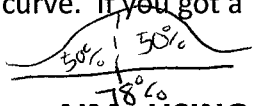


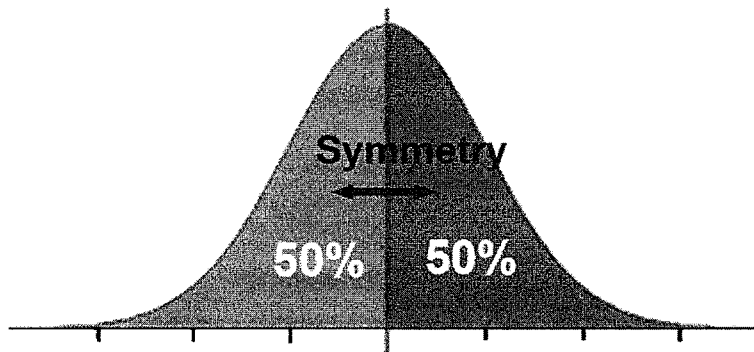
**LESSON #5: NORMAL DISTRIBUTION CALCULATIONS**

*Do Now:* The mean of the last set of test scores was a 78%. When graphed, the data was a normal curve. If you got a 78% on that test, what percent of the class did you do better than?



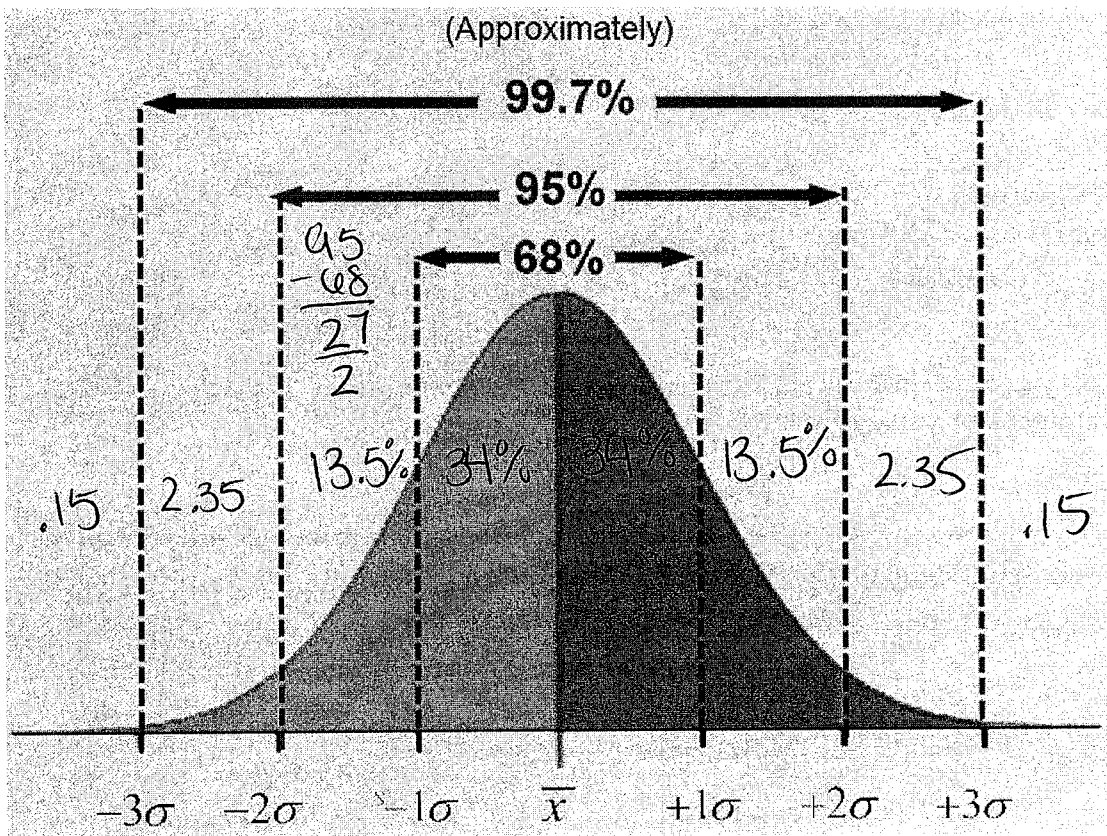
50%

**AIM: USING THE NORMAL CURVE AND THE CALCULATOR TO FIND PROBABILITIES**



The Normal Distribution has:

- Symmetry about the center
- 50% of values less than the mean and 50% greater than the mean



When we calculate the standard deviation, we find that (**approximately**):

- 68% of values are within 1 standard deviation of the mean
- 95% of values are within 2 standard deviations of the mean
- 99.7% of values are within 3 standard deviations of the mean

Using the Normal Curve to find probabilities. It is helpful to draw diagrams.

