A production manager at a wall clock company wants to test their new wall clocks. The designer claims they have a mean life of 16 years with a variance of 25.

If the claim is true, in a sample of 46 wall clocks, what is the probability that the mean clock life would be greater than 17.4 years? Round your answer to four decimal places.

$$z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}}$$

$\mu = 16$

$\sigma^2 = 25 \quad \sigma = 5$

$n = 46 \quad \bar{x} = 17.4$

$$z = \frac{17.4 - 16}{\frac{5}{\sqrt{46}}}$$

$z = 1.90 \rightarrow .9713$

$\overline{}$

.0287

A scientist claims that $7\ \%$ of viruses are airborne.

If the scientist is accurate, what is the probability that the proportion of airborne viruses in a sample of 685 viruses would be greater than $8\ \%$? Round your answer to four decimal places.

$p = .07 \qquad \bar{x} = .08 \qquad n = 685$

$\sigma = \sqrt{p(1-p)} = .25515$

$\sqrt{.07(.93)}$

$z = \dfrac{.08 - .07}{.25515/\sqrt{685}} = 1.03 \rightarrow .8485$

$\overline{}$

.1515

Suppose a sample of 500 is used to estimate the fraction of voters that favor a particular candidate. If the population proportion that favors the candidate is really 0.4, what is the probability that the error of estimation will be less than 0.05?

P

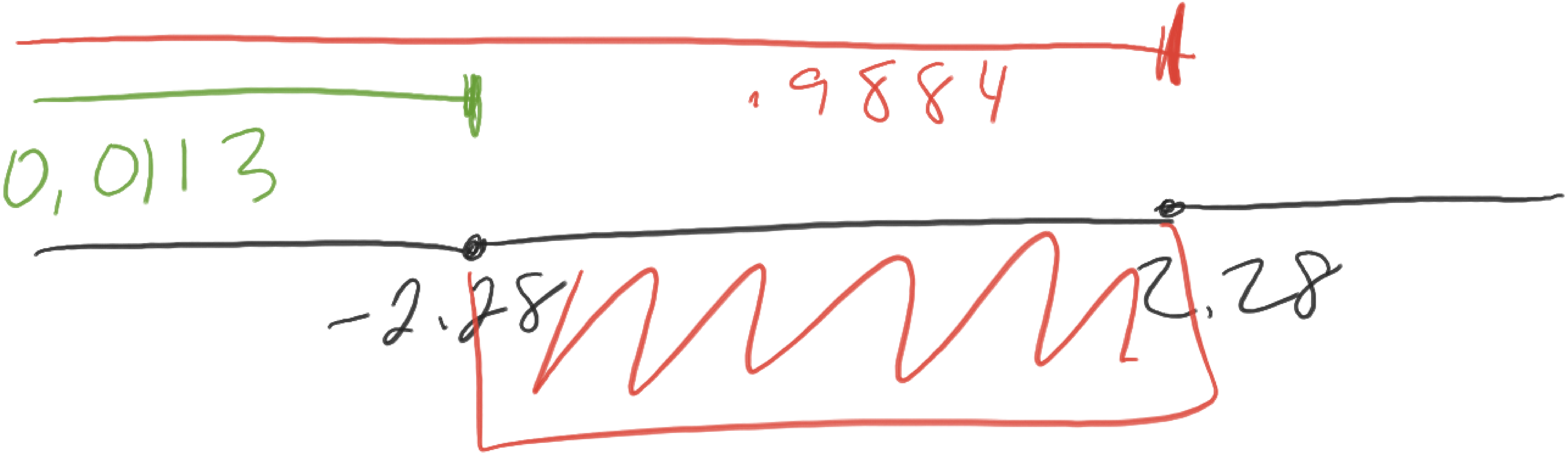
(-2.28) (2.28)

