For all questions, answer choice (E) NOTA means that none of the given answers are correct. Good Luck!

1. Jimbo has a six-sided die that he rolls three times. What is the probability that Jimbo rolls at least one 3?

   (A) $\dfrac{1}{2}$ 　　　　 (B) $\dfrac{125}{216}$ 　　　　 (C) $\dfrac{17}{36}$ 　　　　 (D) $\dfrac{1}{216}$ 　　　　 (E) NOTA

2. Jerma and Star both live on the cartesian coordinate plane. Jerma's house is at the point $(1,2)$, and Star's house is at the point $(9, a)$. If Jerma can walk at a rate of 51 units per hour, and it takes him 20 minutes to walk to Star's house, which of the following could be the value of a?

   (A) -13 　　　　 (B) 6 　　　　 (C) 15 　　　　 (D) 45 　　　　 (E) NOTA

3. Which of the following is equivalent to $\dfrac{1336}{2222}$?

   (A) $0.\overline{3214}$ 　　　　 (B) $0.\overline{6012}$ 　　　　 (C) $0.\overline{5341}$ 　　　　 (D) $0.5\overline{34}$ 　　　　 (E) NOTA

4. Radigan Conagher has two 1-liter bottles. Bottle A is half filled with milk, and bottle B is half filled with Coca-Cola. Radigan pours a third of the milk from bottle A into bottle B, and mixes bottle B thoroughly. Radigan then pours half of the mixture from bottle B into bottle A. What is the ratio of milk to cola in bottle A?

   (A) $\dfrac{5}{3}$ 　　　　 (B) $\dfrac{3}{8}$ 　　　　 (C) $\dfrac{1}{2}$ 　　　　 (D) $\dfrac{4}{3}$ 　　　　 (E) NOTA

5. Evaluate $(5 + 8 \times (3 - (-17))) + 6 + (12 \times 3) \times 0$.

   (A) 0 　　　　 (B) 171 　　　　 (C) 222 　　　　 (D) 260 　　　　 (E) NOTA

6. Timmy is planning on building a washing machine for the annual washing machine competition. Working by himself, he can build it in 60 days. Since the competition is in 59 days, he asks his friend, Gandalf, to help him build it. Gandalf can build a washing machine by himself in 45 days. To the nearest day, how long will it take for them, working together, to complete the washing machine?

   (A) 15 　　　　 (B) 16 　　　　 (C) 26 　　　　 (D) 34 　　　　 (E) NOTA

7. Solve the following system of equations for a:

$$a + b = c$$
$$b - c = 2a$$

   (A) 0 　　　　 (B) $\dfrac{3}{5}$ 　　　　 (C) 2 　　　　 (D) Not enough information

   (E) NOTA

8. The sum of 11 consecutive numbers is 231. What is the 7th number?

   (A) 16 　　　　 (B) 21 　　　　 (C) 22 　　　　 (D) 25 　　　　 (E) NOTA

9. 152399025 is equal to 12345^2. How many factors does 152399025 have?

   (A) 12 　　　　 (B) 20 　　　　 (C) 26 　　　　 (D) 34 　　　　 (E) NOTA

10. A circle has circumference $3x$. What is the area of the circle?

   (A) $9x^2$ 　　　　 (B) $\dfrac{9}{2\pi}x^2$ 　　　　 (C) $\dfrac{9}{4\pi}x^2$ 　　　　 (D) $\dfrac{3\pi}{2}x^2$ 　　　　 (E) NOTA

11. Billy buys 12 solar panels to save electricity, costing 123 dollars each. Before, Billy would pay 41 dollars a month in electricity bills. Now that he uses solar panels, he doesn't have a monthly electricity bill. How many months will it take before the panels pay for themselves?

    (A) 3   (B) 6   (C) 18   (D) 36   (E) NOTA

12. Given

$$x + xy + y = 120$$

    What is the value of $(x+1)(y+1)$?

    (A) 0   (B) 11   (C) 121   (D) Not enough information

    (E) NOTA

13. Bokey and Beta are eating a pizza. Bokey begins by eating $\frac{1}{3}$ of the pizza. Beta then eats $\frac{1}{2}$ of the remaining pizza. Bokey then eats $\frac{1}{3}$ of the remaining pizza. Beta eats $\frac{1}{2}$ of the remaining pizza. Bokey then finishes the pizza. How much more pizza did Bokey eat than Beta?

    (A) $\frac{1}{12}$ (B) $\frac{1}{9}$ (C) $\frac{1}{6}$ (D) $\frac{1}{3}$ (E) NOTA

14. $f(x) = x^2 + 2x + 12$. A is a positive integer. Given $f(A) = 111$, what is the sum of the digits of A?

    (A) 2   (B) 7   (C) 8   (D) 9   (E) NOTA

15. Ian is trying to come up with problems for an invitational mathematics competition. He writes the following question:

    What is the units digit of 1337^{1337}?

    What is the answer to his question?

