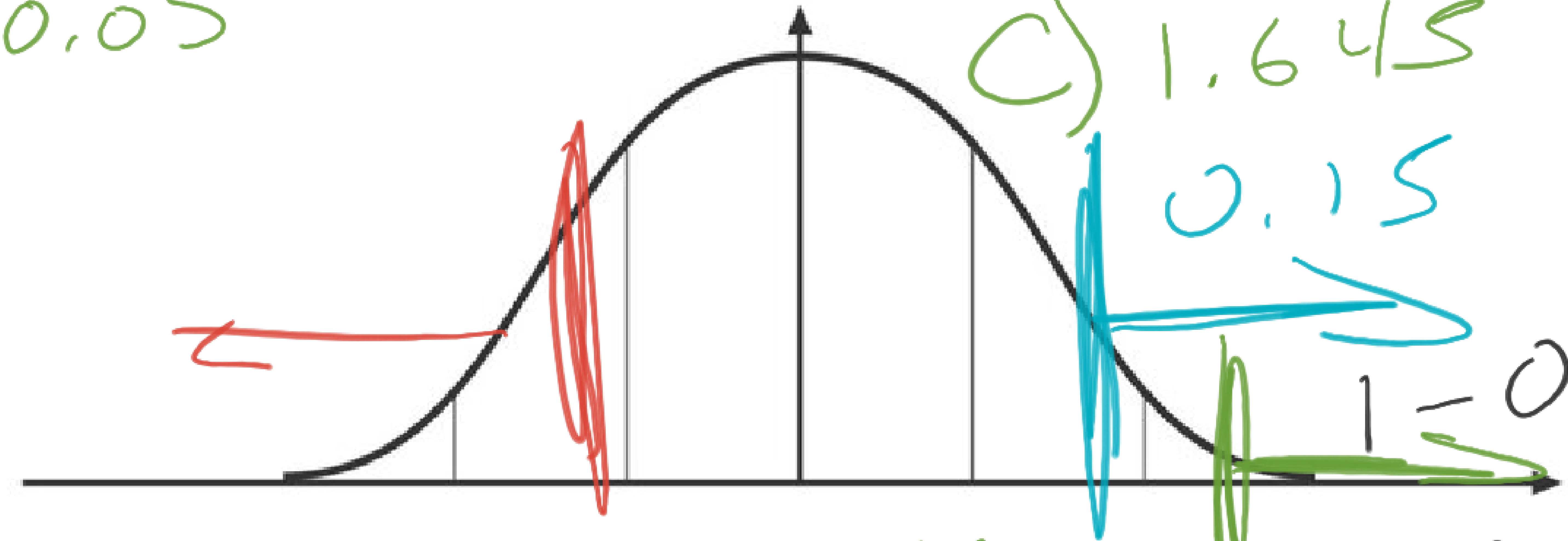
1. (10 points) For the standard normal curve, find the z-score(s)
   a. That have an area 0.250 to its left.
   b. That has area 0.15 to its right.
   c. $z_{0.05}$

a) $-0.67$

b) $1.04$

c) $1.645$

$z_{0.05}$



$0.15$

$1-0.15$

$0.85$

$0.05$

$1-0.05=.95$

(20 points) The GRE is a standardized test that students usually take before entering graduate school. According to the document *GRE Guide to the Use of Scores*, a publication of the ETS, the scores on the math position of the GRE have a mean 152 points and standard deviation 8.8 points. Assuming that these scores are normally distributed

a. Obtain and interpret the quartiles.
b. Find and interpret the 99th percentile.
c. Approximately 68% of the students who took the verbal portion of the GRE scored between ____________ and ____________.
d. Approximately 95% of the students who took the verbal portion of the GRE scored between ____________ and ____________.
e. Approximately 99.7% of the students who took the verbal portion of the GRE scored between ____________ and ____________.

