$(1, 63, 71, 86, 98)$, $\overline{x} = 66.0$.

1. (12 pts) $(0, 8, 10, 12, 12)$, $\overline{x} = 8.6$.

   This is a one-sample test of a proportion. Let $p$ be the obesity rate for all U.S. four-year-olds. The seven steps are

   (1) $H_0 : p = 0.17$.
   $H_1 : p > 0.17$.

   (2) $\alpha = 0.05$.

   (3) $z = \dfrac{\hat{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}}$.

   (4) We have $p_0 = 0.17$, $\hat{p} = 0.184$, and $n = 8550$. So

   $$\begin{aligned} z &= \frac{0.184 - 0.17}{\sqrt{\frac{(0.17)(0.83)}{8550}}} \\ &= \frac{0.014}{0.00406} = 3.446. \end{aligned}$$

   (5) $p$-value = `normalcdf(3.446,E99)` $= 2.845 \times 10^{-4}$.

   (6) Reject $H_0$.

   (7) More than 17% of U.S. four-year-olds are obese.

   For steps 4 and 5, you can use the TI-83 function `1-PropZTest`. Enter `0.17` for $\texttt{p}_0$, 18.4% of 8550, rounded off to `1573`, for `x`, and `8550` for `n`. Choose $\texttt{>p}_0$ and then calculate. The calculator reports that $z = 3.440$ and that the $p$-value is $2.904 \times 10^{-4}$.

2. (8 pts) $(0, 4, 6, 8, 8, 8)$, $\overline{x} = 5.0$.

   The formula is $\hat{p} \pm 1.960\sqrt{\dfrac{\hat{p}(1-\hat{p})}{n}}$, so compute the confidence interval to be $0.17 \pm 1.960(0.00419) = 0.17 \pm 0.00821$. You can use the TI-83 function `1-PropZInt` and get the interval `(.17576,.19219)`.

3. (12 pts) $(0, 2, 9, 10, 12)$, $\overline{x} = 7.1$.

   Let $p_1$ be the obesity rate for white four-year-olds and let $p_2$ be the obesity rate for black four-year-olds. The seven steps are

   (1) $H_0 : p_1 = p_2$.
   $H_1 : p_1 < p_2$.

   (2) $\alpha = 0.05$.

(3) The test statistic is $z = \dfrac{\hat{p}_1 - \hat{p}_2}{\sqrt{\hat{p}(1-\hat{p})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$.

(4) We have $p_1 = 0.159$, $p_2 = 0.208$, $n_1 = 6420$, and $n_2 = 1050$. To get the pooled estimate $\hat{p}$, we need 15.9% of 6420 = 1021 and 20.8% of 1050 = 218. The pooled estimate is $\frac{1021+218}{6420+1050} = \frac{1239}{7470} = 0.1659$. Then the value of the test statistic is

$$\begin{aligned} z &= \frac{0.159 - 0.208}{\sqrt{(0.1659)(0.8341)\left(\frac{1}{6420} + \frac{1}{1050}\right)}} \\ &= -\frac{0.049}{0.01238} \\ &= -3.957. \end{aligned}$$

(5) $p$-value = `normalcdf(-E99,-3.957)` $= 3.797 \times 10^{-5}$.

(6) Reject $H_0$.

(7) The obesity rate for white four-year-olds is less than it is for black four-year-olds.

For steps 4 and 5, you can use the TI-83 function `2-PropZTest`. The calculator will give the values $z = -3.924$ and $p$-value $= 4.360 \times 10^{-5}$.

4. (9 pts) $(0, 0, 8, 9, 9)$, $\overline{x} = 5.6$.

(a) $P(t_{10} > 2.6) =$ `tcdf(2.6,E99,10)` $= 0.0132$.

(b) $P(t_{25} < -1.645) =$ `tcdf(-E99,-1.645,25)` $= 0.0562$.

(c) $P(-2 < t_2 < 2) =$ `tcdf(-2,2,2)` $= 0.8165$.

5. (12 pts) $(0, 6, 10, 11, 12)$, $\overline{x} = 8.4$.

The seven steps:

(1) $H_0 : \mu = 2.049$.
$H_1 : \mu \neq 2.049$.

(2) $\alpha = 0.10$.