    (A) 2   (B) 3   (C) 7   (D) 9   (E) NOTA

16. What is the sum of the values of k for which $f(x) = kx^2 + 3x + 2k$ has only one distinct zero?

    (A) $\frac{8}{9}$ (B) $\frac{22}{3}$ (C) 22   (D) 1   (E) NOTA

17. If we know that *if bananas eat peaches, then oranges are not orange*, which of the following must also be true?

    (A) *If bananas do not eat peaches, then oranges are not orange.*

    (B) *If oranges are not oranges, then bananas eat peaches.*

   (C) *If bananas do not eat peaches, then oranges are orange.*

    (D) *If oranges are orange, then bananas do not eat peaches.*

    (E) NOTA

18. The ratio of a sphere's volume to its surface area is $4 : 3$. What is the radius of the sphere?

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

19. Bill and Ted are having an excellent adventure on the Cartesian coordinate plane. Bill and Ted are at point $(-1, 4)$. They want to get to the potato at point $(12, 21)$, but need water. There is a river defined by the line $y = x$. What is the length of the shortest route that the two can take, going first to the river, then to the potato?

    (A) $\sqrt{458}$ (B) $2\sqrt{137}$ (C) $\sqrt{458} + 5\sqrt{2}$ (D) $\sqrt{367}$ (E) NOTA

20. Assume x is directly proportional to y squared and inversely proportional to z cubed. When $y = 6$ and $z = 3$, $x = 12$. What is x when $z = 6$ and $y = 2$?

    (A) $\dfrac{1}{6}$ (B) $\dfrac{5}{12}$ (C) 1   (D) 9   (E) NOTA

21. Matt is practicing noscoping by shooting at a target. The target is made up of seven concentric squares. The smallest square, at the center has a side length of 1. The next smallest square has a side length of 3, the next smallest has a side length of 5, and so on in this fashion.
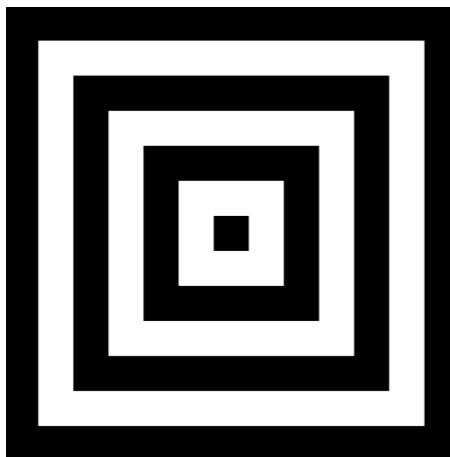
    The squares are painted black and white alternatively starting with black for the innermost square.

    Because Matt isn't very accurate, he may shoot anywhere in a circle of radius 17, with the same center as the squares, with equal probability of shooting any point in the circle. He does not necessarily have to hit the target.

    What is the probability that Matt hits a white part of the target?

    (A) $\dfrac{97}{169}$ (B) $\dfrac{1}{2}$ (C) $\dfrac{72}{289\pi}$ (D) $\dfrac{97}{169\pi}$ (E) NOTA

22. Simplify $4^x \times 2^{3x} + 8^x \times 2^{2x}$.

    (A) 2^{5x+1} (B) 2^{10x} (C) 2^{8x} (D) 2^{4x-2} (E) NOTA

23. A sequence is defined as follows: the first term is 1; after that, the nth term is defined as the $(n-1)$th term plus n. What is the 30th term?

    (A) 30   (B) 59   (C) 436   (D) 465   (E) NOTA

24. Alfonso's Auto Shop sells cars and motorcycles. All of his cars have 4 wheels and all of his motorcycles have 2 wheels. There are 104 wheels in total on all of the vehicles, and there are 34 vehicles in total. How many motorcycles does Alfonso have?

    (A) 16   (B) 18   (C) 24   (D) 26   (E) NOTA

25. Mr. Black makes 14 pounds of pure blue rock candy per hour. His former student, Jesse Redman, makes rock candy at a slower rate. In 2 hours, Mr. Black makes 8 pounds less than Redman makes in 8 hours. How much rock candy can Redman make in one hour?

    (A) 2   (B) 4.5   (C) 6.5   (D) $\dfrac{11}{4}$ (E) NOTA

26. What is the degree of the polynomial $9x^5y^2z + 2x^2y^7z^4 - 10xy^3z^8$?

    (A) 13   (B) 20   (C) 1   (D) 11   (E) NOTA

27. Siddarth is playing his favorite video game, Call of Duty 14: Modern Mountain Dewritos. His character is currently at level 12. The experience points required to advance from level $n - 1$ to level n is defined as $f(n) = n^2 + 3n - 8$. How much experience will it take for Siddarth to get to level 15 from his current level?

    (A) 262   (B) 172   (C) 692   (D) 864   (E) NOTA

28. In how many ways can the letters "TIN CAN" be arranged, such that two distinct groups of letters are formed? For example, "NIT NAC" counts as an arrangement, and "NAC NIT" counts as a different arrangement, but "NITNAC" does not.

    (A) 360   (B) 720   (C) 1800   (D) 2520   (E) NOTA

29. Hexadecimal is the base 16 number system, in which A is a digit that denotes 10, B denotes 11, C denotes 12, D denotes 13, E denotes 14, and F denotes 15. Express 11010101_2 in hexadecimal.

    (A) $D5$ (B) 213   (C) $E3$ (D) $C7$ (E) NOTA

30. Simplify $(a - x)(b - x)(c - x) \ldots (z - x)$.

    (A) 0   (B) 1   (C) $(a - b + 1)(b - c + 1)(c - d + 1) \ldots (y - z + 1)$

    (D) The expression is already simplified.   (E) NOTA