Homework Answers:
#8, 10, 13, 14

Packet Pg. 9

8. **Roulette.**

If a roulette wheel is to be considered truly random, then each outcome is equally likely to occur, and knowing one outcome will not affect the probability of the next. Additionally, there is an implication that the outcome is not determined through the use of an electronic random number generator.

10. **Survival.**

This estimate is based on the long run (so far) experience (data) for similar patients.

LLN ← True

13. **Snow.**

The radio announcer is referring to the "law of averages", which is not true. Probability does not compensate for deviations from the expected outcome in the recent past. The weather is not more likely to be bad later on in the winter because of a few sunny days in autumn. The weather makes no conscious effort to even things out, which is what the announcer's statement implies.

L of A "False"

14. **Cold streak.**

There is no such thing as being "due for a hit". This statement is based on the so-called law of averages, which is a mistaken belief that probability will compensate in the short term for odd occurrences in the past. The batter's chance for a hit does not change based on recent successes or failures.

L of A

8. Roulette A casino claims that its roulette wheel is truly random. What should that claim mean?

10. Survival A doctor tells a patient just diagnosed with a serious disease that there's a 60% chance she'll live at least 5 years. Where do you think that probability comes from?

13. Snow After an unusually dry autumn, a radio announcer is heard to say, "Watch out! We'll pay for these sunny days later on this winter." Explain what he's trying to say, and comment on the validity of his reasoning.

14. Cold streak A batter who had failed to get a hit in seven consecutive times at bat then hits a gamewinning home run. When talking to reporters afterward, he says he was very confident that last time at bat because he knew he was "due for a hit."
Comment on his reasoning.

Introduction to Probability

http://www.learner.org/courses/againstallodds/unitpages/unit18.html

KEY TERMS

The outcome of a **random phenomenon** in any single instance is uncertain. However, if the phenomenon is repeated over and over, a regular pattern to the outcomes emerges over the long run.

Probability is a measure of how likely it is that something will happen or something is true. Probabilities are always between 0 and 1. Events with probabilities closer to 0 are less likely to happen and probabilities closer to 1 are more likely to happen.

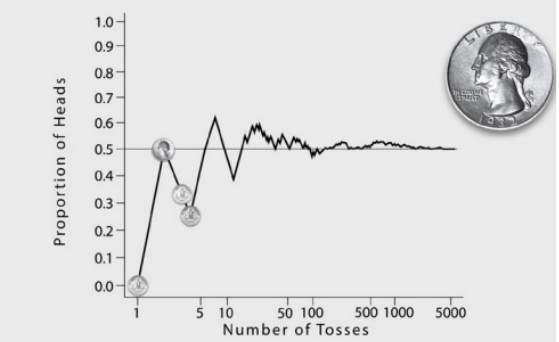

Figure 18.1. Proportion of heads in flipping a coin.

REVIEW QUESTIONS

1. Probability is a measure of how likely an event is to occur. Match each of the probabilities below with one of the statements (a) – (d).

0 0.0002 0.5 1

0 a. Not playing the lottery but still winning.

.5 b. Drawing a black card (club or spade) from a shuffled deck of 52 playing cards.

1 c. The sun will come up tomorrow morning (even if it is cloudy and you can't see it).

.0002 d. Getting struck by lightning in your lifetime.

2. Amanda writes a letter to her local television station telling them to fire their meteorologist. Her evidence was that out of the ten days that the weather reporter stated there would be a 70% chance of rain, it only rained five times. She had carried an umbrella to work on all ten days expecting that with such a high probability, it definitely was going to rain.

a. Explain to Amanda why a 70% chance of rain does not mean that it will definitely rain.

70% is Not 100%. 100% means definite rain

b. It only rained 5 out of 10 days that the weather reporter forecasted a 70% chance of rain. Was Amanda right that the meteorologist was doing a poor job of predicting the weather? Explain.

No, she must not have been in the areas that were getting rain.

Also - 70% estimate based on long range data. 70% chance does not mean it will definitely rain 7 out of 10 days.

3. A perfectly balanced spinner is pictured in Figure 18.5. When you spin the spinner, it can stop on any sector: 1, 2, 3, 4, or 5. In Figure 18.5, the spinner has landed on sector 4.

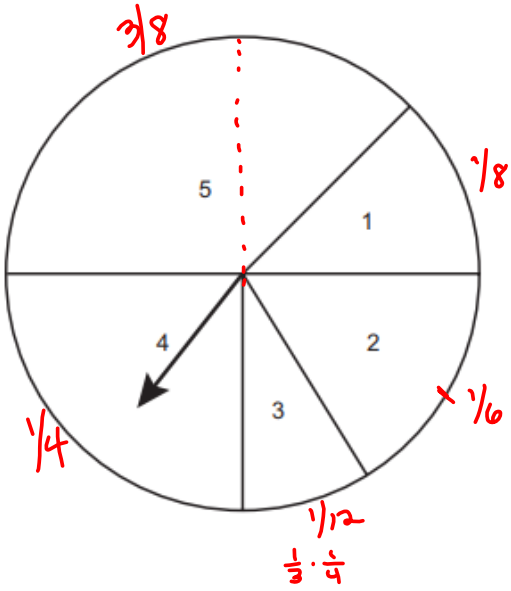

Figure 18.5. Perfectly balanced spinner.

Answer questions that follow. Explain how you arrived at each of your answers.

a. Imagine spinning the spinner shown in Figure 18.5. On which number is it most likely to land? 5

b. Suppose you spin the spinner 1000 times. How many times would you expect it to land in sector 4? Do you think that what you expect to get would be exactly what you would get if you performed this experiment? $\frac{1}{4}(1000) = 250$ No but should be very close (LLN)

c. Approximately how many times more likely is it for the spinner to land on sector 2 than on sector 3? $P(2) = 2P(3)$ 2 X's as likely

d. Estimate the probability of landing on an even number.

$P(4 \text{ or } 2) = \frac{1}{6} + \frac{1}{4}$

$\frac{2}{12} + \frac{3}{12} = \frac{5}{12}$

4. Each year the study *Monitoring the Future: A Continuing Study of American Youth* surveys students on a wide range of topics, including family background. One of the questions on the survey, including the possible responses, follows.

Did your mother have a paid job (half-time or more) during the time you were growing up?

- No
- Yes, some of the time when I was growing up
- Yes, most of the time
- Yes, all or nearly all of the time

The survey was administered to a large sample of 12th grade students. Care was taken to ensure the sample was representative of all 12th grade students. Responses to this question are summarized in Table 18.3.

Response	Frequency	Probability
No	1845	1845/14,278 = .1292
Yes/Some	2637	2637/14,278 = .1847
Yes/Most	2648	.1855
Yes/Nrly All	7148	.5006
	14,278	

Table 18.3. Survey results to question on mother's job.

a. How many students answered this question? 14,278

b. Use the data in Table 18.3 to estimate the probabilities associated with mothers' job patterns. Round your estimates to four decimals. Enter your probabilities into a copy of Table 18.3.

c. What is the sum of the probabilities? Should = 1

d. A randomly selected 12th grade student is asked to answer this question. What is the probability that the student will give a response different from No? Explain how you determined your answer.

P(Not No) = .1847 + .1855 + .5006
or 1 − .1292

P(Not No) = .8708