1. The scores on the last test were approximately normal with a mean of 80 and a standard deviation of 5. Find the percent of scores that were:

a) Above an 80.

50%

b) Between 75 and 85.

68%

c) Between 80 and 85.

34%

d) Between 80 and 90.

$$\frac{95}{2} = 47.5\%$$

e) Greater than 90.

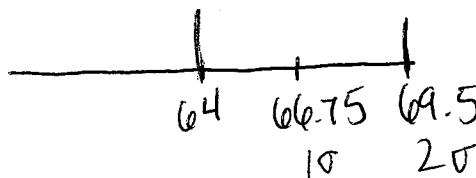
$$\frac{5}{2} = \cancel{2.5} 2.5\%$$

f) Less than 85 or greater than 90.

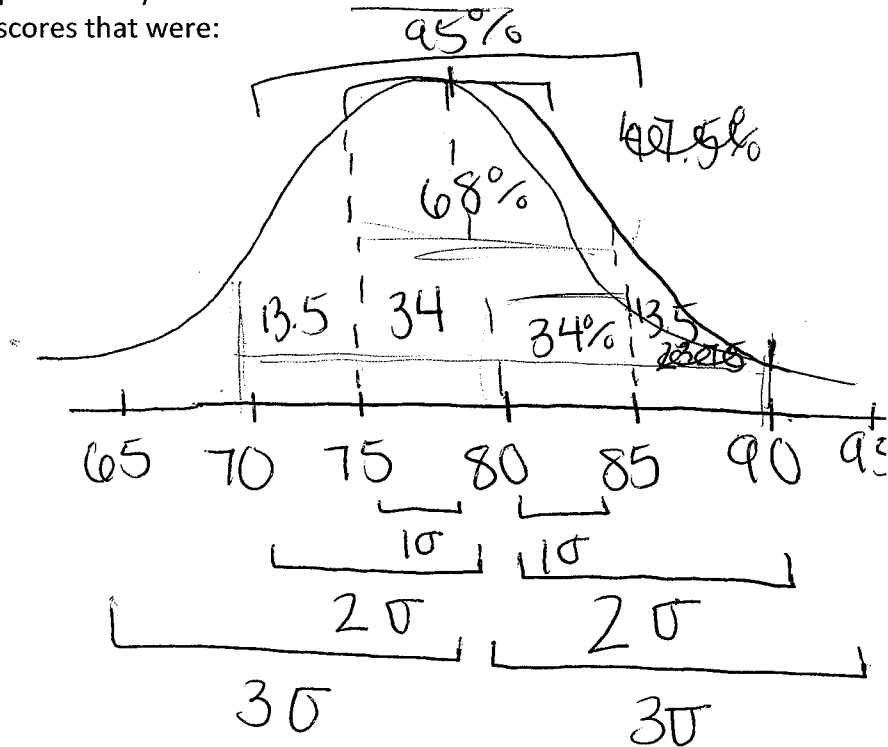
$$+ \frac{50}{84} + \frac{5}{2} = 180.5\%$$

2. The heights of the women in the United States are normally distributed with a mean of 64 inches and a standard deviation of 2.75 inches. The percent of women whose heights are between 64 and 69.5, to the nearest whole percent, is

- a. 6  
 b. 48  
 c. 68  
 d. 95



$$95 \div 2 = 47.5 \approx 48\%$$



3 The lifespan of a 60-watt lightbulb produced by a company is normally distributed with a mean of 1450 hours and a standard deviation of 8.5 hours. If a 60-watt lightbulb produced by this company is selected at random, what is the probability that its lifespan will be between 1440 and 1465 hours?

