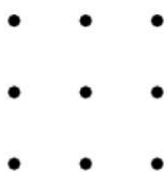# Hybleland L9-Lesson 25 Probability III-Assignment

Geometric Probability & Expected Value

Practice 1.

AMC10A 2004 / Problem 5

A set of three points is randomly chosen from the grid shown. Each three point set has the same probability of being chosen. What is the probability that the points lie on the same straight line?

A. $\frac{1}{21}$ B. $\frac{1}{14}$ C. $\frac{2}{21}$ D. $\frac{1}{7}$ E. $\frac{2}{7}$

Practice 2.

A point (x,y) is chosen at random inside the square with vertices (0,0), (0,1), (1,1), and (1,0). What is the probability that

(1) $x + y \le 0.5$?

(2) $x + 2y \ge 1$?

(3) $|x - y| \le 0.2$?

(4) $x^2 + y^2 < 1$?

(5) The distance from (x,y) to the center (0.5, 0.5) of the square is less than 0.5?

(6) The distance from (x,y) to (0,1) is greater than 1?

Practice 3.

AMC10A 2003 / Problem 12

A point (x, y) is randomly picked from inside the rectangle with vertices $(0, 0)$, $(4, 0)$, $(4, 1)$, and $(0, 1)$. What is the probability that $x < y$?

A. $\frac{1}{8}$ B. $\frac{1}{4}$ C. $\frac{3}{8}$ D. $\frac{1}{2}$ E. $\frac{3}{4}$

Practice 4.

AMC10A 2017 / Problem 15

Chloé chooses a real number uniformly at random from the interval $[0, 2017]$. Independently, Laurent chooses a real number uniformly at random from the interval $[0, 4034]$. What is the probability that Laurent's number is greater than Chloé's number?

A. $\frac{1}{2}$ B. $\frac{2}{3}$ C. $\frac{3}{4}$ D. $\frac{5}{6}$ E. $\frac{7}{8}$

Practice 5.

Steve's kitchen floor has a tile pattern of square tiles of side length 10cm. Steve drops a penny (which has radius 1 cm) on the floor. What is the probability that the penny lies entirely within one tile?
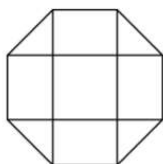
Practice 6.

Maryanne's mail arrives at a random time between 1 p.m. and 3 p.m. Maryanne chooses a random time between 2 p.m. and 3 p.m. to go check her mail. What is the probability that Maryanne's mail has been delivered when she goes to check on it?

Practice 7.

AMC10B 2011 / Problem 16

A dart board is a regular octagon divided into regions as shown. Suppose that a dart thrown at the board is equally likely to land anywhere on the board. What is probability that the dart lands within the center square?

A. $\dfrac{\sqrt{2}-1}{2}$ B. $\dfrac{1}{4}$ C. $\dfrac{2-\sqrt{2}}{2}$ D. $\dfrac{\sqrt{2}}{4}$ E. $2-\sqrt{2}$

Practice 8.

Two fair 6-sided dice are rolled. What is the expected value of the sum of the dice? What is the expected value of the product of the dice?

Practice 9.

A very bizarre weighted coin comes up heads with probability $\frac{1}{2}$, tails with probability $\frac{1}{3}$, and rests on its edge with probability $\frac{1}{6}$. If it comes up heads, I win \$1. If it comes up tails, I win \$3. But if it lands on its edge, I lose \$5. What is the expected winnings from flipping this coin?

Practice 10.

A fair 6-sided die is rolled. If I roll n, then I win \$$n^2$. What is the expected value of my win?

Practice 11.

A 6-sided die is weighted so that the probability of any number being rolled is proportional to the value of the roll. (So, for example, the probability of a ⚁ being rolled is twice that of a ⚀ being rolled.) What is the expected value of a roll of this weighted die?

Practice 12.

Three points x,y,z are chosen at random on the unit interval (0,1). What is the probability that $x \le y \le z$?

Practice 13.

Triangle ABC is a 30-60-90 right triangle with right angle at C, ∠ABC=60°, and hypotenuse of length 2. Let P be a point chosen at random inside ABC, and extend ray BP to hit side AC at D.

What is the probability that $BD < \sqrt{2}$?

Practice 14.

AMC10A 2018 / Problem 19

A number m is randomly selected from the set $\{11, 13, 15, 17, 19\}$, and a number n is randomly selected from $\{1999, 2000, 2001, \ldots, 2018\}$. What is the probability that m^n has a units digit of 1?

A. $\frac{1}{5}$ B. $\frac{1}{4}$ C. $\frac{3}{10}$ D. $\frac{7}{20}$ E. $\frac{2}{5}$

Practice 15.

AMC10A 2003 / Problem 20

A base-10 three-digit number n is selected at random. Which of the following is closest to the probability that the base-9 representation and the base-11 representation of n are both three-digit numerals?

A. 0.3 B. 0.4 C. 0.5 D. 0.6 E. 0.7