

For all questions, answer E) NOTA means none of the above answers is correct. Any question mentioning “die/dice”, “cards”, or “coins” assumes that those objects are fair and standard, unless otherwise stated. Good luck and have fun!

- In how many distinct ways can the letters in LASVEGAS be arranged?
A) 6720 B) 10080 C) 20160 D) 40320 E) NOTA
- What is the probability of drawing a king or a heart from a standard deck of 52 cards?
A) $\frac{1}{26}$ B) $\frac{17}{52}$ C) $\frac{4}{13}$ D) $\frac{1}{13}$ E) NOTA
- In a group of 20 kittens, 10 are female and 6 have stripes. If $\frac{1}{5}$ of the kittens are males with stripes, what is the probability that a randomly chosen kitten is a female without stripes?
A) $\frac{1}{5}$ B) $\frac{3}{10}$ C) $\frac{2}{5}$ D) $\frac{1}{10}$ E) NOTA
- Cindy and Annie are running to be officers for their school’s math team. If there are 10 people running and only 4 people are selected to be officers, how many possible officer teams are there where Cindy and Annie are both officers or neither of them is an officer?
A) 28 B) 70 C) 98 D) 210 E) NOTA
- At a party, every attendee shakes hands with every other attendee once. If 861 handshakes occur at the party, how many people attended?
A) 42 B) 84 C) 41 D) 82 E) NOTA
- What is the constant term in the expansion of $(4x^3 - \frac{2}{x^2})^5$?
A) 1280 B) -1280 C) 2560 D) -2560 E) NOTA
- Two numbers are randomly selected from the set $\{1,2,3,4,5,6,7,8,9\}$ without replacement. What is the probability that the product of the numbers selected is a multiple of 4?
A) $\frac{1}{4}$ B) $\frac{4}{9}$ C) $\frac{5}{12}$ D) $\frac{17}{36}$ E) NOTA

8. Steffi and Ali each arrive at a library at a random time between 11 and 12 o'clock. Steffi stays for 20 minutes, while Ali stays for 10 minutes. What are the chances of their being there at the same time?
- A) $\frac{31}{72}$ B) $\frac{41}{72}$ C) $\frac{11}{36}$ D) $\frac{25}{36}$ E) NOTA
9. Ryan, Jeffrey, and Andrew are playing a game of Mafia with 12 other people. Each player in the game is assigned a unique role, and each role belongs to a specific team. There are 8 roles in the town team, 4 roles in the mafia team, and 3 roles in the neutral team. If all roles are randomly assigned with equal probability, what is the probability that Ryan, Jeffrey, and Andrew are all on the same team?
- A) $\frac{16}{455}$ B) $\frac{61}{455}$ C) $\frac{69}{455}$ D) $\frac{96}{455}$ E) NOTA
10. On the game show "2B or Not 2B", in which contestants try to determine whether a number is equal to 2B in base 16, Kanye West and Lil Wayne have made it to the final round. The two take turns answering questions, and whoever misses a question first loses. If Lil Wayne has a $\frac{2}{3}$ chance of answering a question correctly, Kanye has a $\frac{3}{5}$ chance of answering incorrectly, and Kanye goes first, find the probability that Lil Wayne loses.
- A) $\frac{1}{3}$ B) $\frac{2}{3}$ C) $\frac{2}{11}$ D) $\frac{9}{11}$ E) NOTA
11. If set $A = \{1,2,3,5,8,13\}$, how many subsets does set A have?
- A) 6 B) 32 C) 63 D) 16 E) NOTA
12. How many ways can you get from the origin to the point (5,7) on a standard Cartesian plane if you can only go one unit up or right at a time and you must pass through the point (2,3)?
- A) 196 B) 396 C) 350 D) 792 E) NOTA
13. Sohan has three red shirts, two grey shirts, and four green shirts, along with three pairs of shorts and one pair of khakis. Harish owns four red shirts and five white shirts, as well as four pairs of shorts, two pairs of sweatpants, and one pair of jeans. Sohan and Harish both choose an outfit consisting of one shirt and one choice of legwear at random. What is the probability that their choices are identical (in color of shirt and style of legwear)?
- A) $\frac{5}{126}$ B) $\frac{1}{3}$ C) $\frac{127}{252}$ D) $\frac{4}{63}$ E) NOTA

14. On a standard die, one of the dots is removed at random, with each dot equally likely to be chosen. The die is then rolled. What is the probability that the top face has an odd number of dots?

- A) $\frac{5}{11}$ B) $\frac{10}{21}$ C) $\frac{1}{2}$ D) $\frac{11}{21}$ E) NOTA

15. Arrange the following from most likely to occur to least likely to occur:

- I. Rolling 2 standard dice and getting a sum of 6
- II. Getting a flush (5 cards of the same suit) when drawing 5 cards from a standard deck of 52 cards
- III. Randomly picking an integer with an odd number of factors from the integers 1 through 100 inclusive

- A) II, I, III B) III, I, II C) I, III, II D) I, II, III E) NOTA

16. Qing and Arjun make a bet. The odds against Arjun winning the bet are 11:7. What is the probability of Arjun winning?

