

For all questions, answer choice "E) NOTA" means none of the above answers is correct.

1. You are making 12-inch diameter pizzas out of 12 inch square blocks of pizza dough. What is the least whole number of pizzas you can make to have enough scraps to make an entire extra pizza? Assume the depth of a pizza is the same as that of a block.

- A) 3 B) 8 C) 5 D) 4 E) NOTA

2. Johnny always forgets the last number of his locker combination. However, he remembered that it is the absolute value of the difference between the sum of the roots and the product of the roots of the equation $x^4 - 15x^2 - 10x + 24 = 0$. What is the last number of his locker combination?

- A) -9 B) 24 C) 9 D) -24 E) NOTA

3. The Consumer Price Index (CPI) is directly proportional to the cost of an item. If today milk costs \$3.75 per gallon and the CPI is 210, how much did milk cost 50 years ago when the CPI was 30? Round to the nearest cent.

- A) \$0.53 B) \$0.54 C) \$26.25 D) \$0.35 E) NOTA

4. On planet Krypton, sound travels at the rate of 39 quails/second. If 3 quails equal 7 zargs, and 91 zargs are equal to 11 trillings, how many seconds will it take for Superman to hear the echo from him yelling at a wall that is 99 trillings away?

- A) 24 B) 36 C) 9 D) 18 E) NOTA

5. 0.1% of the population has the disease purpleitis, which makes your hair spontaneously turn purple. There is a test to see if you have purpleitis that is 100% accurate. If you test positive for purpleitis, what is the probability that you actually have purpleitis?

- A) 99.9% B) 99.8% C) 50% D) 75% E) NOTA

6. Find the lowest order a polynomial could have that passes through the points (1,20), (2,49), (3,102), (4,185), and (5,304).

- A) 3 B) 2 C) 1 D) 4 E) NOTA

7. Radiation is being emitted from a source of uranium in the form of neutrons. You want to move farther away from the source to protect yourself (obviously); however, you know radiation flux (particles/area) is inversely proportional to the square of the distance you are from the source. If you are 10 feet away right now, how many feet should you run away to reduce the flux you are exposed to by a factor of 4?
- A) 10 feet B) 20 feet C) 30 feet D) 5 feet E) NOTA
8. BP was so frustrated at the oil spill last summer that they decided to design a frustum to remove oil from contaminated water. The device has a bottom area of 40 square meters, a top area of 20 square meters, and a height of 10 meters. Find the volume of this new device in cubic meters.
- A) $400 + \frac{400\sqrt{2}}{3}$ B) $\frac{1000}{3}$ C) $\frac{200\pi}{3}$ D) $200 + \frac{200\sqrt{2}}{3}$ E) NOTA
9. You want to display the hexadecimal number ABC_{16} in decimal form. What hexadecimal number should you add to this so that it will display in hexadecimal the same as if it was converted to decimal? For example, $A_{16} = 10_{10}$ and $A_{16} + 6_{16} = 10_{16}$, so to make A display the same as decimal, you would add 6_{16} .
- A) 1010 B) 689 C) 1C8C D) 9BD E) NOTA
10. You buy 2 gallons of gas every day of the month that is divisible by 3, and the price per gallon of gas increases by 2 cents each day. How much money will you spend on gas during the month of June if gas costs \$2 per gallon on June 1st? June has 30 days.
- A) \$44.62 B) \$23.10 C) \$11.55 D) \$46.20 E) NOTA
11. Jack and Bob are at a party. Jack gets only 5 numbers from 15 girls without his wingman Bob. Later, with wingman Bob at his side, Jack gets 13 numbers from 15 other girls. What is the positive difference between the percent of numbers he gets with and without his wingman, Bob? Round to the nearest percentage.
- A) 53% B) 25% C) 69% D) 90% E) NOTA
12. Three of the vertices of a quadrilateral region are, in order, $(1,1)$, $(2,7)$, and $(5,7)$. If the area of the enclosed region is 14, and all coordinates have integer values, in how many possible positions could the fourth vertex be?
- A) 8 B) 6 C) 3 D) 1 E) NOTA

13. A 30-question test is such that 40% of the questions are hard (there is a 90% chance you will get them correct), 40% of the questions are very hard (there is a 50% chance you will get them correct), and 20% of the questions are ridiculously hard (there is a 10% chance you will get them correct). Correct answers are worth 5 points, wrong answers are worth -1 points, and you answer all the questions. What is the expected value of your score?

- A) 102 B) 72 C) 132 D) 89 E) NOTA

14. You have in front of you a chess board (an 8×8 grid) and 8 rooks. You want to place the rooks on the board in such a way that they do not threaten each other. Rooks threaten other pieces in the same row or column as themselves. In how many ways can you place the rooks?