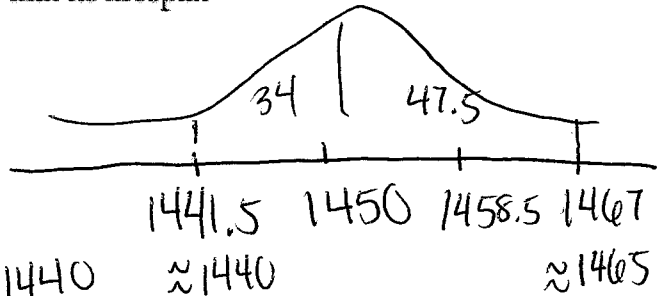
(1) 0.3803

(2) 0.4612

(3) 0.8415

(4) 0.9612

$$34 + 47.5 = 81.5$$



lower: 1440

upper: 1465

$\mu$ : 1450

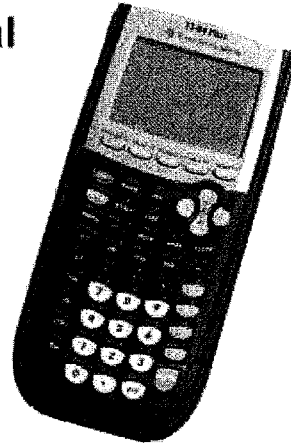
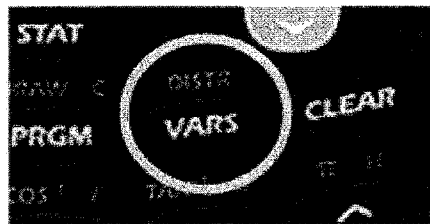
$\sigma$ : 8.5

What if we want the exact answer to # 3?

0.8415

## Using a Graphing Calculator to Find Normal Probabilities

**1** 2nd DISTR



**2** Choose 2: normalcdf(

DISTR DRAW  
 1: normalpdf(  
 → 2: normalcdf(  
 3: invNorm(  
 4: invT(  
 5: tPdf(  
 6: tcdf(  
 7: X<sup>2</sup>pdf(  
 8: X<sup>2</sup>cdf(  
 9: Fpdf(  
 )

**3** Type in the given info

normalcdf  
 lower: left bound  
 upper: right bound  
 $\mu$ : mean  
 $\sigma$ : standard deviation  
 Paste  
 (hit enter twice)

cdf = cumulative distribution function

We can now use the normalcdf function to find probabilities in the normal curve:

4. The mean stay of a car on a lot before being sold is 21 days, with a standard deviation of 3 days. The lengths of stay are normally distributed. What percent of the cars are sold after having been on the lot between 17 and 24 days?

(1) 23.56%

(2) 60.34%

(3) 75.01%

(4) 95.62%

lower:  
upper:  
 $\mu$ :  
 $\sigma$ :

5. The scores on a standardized college entrance examination are found to be normally distributed. The mean is 78 and the standard deviation is 13. What percent, to the nearest tenth scored between 52 and 78?

lower: 52  
upper: 78  
 $\mu = 78$   
 $\sigma = 13$

$$.4772 \times 100 = \boxed{47.7\%}$$

lower:  
upper:  
 $\mu$ :  
 $\sigma$ :

**PARTNER PRACTICE:**

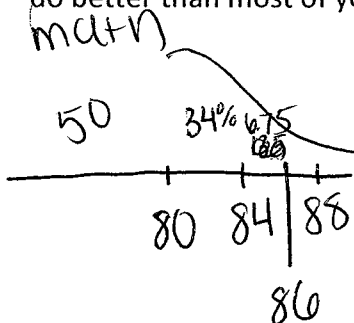
6. 270 students take Algebra 2. On the last test, the mean was an 83 and standard deviation was 3.78. Approximately how many students got between an 80 and a 90?

$$.7542 \times 270 = 203 \text{ students}$$

7. The G.P.A.'s of the senior class is normally distributed with a mean of 84 and a standard deviation of 6. What percent of the senior class has a G.P.A. between a 78 and a 90?

