

# CONFIDENCE INTERVALS: PRACTICE 3\*

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## 1 Student Learning Outcomes

- The student will explore the properties of the confidence intervals for proportions.

## 2 Given

The Ice Chalet offers dozens of different beginning ice-skating classes. All of the class names are put into a bucket. The 5 P.M., Monday night, ages 8 - 12, beginning ice-skating class was picked. In that class were 64 girls and 16 boys. Suppose that we are interested in the true proportion of girls, ages 8 - 12, in all beginning ice-skating classes at the Ice Chalet.

## 3 Estimated Distribution

### Exercise 1

What is being counted?

### Exercise 2

In words, define the Random Variable  $X$ .  $X =$

*(Solution on p. 4.)*

### Exercise 3

Calculate the following:

*(Solution on p. 4.)*

a.  $x =$

b.  $n =$

c.  $p' =$

### Exercise 4

State the estimated distribution of  $X$ .  $X \sim$

*(Solution on p. 4.)*

### Exercise 5

Define a new Random Variable  $P'$ . What is  $p'$  estimating?

*(Solution on p. 4.)*

### Exercise 6

In words, define the Random Variable  $P'$ .  $P' =$

*(Solution on p. 4.)*

### Exercise 7

State the estimated distribution of  $P'$ .  $P' \sim$

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### 4 Explaining the Confidence Interval

Construct a 92% Confidence Interval for the true proportion of girls in the age 8 - 12 beginning ice-skating classes at the Ice Chalet.

**Exercise 8** *(Solution on p. 4.)*

How much area is in both tails (combined)?  $\alpha =$

**Exercise 9** *(Solution on p. 4.)*

How much area is in each tail?  $\frac{\alpha}{2} =$

**Exercise 10** *(Solution on p. 4.)*

Calculate the following:

- a. lower limit =
- b. upper limit =
- c. error bound =

**Exercise 11** *(Solution on p. 4.)*

The 92% Confidence Interval is:

**Exercise 12**

Fill in the blanks on the graph with the areas, upper and lower limits of the Confidence Interval, and the sample proportion.

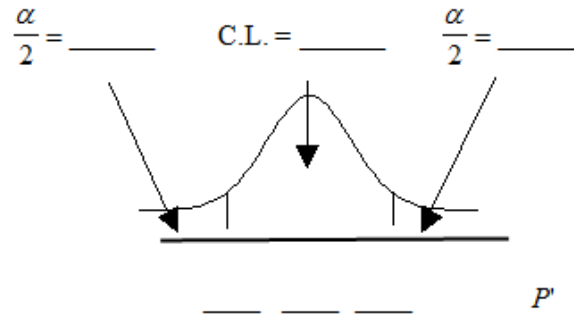


Figure 1

**Exercise 13**

In one complete sentence, explain what the interval means.

### 5 Discussion Questions

**Exercise 14**

Using the same  $p'$  and level of confidence, suppose that  $n$  were increased to 100. Would the error bound become larger or smaller? How do you know?

**Exercise 15**

Using the same  $p'$  and  $n = 80$ , how would the error bound change if the confidence level were increased to 98%? Why?

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**Exercise 16**

If you decreased the allowable error bound, why would the minimum sample size increase (keeping the same level of confidence)?



## Solutions to Exercises in this Module

### Solution to Exercise 2 (p. 1)

The number of girls, age 8-12, in the beginning ice skating class

### Solution to Exercise 3 (p. 1)

- a. 64
- b. 80
- c. 0.8

### Solution to Exercise 4 (p. 1)

$B(80, 0.80)$

### Solution to Exercise 5 (p. 1)

$p$

### Solution to Exercise 6 (p. 1)

The proportion of girls, age 8-12, in the beginning ice skating class.

### Solution to Exercise 8 (p. 2)

$$1 - 0.92 = 0.08$$

### Solution to Exercise 9 (p. 2)

0.04

### Solution to Exercise 10 (p. 2)

- a. 0.72
- b. 0.88
- c. 0.08

### Solution to Exercise 11 (p. 2)

0.72; 0.88

