LARGE-SAMPLE z-TEST ABOUT POP. PROPORTION p [DEVORE 8.4]

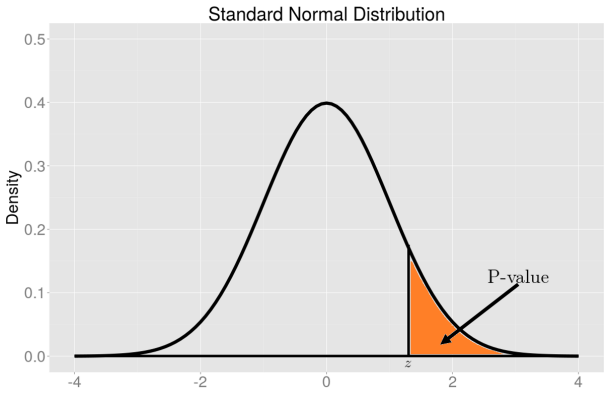
- **LARGE-SAMPLE z-TEST ABOUT POPULATION PROPORTION p (SUMMARY):**

Population:	Unknown proportion p of "successes"
Random Sample:	$\mathbf{X} := (X_1, X_2, \ldots, X_n)$
Realized Sample:	$\mathbf{x} := (x_1, x_2, \ldots, x_n)$
Test Statistic $W(\mathbf{X}; p_0)$ Test Statistic Value $W(\mathbf{x}; p_0)$	$Z = \dfrac{(X/n) - p_0}{\sqrt{p_0 q_0 / n}}$ $\qquad$ $z = \dfrac{\widehat{p} - p_0}{\sqrt{p_0 q_0 / n}}$
	$\widehat{p} := x/n,\ q_0 := 1 - p_0,\ \min\{np_0, nq_0\} \geq 10$ $x \equiv$ # "Successes" in realized sample $\mathbf{x}$

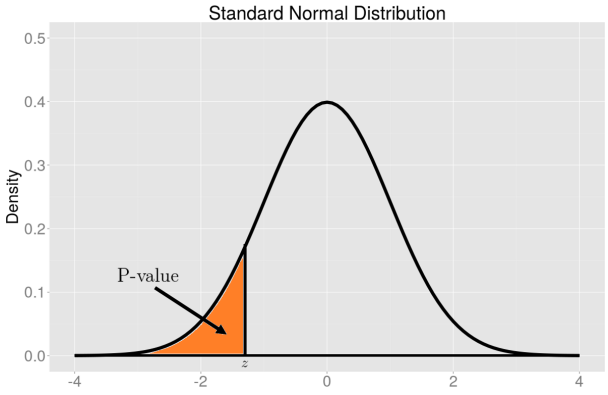
HYPOTHESIS TEST:	**P-VALUE DETERMINATION:**
$H_0: p = p_0$ vs. $H_A: p > p_0$	P-value $= \mathbb{P}(Z \geq z) = 1 - \Phi(z)$
$H_0: p = p_0$ vs. $H_A: p < p_0$	P-value $= \mathbb{P}(Z \leq z) = \Phi(z)$
$H_0: p = p_0$ vs. $H_A: p \neq p_0$	P-value $= \mathbb{P}(\lvert Z \rvert \geq \lvert z \rvert) = 2 \cdot [1 - \Phi(\lvert z \rvert)]$

Decision Rule: If P-value $\leq \alpha$ then reject H_0 in favor of H_A
If P-value $> \alpha$ then accept H_0 (i.e. fail to reject H_0)

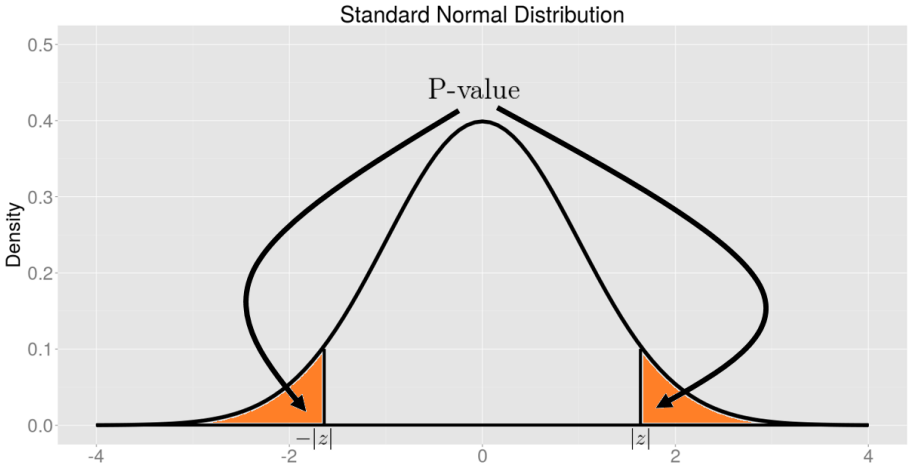
- **LARGE-SAMPLE z-TEST ABOUT POPULATION PROPORTION p (P-VALUES VISUALIZED):**



$H_0: p = p_0$
$H_A: p > p_0$



$H_0: p = p_0$
$H_A: p < p_0$



$H_0: p = p_0$
$H_A: p \neq p_0$

EX 8.4.1: A long-time dollar store owner determined 10 years ago that 38% of customers paid with a credit card.
Recently, he looked backed at the payment methods of 80 customers from last quarter's records.
He discovered that 51 of those customers purchased with a credit card.
Does the sample data suggest that more customers are paying with a credit card these days??
(Use significance level $\alpha = 0.01$)

(a) State the appropriate null hypothesis H_0 & alternative hypothesis H_A.

(b) Compute the appropriate test statistic value for this hypothesis test.

(c) Compute the resulting P-value.

(d) Make the appropriate decision.

EX 8.4.2: A long-time dollar store owner determined 5 years ago that 21 out of 50 customers paid with a credit card.
Recently, he looked backed at the payment methods of 120 customers from last quarter's records.
He discovered that fifty-five of those customers purchased with a credit card.
Does the sample data suggest that the proportion of credit card paying customers has changed nowadays??
(Use significance level $\alpha = 0.05$)

(a) State the appropriate null hypothesis H_0 & alternative hypothesis H_A.

(b) Compute the appropriate test statistic value for this hypothesis test.

(c) Compute the resulting P-value.

(d) Make the appropriate decision.