

1. Let  $A$  = the number of days in four consecutive years and  $B$  = the number of hours in the last three months of the year. What is  $A + B$ ?

- A. 3644      B. 3645      C. 3668      D. 3669      E. NOTA

2. Solve for  $x$ :  $20_6 + 17_8 + 8 - 40_5 = x_{10}$ .

- A. 15      B. 55      C. 191      D. -5      E. NOTA

3. Which of the following describes the solutions of the quadratic  $6x^2 + 25x - 17 = 0$ ?

- A. Two imaginary solutions  
B. One real solution; One imaginary solution  
C. One double root real solution  
D. Two distinct real solutions  
E. NOTA

4. How many ways are there to arrange the letters in the word MISSISSIPPI?

- A. 34,550      B. 34,650      C. 69,300      D. 138,600      E. NOTA

5. Assuming all numbers are positive, natural numbers, determine the number of elements in the set  $(A \cap B) \cup C$  given the following:

$A = \{\text{prime numbers less than 100}\}$   
 $B = \{\text{odd numbers less than 100}\}$   
 $C = \{\text{multiples of 7 less than 100}\}$

- A. 35      B. 36      C. 37      D. 38      E. NOTA

6. What is the solution  $(x, y, z)$  of the system of equations below?

$$x + y + 2z = -1$$

$$x - 2y + z = 0$$

$$3x + y - 2z = 5$$

- A. (-1, 0, 1)      B. (1, 0, -1)      C. (1, 0, 2)      D. (2, 0, 1)      E. NOTA

7. Dale and Della are making Kool-Aid. Dale mixes a 20-ounce drink composed of 25% sugar while Della mixes an 18-ounce drink with 30% sugar. If the two drinks are combined, what percent (rounded to the nearest percent) of the new mixture is composed of sugar?

- A. 26%      B. 27%      C. 28%      D. 29%      E. NOTA

8. Find the units digit of  $(867)^{5309}$ .

- A. 1                  B. 3                  C. 7                  D. 9                  E. NOTA

9. Factor completely:  $49j^2 - k^2 + 12k - 36$

- A.  $(7j - k - 6)^2$   
B.  $(7j + k + 6)^2$   
C.  $(7j + k - 6)^2$   
D.  $(7j + k - 6)(7j - k + 6)$   
E. NOTA

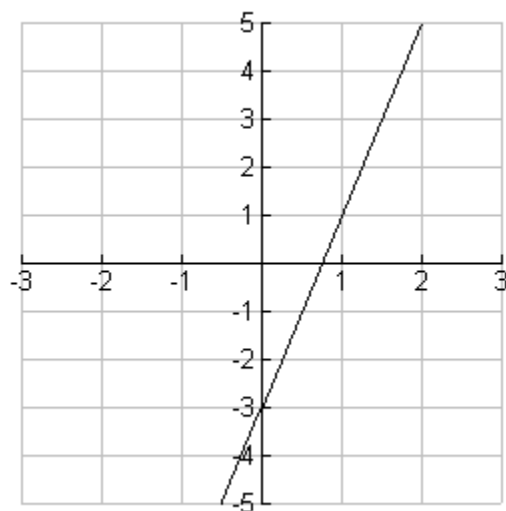
10. Bert, Burt, and Belle are professional elephant manicurists. Bert can manicure an elephant toe in 5 minutes, Burt can manicure an elephant toe in 8 minutes, and Belle can manicure an elephant toe in 5 minutes. How long, to the nearest minute, would it take the three of them working together to manicure five elephant toes?

- A. 9                  B. 10                  C. 11                  D. 12                  E. NOTA

11. Della bought a custom charm bracelet with eight charms. If the bracelet has no clasp, in how many ways can she arrange the charms on the bracelet?

- A. 2520              B. 5040              C. 10,080            D. 13,440            E. NOTA

12. What is the equation of the line formed by reflecting the line shown below over the line  $y = x$ ?



- A.  $y = 4x - 3$   
B.  $y = \frac{1}{4}x + \frac{3}{4}$   
C.  $y = -4x - 3$   
D.  $y = \frac{3}{4}x + \frac{1}{4}$   
E. NOTA

13. Find  $A + B + C + D - E$  if each letter represents a distinct digit from 0 to 9 and the following is true.

$$\begin{array}{r} A \quad B \quad A \\ + \quad C \quad A \quad D \\ \hline D \quad D \quad E \quad C \end{array}$$

- A. 0                      B. 7                      C. 11                      D. 21                      E. NOTA

14. Find the area enclosed by the x-axis,  $x \leq 8$ , and  $y \geq -2x + 7$ .

- A.  $\frac{81}{2}$                       B. 27                      C.  $\frac{81}{4}$                       D.  $\frac{81}{8}$                       E. NOTA

15. Solve the inequality:  $|x - 3| \geq |2x + 1|$ .

- A.  $-\frac{2}{3} < x < 4$   
 B.  $-4 < x \leq \frac{2}{3}$   
 C.  $-4 \leq x \leq \frac{2}{3}$   
 D.  $-\frac{2}{3} \leq x < 4$   
 E. NOTA