- A) $\frac{7}{11}$ B) $\frac{4}{11}$ C) $\frac{11}{18}$ D) $\frac{7}{18}$ E) NOTA

17. Chris the spider has one sock and one shoe for each of his eight legs. If the sock must be put on before the shoe on each leg, in how many different orders can he put on his socks and shoes?

- A) 8! B) $(8!)^2$ C) $2^8 * 8!$ D) $\frac{16!}{2}$ E) NOTA

18. How many positive integral factors of 420 are also factors of 2860?

- A) 6 B) 8 C) 10 D) 12 E) NOTA

19. Andy is a master driver, meaning that the probability of his running a stop sign is less than fifty percent. The probability that he doesn't run a stop sign until the second stop sign that he comes across is $\frac{7}{64}$. What is the probability that he doesn't run a stop sign until the fourth stop sign he comes across? Assume that the probability of Andy running the sign at each stop sign is constant and independent.

- A) $\frac{7}{4096}$ B) $\frac{49}{512}$ C) $\frac{7}{512}$ D) $\frac{343}{4096}$ E) NOTA

20. 8 people are lining up to receive trophies at a competition. If Helena, Kira, and Alice are in the top three, but are not necessarily in that order, how many possible arrangements of the 8 trophy winners are there?
- A) 120 B) 720 C) 1120 D) 6720 E) NOTA
21. How many rectangles can be made on a 6×6 grid of unit squares?
- A) 441 B) 91 C) 350 D) 225 E) NOTA
22. A jar contains 8 red jelly beans, 12 blue jelly beans, and 4 green jelly beans. If two jelly beans are drawn one at a time and without replacement, find the probability that they are different colors.
- A) $\frac{44}{69}$ B) $\frac{11}{18}$ C) $\frac{25}{69}$ D) $\frac{7}{18}$ E) NOTA
23. A game is played where a standard six-sided die is rolled until a 6 occurs, and the sum of all the rolls up to and including the 6 is taken. What is the probability that this sum is even?
- A) $\frac{1}{2}$ B) $\frac{11}{21}$ C) $\frac{3}{5}$ D) $\frac{4}{7}$ E) NOTA
24. Amy the bunny is hiding eggs in celebration of spring. In how many ways can she hide 10 identical eggs in 4 rooms, if each room must get at least 1 egg?
- A) 286 B) 64 C) 84 D) 210 E) NOTA
25. Ben has a $\frac{2}{3}$ chance of winning any given chess match against Bryan. In a best of five series, what is the probability that Bryan wins the series on the fifth match?
- A) $\frac{8}{81}$ B) $\frac{4}{243}$ C) $\frac{16}{81}$ D) $\frac{8}{243}$ E) NOTA
26. 25% of students are infected with a deadly disease called Maoitis. A very efficient test for Maoitis returns 80% of those infected as positive and 40% of those not infected as negative. What percent of students test negative?
- A) 70% B) 35% C) 50% D) 30% E) NOTA

Use the following information for questions 25 and 26: A dartboard is made from 3 concentric circles of radii 2, 5, and 7. Justin plays a game where he throws a dart that lands randomly on the board. He is awarded 10 dollars for landing in the inner circle, 3 dollars for landing outside the inner circle but inside the circle of radius 5, and 1 dollar for landing in the outermost ring. It costs 3 dollars to play the game once.

27. What is Justin's expected net award in dollars if he plays once?

- A) $\frac{127}{49}$ B) $\frac{20}{49}$ C) $\frac{134}{49}$ D) $\frac{18}{7}$ E) NOTA

28. What is the probability that he makes a net profit of more than 6 dollars in prize money from the game if he plays twice?

- A) $\frac{100}{2401}$ B) $\frac{184}{2401}$ C) $\frac{1321}{2401}$ D) $\frac{1080}{2401}$ E) NOTA

Use the following information for questions 27 and 28: There are 75 members of a club. 44 of them play Puzzle and Dragons (PAD), 42 of them play Clash Royale, and 36 of them play Pokémon Go. 24 play PAD and Clash Royal, 20 play PAD and Pokémon Go, 15 play all three, and 3 play none of these games.

29. Find the number of members that play fewer than two of the games.

- A) 37 B) 40 C) 43 D) 46 E) NOTA

30. Find the probability that a randomly chosen member plays Pokémon Go, given that they play Clash Royale.

- A) $\frac{7}{21}$ B) $\frac{7}{25}$ C) $\frac{3}{7}$ D) $\frac{1}{2}$ E) NOTA