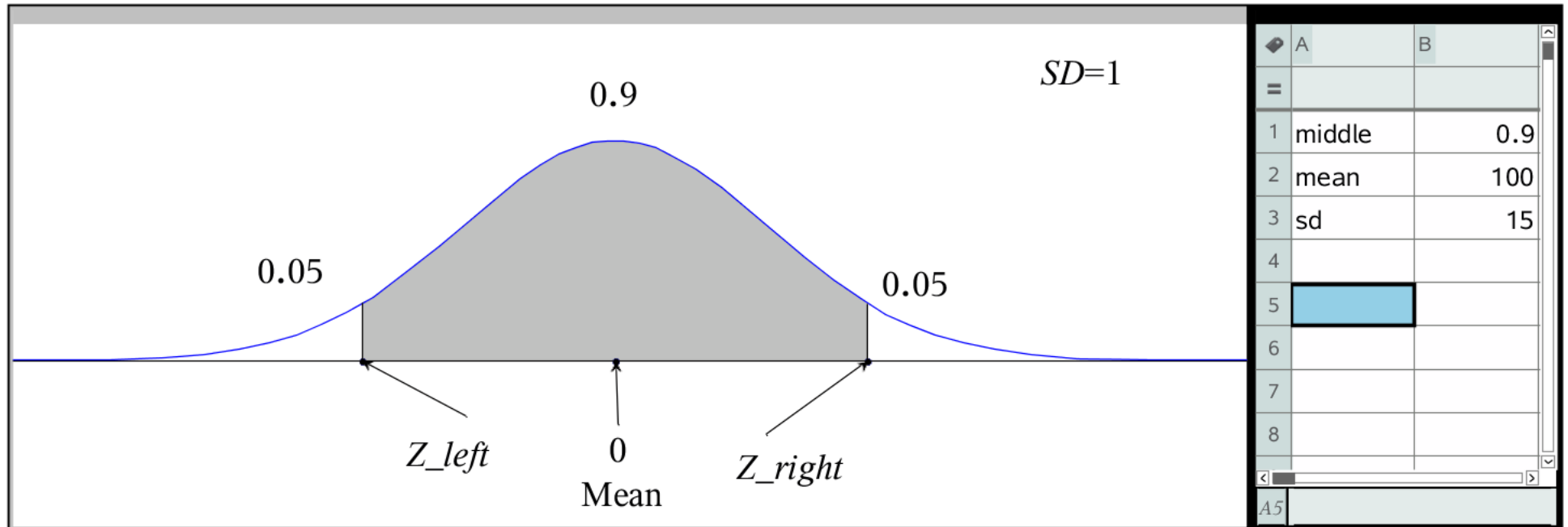


## Between and Symmetric



Find Z scores that yield a MIDDLE of x% given mean =0 and SD = 1

Step 1) State x % as a decimal

Step 2) Find LEFT TAIL associated with a symmetric middle LEFT TAIL =  $\frac{1-x}{2}$

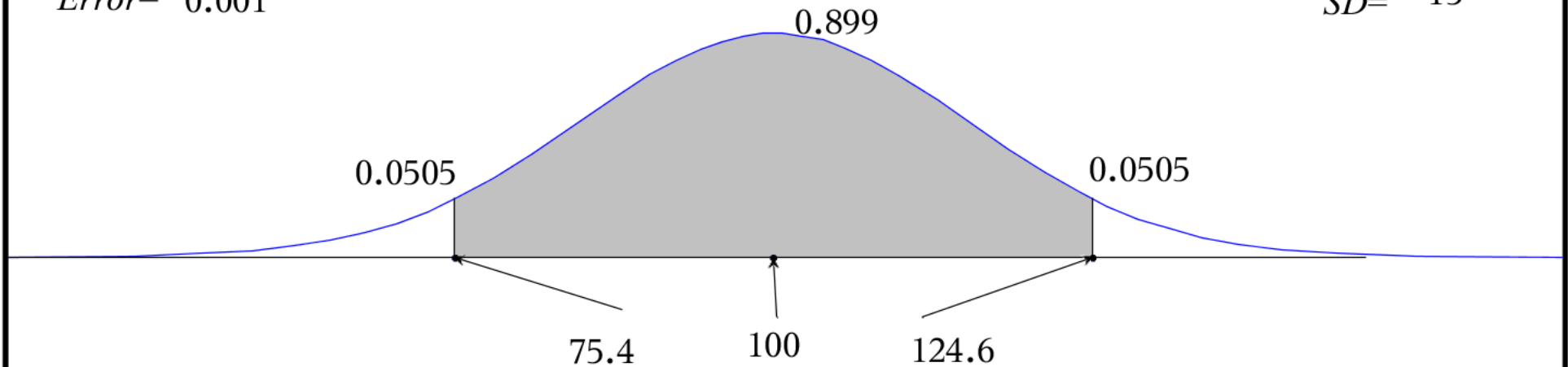
Step 3) look up this area in the chart (this is  $\frac{1-x}{2}$ )

Step 4) The Z score associated with this LEFT TAIL is  $Z_{LEFT}$

Step 5) SINCE this is SYMMETRIC ,the Z score associated with the RIGHT TAIL is  $-Z_{LEFT}$

