

# Large-Sample Test of a Hypothesis about a Population Proportion

## The Rope Example



## The Problem:

Rope designed for use in the theatre must withstand unusual stresses. Assume a brand of 3" three-strand rope is expected to have a breaking strength of 1400 lbs. A vendor receives a shipment of rope and needs to (destructively) test it.

The vendor will reject any shipment which cannot pass a 1% defect test. 1500 sections of rope are tested, with 20 pieces failing the test. At the  $\alpha = .01$  level, should the shipment be rejected?



## The Solution:

$$H_0: p = .01$$

$$H_a: p > .01$$

Rejection region:  $|z| > 2.32$  (.5 - .01 = .49 look up on table 4)

Test statistic:

$$\begin{aligned} z &= \frac{\hat{p} - p_0}{\sigma_{\hat{p}}} = \frac{\frac{20}{1500} - .01}{\sqrt{(.013)(.987)/1500}} \\ &= \frac{.013 - .01}{\sqrt{(.013)(.987)/1500}} \\ &= 1.14 \end{aligned}$$

There is insufficient evidence to reject the null hypothesis based on the sample results.