Time Frame: 50 minutes

Subject Matter: Binomial Distribution TELL ME

Objective: Find the exact probability for *X* successes in *n* trials of a binomial experiment.

Standards: DA – 5.6

 Materials: Transparencies and Worksheets

SHOW ME

Presentation of Information:

The teacher will discuss the following:

**Example 1:**

A survey found that one out of five Americans says he or she has visited a doctor in any given month. If 10 people are selected at random, find the probability that exactly 3 will have visited a doctor last month.

Source: *Reader's Digest.*

**Solution**

In this case, *n* = 10, X = 3, *p* = $\frac{1}{5}$,and *q* = $\frac{4}{5}$.Hence,

$$P\left(3\right)= \frac{10!}{\left(10-3\right)!3!}∙\left(\frac{1}{5}\right)^{3}∙\left(\frac{4}{5}\right)^{7}=0.201$$

**Example 2:**

A survey from Teenage Research Unlimited (Northbrook, Ill.) found that 30% of teenage consumers receive their spending money from part-time jobs. If 5 teenagers are selected at random, find the probability that at least 3 of them will have part-time jobs.

**Solution**

To find the probability that at least 3 have part-time jobs, it is necessary to find the individual probabilities for either 3, or 4, or 5, and then add them to get the total probability.

$$P\left(3\right)= \frac{5!}{\left(5-3\right)!3!}∙\left(0.3\right)^{3}∙\left(0.7\right)^{2}=0.132$$

$$P\left(4\right)= \frac{5!}{\left(5-4\right)!4!}∙\left(0.3\right)^{4}∙\left(0.7\right)^{1}=0.028$$

$$P\left(5\right)= \frac{5!}{\left(5-5\right)!5!}∙\left(0.3\right)^{5}∙\left(0.7\right)^{0}=0.002$$

Hence,

*P(* at least three teenagers have part-time jobs)

= 0.132 + 0.028 + 0.002 = 0.162 **Answer**

**Example 3:**

A report from the Secretary of Health and Human Services stated that 70% of single vehicle traffic fatalities that occur at night on weekends involve an intoxicated driver. If a sample of 15 single-vehicle traffic fatalities that occur at night on a weekend is selected, find the probability that exactly 12 involve a driver who is intoxicated.

Source: *J 00% American* by Daniel Evan Weiss.

**Solution**

Now, *n* = 15, *p* = 0.70, and X = 12.From Table B, *P(12)* = 0.170.Hence, the probability is 0.17.

Let Me Try

Assume all variables are binomial. Use the binomial formula.

1. A burglar alarm system has 6 fail-safe components. The probability of each failing is 0.05. Find these probabilities.
2. Exactly 3 will fail.
3. Fewer than 2 will fail.
4. None will fail.
5. Compare the answers for parts *a, b,* and c, and explain why the results are reasonable.
6. A student takes a 20-question, true/false exam and guesses on each question. Find the probability of passing if the lowest passing grade is 15 correct out of 20. Based on your answer, would it be a good idea not to study and to depend on guessing?
7. If a student takes a multiple-choice quiz with five choices for each question, find the probability of guessing at least 6 correct out of 10.
8. In a Gallup Survey, 90% of the people interviewed were unaware that maintaining a healthy weight could reduce the risk of stroke. If 15 people are selected at random, find the probability that at least 9 are unaware that maintaining a proper weight could reduce the risk of stroke.

Source: USASnapshot, *USA TODAY.*

Homework:

1. In a survey, three of four students said the courts show "too much concern" for criminals. Find the probability that at most three out of seven randomly selected students will agree with this statement.

Source: *Harper's Index.*

1. It was found that 60% of American victims of health care fraud are senior citizens. If 10 victims are randomly selected, find the probability that exactly 3 are senior citizens.

Source: *100% American* by Daniel Evan Weiss.

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