

# Normal Distributions

5, 10, 12, 12, 15, 16, 16, 18, 25, 30

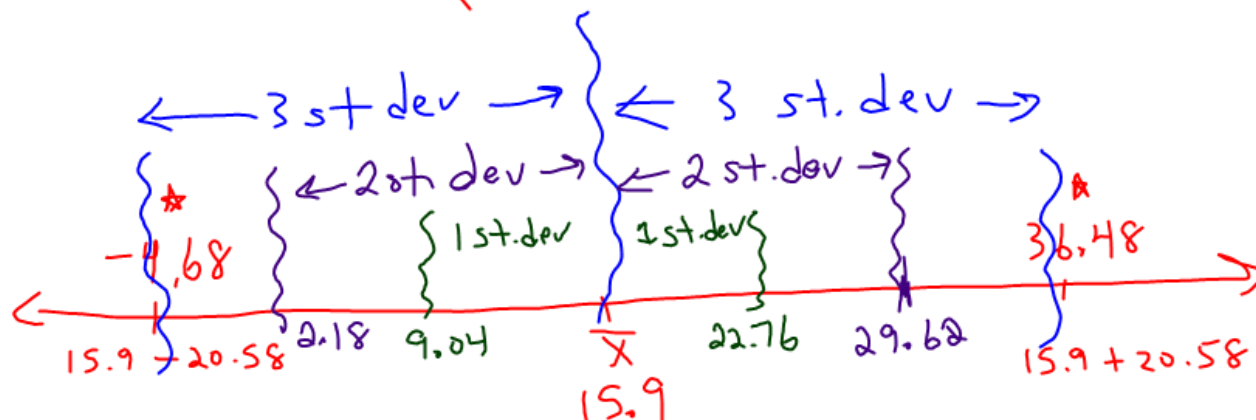
Find the mean and standard deviation of this data set:

$$\bar{X} = 15.9$$

$$\sigma = 6.86$$

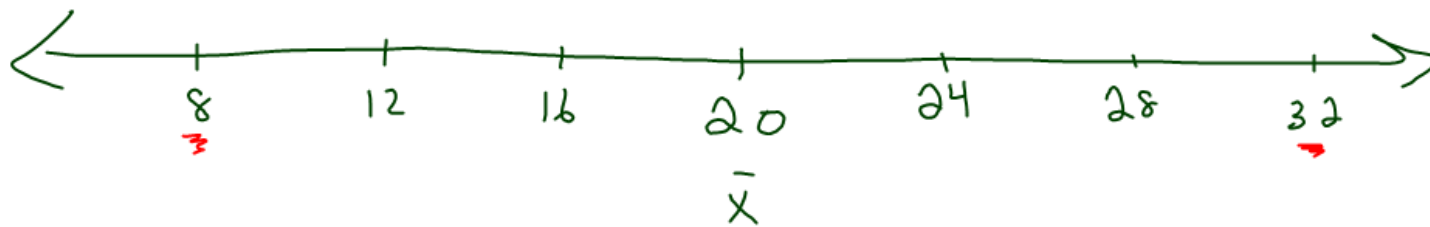
Are there any outliers in the data set? No outliers

