



- Liquid is running into a tank at the rate of four gallons in three days. Meanwhile, liquid is running out from a drain at the rate of two gallons in four days. What will be the net change in gallons of liquid in the tank after 1 day?  
A.  $5/6$                       B.  $6/5$                       C. 12                      D. 24                      E. NOTA
- After spending  $1/4$  of my money, then  $1/5$  of the remainder, I now have \$66 dollars remaining. How many dollars did I start with?  
A. \$5.50                      B. \$11                      C. \$110                      D. \$120                      E. NOTA
- A person invests \$25,000 in three accounts, paying 6%, 8%, and 9% simple interest. Because of the risk factor, she wants to invest twice as much in the 6% account as in the 9% account. If she wants to earn \$1850 in interest after one year, how much should she invest at 9%?  
A. \$3000                      B. \$5000                      C. \$6000                      D. \$10000                      E. NOTA
- A triangle has vertices at (3, 5), (-2, 4), and (4, -3). Find the area of the triangle to the nearest whole unit.  
A. 18                      B. 20                      C. 21                      D. 37                      E. NOTA
- Darryl has a keychain that has his name on it in beads. There are 6 beads in total, each of which has one letter of his name. How many different ways can Darryl rearrange these beads on his keychain?  
A. 120                      B. 60                      C. 30                      D. 15                      E. NOTA
- The graphs of  $y = 5$ ,  $y = 1$ ,  $y = 2x + 5$ , and  $y = 10 - x$  bound a quadrilateral region with two parallel horizontal sides. Find the area of that quadrilateral.  
A. 22                      B. 26                      C. 32                      D. 34                      E. NOTA
- A particle moves along the  $x$ -axis with its distance from the origin given by  $x(t) = |-16t^2 + 48t + 2|$ , at  $t$  seconds, for  $t \geq 0$ . For the time interval  $[0, 4]$  seconds, what is the greatest distance that the particle is from the origin?  
A. 1.5                      B. 34                      C. 38                      D. 62                      E. NOTA
- John is three times Rebecca's age. One year ago, John was four times Rebecca's age. Assuming that John and Rebecca share the same birthday, in how many years will John be twice Rebecca's age?  
A. 4                      B. 3                      C. 2                      D. 1                      E. NOTA
- A tank has the form of a right circular cylinder with hemispherical ends. Its volume is  $100 \text{ in}^3$ . Find the height of the cylinder in terms of the radius of the hemisphere.  
A.  $\frac{100 - \pi r^2}{\pi r^2}$                       B.  $\frac{300 - 4\pi r^3}{3\pi r^2}$                       C.  $\frac{50 - 4\pi r^3}{3\pi r^2}$                       D.  $\frac{100 - 4\pi^2 r^3}{\pi r^2}$                       E. NOTA



10. Bill, Bob and Barry are hired to paint signs. In 8 hours Bill can paint 1 sign, Bob can paint 2 signs, and Barry can paint  $1\frac{1}{3}$  signs. They all come to work the first day, but Barry does not like the job and quits after 3 hours. Bob works half an hour longer than Barry, and then Bob quits. How long will it take Bill to finish the 2 signs that were supposed to be painted?
- A. 1 hour                      B.  $1\frac{1}{2}$  hours                      C. 2 hours                      D.  $2\frac{1}{2}$  hours                      E. NOTA
11. Mary drove 156 miles at a constant rate. If she had driven  $9\text{mi}/\text{h}$  faster, she could have reduced her driving time by 45 minutes. Find the rate at which she actually drove.
- A. 38 mph                      B. 39 mph                      C. 48 mph                      D. 49 mph                      E. NOTA
12. Rudy bought a math book and then sold it to Lalitha for 20% less than the original price. Lalitha sold the book to Pooja for 20% less than what she paid for it. Pooja then made a 50% profit by selling the book to Suchandan for \$5.28. How much did Rudy pay for the math book?
- A. \$5.40                      B. \$5.60                      C. \$5.80                      D. \$5.90                      E. NOTA
13. A cathedral tower 100 feet high is 200 feet from a church tower 60 feet high. On top of each tower is a pigeon. The two pigeons fly off at the same time and at the same speed directly to some grain on the level straight road that connects the two towers. If the pigeons reach the grain at the same instant, how far is the grain from the foot of the cathedral tower?
- A. 81 ft                      B. 82 ft                      C. 83 ft                      D. 88 ft                      E. NOTA
14. Movies tickets at a local movie theater cost \$4 for children and \$7 for adults. If 27 tickets were sold and \$165 was collected, how many children's tickets were sold?
- A) 7                      B) 8                      C) 11                      D) 10                      E) NOTA
15. Here is your bouncing ball problem! Gina is standing on a tower and holding a ball 90 feet above the ground. She drops the ball and determines that after each bounce, it rebounds to only two-thirds of its previous height. How far has the ball traveled when it comes to rest?
- A. 270 feet                      B. 360 feet                      C. 450 feet                      D. 540 feet                      E. NOTA
16. A Chenyu divides into two Chenyu's once every hour. How long, in hours, will it take for a single Chenyu to become a colony of 32,768 Chenyus?
- A. 8                      B. 12                      C. 16                      D. 17                      E. NOTA
17. One of the corner sections of a football stadium has one seat in the first row, three seats in the second row, five seats in the third row, and so on. If this section of the stadium will hold 1600 people when full with one person per seat, how many people can sit in the last row, one person per seat?
- A. 65                      B. 79                      C. 101                      D. 159                      E. NOTA