- A) 5040 B) 40320 C) 1024 D) 64 E) NOTA

15. Which of these numbers is largest?

- A) 2^{10} B) 10^3 C) the volume of a cylinder with radius 6 and height 9
D) 3^6 E) $\binom{14}{4}$

16. A manufacturing line that makes circular disks is interested in reducing the scrap metal between parts. All the disks are the same size with radius of length r . If each disk is tangent to 6 other disks, what is the area wasted in-between 3 mutually tangent disks?

- A) $\sqrt{3}\pi r^2$ B) $\frac{16}{7}r^2$ C) $\left(\frac{\sqrt{3}}{4} - \frac{\pi}{2}\right)r^2$ D) $\left(\sqrt{3} - \frac{\pi}{2}\right)r^2$ E) NOTA

17. If the number of transistors on a computer chip is doubling every two years, by what factor does the number of transistors increase each year?

- A) 0.5 B) 1.5 C) $\sqrt{2}$ D) $\log 2$ E) NOTA

18. What is the absolute value of the difference between the maximum and minimum number of regions 10 distinct lines can divide a plane?

- A) 48 B) 56 C) 25 D) 45 E) NOTA

19. A parabolic tunnel is 12 feet high and 8 feet wide at its base. What is the tallest a 6 foot wide train could be, in feet, and still fit through the tunnel?

- A) $6\sqrt{2}$ B) 5.25 C) 6 D) 4.4 E) NOTA

20. What is the area enclosed by the largest square that can fit on or inside a circle with diameter 4?

- A) 4 B) 8 C) $4\sqrt{2}$ D) $2\sqrt{2}$ E) NOTA

21. Which of the following regular shapes cannot be used to tile a floor with no gaps between tiles?

- A) triangle B) square C) pentagon D) hexagon E) NOTA

22. Under Antarctic tax laws, your first \$100,000 of income is tax free. However, after that, your tax rate increases by 5% for every \$10,000 additional dollars you earn (for example, if you make between \$120,000 and \$129,999.99, you will be taxed 15% of your total income). What is the optimal amount of pre-tax income (the least pre-tax amount earned which yields the most take-home pay, rounded to the nearest cent)?

- A) \$149999.99 B) \$159999.99 C) \$129999.99 D) \$269999.99 E) NOTA

23. John is having computer problems. He noticed that 6 of the 26 letters on his keyboard aren't working. If John's computer password consists of 5 distinct letters, what is the probability that John will still be able to type in his password (all 5 letters are working)?

- A) $\frac{10}{13}$ B) $\frac{3876}{16445}$ C) $\left(\frac{10}{13}\right)^5$ D) $\frac{41}{45}$ E) NOTA

24. You are on the edge of a circle with diameter of length 5 m which is rotating twice per minute. What is the straight line distance you would travel, in m, in 1 hour?

- A) 300π B) 600π C) 150π D) 1200π E) NOTA

25. A company advertises that their computers only fail once every million years. If there is a probability of computer failure of one-one-millionth, and if it costs \$200 to replace a computer, and your company has 60,000 computers, how much should you expect to spend to replace computers in the first 5 years?

- A) \$400 B) \$4000 C) \$60 D) \$600 E) NOTA

26. A barrel contained 10 gallons of water and 2 gallons of oil. How many gallons of a solution that is 5% oil and 95% water must be added to the barrel to dilute the oil down to 10% of the total volume in the barrel?

- A) 8 B) 11 C) 16 D) 24 E) NOTA

27. Both my birthday and my sister's birthday are technically at 12:00:00 am on January 1. In 4 years I will be twice as old as my sister was 7 years ago. If I was 23 last year, how old is my sister now?

- A) 16 B) 21 C) 19 D) 32 E) NOTA

28. Current computers only work in two states (on or off, 1 or 0, etc.), where an object is represented by some number of cells, each of which is in one of the two states. One of the exciting aspects of quantum computing is that there can be 3 possible states (on, off, or unknown) for each cell. The total number of objects that can be identified by a fixed number of cells is the total number of permutations of the states in the cells. How many complete cells in a quantum computer would be necessary to represent the same number of objects that can be represented in a current computer with 20 memory cells?

- A) 13 B) 12 C) 16 D) 9 E) NOTA

29. The Earth and a killer asteroid are 10,000 miles apart. The asteroid is traveling towards the Earth at a rate of 638 mi/hr, and the Earth is traveling away from the asteroid at 388 mi/hr. In how many hours will the two objects collide?

- A) 29.8 B) 36.5 C) 40 D) 30 E) NOTA

30. Captain Ahab is on a rowboat at one bank of a river. He needs to get to the other bank and back, and he can only row upstream or perpendicular to the bank. If Captain Ahab wants to row upstream first, then over to the other bank and back, how long, in sec, should he row upstream so that he returns to his original starting spot? The river flows at 5 m/s, the river is 68 m wide, and Captain Ahab rows at 8 m/s.

- A) 85 B) 25 C) $\frac{85}{8}$ D) $\frac{85}{3}$ E) NOTA