Error= 0.001

SD= 15



Find Z scores that yield a MIDDLE of 90. %  $\rightarrow$  0.9 given mean = 100 and SD = 15

Step 1) Find LEFT TAIL associated with a symmetric middle LEFT TAIL =  $\frac{1 - \text{middle}}{2} = 0.05$

Step 2) look up this area in the chart (this is -1.64 )

Step 3) The Z score associated with this LEFT TAIL is  $Z_{\text{LEFT}}$  (this is  $Z_{\text{LEFT}} = -1.64$  )

Step 4) SINCE this is SYMMETRIC ,the Z score associated with the RIGHT TAIL is  $-Z_{\text{LEFT}}$

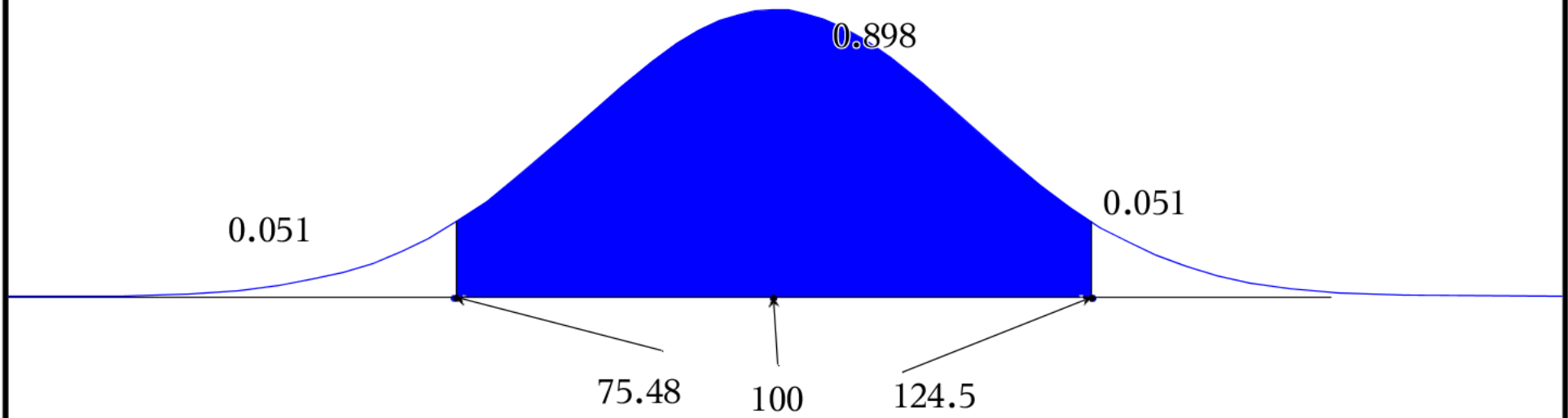
THAT is  $Z_{\text{RIGHT}} = -Z_{\text{LEFT}}$  (this is  $Z_{\text{RIGHT}} = 1.64$  )

✓✓ normcdf(-1.64 , 1.64 , 0, 1) = 0.899 (Error with chart = 0.001 )

Finding X values  $X_{\text{LEFT}} = (-1.64)(15) + 100 \approx 75.4$   $X_{\text{RIGHT}} = (1.64)(15) + 100 \approx 124.6$

Error = 0.002

SD= 15



Find Z scores that yield a MIDDLE of 90. % given mean =100 and SD = 15

Recall, we used the chart to find  $Z_{\text{LEFT}} = -1.64$  and  $Z_{\text{RIGHT}} = 1.64$  Error with chart =0.001

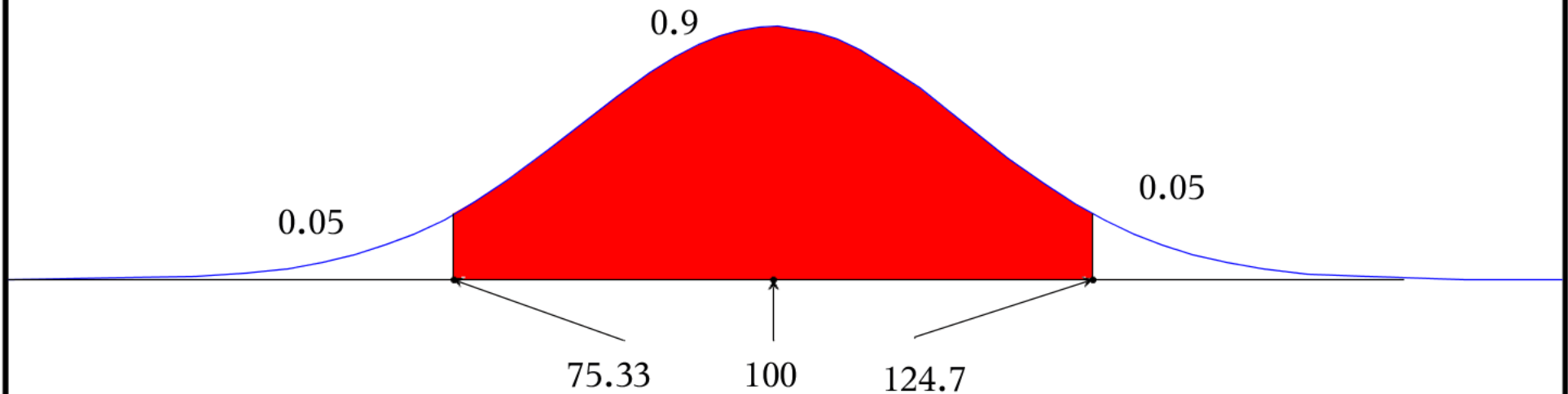
If we want to see if an UNDERESTIMATE of Z will be better bring z scores in 0.005