$$\text{st. dev} \times 3 = (6.86)(3) = 20.58$$

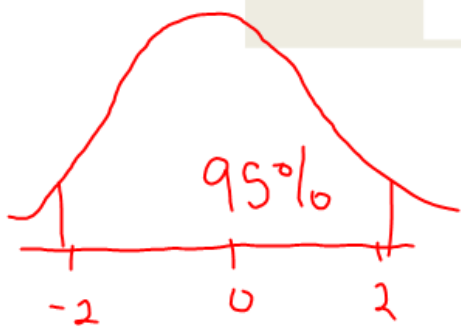
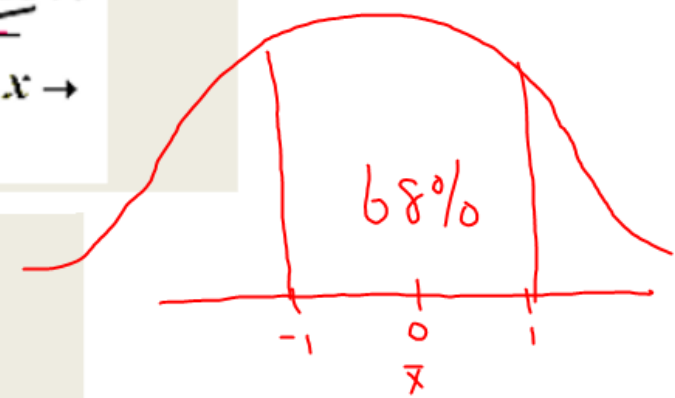
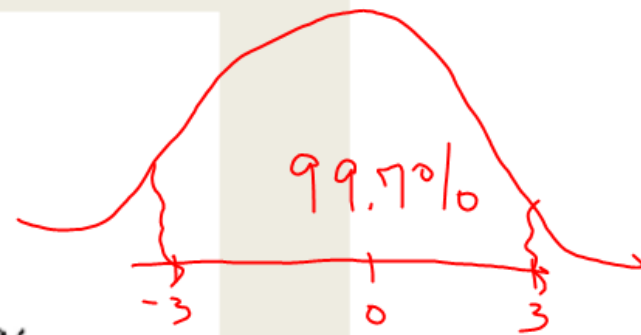
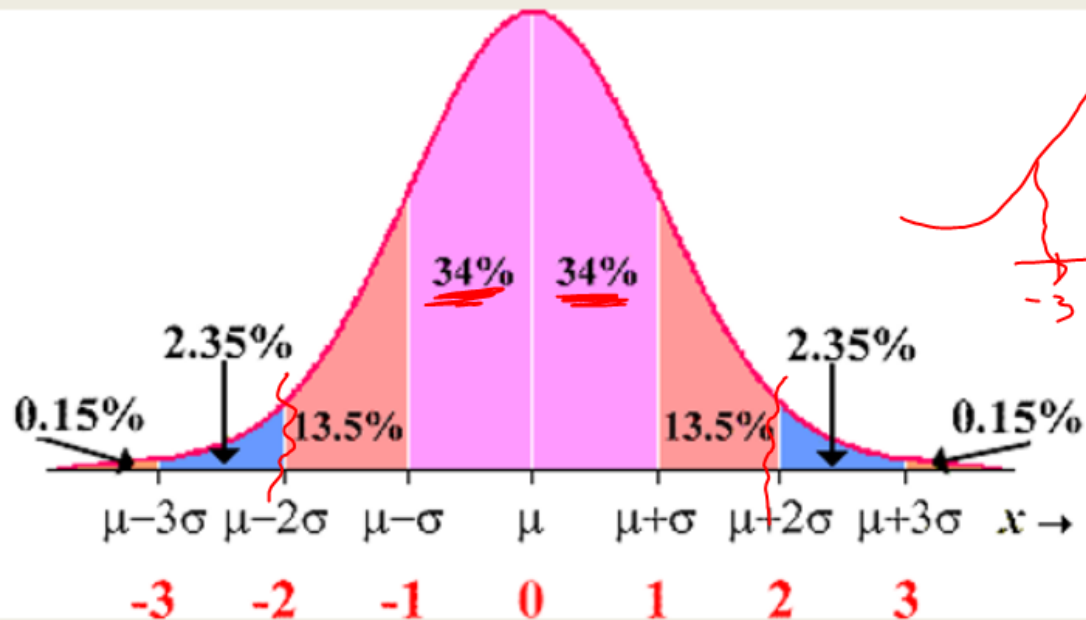