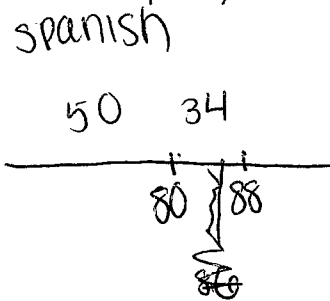
$$.6826 \times 100 = \boxed{68.3\%}$$

8. Suppose that you took a math test and a Spanish test. The mean for both tests was 80, the standard deviation of the math scores was 4, and the standard deviation of the Spanish scores was 8. You got an 86 in math and a 88 in Spanish. On which test did you do better than most of your classmates? Explain your answer.



$$50 + 40.75\% = \boxed{90.75\%}$$

2.5  $\uparrow$  mean



$$50 + 34\% \approx \boxed{84\%}$$

< 1  $\uparrow$  mean

9. The mileage of returned leased vehicles at a local dealership is normally distributed with a mean of 34,600 and a standard deviation of 3,200. What percent of the vehicles are returned with fewer than 30,000 miles?

(1) 5%

(2) 7.5%

(3) 84.9%

(4) 92.5%

lower = 0  
upper = 30,000  
 $\mu = 34,600$   
 $\sigma = 3200$

$$.0752 \times 100 = 7.5\%$$

\*10. The number of students at 189 randomly selected bus stops is normally distributed with a mean of 4.3 students and a standard deviation of 1.4 students. About how many of the bus stops will have more than 6 students?

(1) 61

(2) 48

(3) 22

(4) 2

$$.1123 \times 189 = 22$$

11. The runtime of a sample of 213 movies is normally distributed with  $\mu = 104.6$  minutes and  $\sigma = 8.2$  minutes. Find the probability that a randomly selected movie has a runtime of more than 120 minutes.

(1) 1.3%

(2) 2.5%

(3) 3.02%

(4) 5.0%

lower = 120  
upper =

$$.0302$$

\*12. The number of minutes per day spent in traffic by a sample of 388 drivers is normally distributed with a mean of 19.7 minutes and a standard deviation of 6.2 minutes. If we randomly selected a driver, would it be surprising if they spent less than 5 minutes per day in traffic?

.0081  
.8% yes! very low %

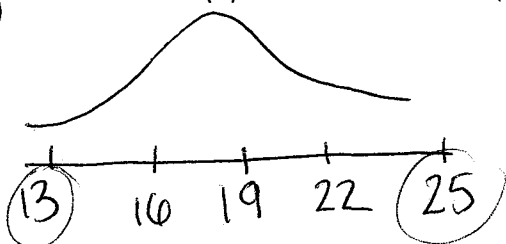
13. A normal distribution has a mean of 19 and a standard deviation of 3. Find the range of values that represent the middle 99% of the data.

(1)  $13 < X < 25$

(2)  $10 < X < 28$

(3)  $7 < X < 31$

(4)  $16 < X < 22$



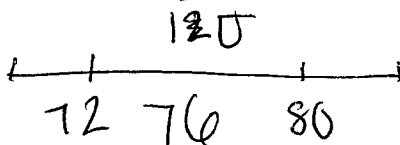
Name: Kelly  
CC ALGEBRA 2

Date: 5/18/18  
TROI CI

LESSON #5: EXIT TICKET

1. On a normally distributed standardized test, the mean is 76 and the standard deviation is 4. Between which two scores will approximately 68% of the data fall?

- (1) 72 and 80  
(2) 76 and 80  
(3) 74 and 78  
(4) 68 and 84



2. A recent study found that the mean amount spent by individuals on a music service website was normally distributed with a mean of \$384 with a standard deviation of \$48. Which of the following gives the proportion of the individuals that spend more than \$400?

- (1) 0.43  
(2) 0.74  
(3) 0.12  
(4) 0.37

3. The hold time experienced by people calling a government agency was found to be normally distributed with a mean of 12.4 minutes and a standard deviation of 4.3 minutes. Which percent represents the percent of calls answered in less than 5 minutes?

- (1) 4.3%  
(2) 5.3%  
(3) 6.8%  
(4) 12.9%

4. A company produced 5,000 lightbulbs last month. The lifespan of a 60-watt lightbulb produced by this company is normally distributed with a mean of 1450 hours and a standard deviation of 8.5 hours. Approximately how many lightbulbs will have a lifespan between 1440 and 1465 hours?

- (1) 1902  
(2) 2306  
(3) 4207  
(4) 4806

0.8414