(3) The population is normal and we must use $s$ instead of $\sigma$. Therefore, the test statistic is $t$. Because the sample size is small, we do not have the option of using $z$ as an approximation. The formula is

$$t = \frac{\overline{x} - \mu_0}{s/\sqrt{n}}.$$

(4) Enter the data into the TI-83 and use `1-Var Stats`. We find that $\overline{x} = 2.2016$ and $s = 0.06586$. So

$$\begin{aligned} t &= \frac{2.016 - 2.049}{0.06586/\sqrt{10}} \\ &= -\frac{0.033}{0.02083} \\ &= -1.584. \end{aligned}$$

(5) $p$-value = `tcdf(-E99,-1.584,9)` = 0.0738.

(6) At the 10% level, we may reject $H_0$.

(7) The average price of a gallon of gas in Farmville is not \$2.049.

6. (8 pts) $(0, 7, 8, 8, 8)$, $\overline{x} = 6.5$.

The formula is $\overline{x} \pm t_{\alpha/2}\frac{s}{\sqrt{n}}$. You would have to use the $t$ tables to find $t_{\alpha/2}$. We have $df = 9$ and $\alpha/2 = 0.05$, so use row 9, column 0.05 and get $t_{9,0.05} = 1.833$. Calculate $2.016 \pm (1.833)\left(\frac{0.06586}{\sqrt{10}}\right) = 2.016 \pm 0.0381$.

You could use the TI-83 function `TInterval` and get `(1.9778,2.0542)`.

7. (14 pts) $(0, 6, 10, 13, 14)$, $\overline{x} = 8.8$.

Here we are comparing means of two different samples. Let the population means be $\mu_1$ = the average price of a gallon of gas in January and $\mu_2$ = the average price of a gallon of gas in July. The seven steps:

(1) $H_0 : \mu_1 = \mu_2$.
$H_1 : \mu_1 < \mu_2$.

(2) $\alpha = 0.05$.

(3) The populations are normal and we are using $s_1$ and $s_2$ instead of $\sigma_1$ and $\sigma_2$, so the test statistic is $t$. The formula is

$$t = \frac{\overline{x}_1 - \overline{x}_2}{s_p\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}},$$

where $s_p$ is the pooled estimate for $s$.

(4) Compute $s_p = \sqrt{\frac{9(0.691)^2+9(0.945)^2}{18}} = 0.8278$. Then compute

$$\begin{aligned} t &= \frac{1.702 - 2.063}{0.8278\sqrt{\frac{1}{10} + \frac{1}{10}}} \\ &= -\frac{0.361}{0.3702} \\ &= -0.9751. \end{aligned}$$

(5) $p$-value = `tcdf(-E99,-.9751,18)` = 0.1712.

(6) Accept $H_0$.

(7) The average price of gas in January is the same as the average price in July.

You could use the TI-83 function `2-SampTTest` for steps 4 and 5. Enter the statistics and the TI-83 reports that $t = -.9751$, $p$-value $= 0.1712$, and, as a bonus, $s_p = 0.8278$.

8. (25 pts) $(1, 12, 18, 21, 25)$, $\overline{x} = 15.9$.

(a) (3 pts) See the diagram for the scatterplot.

(b) (2 pts) The scatterplot shows a fairly strong positive linear relationship.

(c) (8 pts) To find the equation of the regression line, enter the $x$ values into list $\texttt{L}_1$ and the $y$ values into list $\texttt{L}_2$. Then use $\texttt{LinReg(a+bx) L}_1\texttt{,L}_2\texttt{,Y}_1$ to get the equation of the regression line. The calculator reports that $a = -0.8089$ and $b = 1.5598$. So the equation is

$$\hat{y} = -0.8089 + 1.5598x.$$

(d) (3 pts) See the diagram for the graph of the regression line.

(e) (4 pts) The predicted price of gas in Los Angeles when the price of gas in New York is \$1.95 is

$$\hat{y} = -0.8089 + 1.5598(1.95) = 2.233.$$

(f) (5 pts) To find SSE, first find the values of $\hat{y}$. Enter $\texttt{Y}_1\texttt{(L}_1\texttt{)} \rightarrow \texttt{L}_3$ to store the $\hat{y}$ values. The compute $(y - \hat{y})^2 = \texttt{(L}_2\texttt{-L}_3\texttt{)}^2$. Finally, apply sum to the answer and get SSE $= 0.01015$.