0.113 $\quad 0.35 \leftarrow 0.40 \rightarrow 0.45 \quad 0.113$

%

$$z = \frac{0.45 - 0.40}{\sqrt{\frac{0.4(0.6)}{500}}} = 2.28 \rightarrow .0113$$

.9774


.9884
0,0113
-2,28
2,28

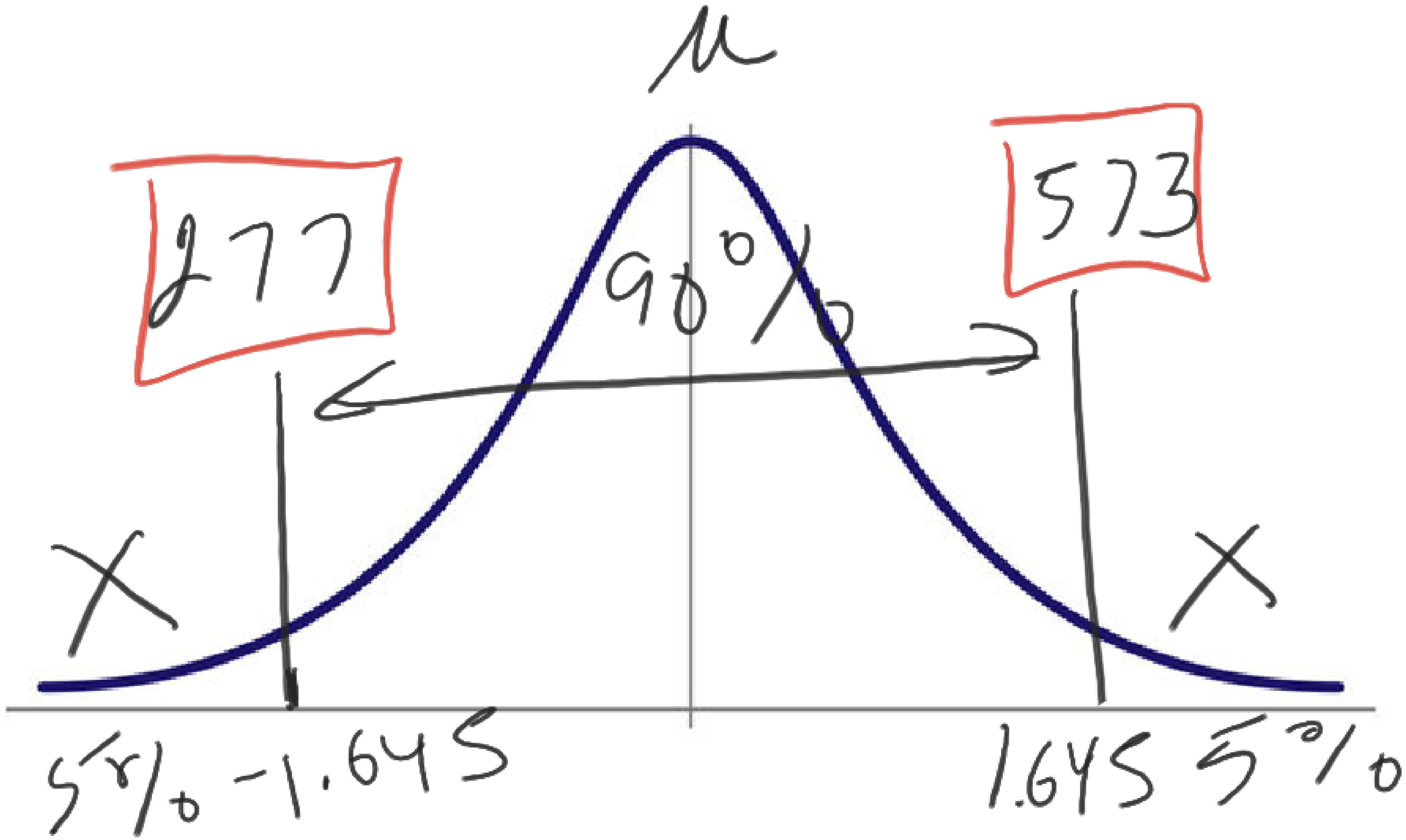
10.1 Point Estimation of the Population Mean

Table 10.1.1 - Point Estimators	
Point Estimator	Parameter Being Estimated
$\bar{x}$	μ
$\hat{p}$	p
s	σ

10.2 Interval Estimation of the Population Mean

A random sample of 100 car engines has a mean weight of 425 pounds. Construct [redacted]%, 90%, 95%, and [redacted]% confidence intervals for the population mean if the standard deviation of the population is 900.

$$425 \pm 1.645\left(\frac{900}{\sqrt{100}}\right)$$



80% Confidence Interval

$$425 \pm 1.28 \cdot \frac{900}{\sqrt{100}} \text{ or } 309.8 \text{ to } 540.2$$

90% Confidence Interval

$$425 \pm 1.645 \cdot \frac{900}{\sqrt{100}} \text{ or } 276.95 \text{ to } 573.05$$

95% Confidence Interval

$$425 \pm 1.96 \cdot \frac{900}{\sqrt{100}} \text{ or } 248.6 \text{ to } 601.4$$

99% Confidence Interval

$$425 \pm 2.575 \cdot \frac{900}{\sqrt{100}} \text{ or } 193.25 \text{ to } 656.75$$

$100(1-\alpha)\%$ Confidence Interval for the Population Mean, σ Known

If σ is known and the sample is drawn from a normal population or $n > 30$, a **$100(1-\alpha)\%$ confidence interval for the population mean** is given by

$$\bar{x} \pm z_{\alpha/2}\frac{\sigma}{\sqrt{n}}.$$

FORMULA

Table 10.2.1 - Critical Values of z	
Confidence $(1-\alpha)$	$z_{\alpha/2}$
0.80	1.28
0.90	1.645
0.95	1.96
0.99	2.575

A paint manufacturer is developing a new type of paint. Thirty panels were exposed to various corrosive conditions to measure the protective ability of the paint. The mean life for the samples was 168 hours before corrosive failure. The life of paint samples is assumed to be normally distributed with a population standard deviation of 30 hours. Find the 95% confidence interval for the mean life of the paint.

$\bar{x} = 168$ $\sigma = 30$ $n = 30$ $CI = 95\%$

$$168 \pm 1.96\left(\frac{30}{\sqrt{30}}\right) \to 157.3$$

$$\to 178.7$$

Suppose a sample of 410 randomly selected radio listeners revealed that 48 listened to WXQI. Find a 95% confidence interval for the proportion of radio listeners that listen to WXQI.

$n = 410$

$C.I. = 95\%$

$P = \frac{48}{410} = .117$

$z = 1.96$

$$.117 \pm 1.96\left(\sqrt{\frac{(.117)(.883)}{410}}\right)$$

$= 0.08588731975$

$= 0.1481126802$

A hospital would like to determine the mean length of stay for its patients having abdominal surgery. A sample of 15 patients revealed a sample mean of 6.4 days and a sample standard deviation of 1.4 days.

a. Find a 95% confidence interval for the mean length of stay for patients with abdominal surgery.

b. Interpret this interval and state any assumptions that were made in the construction of the interval.

$\bar{x} = 6.4$ $s = 1.4$ $n = 15$ $CI = 95\%$

$$6.4 \pm 1.96\left(\frac{1.4}{\sqrt{15}}\right) =$$

$$6.4 - 1.96\left(\frac{1.4}{\sqrt{15}}\right) = 5.691502247$$

$$6.4 + 1.96\left(\frac{1.4}{\sqrt{15}}\right) = 7.108497753$$