

Name: _____ Hour: _____ Date: _____

Is this gender discrimination?

A local engineering firm had to conduct a series of layoffs recently. The company has 180 employees that could be laid off and they will choose 10. All are equally qualified so the company decides to use a lottery system to be carried out by the manager to decide who will be laid off. The manager posts a list of the employees to be laid off. Five employees are women and five are men. One of the women claims this is gender discrimination and starts a lawsuit against the company.

60 females ($\frac{1}{3}$)
120 males ($\frac{2}{3}$)

1. The manager responds, "How could there be gender discrimination when half of the employees laid off were female and half were male?" What additional information do you need to evaluate this statement?

We need to know how many females and how many males work at the company.

2. How can you use a simulation to investigate the gender discrimination claim? Detail a process that could be used.

H_0 : Lottery fair ($p=0.333$)
 H_a : Lottery unfair ($p>0.333$)

Hat: put 180 names in hat

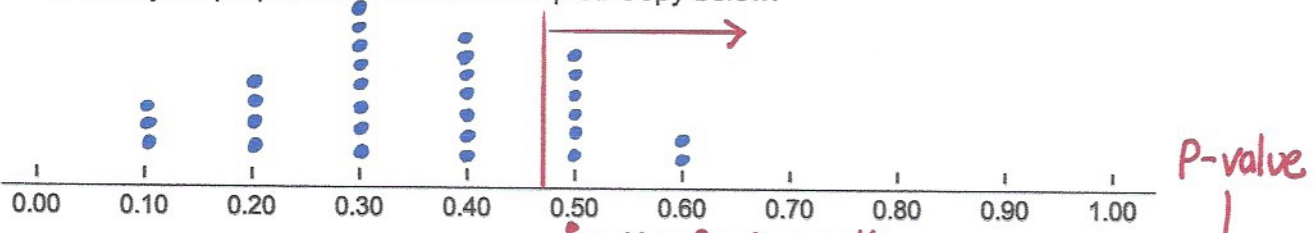
Dice: 1 & 2 are female
3-6 are male

Spinner: $\frac{1}{3}$ female
 $\frac{2}{3}$ male

RNG: 1-60 are female
61-180 are male

3. Perform one repetition of the simulation. Proportion of females in sample = $0.30 = \hat{p}$

4. Add your proportion to the class dotplot. Copy below.



5. What percentage of the dots represent half or more females being laid off? $\frac{8}{30} = 27\%$

6. Interpret this percentage in context.

Assuming the lottery is fair, there is a 27% chance of getting a sample proportion of female of 0.50 or greater purely by chance.

7. Do you have convincing evidence of gender discrimination? Explain.

$P\text{-value} > \alpha$
No. Because 27% > 5%, we do not have convincing evidence of gender discrimination. $\leftarrow H_a$

$P\text{-value} > \alpha \rightarrow$ not convincing evidence for H_a .
 \rightarrow fail to reject H_0 .

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Significance Tests: The Basics

Important ideas:		
<p>LT#1 Hypotheses</p> <p><u>NULL</u></p> $H_0: P_M = \text{null value}$ <p><u>ALTERNATIVE</u></p> $H_a: P_M < \text{null value}$	<p>LT#2 Interpret P-value</p> <p>Assuming H_0 is true ($\frac{\quad}{H_0}$), there is a <u>P-value</u> probability of getting the observed result or more extreme, purely by chance.</p>	<p>LT#3 Conclusion</p> <p>Because P-value $</> \alpha$ we do/do not have convincing evidence for H_a (context).</p> <p>P-value $< \alpha \Rightarrow$ Reject H_0 P-value $> \alpha \Rightarrow$ Fail to reject H_0</p>

Check Your Understanding

Factinate.com claims that 84% of teenagers think highly of their mother. To investigate this claim, a school psychologist selects a random sample of 150 teenagers and finds that 135 think highly of their mother. Do these data provide convincing evidence that the true proportion of teens who think highly of their mother is greater than 0.84?

$$\hat{p} = \frac{135}{150} = 0.90$$

1. State appropriate hypotheses for performing a significance test. Be sure to define the parameter of interest.

$$H_0: p = 0.84$$

$$H_a: p > 0.84$$

$p \rightarrow$ true proportion of all teens who think highly of their mother

The school psychologist performed the significance test and obtained a P-value of 0.0225.

2. Explain what it would mean for the null hypothesis to be true in this setting.

84% of all teens think highly of their mother and the sample proportion (0.90) happened purely by chance

3. Interpret the P-value.

Assuming H_0 is true ($p=0.84$), there is a 0.0225 probability of getting a sample proportion of $135/150=0.90$ or greater purely by chance.

4. What conclusion would you make at the $\alpha = 0.05$ level?

Because $0.0225 < 0.05$ we do have convincing evidence that the true proportion of teens who think highly of their mother is greater than 0.84. Reject H_0 .

Assignment #9.1b

- 12) a) On average, Jordanian children are not at risk of anemia
- b) If the mean hemoglobin level of Jordanian children really is 12, we'd get a sample mean as low or lower than 11.3 .0016 proportion of the time by chance variation
- 16) For $\alpha = .01$ or $\alpha = .05$ we would reject H_0 .

$b = 0.20$
 $11^{\circ} b = 0.20$

$\alpha = 0.01$

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