1. You wish to construct a 95% confidence interval for a proportion \( p \) with a maximum margin of error of \( \pm 2.5 \) percentage points.

(a) Determine the minimum sample size that would guarantee the desired result.

\[
n \geq \left( \frac{1.96 \times 0.5}{0.025} \right)^2 = 1536.64
\]

Sample \( n = 1537 \)

(b) Determine the required sample size when sampling from a population of size 2000.

\[
n \geq \frac{2000 \times 1536.64}{1999 + 1536.64} = 869.229
\]

Now sample only 870.

2. In a national survey, 882 out of 1225 adults favored stronger border enforcement.

(a) Give a 98% confidence interval for the true proportion of adults in favor.

Note: \( \overline{p} = \frac{882}{1225} = 0.72 \) Using the 1–PropZInt screen, we obtain \( 0.69 \leq p \leq 0.75 \), or \( p = 0.72 \pm 0.03 \).

(b) Express the result in words as a percentage using the maximum margin of error.

Using the maximum deviation of \( U = 0.5 \) for a proportion, we obtain

\[
p = \overline{p} \pm \frac{z_{\alpha/2} \times 0.5}{\sqrt{n}} = 0.72 \pm \frac{2.326 \times 0.5}{\sqrt{1225}} = 0.72 \pm 0.0332
\]

The proportion of adults in favor of stronger border enforcement is 72% plus or minus 3.332 percentage points.

(c) Can you clearly say whether or not at least two-thirds are in favor? Explain.

Yes, the lowest proportion in favor is \( 0.72 - 0.0332 = 0.6868 \); so at least 68.68% are in favor, which is more than two-thirds.

(d) Can you clearly say whether or not less than 75% are in favor? Explain.

No, the proportion in favor could be as low as 0.6868, but it could also be as high as \( 0.72 + 0.0332 = 0.7532 \) which is more than 75%.

So we can’t know for sure if less than 75% are in favor.
You wish to construct a 98\% confidence interval for a proportion \( p \) with a maximum margin of error of \( \pm 2.9 \) percentage points.

(a) Determine the minimum sample size that would guarantee the desired result.

\[
n \geq \left( \frac{2.326 \times 0.5}{0.029} \right)^2 = 1608.286564
\]

Sample \( n = 1609 \)

(b) Determine the required sample size when sampling from a population of size 1800.

\[
n \geq \frac{1800 \times 1608.286564}{1799 + 1608.286564} = 849.625
\]

Now sample only 850.

In a national survey, 793 out of 1220 adults favored congressional term limits.

(a) Give a 95\% confidence interval for the true proportion of adults in favor.

Note: \( \bar{p} = \frac{793}{1220} = 0.65 \)

Using the 1-PropZInt screen, we obtain \( 0.62324 \leq p \leq 0.67676 \), or \( p = 0.65 \pm 0.027676 \).

(b) Express the result in words as a percentage using the maximum margin of error.

Using the maximum deviation of \( U = 0.5 \) for a proportion, we obtain

\[
p = \bar{p} \pm z_{\alpha/2} \times \frac{0.5}{\sqrt{n}} = 0.65 \pm \frac{1.96 \times 0.5}{\sqrt{1220}} = 0.65 \pm 0.028
\]

The proportion of adults in favor of congressional term limits is 65\% plus or minus 2.8 percentage points.

(c) Can you clearly say whether or not at least 60\% are in favor? Explain.

Yes, the lowest proportion in favor is \( 0.65 - 0.028 = 0.622 \); so at least 62.2\% are in favor, which is more than 60\%.

(d) Can you clearly say whether or not less than two-thirds are in favor? Explain.

No, the proportion in favor could be as high as \( 0.65 + 0.028 = 0.678 \) which is slightly more than two-thirds, or \( p \) could be lower than two-thirds.