9.4 Normal Calculations

SWBAT use the invNorm, normalcdf, and z-scores to find unknown proportions and scores.

	Normalcdf(	**InvNorm(**
The Normal Curve:	The area under the normal bell curve can represent either a probability, or a percentage.	
When to use it:	• Use the normalcdf function to find the area under the curve when two "bounds" or scores are known.	• Use the invNorm function to find the number line value when the area under the curve **to the left** of that value is known
How to Use it:	$normalcdf(Lower, Upper, \mu, \sigma)$	$invNorm(Area\ to\ the\ \mathbf{left}, \mu, \sigma)$

Example 1: The lengths of adult carp in a lake are normally distributed with a mean length of 16.0 inches and a standard deviation of 2.0 inches. What percent of the adult carp in the lake are between 12 and 18 inches in length?

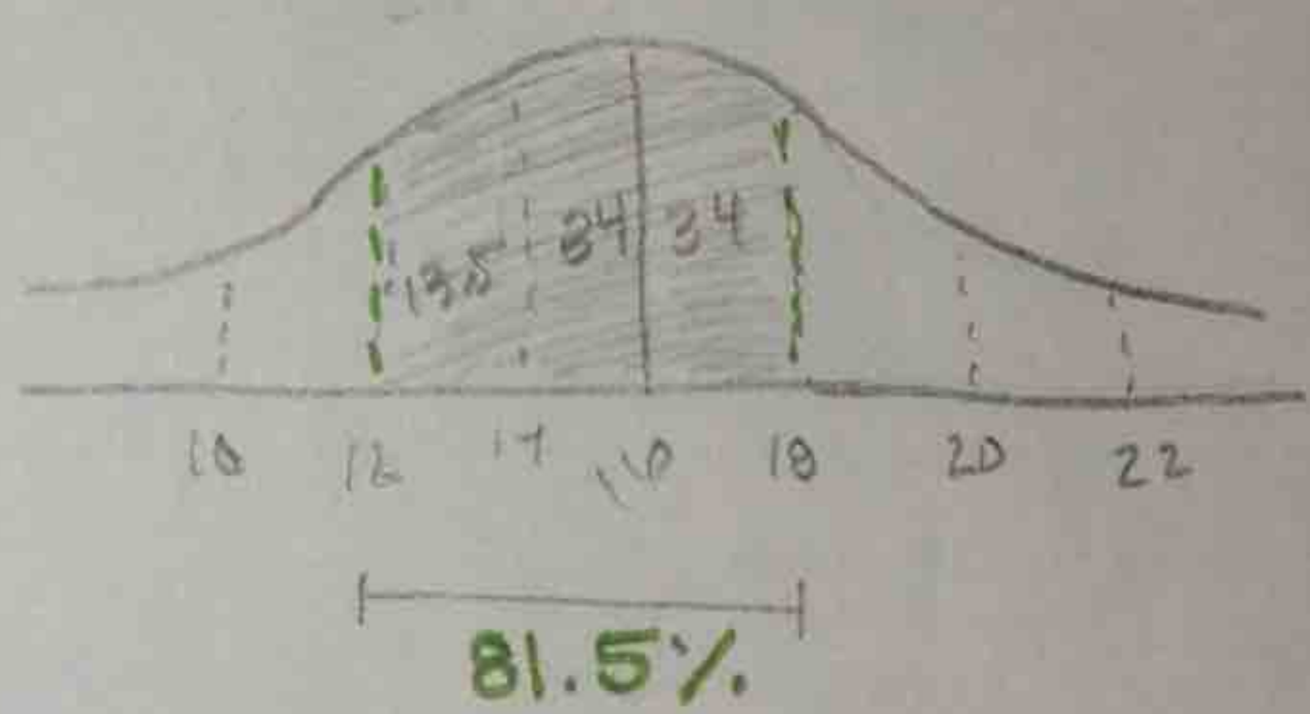
a) Sketch a bell curve.

Empirical Rule!

b) Label the relevant lower bound and the upper bound.

c) Shade the relevant area under the curve.

d) Use the calculator to find the value.



