Name: _____

SM2 10.2: Theoretical vs Experimental Probability

Find the theoretical probability of each circumstance.

Scenario: Rolling a fair, 6-sided die. Let event A be rolling less than 5. Let event B be rolling a prime (1 is not considered prime).

1) $P(rolling\ an\ even)$
$1/2 = .5$
2) $P(rolling\ not\ odd)$
$1/2 = .5$
3) $P(A)$
$2/3 \approx .67$
4) $P(B)$
$1/2 = .5$
5) $P(A\ or\ B)$
$5/6 \approx .83$
6) $P(A \cap B)$
$1/3 \approx .33$
7) $P(A^c\ and\ B)$
$1/6 \approx .17$
8) $P(\sim B)$
$\frac{1}{2} = .5$

Scenario: Rolling 2 fair, 6-sided dice and adding them together.

9) $P(sum = 7)$
$1/6 \approx .17$
10) $P(sum\ is\ greater\ than\ 3)$
$11/12 \approx .92$
11) $P(sum\ is\ 13)$
0
12) $P(sum\ is\ even\ and\ 8)$
$5/36 \approx .14$
13) $P(sum = 4\ or\ is\ prime)$
$1/2 = .5$
14) $P(sum\ is\ not\ 6\ nor\ 9)$
$3/4 = .75$

Scenario: Choosing a letter from the alphabet. Let event A be choosing a letter from RAMSTEN. Let event B be choosing a letter from AWESOME.

15) $P(A)$
$7/26 \approx .27$
16) $P(B)$
$3/13 \approx .23$
17) $P(\sim A)$
$19/26 \approx .73$
18) $P(A \cup B)$
$9/26 \approx .35$
19) $P(A\ and\ B)$
$2/13 \approx .15$
20) $P(\sim A \cap B)$
$1/13 \approx .08$

Scenario: Randomly drawing from a standard 52 card deck with 13 cards in each suit (A-10, J, Q, K) and 4 suits (spades, clubs, diamonds, and hearts).

21) $P(drawing\ a\ heart\ or\ an\ Ace)$
$4/13 \approx .31$
22) $P(drawing\ not\ even)$
$8/13 \approx .62$
23) $P(drawing\ neither\ a\ club\ nor\ a\ King)$
$9/13 \approx .69$
24) $P(drawing\ higher\ than\ a\ 9\ with\ Ace\ high)$
$5/13 \approx .38$
25) $P(drawing\ a\ King\ and\ red)$
$1/26 \approx .04$

Find the experimental probability for each circumstance.

Scenario: You have rolled a die 200 times. You rolled a 1 37 times, a 2 42 times, a 3 26 times, a 4 29 times, a 5 34 times, and a 6 32 times..

26) $P(next\ roll\ will\ be\ a\ 2)$

$21/100 = .21$

27) $P(next\ roll\ will\ be\ even)$

$103/200 = .515$

28) $P(next\ roll\ will\ be\ a\ 7)$

0

29) $P(next\ roll\ will\ be\ greater\ than\ 3\ or\ even)$

$137/200 = .685$

30) $P(next\ roll\ will\ be\ greater\ than\ 3\ and\ even)$

$61/200 = .305$

31) $P(next\ roll\ will\ be\ a\ 6)$

$4/25 \approx .16$

Scenario: You have flipped a coin 1000 times. You flipped 200 Heads and 800 Tails.

32) $P(next\ flip\ is\ heads)$

$1/5 = .2$

33) $P(next\ flip\ is\ not\ heads)$

$4/5 = .8$

34) Write a comparison of this experiment to the theoretical probability of a fair coin.

The theoretical probability of flipping a heads with a fair coin is $0.5 = 1/2$. The experimental probability for this coin indicates that the chance of a heads on the next flip is $.2 = 1/5$. The law of large numbers says that as the number of trials of a random process increase, the percentage of difference between the expected and actual value goes to zero.

Although we can't for sure say that this coin is not a fair coin (because it is still possible to flip this many heads in that number of trials since it is random chance), I'd be suspect of the coin and want to investigate further.