Name Answer Key

Statistics; Sec 5.1 – What is Probability

Answer all questions using complete sentences.

1. Suppose the newspaper states that the probability of rain today is 30%. What is the complement of the event "rain today?" What is the probability of the complement?

   no rain today

   $P(A^c) = 70\%$

2. What is the probability of
   a. an event A that is certain to occur?

      $P(A) = 1$

   b. an event B that is impossible?

      $P(B) = 0$

3. What is the law of large numbers? If you were using the relative frequency of an event to estimate the probability of the event, would it be better to use 100 trials or 500 trials? Explain.

   The larger the sample, the closer the probability will be to the theoretical Probability.

   500 would be better.

4. A Harris Poll indicated that of those adults who drive and have a cell phone, the probability that the driver between the ages of 18 and 24 sends or reads a text message is 0.51. Can this probability be applied to *all* drivers with cell phones? Explain.

   No, probability only for ages 18-24.

5. A recent Harris Poll survey of 1010 U.S. adults selected at random showed that 627 consider the occupation of firefighter to have very great prestige. Estimate the probability (to the nearest hundredth) that a U.S. adult selected at random thinks the occupation of firefighter has very great prestige.

   $P(\text{great prestige}) = \frac{627}{1010} \approx 0.62$

6. Consider a family with 3 children. Assume the probability that one child is a boy is 0.5 and the probability that one child is a girl is also 0.5, and that the events "boy" and "girl" are independent.
   a. List the equally likely events for the gender of the 3 children, from oldest to youngest.

M M M M F F F F M
M M F F F M F F F
M F M F M F

   b. What is the probability that all 3 children are male? Notice that the complement of the event "all three children are male" is "at least one of the children is female." Use this information to compute the probability that at least one child is female.

$P(3M) = \frac{1}{8}$

$P(\text{At least 1 F}) = \frac{7}{8}$

7. When do creative people get their *best* ideas? *USA Today* did a survey of 966 inventors (who hold U.S. patents) and obtained the information to the right.

Time of Day When Best Ideas Occur

Time	Number of Inventors
6 A.M. - 12 noon	290
12 noon - 6 P.M.	135
6 P.M. - 12 midnight	319
12 midnight - 6 A.M.	222

   a. Assuming that the time interval includes the left limit and all times up to but not including the right limit, estimate the probability that an investor has a best idea during each time interval: from 6 $A.M.$ to 12 noon, from 12 noon to 6 $P.M.$, from 6 $P.M.$ to 12 midnight, and from 12 midnight to 6 $A.M.$

$P(6 \text{ to NOON}) = \frac{290}{966} \approx 0.30$ $P(000 \text{ to } 0600) = \frac{222}{966} \approx 0.23$

$P(\text{NOON to } 1800) = \frac{135}{966} \approx 0.14$

$P(1800 \text{ to } 000) = \frac{319}{966} \approx 0.33$

   b. Do the probabilities of part (a) add up to 1? Why should they? What is the sample space in this problem?

$0.3 + 0.14 + 0.23 + 0.33 = 1$ ✓

Add to 1 because makes up entire sample space.

Sample space is the 4 time intervals.

8. John runs a computer software store. Yesterday he counted 127 people who walked by his store, 58 of whom came into the store. Of the 58, only 25 bought something in the store.
   a. Estimate the probability that a person who walks by the store will enter the store.

$P(\text{enter}) = \frac{58}{127} \approx 0.46$

   b. Estimate the probability that a person who walks into the store will buy something.

$P(\text{Buy}) = \frac{25}{58} \approx 0.43$

   c. Estimate the probability that a person who walks by the store will come in *and* buy something.

$P(\text{enter and buy}) = \frac{25}{127} \approx 0.20$

   d. Estimate the probability that a person who comes into the store will buy nothing.

$P(\text{not buy}) = 1 - P(\text{Buy}) = 1 - 0.43 \approx 0.47$