1. What is the probability that a randomly drawn positive factor of 60 is less than 7?

(A) \(\frac{1}{10}\)  (B) \(\frac{1}{6}\)  (C) \(\frac{1}{4}\)  (D) \(\frac{1}{3}\)  (E) \(\frac{1}{2}\)

2. Using the letters A, M, O, S, and U, we can form 120 five-letter “words”. If these “words” are arranged in alphabetical order, then the “word” USAMO occupies position

(A) 112  (B) 113  (C) 114  (D) 115  (E) 116

3. 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) \(\frac{3}{4}\)

4. What is the probability that an integer in the set \{1, 2, 3, \ldots, 100\} is divisible by 2 and not divisible by 3?

(A) \(\frac{1}{6}\)  (B) \(\frac{33}{100}\)  (C) \(\frac{17}{50}\)  (D) \(\frac{1}{2}\)  (E) \(\frac{18}{25}\)

5. Juan rolls a fair regular octahedral die marked with the numbers 1 through 8. Then Amal rolls a fair six-sided die. What is the probability that the product of the two rolls is a multiple of 3?

(A) \(\frac{1}{12}\)  (B) \(\frac{1}{3}\)  (C) \(\frac{1}{2}\)  (D) \(\frac{7}{12}\)  (E) \(\frac{2}{3}\)

6. A point \(P\) is chosen at random in the interior of equilateral triangle \(ABC\). What is the probability that \(\triangle ABP\) has a greater area than each of \(\triangle ACP\) and \(\triangle BCP\)?

(A) \(\frac{1}{6}\)  (B) \(\frac{1}{4}\)  (C) \(\frac{1}{3}\)  (D) \(\frac{1}{2}\)  (E) \(\frac{2}{3}\)

7. Pat is to select six cookies from a tray containing only chocolate chip, oatmeal, and peanut butter cookies. There are at least six of each of these three kinds of cookies on the tray. How many different assortments of six cookies can be selected?

(A) 22  (B) 25  (C) 27  (D) 28  (E) 729

8. A large equilateral triangle is constructed by using toothpicks to create rows of small equilateral triangles. For example, in the figure we have 3 rows of small congruent equilateral triangles, with 5 small triangles in the base row. How many toothpicks would be needed to construct a large equilateral triangle if the base row of the triangle consists of 2003 small equilateral triangles?

(A) 1,004,004  (B) 1,005,006  (C) 1,507,509  (D) 3,015,018  (E) 6,021,018

9. Tina randomly selects two distinct numbers from the set \{1, 2, 3, 4, 5\}, and Sergio randomly selects a number from the set \{1, 2, \ldots, 10\}. The probability that Sergio’s number is larger than the sum of the two numbers chosen by Tina is

(A) \(\frac{2}{5}\)  (B) \(\frac{9}{20}\)  (C) \(\frac{1}{2}\)  (D) \(\frac{11}{20}\)  (E) \(\frac{24}{25}\)
10. A point $P$ is randomly selected from the rectangular region with vertices $(0, 0), (2, 0), (2, 1), (0, 1)$. What is the probability that $P$ is closer to the origin than it is to the point $(3, 1)$?

(A) $\frac{1}{2}$      (B) $\frac{2}{3}$     (C) $\frac{3}{4}$     (D) $\frac{4}{5}$     (E) 1

11. How many 15-letter arrangements of 5 A’s, 5 B’s, and 5 C’s have no A’s in the first 5 letters, no B’s in the next 5 letters, and no C’s in the last 5 letters?

(A) $\sum_{k=0}^{5} \binom{5}{k}^3$     (B) $3^5 \cdot 2^5$     (C) $2^{15}$     (D) $\frac{15!}{(5!)^3}$     (E) $3^{15}$

12. Triangle $ABC$ is a right triangle with $\angle ACB$ as its right angle, $m\angle ABC = 60^\circ$, and $AB = 10$. Let $P$ be randomly chosen inside $\triangle ABC$, and extend $BP$ to meet $AC$ at $D$. What is the probability that $BD > 5\sqrt{2}$?

(A) $\frac{2 - \sqrt{2}}{2}$     (B) $\frac{1}{3}$     (C) $\frac{3 - \sqrt{3}}{3}$     (D) $\frac{1}{2}$     (E) $\frac{5 - \sqrt{5}}{5}$

13. Objects $A$ and $B$ move simultaneously in the coordinate plane via a sequence of steps, each of length one. Object $A$ starts at $(0, 0)$ and each of its steps is either right or up, both equally likely. Object $B$ starts at $(5, 7)$ and each of its steps is either left or down, both equally likely. Which of the following is closest to the probability that the objects meet?

(A) 0.10     (B) 0.15     (C) 0.20     (D) 0.25     (E) 0.30