6.2 Day 1:<u>**Applications of the Normal Distribution**</u>   Date: <u>**5/17**</u>

$$Z = \text{negative} \qquad Z = \text{positive}$$
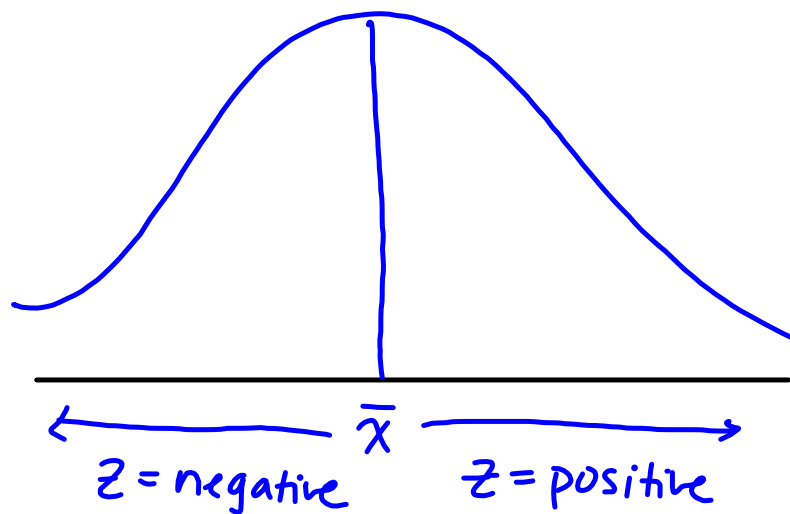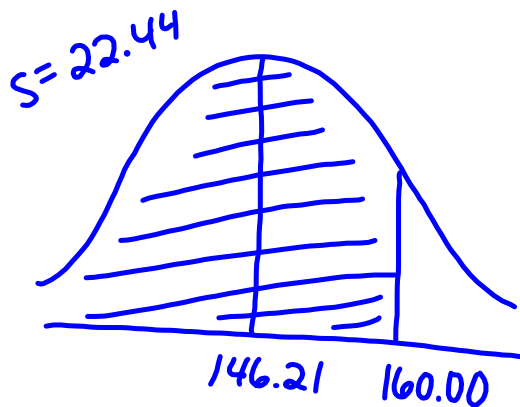
To transform the original value of the variable into standard units or z-values:

$$Z = \frac{X - \bar{X}}{S}$$

$$\begin{array}{cc} 20 & 30 \end{array}$$

$$Z = \frac{10}{5} = 2$$

$$S = 5$$

Ex 1). A survey found that women spend on average $146.21 on beauty products during the summer months. Assume the standard deviation is $22.44. Find the percentage of women who spend less than $160.00. Assume the variable is normally distributed.
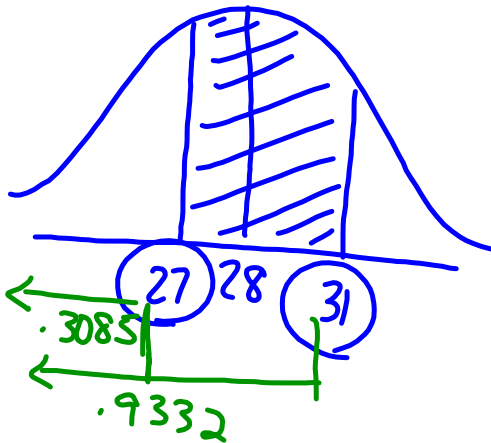
$s = 22.44$

$$z = \frac{160.00 - 146.21}{22.44} = 0.61$$

72.91%

146.21   160.00

Ex 2). Each month, an American household generates an average of 28 pounds of newspaper for garbage or recycling. Assume the standard deviation is 2 pounds. If a household is selected at random, find the probability of its generating:

$$\bar{x} = 28 \quad s = 2$$

a) Between 27 and 31 pounds per month
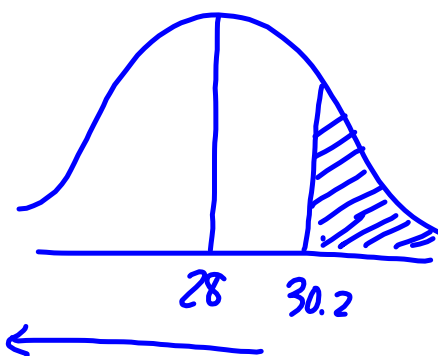
Convert: $z = \dfrac{31-28}{2} = 1.5$