$$\bar{x} = 20$$

$$\sigma = 4$$



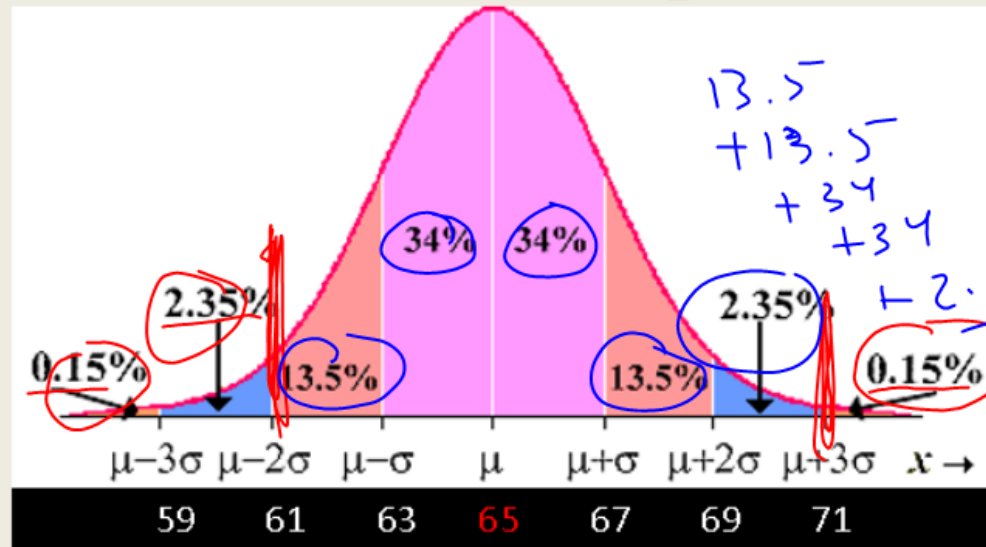
# The Normal Curve



## Normal Distribution:

- Modeled by a bell-shaped curve [normal curve]
- Symmetrical about the mean,  $\bar{x}$ .
- Each area determined by adding or subtracting the standard deviation,  $\sigma$ .
- Total area under the curve is 100%, or 1.

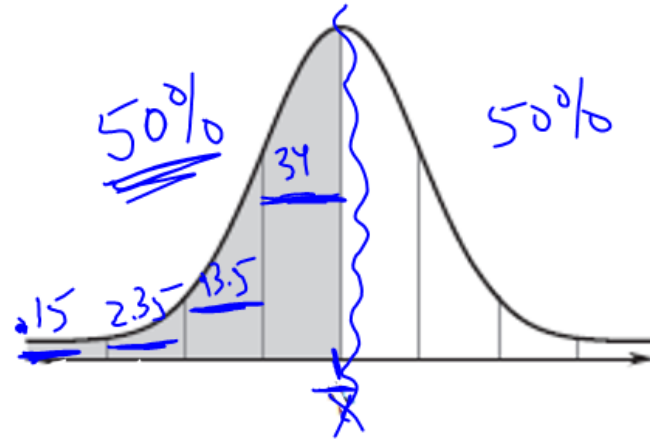
# The Normal Curve



**The mean is 65, and standard deviation is 2.  
Use this information to fill out the x-axis.**

$$\begin{array}{r}
 100 \\
 - 2.35 \\
 - .15 \\
 \hline
 97.35\%
 \end{array}$$

Ex. 1 Give the area under the normal curve represented by the shaded region.

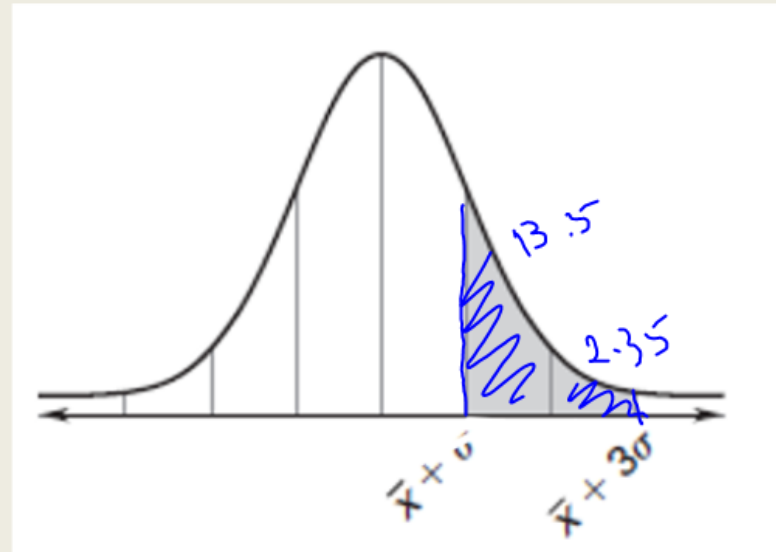


50%  
0.5  
.5

$$.15 + 2.35 + 13.5 + 34 = 50 \rightarrow .5$$



Ex. 2 Give the area under the normal curve represented by the shaded region.

