

## EXPERIMENTAL AND THEORETICAL PROBABILITY

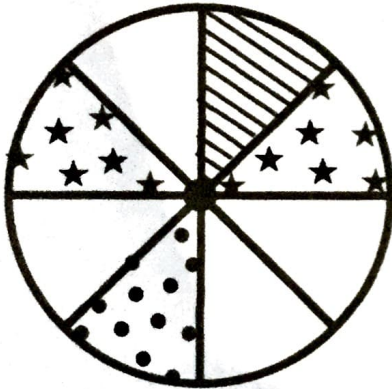
### EXPERIMENTAL PROBABILITY

- The ratio of the number of times an event occurs to the total number of trials. *Use an experiment's data.*
- "What does happen?"

### THEORETICAL PROBABILITY

- The probability of an event happening based on the possible outcomes
- "What should happen?"

Use the spinner below to answer the questions. Then, spin the spinner 10 times and complete the table below.



1. What is the theoretical probability of spinning a section with stripes?  $\frac{1}{8}$

2. What is the theoretical probability of spinning a section with stars?  $\frac{2}{8} = \frac{1}{4}$

3. What is the theoretical probability of **not** spinning a solid or a striped section?  $\frac{3}{8}$

Answers vary here.

	TALLY	TOTAL NUMBER OF SPINS	EXPERIMENTAL PROBABILITY
STRIPES			
WHITE			
DOTS			
STARS			

4. Are there any results in which the theoretical and experimental probability are the same? Why or why not?

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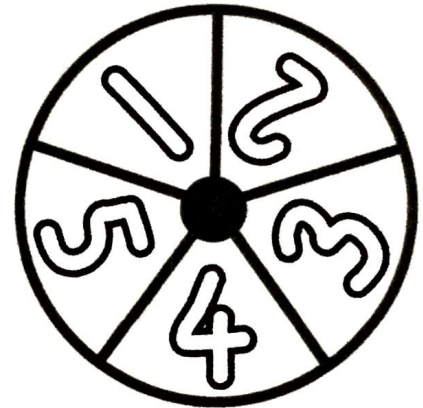
## RELATIVE FREQUENCY

- Relative frequency is the total number of successful attempts divided by the total number of trials. It can be used to make predictions.
- As the number of trials increases, the relative frequency of an event will approach the theoretical probability.

The spinner at right is spun 50 times, and the results are shown in the table below. Complete the experiment below.

Answers vary here.

RESULT	SPIN 50 TIMES	RELATIVE FREQUENCY	SPIN 100 TIMES	RELATIVE FREQUENCY
1	12	$\frac{12}{50} = \frac{6}{25}$		
2	8	$\frac{8}{50} = \frac{4}{25}$		
3	13	$\frac{13}{50}$		
4	10	$\frac{10}{50} = \frac{1}{5}$		
5	7	$\frac{7}{50}$		



5. What did you notice as you spun the spinner 100 times? What patterns did you discover?

Theoretically the probability of landing on each # is 20%. After 100 spins, most of the experimental probabilities are at or close to 20%.

6. What is the theoretical probability of spinning each of the numbers?

$P(1) \frac{1}{5} 20\%$     $P(2) \frac{1}{5} 20\%$   
 $P(3) \frac{1}{5} 20\%$     $P(4) \frac{1}{5} 20\%$   
 $P(5) \frac{1}{5} 20\%$

7. How does the relative frequency change between when the spinner is spun 50 times vs. 100 times?

As the # of trials increases, the more the theoretical & experimental get closer together.

8. Suppose the spinner is spun 1,000 times. Predict the relative frequency of each spin.

$P(1) \frac{1}{5}$     $P(2) \frac{1}{5}$   
 $P(3) \frac{1}{5}$     $P(4) \frac{1}{5}$   
 $P(5) \frac{1}{5}$   
 or very close to  $\frac{1}{5}$ .

## EXPERIMENTAL AND THEORETICAL PROBABILITY

Read and answer each of the questions below. Use the number bank to help you check your solutions. Not all numbers will be used.

$\frac{4}{15}$	$\frac{1}{4}$	$\frac{8}{15}$	$\frac{1}{3}$	$\frac{1}{6}$	$\frac{1}{2}$	$\frac{4}{5}$	$\frac{1}{3}$	$\frac{7}{20}$
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1. In the media cabinet at Jacquelyn's house, there are 7 comedy DVDs, 4 mystery DVDs, and 4 documentary DVDs. What is the probability of randomly selecting a mystery DVD from the cabinet?

$$\frac{4}{15}$$

$$\frac{4}{15}$$

DVDs: 15

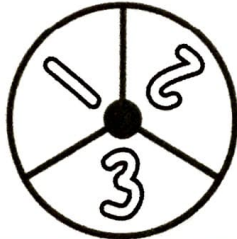
2. Ms. Mitchell's coin purse has 20 coins. There are 6 pennies, 4 quarters, 3 dimes, and the remainder are nickels. What is the theoretical probability of randomly selecting a nickel from Ms. Mitchell's coin purse?

$$\frac{7}{20}$$

coins: 20

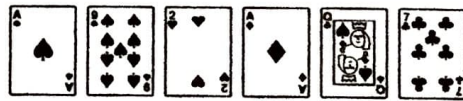
3. The spinner below is spun 10 times. If the experimental probability of landing on a 3 is  $\frac{1}{2}$ , then what is the difference between the experimental and the theoretical probabilities?

$$\frac{1}{2} - \frac{1}{3} = \frac{3}{6} - \frac{2}{6} = \frac{1}{6}$$



spinner: \_\_\_\_\_

4. The following cards are used in a game. If each of the cards is turned over and shuffled, then how much of a greater chance is there in drawing a spade over drawing a 7?



$$\text{Spade } \frac{3}{6} \quad 7\text{'s } \frac{1}{6}$$

cards: \_\_\_\_\_  $\frac{2}{6} = \frac{1}{3}$  greater chance

5. A fair coin is tossed in the air four times. If the experimental probability of landing on tails is  $\frac{1}{4}$ , then what is the difference between the experimental and theoretical probability?

$$\frac{1}{2} - \frac{1}{4} = \frac{2}{4} - \frac{1}{4} = \frac{1}{4}$$

coins:  $\frac{1}{4}$

6. During a team building game, participants reach into a bag and randomly select a colored flag, which determines their team. If there are 7 green flags, 5 red flags, and 3 yellow flags, then what is the theoretical probability of selecting a red flag?

flags:  $\frac{5}{15} = \frac{1}{3}$