Investigation: Theoretical vs. Experimental Probability

P(5) = 1/6

Investigation: Theoretical vs. Experimental Probability

Part 1: Theoretical Probability

Probability is the chance or likelihood of an event occurring. We will study two types of probability, theoretical and experimental.

Theoretical Probability: the probability of an event is the ratio or the number of favorable outcomes to the total possible outcomes.

P(Event) = Number or favorable outcomes

Total possible outcomes

Sample Space: The set of all possible outcomes. For example, the sample space of tossing a coin is (Heads, Tails) because these are the only two possible outcomes. Theoretical probability is based on the set of all possible outcomes, or the sample space.

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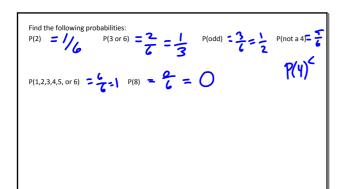
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DFILE a coin twice {HH,TT, HT, TH}

HFOR HEAD, and TFOR Tail List the sample space for rolling a six-sided die (remember you are listing a set, so you should use brackets {}):

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2. List the sample space for tossing two coins: $\begin{cases} H H, HT, TH, TT \end{cases}$ Find the following probabilities: $P(\text{two heads}) = \begin{matrix} \downarrow \\ \end{matrix} \qquad P(\text{one head and one tail}) = \begin{matrix} 2\\ \end{matrix} = \begin{matrix} 1\\ \end{matrix} \qquad P(\text{head, then tail})$ $P(\text{all tails}) = \begin{matrix} 1\\ \end{matrix} \qquad P(\text{no tails}) = \begin{matrix}$

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3. Complete the sample space for tossing two six-sided dice:
{(1,1), (1,2), (1,3), (1,4), (1,5), (1,6),
(2,1), (2,2), (2,2), (2,2), (2,2), (2,4), (2,2), (2,4), (2,5), (2,4), (2,5), (3,4), (3,2), (3,

5. When would you expect the probability of an event occurring to be 0, or 0%? Describe an event whose probability of occurring is 0.

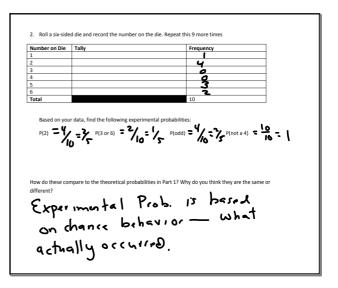
Cannot happen
. Prob of rolling a

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	perimental Probability Probability: the ratio of the number of times the event occurs to the total number of trials.
(Event) =	Number or times the event occurs
	Total number of trials
	ou think that theoretical and experimental probabilities will be the same for a certain event occurring? in your answer.
J .	
Ye	so it Could happen.
Ye	so it Could happen.
Te	So it Could happen.
Te	59 it Could happen.
Te	59 it Could happen.
Ye	59 it Could happen.

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Record your data on the board (number on die and frequency only your class. Explain what you observe about your data compared to observations. Experimental Prob	
P(1) = 17/40 = 0.18	P(1) = 12 = 0.16
$P(z) = \frac{12}{90} = 0.13$	P(2).
P(3)=17/90=0.18	<u>;</u>
P(4) = 13/40 = 0.14	,
$P(s) = \frac{10}{90} = 0.11$	P(b)=== 6.16
b(c) = 51/40 = 0.53	1760736
	1

Number on Die	Frequency		
1			
2			
3			
4			
5			
6			
Total			
		_	

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2

Counting Principal

When there are \mathbf{m} ways to do one thing, and \mathbf{n} ways to do another, then there are $\mathbf{m} \times \mathbf{n}$ ways of doing both.

Draw a tree diagram for each of the following problems.

1) You go to the snack bar to buy a bagel and a drink for lunch. You can choose from a plain bagel, a blueberry bagel, or a raisin bagel. The choices for a drink include water or a sports drink. How many different lunches could be made with these choices?

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2. When you get ready to get dressed for school you open your closet to find that you have the following choices: a red, blue, or white shirt; jeans or sweatpants; tennis shoes or sandals. How many different outfits could be made with these choices?

Use fundamental Counting Principal to answer:

3) You go to Wal-mart to buy batteries. You can choose from EverReady, Duracell, or Ray-O-Vac. Once you decide on the brand you then have to decide whether to get alkaline or non-alkaline batteries. Finally you must decide between AAA, AA, C, or D batteries. How many different kinds of batteries are available for you to buy?

$$p = M. p$$

 $P = 3 \times 4 = 12$ Kinds

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4) You toss a penny 4 times. How many different outcomes are there?

 $5)\ \mbox{ln}$ how many ways can the four call letters of a radio station be arranged if the first letter must be W or K and no letters repeat?

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