18. An urn is filled with coins and beads, all of which are either silver or gold. Twenty percent of the objects in the urn are beads. Forty percent of the coins in the urn are silver. What percent of the objects in the urn are gold coins?
- A. 32                      B. 46                      C. 48                      D. 52                      E. NOTA
19. The electrical resistance of a wire varies directly as the length and inversely as the square of the diameter of the wire. If 65 meters of wire of diameter 3 millimeters has a resistance of 10 ohms, what is the resistance, in ohms, of 50 meters of the same type of wire if the diameter is 5 millimeters?
- A.  $\frac{36}{13}$                       B.  $\frac{60}{13}$                       C. 6                      D.  $\frac{180}{13}$                       E. NOTA
20. The sum of the squares of three successive negative integers is 434. Find the sum of these three integers.
- A. -48                      B. -42                      C. -36                      D. -30                      E. NOTA
21. For the equation  $2x^2 - 4x - c = 0$ : Let  $c_1$  represent the value of  $c$  if the roots are equal;  $c_2$  represent the value of  $c$  if one of the roots is 10;  $c_3$  represent the value of  $c$  if one of the roots exceeds the other by 10. Find  $c_1 + c_2 + c_3$ .
- A. 110                      B. 112                      C. -114                      D. 206                      E. NOTA
22. The roots of the equation  $x^3 + kx^2 - 54x + 216 = 0$  can be arranged to form a geometric progression. Find the value of  $k$ .
- A. -3                      B. -6                      C. -9                      D. 8                      E. NOTA
23. What is the area, in square units, of the trapezoid that can be formed by connecting the intersections of the curves whose equations are  $x^2 + 4y^2 = 6x + 8y + 67$  and  $x^2 = 6x + 8y + 31$ ?
- A. 72                      B. 144                      C. 96                      D. 36                      E. NOTA
24. For any complex number  $z$  in the form  $a + bi$ , where  $a$  and  $b \neq 0$ , then the value of  $z(\bar{z})$  is
- A. real and positive                      B. real and negative  
C. pure imaginary                      D. real and positive and negative                      E. NOTA
25. A dinner party is being planned for eight people; among the eight attendees Eric is dating Stephanie and Russell is dating Heather. If all eight people are assigned random seats around a circular table, what is the probability that both Eric and Russell get to sit next to their dates?
- A)  $\frac{1}{24}$                       B)  $\frac{2}{15}$                       C)  $\frac{2}{21}$                       D)  $\frac{1}{8}$                       E) NOTA



26. Given two positive real numbers, if their geometric mean is greater than or equal to their arithmetic mean, how many of the following are always true?

- I. their product is greater than their sum
- II. at least one number is less than or equal to one
- III. one number is at least twice as large as the other
- IV. both numbers are less than or equal to 1

A. 0                      B. 1                      C. 2                      D. 4                      E. NOTA

27. If the sum of the interior angles of a convex polygon is  $88,560^\circ$ , how many sides does the polygon have?

A. 492                      B. 493                      C. 494                      D. 495                      E. NOTA

28. The base of an equilateral triangle lies on the  $x$ -axis. What is the sum of the slopes of the three sides?

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

29. Five letter arrangements are formed by selecting letters from the word FRESHMAN with no repetition allowed. If a five letter arrangement is selected at random, what is the probability that it contains at least one vowel?

A.  $\frac{3}{28}$                       B.  $\frac{7}{8}$                       C.  $\frac{25}{28}$                       D.  $\frac{13}{14}$                       E. NOTA

30. A survey of 100 Mu Alpha Theta students revealed the following data:

- 45 played extra-curricular sports
- 34 played musical instruments
- 15 participated on academic teams
- 20 played extra-curricular sports and musical instruments ONLY
- 7 played extra-curricular sports and participated on academic teams ONLY
- 6 played musical instruments and participated on academic teams ONLY
- 1 played extra-curricular sports and musical instruments, and participated on academic teams

How many students did not play extra-curricular sports, musical instruments, or participate on other academic teams?

A. 6                      B. 32                      C. 41                      D. 60                      E. NOTA