Name: _____ Hour: _____ Date: _____

Lesson 11.1: Day 1: Which color M&M is the most common?


The company that makes milk chocolate M&Ms claims the following distribution:
13% Brown, 14% Yellow, 20% Orange, 16% Green, 24% Blue, and 13% Red. Is this true?

1. Observed values: Brown:_____ Yellow:_____ Orange:_____ Green:_____ Blue:_____ Red:_____

Total number of M&Ms:_____

2. As a class, write down hypotheses for a significance test.

H_0: The claimed color distribution is true.

H_a: The claimed color distribution is not true.

3. Let's suppose that M&Ms claimed distribution is correct. If they are correct, how many of each color would we expect to get in our sample.

n*p

Expected values: Brown:_____ Yellow:_____ Orange:_____ Green:_____ Blue:_____ Red:_____

Use the table to calculate the test statistic.

	Observed	Expected	(Observed - Expected)	(Observed - Expected)²	$\frac{(Observed - Expected)^2}{Expected}$
Brown					
Yellow					
Orange					
Green					
Blue					
Red					

Add up all the numbers in the last column. This is our test statistic:_____ $= \chi^2 = \sum \frac{(O-E)^2}{E}$

4. What value would we get for the test statistic if our sample was very close to what is expected? Explain.

It would be close to zero.

5. What value would we get for the test statistic if our sample was very far from what is expected? Explain.

It would be a large number.

Name: _____ Hour: _____ Date: _____

Lesson 11.1: Day 1: Chi-Square Test: Goodness of Fit

Important ideas:

LT #1 Hypotheses, Expected

H_0: The claimed distribution is true. (context)

H_a: The claimed distribution is not true.

Expected values = $P_i * n$

Prob. for each category, sample size

LT #2 Chi Square Test Statistic

$$\chi^2 = \sum \frac{(O-E)^2}{E}$$

LT #3 Df and P-value

df = categories − 1

P-value → Table C

Check Your Understanding

Carrie made a 6-sided die in her ceramics class and rolled it 90 times to test if each side was equally likely to show up. The table summarizes the outcomes of her 90 rolls.

Outcome of roll	1	2	3	4	5	6	Total
Frequency	12	28	12	13	10	15	90

(a) State the hypotheses that Carrie should test.

H_0: The claimed distribution of ⅙ prob. for each roll is true.

H_a: The claimed distribution is not true (die isn't fair).

(b) Calculate the expected count for each of the possible outcomes.

$\frac{1}{6} \times 90 = 15$ Each should be 15.

(c) Calculate the value of the chi-square test statistic.

$$\frac{(12-15)^2}{15} + \ldots + \frac{(15-15)^2}{15} = 14.4 = \chi^2$$

(d) Which degrees of freedom should you use?

$df = 6 - 1 = 5$

(e) Use table C to find the p-value. What conclusion would you make?

P-value = Between .01 and .02.

This is convincing evidence. Reject the null and conclude the die is not fair.