Normalcdf $(-2, 1) = \boxed{81.9\%}$

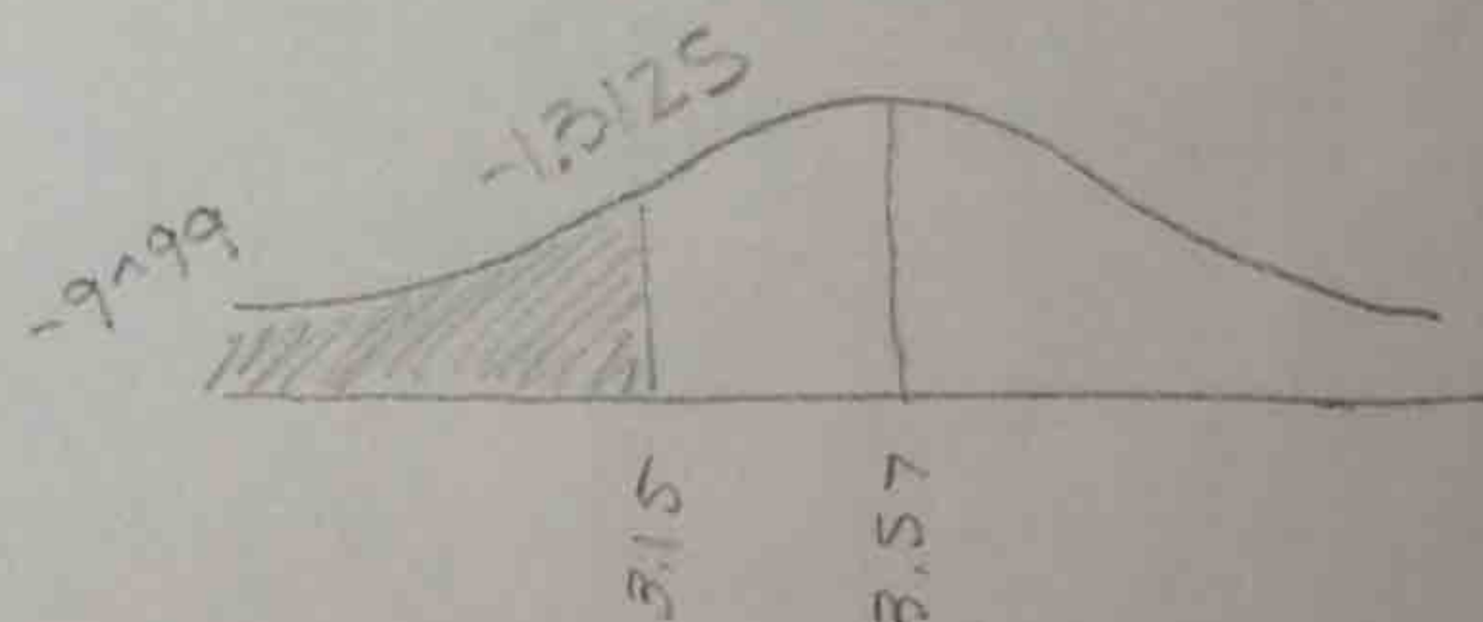
You Try! The average GPA at ECF is 3.57 with a standard deviation of 0.32. What percent of students at ECF have a GPA that is less than 3.15?

a) Sketch a bell curve. $z = -1.3125$

b) Label the relevant lower bound and the upper bound.

c) Shade the relevant area under the curve.

d) Use the calculator to find the value.



Normalcdf (-9^99, -1.3125) = 9.5%

Example 2: Graduating seniors at a certain high school with GPAs in the top 20% are eligible for a special college scholarship. Grade point averages for seniors at that high school are normally distributed with a mean of 2.35 and a standard deviation of 0.15. What is the minimum grade point average that a senior at that school must have in order to qualify for the scholarship?

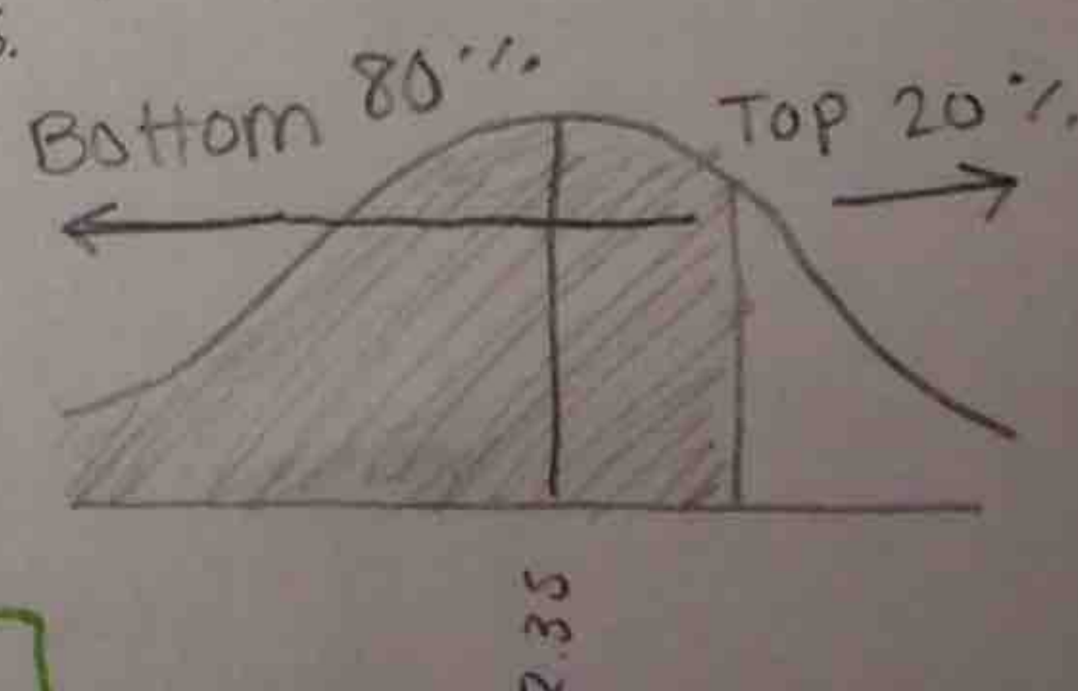
Score! invNorm(

a) Sketch a bell curve and note the median on the number line for a reference point.
Note: *Recall that the median separates the top 50% from the bottom 50%.*
Second Note: *Values and percentiles increase from left to right.*

b) Draw a vertical line at the right end and denote the top 20% as 0.20

c) Use subtraction to determine the area to the left of the vertical line.

