z-CI for Population Proportion

1. $\hat{p} = \frac{111}{150} = 0.74$ claim: $p = 0.85$ verify the claim using the sample

$n = 150$

$z^*_{0.95} = 1.96$

a. $\hat{p} \pm z^* \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} = 0.74 \pm 1.96 \sqrt{\frac{(0.74)(0.26)}{150}}$

$= 0.74 \pm 0.0702$

$= (0.67, 0.81)$

We are 95% confident that the interval (0.67, 0.81) contains the true proportion of seeds that germinate under normal conditions.

b. $\hat{p} = 0.74$

c. $\sqrt{\frac{\hat{p}(1-\hat{p})}{150}} = 0.0358$

d. $z^*_{0.95} = 1.96$

e. 0.0702

f. The interval does not contain 0.85 so the data does not support the company's claim.

2. $n = 1000$

$\hat{p} = \frac{120}{1000} = 0.12$

$z^*_{0.99} = 2.576$

a. $\hat{p} \pm 2.576\sqrt{\frac{(0.12)(0.78)}{1000}} = 0.12 \pm 0.025$

$= \boxed{(0.095, 0.145)}$

We are 99% confident that the interval (0.095, 0.145) contains the true proportion of people with blood type B.

b. $\boxed{0.025}$

c. $n = \left(\frac{z^*}{M}\right)^2 \cdot \hat{p} \cdot (1-\hat{p}) = \left(\frac{2.576}{0.02}\right)^2 (0.12)(0.78) = 1552.8$

$\boxed{n = 1553}$

new margin of error $= 0.02$

3. $n = 400$

$\hat{p} = \frac{220}{400} = 0.55$

$z^*_{0.90} = 1.64$

a. $\hat{p} \pm 1.64\sqrt{\frac{(0.55)(0.45)}{400}} = 0.55 \pm 0.0408$

$= \boxed{(0.51, 0.59)}$

b. $\boxed{0.0408}$

c. $n = \left(\frac{1.64}{0.03}\right)^2 (0.55)(0.45) = 739.64$

$\boxed{n = 740}$

4. $n = \left(\frac{1.96}{0.025}\right)^2 (0.65)(0.35) = 1398.34$

$\boxed{n = 1399}$