Note: $Z_{\alpha/2}$ Critical values for Confidence intervals:	**Formulae:**
80%, $Z_{\alpha/2} = 1.282$ 90%, $Z_{\alpha/2} = 1.645$ 95%, $Z_{\alpha/2} = 1.96$ 96% $Z_{\alpha/2} = 2.05$ 98%, $Z_{\alpha/2} = 2.326$ 99%, $Z_{\alpha/2} = 2.576$	$\hat{p} = \frac{x}{n}$ $\hat{p} + \hat{q} = 1 \quad that\ \ is, \qquad \hat{q} = 1 - \hat{p}$

Constructing the Confidence interval:

$$\hat{p} \pm z_{\alpha/2} \cdot \sqrt{\frac{\hat{p} \cdot \hat{q}}{n}}$$

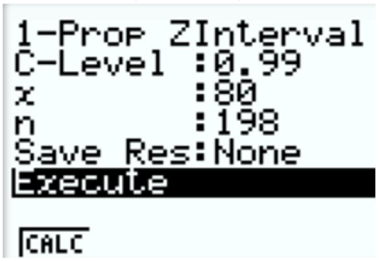
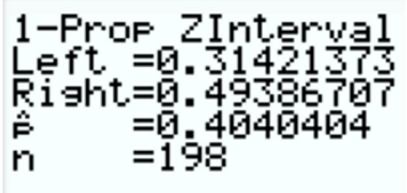
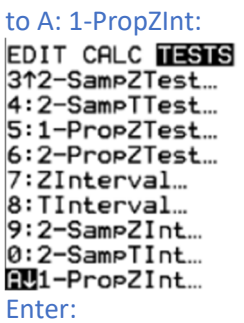
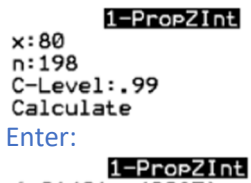
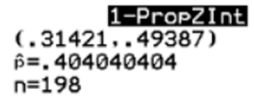
1. Use the given data to construct a confidence interval of the requested level. $x = 80,\ n = 198$, confidence level 99%

$$\hat{p} = \frac{80}{198} = 0.404 \qquad \hat{q} = 1 - 0.404 = 0.596$$

$$0.404 - 2.576 \cdot \sqrt{\frac{0.404 \times 0.596}{198}} = 0.314$$

$$0.404 + 2.576 \cdot \sqrt{\frac{0.404 \times 0.596}{198}} = 0.494$$

$$0.314 < p < 0.494$$

CASIO 9750	*TI84*
F4 for INTR, F1 for Z, F3 for 1-P  EXE  	STAT, then TESTS, then scroll down to A: 1-PropZInt:  Enter:  Enter: 

2. In a survey of 298 registered voters, 150 of them wished to see Mayor Waffleskate lose her next election. Construct a 90% confidence interval for the proportion of registered voter who want to see Mayor Waffleskate defeated.

$$\hat{p} = \frac{150}{298} = 0.503$$

$$\hat{q} = 1 - 0.503 = 0.497$$

$$0.503 - 1.645 \cdot \sqrt{\frac{0.503 \times 0.497}{298}} = 0.456$$

$$0.503 + 1.645 \cdot \sqrt{\frac{0.503 \times 0.497}{298}} = 0.551$$

$$0.456 < p < 0.551$$

CASIO 9750	*TI84*
F4 for INTR, F1 for Z, F3 for 1-P 1-Prop ZInterval C-Level :0.9 x :150 n :298 Save Res:None Execute CALC EXE 1-Prop ZInterval Left =0.45571487 Right=0.55099653 p̂ =0.5033557 n =298	STAT, then TESTS, then scroll down to A: 1-PropZInt: 1-PropZInt x:150 n:298 C-Level:.9 Calculate Enter: 1-PropZInt (.45571..551) p̂=.5033557047 n=298

3. A survey of 800 women shoppers found that 17% of them shop on impulse. What is the 98% confidence interval for the true proportion of women shoppers who shop on impulse?

$\hat{p} = 17\% = 0.17$
$\hat{q} = 1 - 0.17 = 0.83$

$$0.17 - 2.326 \cdot \sqrt{\frac{0.17 \times 0.83}{800}} = 0.139$$

$$0.17 + 2.326 \cdot \sqrt{\frac{0.17 \times 0.83}{800}} = 0.201$$

$$0.139 < p < 0.201$$

On calculators when x is not given, we need to find it. Since $\hat{p} = \frac{x}{n}$ it follows that $x = n \cdot \hat{p}$.

CASIO 9750	*TI84*
F4 for INTR, F1 for Z, F3 for 1-P 1-Prop ZInterval C-Level :0.98 x :800×0.17 n :800 Save Res:None Execute **Note**: x must be a whole number. If it is not, round it properly. EXE 1-Prop ZInterval Left =0.13910464 Right=0.20089535 p̂ =0.17 n =800	STAT, then TESTS, then scroll down to A: 1-PropZInt: 1-PropZInt x:800*0.17 n:800 C-Level:.98 Calculate **Note**: x must be a whole number. If it is not, round it properly. Enter: 1-PropZInt (.1391..2009) p̂=.17 n=800

4. A random sample of 100 voters found that 46% were going to vote for a certain candidate. Find the 90% confidence interval for the population proportion of voters who will vote for that candidate.

