



Grade 9/10 Math Circles

March 20, 2024

Probability I - Problem Set

In-Lesson Exercises

1. Is $\{AB\}$ a subset of $\{A,B,C\}$?
2. List all subsets of $S = \{x, y, z\}$.
3. Give an example of an experiment, its sample space, and two events.
4. Suppose $A \subseteq B$. What are $A \cap B$ and $A \cup B$?
5. Suppose you roll a six-sided die. Consider the events $O =$ odd roll, $E =$ even roll, $P =$ prime roll, $L =$ less than 3. Find:
 - (a) $E \cap P$
 - (b) $O \cap L$
 - (c) $E \cup L$
 - (d) $P \cup O$

Bonus: Are any of the four events disjoint?

6. Suppose you roll a six-sided die. Find the probabilities of the following events:
 - (a) $A =$ Rolling a 2
 - (b) $B =$ Rolling an odd number
 - (c) $A \cap B$
 - (d) $A \cup B$
7. Suppose that a spinner has red, green, and blue spaces. If $P(\text{red}) = 0.2$ and $P(\text{green}) = 0.3$, what is $P(\text{blue})$?



Additional Exercises

1. Suppose that you roll two six-sided dice. What is the probability that you roll doubles? What is the probability that their sum is less than 11?
2. Suppose you draw a random card from a standard 52 card deck. What is the probability that you draw either an ace or a spade? What about the probability that you draw a face card or a spade?
3. Suppose you have a bag with identically wrapped chocolates. There are 3 white chocolates, 6 milk chocolates, and 1 dark chocolate. Your friend adds k dark chocolates to the bag and tells you that the probability of picking a white or dark chocolate is now 25%. What is k ?
4. Suppose there are 10 red balls and 10 blue balls in a box. 9 of those balls have the number 1 written on them, while the remainder have number 2 written on them. Moreover, the probability of selecting a ball that is red or has a 1 on it is $13/20$. Determine the probability of drawing a ball of each type (red and 1, red and 2, blue and 1, blue and 2).