25% 50% 75%

-0,67 0 0.67

$\mu = 152$ $\sigma = \boxed{8.8} \times 0,67$

a) 25% → 146.1 50% = 152 75% → 157.9

(20 points) The GRE is a standardized test that students usually take before entering graduate school. According to the document *GRE Guide to the Use of Scores*, a publication of the ETS, the scores on the math position of the GRE have a mean 152 points and standard deviation 8.8 points. Assuming that these scores are normally distributed

a. Obtain and interpret the quartiles.

b. Find and interpret the 99th percentile.

b) $99 \rightarrow z = 2.33$

c. Approximately 68% of the students who took the verbal portion of the GRE scored between _____________ and _____________.

d. Approximately 95% of the students who took the verbal portion of the GRE scored between _____________ and _____________.

e. Approximately 99.7% of the students who took the verbal portion of the GRE scored between _____________ and _____________.

b) $2.33(8.8) = 20.50 + 152 = \boxed{172.5}$

(20 points) The GRE is a standardized test that students usually take before entering graduate school. According to the document *GRE Guide to the Use of Scores*, a publication of the ETS, the scores on the math position of the GRE have a mean 152 points and standard deviation 8.8 points. Assuming that these scores are normally distributed

a. Obtain and interpret the quartiles.

b. Find and interpret the 99th percentile.

1 c. Approximately 68% of the students who took the verbal portion of the GRE scored between 143.2 and 160.8.

2 d. Approximately 95% of the students who took the verbal portion of the GRE scored between 134.4 and 169.6.

3 e. Approximately 99.7% of the students who took the verbal portion of the GRE scored between 125.6 and 178.4.

(15 points) Acute rotavirus diarrhea is the leading cause of death among children under the age of 5, killing an estimated 4.5 million annually in developing countries. Scientists from Finland and Belgium claim that a new oral vaccine is 90% effective against rotavirus diarrhea. Assuming that the claim is correct, use the normal approximation to the binomial distribution to find the probability that out of 1500 cases, the vaccine will be effective in:

a. Exactly 1325 cases
b. At least 1275 cases
c. Between 1050 and 1150 cases, inclusive.

$\mu = 1500(.90) = 1350$

$\sigma = \sqrt{1500(.9)(.1)} = 3.49$

**Step 1** Find $n$, the number of trials, and $p$, the success probability.

**Step 2** Continue only if both $np$ and $n(1-p)$ are 5 or greater.

**Step 3** Find $\mu$ and $\sigma$, using the formulas $\mu = np$ and $\sigma = \sqrt{np(1-p)}$.

**Step 4** Make the correction for continuity, and find the required area under the normal curve with parameters $\mu$ and $\sigma$.

(15 points) Acute rotavirus diarrhea is the leading cause of death among children under the age of 5, killing an estimated 4.5 million annually in developing countries. Scientists from Finland and Belgium claim that a new oral vaccine is 90% effective against rotavirus diarrhea. Assuming that the claim is correct, use the normal approximation to the binomial distribution to find the probability that out of 1500 cases, the vaccine will be effective in:

a. Exactly 1325 cases
b. At least [redacted] 1360
c. Between 1050 and 1150 cases, inclusive.

$$\mu = 1500(.90) = 1350$$

$$\sigma = \sqrt{1500(.9)(.1)} = 3.49$$

a) $1324.5 \leftrightarrow 1325.5$

$$z = \frac{x-\mu}{\sigma} = \frac{1324.5 - 1350}{3.49} = -7.30 \qquad 0$$

$$-7.29 \qquad 0$$

b) $1359.5 \rightarrow$

$$z = \frac{1359.5 - 1350}{3.49} = 2.72 \qquad 1 - .9967 = \boxed{.0036}$$

(15 points) Acute rotavirus diarrhea is the leading cause of death among children under the age of 5, killing an estimated 4.5 million annually in developing countries. Scientists from Finland and Belgium claim that a new oral vaccine is 90% effective against rotavirus diarrhea. Assuming that the claim is correct, use the normal approximation to the binomial distribution to find the probability that out of 1500 cases, the vaccine will be effective in:

a. Exactly ~~[illegible] cases~~ 1347
b. At least 1275 cases
~~c. Between 1050 and 1150 cases, inclusive.~~

$\mu = 1500(.90) = 1350$

$\sigma = \sqrt{1500(.9)(.1)} = 3.49$

a) $1346.5 \rightarrow z = \dfrac{1346.5 - 1350}{3.49} = -1.00$ $(.1587)$

$1347.5 \rightarrow z = \dfrac{1347.5 - 1350}{3.49} = -0.72$ $(.2358)$

$.2358 - .1587 = 0.0771 \approx \boxed{7.71\%}$

(15 points) The foraging behavior of the western pygmy-possum was investigated. The weights of adult male pygmy-possums in Australia are normally distributed with a mean of 8.3g and a standard deviation of 0.4g.