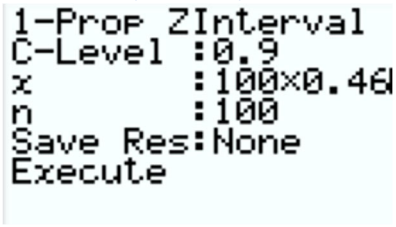
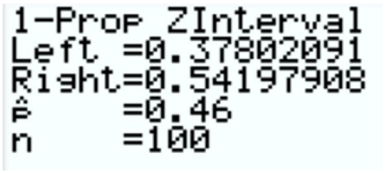
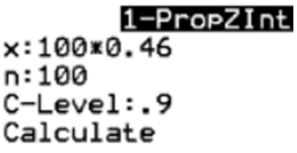
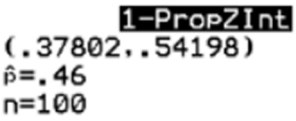
$\hat{p} = 46\% = 0.46$

$\hat{q} = 1 - 0.46 = 0.54$

$$0.46 - 1.645 \cdot \sqrt{\frac{0.46 \times 0.54}{100}} = 0.378 = 37.8\%$$

$$0.46 + 1.645 \cdot \sqrt{\frac{0.46 \times 0.57}{100}} = 0.542 = 54.2\%$$

$37.8\% < p < 54.2\%$

CASIO 9750	*TI*84
F4 for INTR, F1 for Z, F3 for 1-P  **Note**: x must be a whole number. If it is not, round it properly. EXE  	STAT, then TESTS, then scroll down to A: 1-PropZInt:  **Note**: x must be a whole number. If it is not, round it properly. Enter: 

5. It was found that in a sample of 90 teenage boys, 70% of them have received speeding tickets. What is the 90% confidence interval of the true proportion of teenage boys who have received speeding tickets?

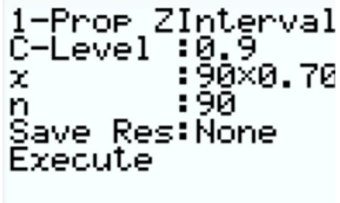
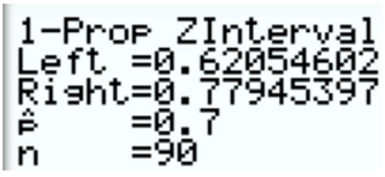
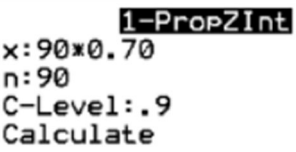
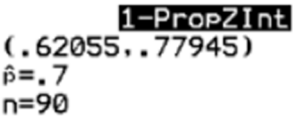
$\hat{p} = 70\% = 0.70$

$\hat{q} = 1 - 0.70 = 0.30$

$$0.70 - 1.645 \cdot \sqrt{\frac{0.70 \times 0.30}{90}} = 0.620$$

$$0.70 + 1.645 \cdot \sqrt{\frac{0.70 \times 0.30}{90}} = 0.780$$

$0.620 < p < 0.780$

CASIO 9750	*TI*84
F4 for INTR, F1 for Z, F3 for 1-P  **Note**: x must be a whole number. If it is not, round it properly. EXE  	STAT, then TESTS, then scroll down to A: 1-PropZInt:  **Note**: x must be a whole number. If it is not, round it properly. Enter: 

6. A report states that 40% of home owners have a vegetable garden. How large a sample is needed to estimate the true proportion of home owners who have vegetable gardens to within 6 percentage points with 96% confidence?

   Sample size determination. Formula: $n = \hat{p} \cdot \hat{q} \left(\frac{z_{\alpha/2}}{E}\right)^2$

   $\hat{p} = 0.40$, since the estimate of p-hat is 40%
   $\hat{q} = 0.60$
   $Error = 6\% = 0.06$

   $n = 0.40 \cdot 0.60 \left(\frac{2.05}{0.06}\right)^2 = 280.16 \ldots \Rightarrow 281.$ **Note**: n is always rounded up to the next integer.

   ```
   0.40*0.60(2.05/0.06)^2
                  280.1666667
   ```

7. John Davis, a manager of a supermarket, wants to estimate the proportion of customers who use food stamps at his store. He has no initial estimate of what the sample proportion will be. How large a sample is required to estimate the true proportion to within 3 percentage points with 98% confidence?

   No estimate of $\hat{p}$ known; therefore use $\hat{p} = \hat{q} = 0.5$

   $Error = 3\% = 0.03$

   $n = \hat{p} \cdot \hat{q} \left(\frac{z_{\alpha/2}}{E}\right)^2$

   $n = 0.50 \cdot 0.50 \left(\frac{2.33}{0.03}\right)^2 = 1508.02 \ldots => 1509$ **Note**: n is always rounded up to the next integer.

   ```
   0.50*0.50(2.33/0.03)^2
                  1508.027778
   ```