AP Stats
Chap 22
Practice Quiz

Insurance companies track life expectancy information to assist in determining the cost of life insurance policies. The insurance company knows that, last year, the life expectancy of its policyholders was 77 years. They want to know if their clients this year have a longer life expectancy, on average, so the company randomly samples some of the recently paid policies to see if the mean life expectancy of policyholders has increased. The insurance company will only change their premium structure if there is evidence that people who buy their policies are living longer than before.

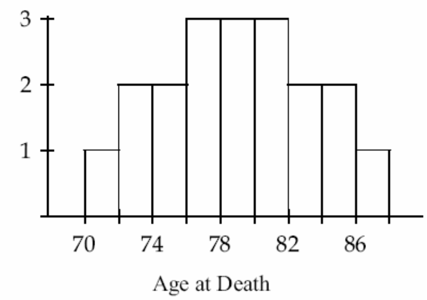
86	75	83	84	81	77	78	79	79	81
76	85	70	76	79	81	73	74	72	83

1. Does this sample indicate that the insurance company should change its premiums because life expectancy has increased? Test an appropriate hypothesis and state your conclusion.

2. For more accurate cost determination, the insurance companies want to estimate the life expectancy to within one year with 95% confidence. How many randomly selected records would they need to have?

AP Statistics Quiz B – Chapter 23 – Key

1. $H_0 : \mu = 77\ years$, $H_A : \mu > 77\ years$



   * Randomization condition: The records from the insurance company were randomly sampled.
   * 10% Condition: 20 records represent less than 10% of the companies 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. $SE(\bar{y}) = \frac{s}{\sqrt{n}} = \frac{4.48}{\sqrt{20}} = 1.002$ 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.

2. We wish to find the sample size, n, that would allow a 95% confidence level for the mean life expectancy of a policy holder from the insurance company to have a margin of error of only one year.

First estimate:	Although not necessary, since 78 is quite large, we could find a better estimate using $t_{75}^* = 1.992$, from Table T.
$ME = z^* \times SE(\bar{y})$	$ME = t_{75}^* \times SE(\bar{y})$
$1 = 1.96 \times \frac{4.48}{\sqrt{n}}$	$1 = 1.992 \times \frac{4.48}{\sqrt{n}}$
$n = 77.1 \approx 78$	$n = 79.6 \approx 80$