$z = \dfrac{27-28}{2} = -0.5$

Look up: $z < 1.5 = 0.9332$

$z < -0.5 = 0.3085$

Subtract: $0.9332 - 0.3085 = \boxed{62.47\%}$

.3085

.9332

b) More than 30.2 pounds per month
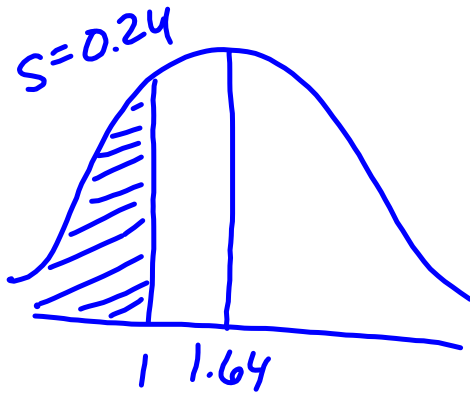
$z = \dfrac{30.2-28}{2} = 1.1$

$z < 1.1 = 0.8643$

$1 - 0.8643 = \boxed{13.57\%}$

28   30.2

Ex 3). Americans consume an average of 1.64 cups of coffee per day. Assume the variable is approximately normally distributed with a standard deviation of 0.24 cup. If 500 individuals are selected, approximately how many will drink less than 1 cup of coffee per day?
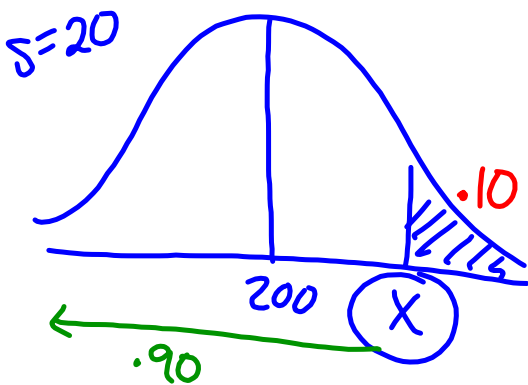
$s = 0.24$

$$z = \frac{1 - 1.64}{0.24} = -2.67$$

$$z < -2.67 = 0.0038$$

$$0.38\% \text{ drink} < 1 \text{ cup/day}$$

$$500(.0038) \approx \boxed{1.9 \text{ people}}$$

Find data values given specific probabilities:

Ex 4). To qualify for a police academy, candidates must score in the top 10% on a general abilities test. The test has a mean of 200 and a standard deviation of 20. Find the lowest possible score to qualify. Assume the test scores are normally distributed.
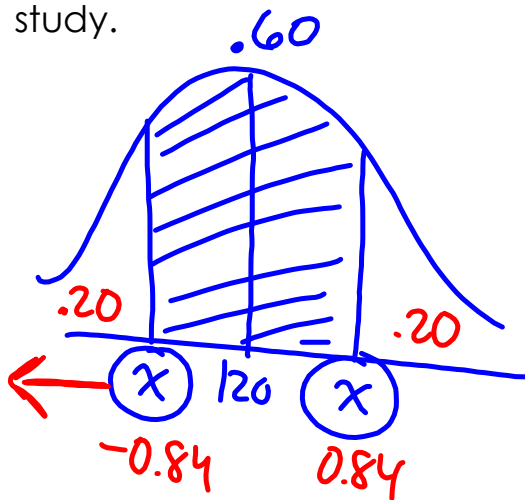
Look up closest area to 0.90

$$0.8997 = z = 1.28$$

$$z = \frac{x - \bar{x}}{S}$$

$$1.28 = \frac{x - 200}{20}$$

$$\boxed{x = 225.6 \text{ score minimum}}$$

Ex 5). For a medical study, a researcher wishes to select people in the middle 60% of the population based on blood pressure. If the mean systolic blood pressure is 120 and the standard deviation is 8, find the upper and lower readings that would qualify people to participate in the study.

Look up area of $0.20 = 0.2005$

$z = \pm 0.84$

$z = \dfrac{x - \bar{x}}{s}$

$-0.84 = \dfrac{x - 120}{8}$ $0.84 = \dfrac{x - 120}{8}$

$= 113.28$ $= 126.72$

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