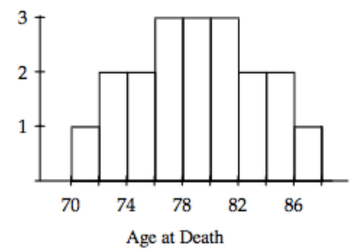
CW #6.23C

**1a)** $H_0 : \mu = 77$ *years*. The mean life expectancy of the company's patients is 77 years.

$H_A : \mu > 77$ *years*. The mean life expectancy of the company's patients is greater than 77 years.




* Randomization condition: The records from the insurance company were randomly sampled.

* 10% Condition: 20 records represent less than 10% of the company's records.

* Nearly Normal condition: The histogram of the ages at death is unimodal and reasonably symmetric. This is close enough to Normal for our purposes.

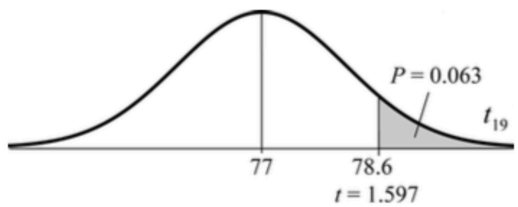
Under these conditions, the sampling distribution of the mean can be modeled by Student's $t$ with $df = n - 1 = 20 - 1 = 19$. We will use a one-sample $t$-test for the mean.

We know: $n = 20$, $\bar{y} = 78.6$ years, and $s = 4.48$ years.

$$SE(\bar{y}) = \frac{s}{\sqrt{n}} = \frac{4.48}{\sqrt{20}} = 1.002 \text{ years.}$$

$$t = \frac{\bar{y} - \mu_0}{SE(\bar{y})} = \frac{78.6 - 77}{1.002} = 1.597.$$

$$P = P(t_{19} > 1.597) = 0.063$$




The $P$– value of 0.063 is fairly high, so we fail to reject the null hypothesis. The insurance company shouldn't need to increase their premiums because there is little evidence to indicate that people who buy their policies are living longer than before.

b.

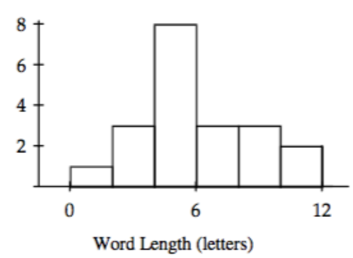
$$ME = z^* \times SE(\bar{y})$$

$$1 = 1.96 \times \frac{4.48}{\sqrt{n}}$$

$$n = 77.1 \approx 78$$

**2a)** $H_0 : \mu = 6.5$. The mean word length in the book is 6.5 words.

$H_A : \mu \neq 6.5$. The mean word length in the book is not 6.5 words.




* Randomization Condition: We have a random sample of the words in the book.

* 10% Condition: The words are less than 10% of all words in the book.

* Nearly Normal Condition: A histogram of the observed word lengths looks roughly unimodal and symmetric, so the population of all word lengths may be approximately Normal.

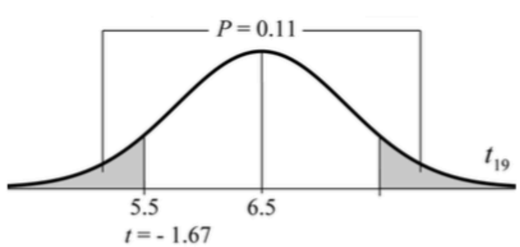
Since the conditions are satisfied, we will to use a two-tail, one-sample $t$-test.

$n = 20$ $\quad \bar{y} = 5.5$

$s = 2.685$ $\quad df = 19$

$$t = \frac{5.5 - 6.5}{2.865 / \sqrt{20}} = -1.67$$

$$P = 2 \cdot P(t_{19} < -1.67) = 0.11$$




Because the $P$-value is so high we do not reject the null hypothesis. This sample does not provide evidence that the average word length differs from the goal of 6.5 letters.

2b)

$$ME = z^* \times SE(\bar{y})$$

$$0.5 = 2.326 \times \frac{2.685}{\sqrt{n}}$$

$$n = 156.02 \approx 157$$

3.

We want to calculate a 90% confidence interval to estimate the true mean phosphate level of the patient. We will use $\bar{x}$ to estimate $\mu$.

Conditions:

① Normal - we are told that phosphate levels vary normally

② SRS - Assume 6 consecutive visits are representative of all clinic visits - proceed w/caution

③ Independent - we are looking at one patients changes over time

We will calculate a t-interval where $df = 5$, $t^* = 2.015$

$$\bar{x} \pm t^* \frac{s}{\sqrt{n}} = 5.367 \pm 2.015\left(\frac{.2716}{\sqrt{6}}\right)$$

$(4.8193, 5.914)$

4.

a) make sure you check the conditions.

$(1.5981, 1.9019)$

b) No, we would not reject $H_0 = 1.6$ because it is contained in the interval.