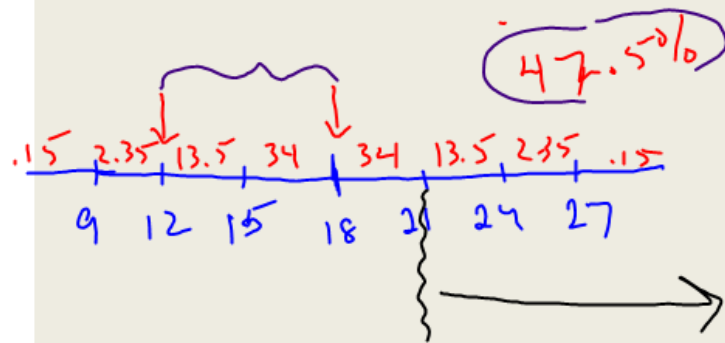


$$13.5 + 2.35 = 15.85 \rightarrow .1585$$

15.85

A normal distribution has a mean of 18 and a standard deviation of 3. Find the probability that a randomly selected x-value from the given distribution is in the interval.

a. Between 12 and 18



$$13.5 + 34 = 47.5 \rightarrow .475$$

b. At least 21

16%

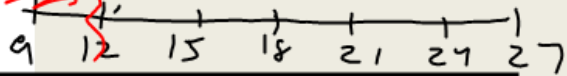
$$13.5 + 2.35 + .15 = 16 \rightarrow .16$$



**Ex. 3** A normal distribution has a mean of 18 and a standard deviation of 3. Find the probability that a randomly selected x-value from the given distribution is in the interval.

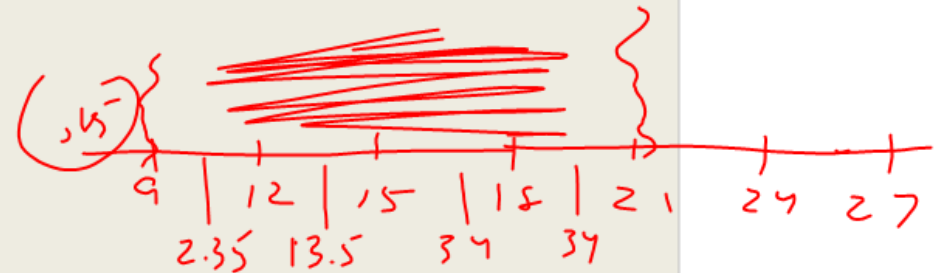
**YOU TRY!**

c. At most 12



$$.15 + 2.35 = 2.5 \rightarrow .025$$

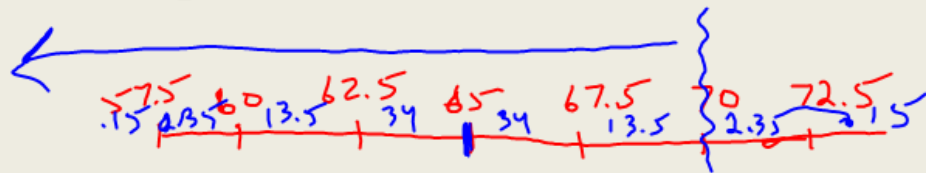
d. Between 9 and 21



$$2.35 + 13.5 + 34 + 34 = 83.85 \rightarrow .8385$$

4. The heights of 3000 women at a particular college are normally distributed with a mean of 65 inches and a standard deviation of 2.5 inches.

- a) About what percentage of college women have heights below 70 inches?



