10.54 Do you believe that an exceptionally high percentage of the executives of large corporations are right-handed? Although 85% of the general public is right-handed, a survey of 300 chief executive officers of large corporations found that 96% were right-handed.

    a Is this difference in percentages statistically significant? Test using $\alpha = .01$.

    b Find the p-value for the test and explain what it means.

a) $P =$ proportion of right-handed

    $H_0 : P = P_0 = 0.85$

    $H_a : P > P_0 = 0.85$

$$\psi = \frac{\hat{p} - P_0}{\sqrt{\frac{P_0(1-P_0)}{n}}}$$

$\hat{p} = \frac{y}{n} = 0.96$ $Y \sim Bin(n, P_0)$

$IE \, \hat{p} = P_0$

$Var(\hat{p}) = \frac{P_0(1-P_0)}{n}$

$$\psi_0 = \frac{0.96 - 0.85}{\sqrt{\frac{0.85 \cdot 0.15}{300}}} \approx 5.34$$

$RR : \{ \psi_0 > Z_\alpha \}$ $\alpha = 0.01 = P(\text{reject } H_0 \mid H_0 \text{ true})$

                                 $= P(Z > Z_\alpha) = P(Z > 2.32)$

$\psi_0 = 5.34 > Z_\alpha = 2.32 \quad \Rightarrow \quad$ reject H_0

b) P-value?

    $P = P(Z > \psi_0)$

      $= P(Z > 5.34) < 0.000001$

    $\forall \alpha > P \longrightarrow$ reject H_0

10.18 The hourly wages in a particular industry are normally distributed with mean \$13.20 and standard deviation \$2.50. A company in this industry employs 40 workers, paying them an average of \$12.20 per hour. Can this company be accused of paying substandard wages? Use an $\alpha = .01$ level test.

$X \sim N(13.2, 2.5^2)$

$n = 40, \quad \bar{X} = 12.2, \quad \alpha = 0.01$

$H_0: \mu = \mu_0 = 13.2$

$H_a: \mu < \mu_0 = 13.2$

$\varphi = \dfrac{\bar{X} - \mu_0}{\sigma/\sqrt{n}} = \dfrac{12.2 - 13.2}{2.5/\sqrt{40}} \approx -2.53$

$RR: \{\varphi_0 < -z_\alpha\} = \{\varphi_0 < -2.326\}$

$\varphi_0 < -z_\alpha \implies$ reject H_0

10.27 The state of California is working very hard to ensure that all elementary age students whose native language is not English become proficient in English by the sixth grade. Their progress is monitored each year using the California English Language Development test. The results for two school districts in southern California for the 2003 school year are given in the accompanying table.[7] Do the data indicate a significant difference in the 2003 proportions of students who are fluent in English for the two districts? Use $\alpha = .01$.

District	Riverside	Palm Springs
Number of students tested	6124	5512
Percentage fluent	40	37

7. *Source:* Cadonna Peyton, "Pupils Build English Skills," *Press-Enterprise* (Riverside, Calif.), March 19, 2004, p. B-1.

$H_0: P_1 - P_2 = 0$

$H_a: P_1 - P_2 \neq 0$

$\varphi = \dfrac{(\hat{P_1} - \hat{P_2}) - (P_1 - P_2)}{\sqrt{\dfrac{P_1 q_1}{n_1} + \dfrac{P_2 q_2}{n_2}}} \quad \xleftarrow{H_0} \quad P_1 = P_2 = P \qquad \hat{P}_P = \dfrac{y_1 + y_2}{n_1 + n_2} = \dfrac{n_1 \hat{P_1} + n_2 \hat{P_2}}{n_1 + n_2}$

$\varphi_0 = -0.12$

RR: $\{\varphi_0 < -z_{\partial/2} \text{ or } \varphi_0 > z_{\partial/2}\}$

Do not reject H_0