a. Find the standard deviation of a sample size of 16.
b. Find the percentage of samples of 16 pygmy-possums that have mean weights within 0.125 g of the population mean weight of 8.5g.
c. Find the percentage of samples of 25 pygmy-possums that have mean weights within 0.125 g of the population mean weight of 8.5g.

a) $\sigma_{\bar{x}} = \frac{0.4}{\sqrt{16}} = 0.1$

b) $\frac{0.125}{0.1} = \pm 1.25$

$.1056 \longleftrightarrow .8944$

$0.7888 = \boxed{78.88\%}$

(15 points) The foraging behavior of the western pygmy-possum was investigated. The weights of adult male pygmy-possums in Australia are normally distributed with a mean of 8.3g and a standard deviation of 0.4g.

a. Find the standard deviation of a sample size of 16.
b. Find the percentage of samples of 16 pygmy-possums that have mean weights within 0.125 g of the population mean weight of 8.5g.
c. Find the percentage of samples of 25 pygmy-possums that have mean weights within 0.125 g of the population mean weight of 8.5g.

$$\sigma_{\bar{x}} = \frac{0.4}{\sqrt{25}} = 0.08$$

c) $$\frac{0.125}{0.08} = 1.56$$

$.0594 \longleftrightarrow .9406$

$$\boxed{88.12\%}$$

(10 points) A roof manufacturer claims that his material will last an average of 25 years. Assuming that a roofs life is normally distributed and has a standard deviation of 3 years answer the following questions

a. Suppose you put a roof on one house and it lasts 23 years. Would you consider that evidence against the manufacturers claim?

b. Suppose you put a roof on 100 houses and it lasts an average of 24 years for the 100 houses. Would you consider that evidence against the manufacturers claim?

$$z = \frac{23-25}{3} = \frac{-2}{3} = -0.67 \qquad 25.14\%$$

$$\sigma_{\bar{x}} = \frac{3}{\sqrt{100}} = .3$$

$$z = \frac{24-25}{.3} = -3.33$$

(20 points) A brand of water-softener salt comes in packages marked "net weight 40 lb." The company that packages the salt claims that the bags contain an average of 40 lb of salt and that the standard deviation of the weights is 1.5 lb.

a. Obtain the probability that the weight of one randomly selected bag of water-softener salt will be 41 lb or less, if the company's claim is true.

b. Determine the probability that the mean weight of 10 randomly selected bags of water-softener salt will be 41 lb or less, if the company's claim is true.

c. If you bought one bag of water-softener salt and it weighed 41 lb, would you consider this evidence that the company's claim is incorrect? Explain your answer.

d. If you bought 10 bags of water-softener salt and their mean weight was 41 lb, would you consider this evidence that the company's claim is incorrect? Explain your answer.

Assume that the weights are normally distributed.

a) $\frac{41-40}{1.5} = 0.67 \longrightarrow 0.7486$ 74.86%

(20 points) A brand of water-softener salt comes in packages marked "net weight 40 lb." The company that packages the salt claims that the bags contain an average of 40 lb of salt and that the standard deviation of the weights is 1.5 lb.

a. Obtain the probability that the weight of one randomly selected bag of water-softener salt will be 41 lb or less, if the company's claim is true.
b. Determine the probability that the mean weight of 10 randomly selected bags of water-softener salt will be 41 lb or less, if the company's claim is true.
c. If you bought one bag of water-softener salt and it weighed 41 lb, would you consider this evidence that the company's claim is incorrect? Explain your answer.
d. If you bought 10 bags of water-softener salt and their mean weight was 41 lb, would you consider this evidence that the company's claim is incorrect? Explain your answer.

Assume that the weights are normally distributed.

$$\sigma_{\bar{x}} = \frac{1.5}{\sqrt{10}} = 0.47$$

$$z = \frac{41-40}{0.47} = 2.13$$

98.34%

(10 points) In the 1950s the mean height of women in their 20s was 62.6 inches. Assume that the heights of today's women in their 20's are approximately normally distributed with a standard deviation of 2.88 inches. If the mean height today is the same as that of the 1950s what percentage of all samples of 50 of today's women in their 20s have a mean height of at least 64.24 inches?

$\mu = 62.6$

$\sigma = 2.88$

$\sigma_{\bar{x}} = \frac{2.88}{\sqrt{50}} = 0.41$

$z = \frac{64.24 - 62.6}{0.41} = 4$

$\boxed{\text{none}}$