**97.5%**

- b) About how many of the college women have heights between 60 inches and 65 inches?

$$\% \text{ b/w } 60 - 65 : 47.5\%$$

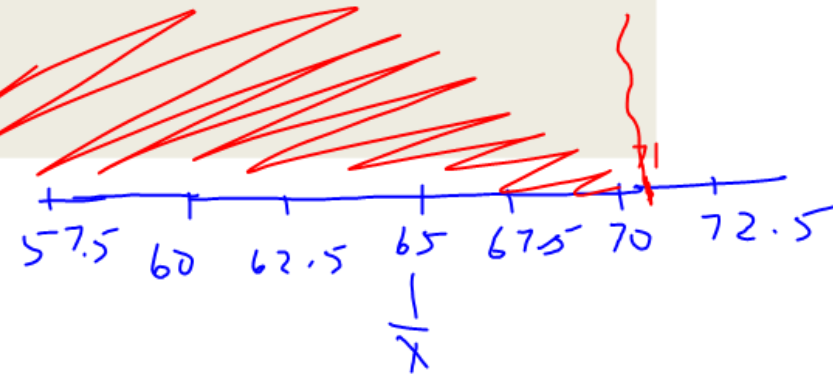
**1425 women**

$$\begin{array}{r} .475 \\ \times 3000 \\ \hline \end{array}$$

4. The heights of 3000 women at a particular college are normally distributed with a mean of 65 inches and a standard deviation of 2.5 inches.

- a) What is the probability that a woman in this college would have a height less than 71 inches?

**If it's not on the curve:**



99.18%

normalcdf

$$\mu = 65$$

$$\sigma = 2.5$$

L.B.

-1E99

U.B.

71

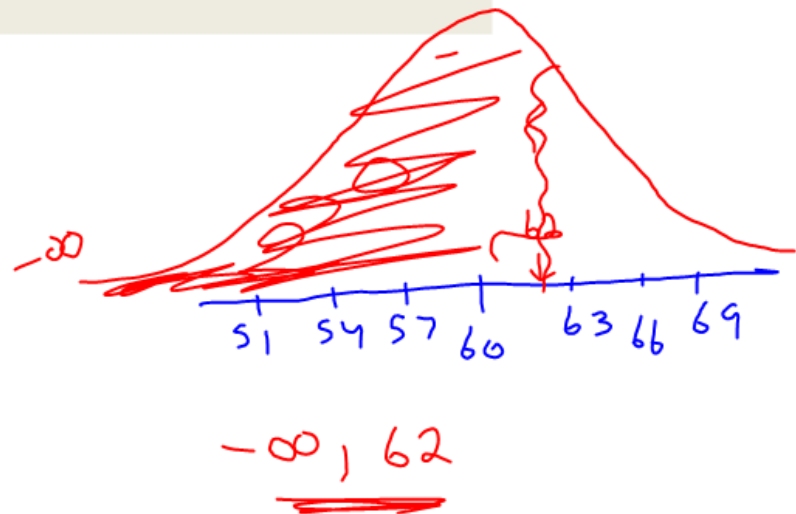
5. A particular leg bone for dinosaur fossils has a mean length of 5 feet with standard deviation of 3 inches. What is the probability that a leg bone is less than 62 inches?

$$\bar{X} = 5 \text{ feet} = \underline{60 \text{ inches}}$$

$$\sigma = \underline{3 \text{ in}}$$

less than 62 inches

74.75%



6. The weight of chocolate bars from a particular chocolate factory has a mean of 8 ounces with standard deviation of .1 ounce. What is the percent that a randomly selected bar is between 7.85 and 8.15 ounces?

$$\bar{x} = 8$$

$$\sigma = .1$$

$$L.B = 7.85$$

$$U.B = 8.15$$

Prob: 86.64%

**7. The grades on a statistics midterm exam were normally distributed with a mean of 72 and a standard deviation of 8.**

**a. What is the proportion of students received a B grade.**

**b. What is the probability that a randomly selected student received between a 65 and 85?**

**c. What is the percent of students that failed the exam?**