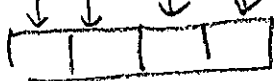


1. A dice is rolled four times. You win \$1 if there is at least one 3. What are your chances of winning?

Sample space S: Set of length-4 lists made from 1, 2, 3, 4, 5, 6

$$|S| = 6 \cdot 6 \cdot 6 \cdot 6 = 6^4$$



Event A: "None of the rolls is 3."

$$|A| = 5 \cdot 5 \cdot 5 \cdot 5 = 5^4$$

Answer: $P(\bar{A}) = 1 - P(A) = 1 - \frac{|A|}{|S|}$

$$= 1 - \frac{5^4}{6^4} = \frac{6^4 - 5^4}{6^4}$$

$$= \boxed{51.774\%}$$

1. Two cards are dealt off a shuffled 52-card deck. You win \$1 if both cards are red or if both are clubs. Find your chances of winning.

Sample space S: Set of all 2-element subsets of the set of 52 cards. Therefore, $|S| = \binom{52}{2}$.

Events A: "Both cards are red" $|A| = \binom{26}{2}$

B: "Both cards are clubs" $|B| = \binom{13}{2}$


Note: Events A and B are mutually exclusive because clubs are not red.

Answer: $P(A \cup B) = P(A) + P(B) = \frac{|A|}{|S|} + \frac{|B|}{|S|}$

$$= \frac{\binom{26}{2}}{\binom{52}{2}} + \frac{\binom{13}{2}}{\binom{52}{2}} = \frac{13 \cdot 25}{26 \cdot 51} + \frac{13 \cdot 6}{26 \cdot 51} = \frac{25}{102} + \frac{6}{102} = \frac{31}{102} = \boxed{30.39\%}$$

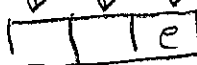
1. A dice is tossed 3 times. You win \$1 if the first toss is 6 or the last toss is even. Find your chances of winning.

Sample space S: Set of length-3 lists made from 1, 2, 3, 4, 5, 6.

$$|S| = 6 \cdot 6 \cdot 6 = 216$$


Events: A: "First toss is 6" $|A| = 6 \cdot 6 = 36$

B: "Last toss is even" $|B| = 6 \cdot 6 \cdot 3 = 108$




Answer $p(A \cup B) = p(A) + p(B) - p(A \cap B)$

$$= \frac{|A|}{|S|} + \frac{|B|}{|S|} - \frac{|A \cap B|}{|S|}$$

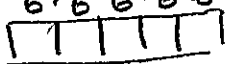
$$= \frac{36}{216} + \frac{108}{216} - \frac{18}{216} = \frac{126}{216} = \frac{63}{108} = \frac{7}{12} = \boxed{58.3\%}$$

$|A \cap B| = 1 \cdot 6 \cdot 3 = 18$




1. A dice is tossed 5 times. You win \$1 if not all tosses are even. Find your chances of winning.

Sample space S: Set of length-5 lists made from 1, 2, 3, 4, 5

$$|S| = 6 \cdot 6 \cdot 6 \cdot 6 \cdot 6 = 6^5$$


Event: A: "All tosses are even." $|A| = 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 = 3^5$



Answer $p(\bar{A}) = 1 - p(A) = 1 - \frac{|A|}{|S|} = 1 - \frac{3^5}{6^5}$

$$= 1 - \left(\frac{3}{6}\right)^5$$

$$= 1 - \left(\frac{1}{2}\right)^5$$

$$= 1 - \frac{1}{32} = \frac{31}{32} = \boxed{96.875\%}$$