✓✓normcdf(-1.635 ,1.635 , 0, 1)=0.898 NEW Error with chart =0.002

Finding X values  $X_{\text{LEFT}} = (-1.635)(15) + 100 \approx 75.48$   $X_{\text{RIGHT}} = (1.635)(15) + 100 \approx 124.5$

Error=  $3.019E-5$

SD = 15



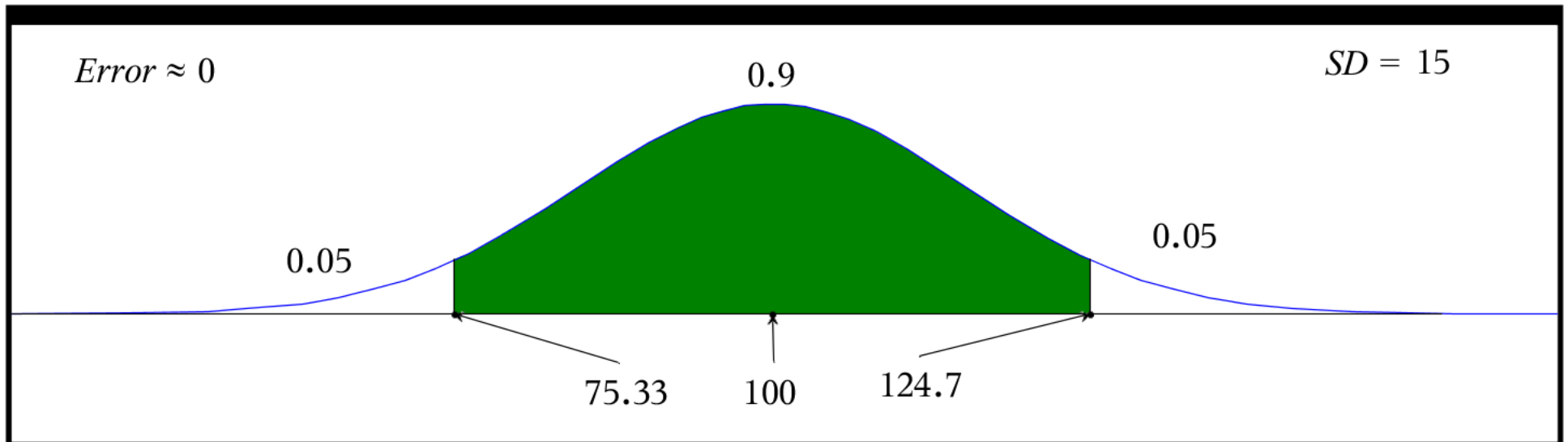
Find Z scores that yield a MIDDLE of 90. % given mean =100 and SD = 15

Recall, we used the chart to find  $Z_{\text{LEFT}} = -1.64$  and  $Z_{\text{RIGHT}} = 1.64$  Error with chart =0.001

If we want to see if an OVERESTIMATE of Z will be better bring z scores out 0.005

✓✓ normcdf(-1.645 ,1.645 , 0, 1)=0.9 NEW Error with chart =3.022E-5

Finding X values  $X_{\text{LEFT}} = (-1.645)(15) + 100 \approx 75.33$   $X_{\text{RIGHT}} = (1.645)(15) + 100 \approx 124.7$



Find Z scores that yield a MIDDLE of 90. % given mean =100 and SD = 15

Step 1) Find LEFT TAIL associated with a symmetric middle LEFT TAIL =  $\frac{1-\text{middle}}{2} = 0.05$

Step 2) USE INVERSE NORMAL to find  $Z_{\text{LEFT}} = \text{invnorm}(0.05, 0, 1) = -1.645$

Step 3) SINCE this is SYMMETRIC ,the Z score associated with the RIGHT TAIL is  $-Z_{\text{LEFT}}$

THAT is  $Z_{\text{RIGHT}} = -Z_{\text{LEFT}}$  (this is  $Z_{\text{RIGHT}} = 1.645$  )

✓✓  $\text{normcdf}(-1.645, 1.645, 0, 1) = 0.9$  (Error with invnorm =  $3.11\text{E-}8$  )

Recall  $1.0\text{E-}7 = 0.0000001$

Finding X values  $X_{\text{LEFT}} = (-1.645)(15) + 100 \approx 75.33$      $X_{\text{RIGHT}} = (1.645)(15) + 100 \approx 124.7$