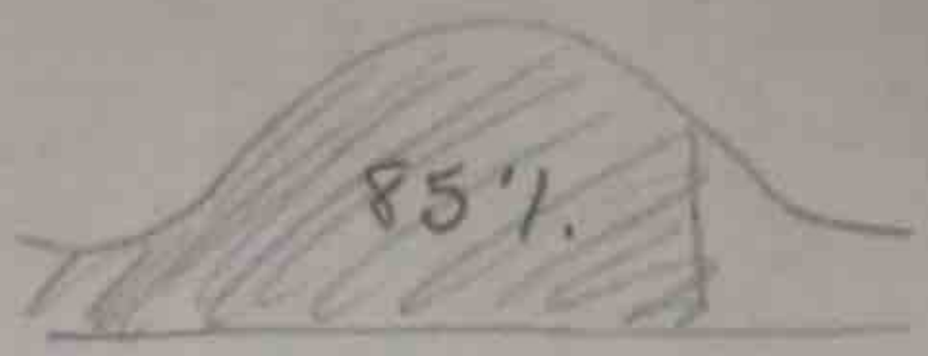
d) Label this bottom 80% under the curve as 0.80



invNorm $(0.8, 2.35, 0.15) = \boxed{2.45\text{ GPA}}$

Example 3: The SAT math test has a mean of 500 and a standard deviation of 100. What score would you need to be placed in the following percentages?

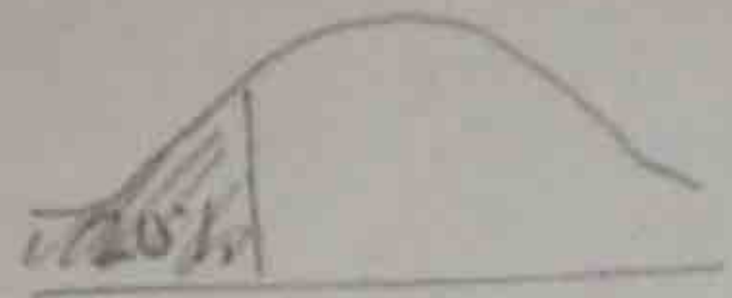
a) Top 15% = Bottom 85%



invNorm(.85, 500, 100)

$\boxed{\text{= Above 604}}$

b) Lower 20%



invNorm(.2, 500, 100) = $\boxed{\text{Below 416}}$

c) Top 25% = Bottom 75%

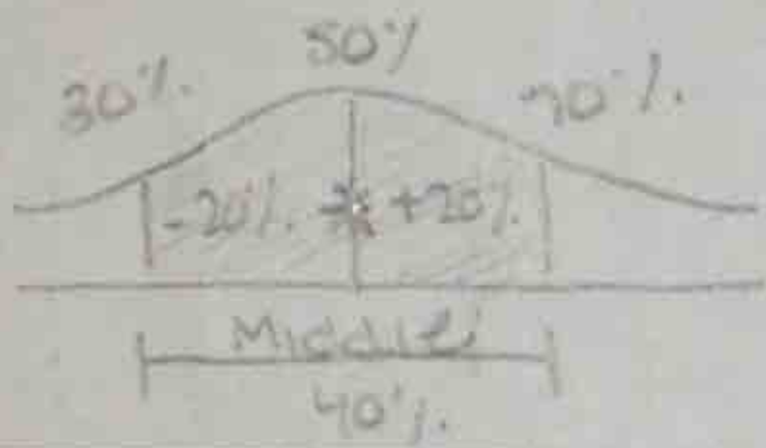
invNorm(.75, 500, 100)

$\boxed{\text{= Above 567}}$

d) Lower 10%

invNorm(.1, 500, 100) = $\boxed{\text{Below 372}}$

e) Middle 40%



invNorm(.3, 500, 100) = 447

invNorm(.7, 500, 100) = 552

$\boxed{\text{Between 447 and 552}}$

E C F I S 8 1 11 5 2 G R E A T ! 9 3 10 4 7 6	1. $z = \frac{59-50}{5} = 1.8$ C	5. -9^99 2.91  Normalcdf(-9^99, 2.91) 99.8% I
9. 2 G	2. $z = \frac{17-10}{1.3} = 5.38$ S	6. !  0.97 9^99 Normalcdf(.97, 9^99) = 16.6%
10. 2, 3, 5, 7, 11, 13 Sx = 4.4 E	3. $z = \frac{20-16}{3} = 1.33$ R	7.  2.53 3.09 0.47% T
11. 2, 4, 6, 8, 10, 12, 14, 16 Sx = 4.9 F	4. 99.7% A	8.  -9^99 -2.84 0.23% E