1. **Problem:**
   A new virus has been devastating corn production. When exposed, 52.3% of common seedlings die within a week. We are trying to develop a resistant strain of corn.

   When we expose 600 seedlings of our strain to the virus, 48.2% die within a week. Using a significance level of 0.025, can we conclude that our strain is significantly more resistant?

   (a) What kind of hypothesis test is appropriate?

   (b) State the hypotheses

   (c) Determine the *p*-value.

   (d) Decide whether we reject or retain the null hypothesis.

   (e) Do we think the student did significantly better than random guessing?

Solution: This is a left-tail (one-tail) proportion test because we only care whether a lower percentage of seedlings will die.

State the hypotheses.

$$H_0 \quad \text{claims} \quad p = 0.523$$
$$H_A \quad \text{claims} \quad p < 0.523$$

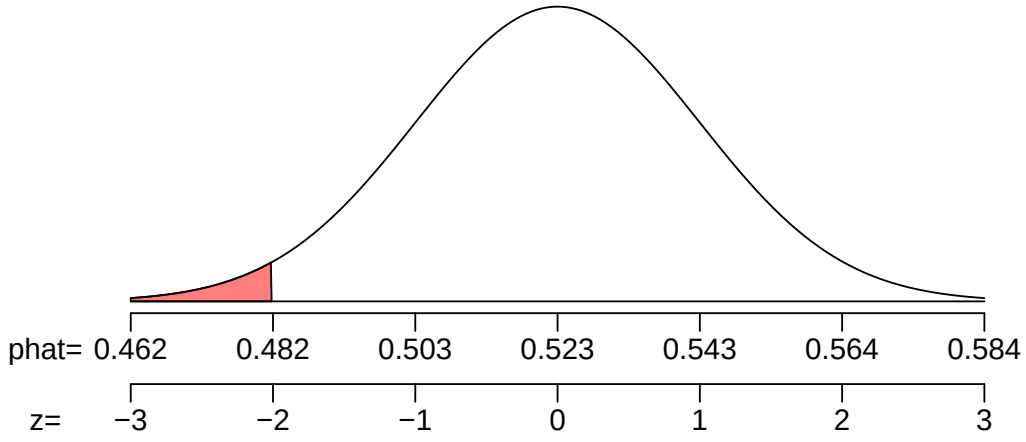
Determine the standard error.

$$\sigma_{\hat{p}} = \sqrt{\frac{p_0(1-p_0)}{n}} = \sqrt{\frac{0.523(1-0.523)}{600}} = 0.0204$$

Determine a z score. For simplicity, we ignore the continuity correction.

$$z = \frac{\hat{p} - p_0}{\sigma_{\hat{p}}} = \frac{0.482 - 0.523}{0.0204} = -2.01$$

The p-value is a left area.



To determine that left area, we use the z table.

$$\begin{aligned} p\text{-value} &= P(\hat{p} < 0.482) \\ &= P(Z < -2.01) \\ &= 0.0222 \end{aligned}$$

Compare p-value to α (which is 0.025).

$$p\text{-value} < \alpha$$

Make the conclusion: we reject the null hypothesis.

We think our strain is more resistant than common corn.

(a) Left-tail (one-tail) proportion test
(b) Hypotheses: H_0 claims $p = 0.523$ and H_A claims $p < 0.523$.
(c) The p-value is 0.0222
(d) We reject the null hypothesis.
(e) We think our strain is more resistant than common corn.

2. **Problem:**
   A new virus has been devastating corn production. When exposed, 17.4% of common seedlings die within a week. We are trying to develop a resistant strain of corn.

   When we expose 500 seedlings of our strain to the virus, 13.4% die within a week. Using a significance level of 0.02, can we conclude that our strain is significantly more resistant?

   (a) What kind of hypothesis test is appropriate?

   (b) State the hypotheses

   (c) Determine the p-value.

   (d) Decide whether we reject or retain the null hypothesis.

   (e) Do we think the student did significantly better than random guessing?

Solution: This is a left-tail (one-tail) proportion test because we only care whether a lower percentage of seedlings will die.

State the hypotheses.

$$H_0 \quad \text{claims} \quad p = 0.174$$
$$H_A \quad \text{claims} \quad p < 0.174$$

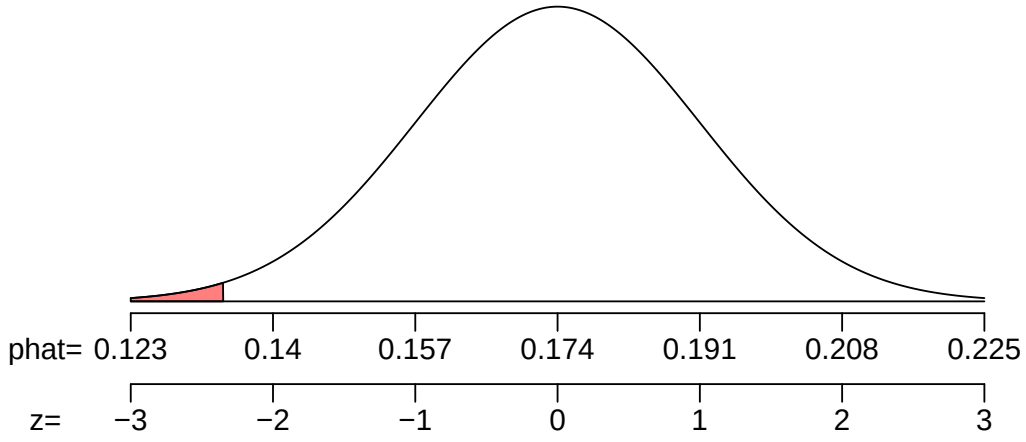
Determine the standard error.

$$\sigma_{\hat{p}} = \sqrt{\frac{p_0(1-p_0)}{n}} = \sqrt{\frac{0.174(1-0.174)}{500}} = 0.017$$

Determine a z score. For simplicity, we ignore the continuity correction.

$$z = \frac{\hat{p} - p_0}{\sigma_{\hat{p}}} = \frac{0.134 - 0.174}{0.017} = -2.35$$

The p-value is a left area.



To determine that left area, we use the z table.

$$\begin{aligned} p\text{-value} &= P(\hat{p} < 0.134) \\ &= P(Z < -2.35) \\ &= 0.0094 \end{aligned}$$

Compare p-value to α (which is 0.02).

$$p\text{-value} < \alpha$$

Make the conclusion: we reject the null hypothesis.

We think our strain is more resistant than common corn.

(a) Left-tail (one-tail) proportion test
(b) Hypotheses: H_0 claims $p = 0.174$ and H_A claims $p < 0.174$.
(c) The p-value is 0.0094
(d) We reject the null hypothesis.
(e) We think our strain is more resistant than common corn.