16. What is the product of the values  $x$  and  $y$  that solve the following matrix equation?

$$\begin{bmatrix} 3x + 4 \\ 11 \end{bmatrix} = \begin{bmatrix} -8 \\ 5 - 3y \end{bmatrix}$$

- A. -8                      B. 8                      C.  $\frac{68}{9}$                       D.  $-\frac{68}{9}$                       E. NOTA

17. Simplify:  $\sqrt{6 + \sqrt{6 + \sqrt{6 + \dots}}}$ .

- A. 2                      B. 3                      C. 6                      D.  $2\sqrt{2}$                       E. NOTA

18. How many positive, integral factors does the number 7429 have?

- A. 8                      B. 9                      C. 16                      D. 17                      E. NOTA

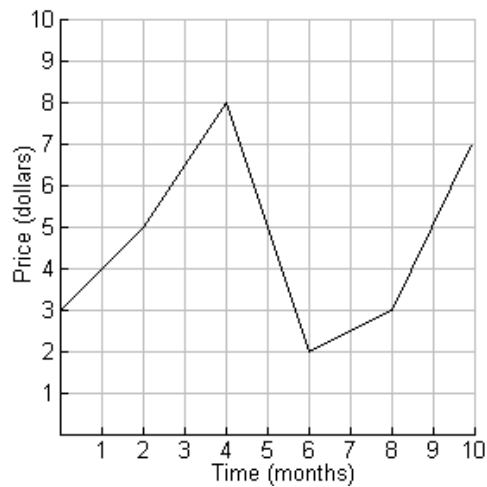
19. Factor completely:  $x^3 + 6x^2 - x - 30$ .

- A.  $(x - 3)(x + 2)(x + 5)$   
 B.  $(x + 3)(x - 2)(x + 5)$   
 C.  $(x + 3)(x + 2)(x - 5)$   
 D.  $(x + 3)(x + 6)(x^2 - 1)$   
 E. NOTA

20. Debbie begins working on a test at 12:04 and finished the test a few minutes later at 12:26. By how many degrees has the distance between the minute hand and the hour hand increased during this time interval? Assume the smallest angle formed in your calculations.

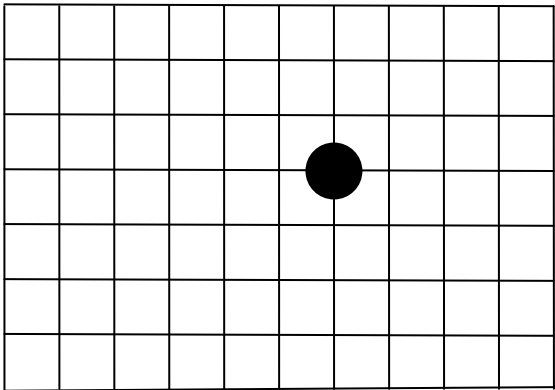
- A.  $81^\circ$       B.  $121^\circ$       C.  $132^\circ$       D.  $143^\circ$       E. NOTA

21. The graph below shows the price of a certain stock over a ten month period. Define  $z$  as the change in price of the stock over a given interval. Which of the intervals does the magnitude of  $z$  change the most?



- A. Month 0 to Month 2  
 B. Month 2 to Month 4  
 C. Month 4 to Month 6  
 D. Month 6 to Month 8  
 E. Month 8 to Month 10

22. If you can only move up or right, in how many ways can you travel from the bottom left-hand corner to the top right-hand corner AND pass through the intersection marked by the giant black circle?



- A. 2940      B. 4410      C. 7350      D. 11,760      E. NOTA

23.  $z$  varies directly as  $x$  and inversely as  $y$  and  $w$ . When  $z$  is 54,  $x$  is 26,  $y$  is 2 and  $w$  is 7. Find  $z$  when  $x$  is 117,  $y$  is 27 and  $w$  is 21.

- A.  $\frac{378}{13}$       B.  $\frac{182}{27}$       C. 6      D. 18      E. NOTA

24. If  $f(x) = 6x - 7$ ,  $g(x) = -x^2 - 11$ , and  $h(x) = x + 5$ , and if  $g(f(h(x))) = -372$ , then what are the values of  $x$ ?

- A.  $-\frac{2}{3}, -7$     B.  $-\frac{1}{3}, -\frac{7}{2}$     C.  $\frac{2}{3}, 7$     D.  $\frac{7}{6}, -4$     E. NOTA

25. Billy rides his gas-efficient motor scooter to school everyday in a meandering way. He rides 5 miles north, then 3 miles east, then 6 miles south, then 8 miles west, then 3 miles north, then 10 miles east, then 2 miles west, then 7 miles north, then 15 miles west, then 9 miles south, then 6 miles east, then 4 miles west, then 13 miles south, then 3 miles west, then 4 miles north, then 12 miles east to reach school. If, instead of meandering, Billy rode in a straight line to school, what would be the slope of the line perpendicular to the path?

- A.  $\frac{1}{9}$     B. 9    C.  $-\frac{1}{9}$     D. -9    E. NOTA

TB1 Triangle ABC with vertices A (0, 1), B(4, 5), and C(3, 0) is reflected over the y-axis to transform into triangle A'B'C'. What is the distance between B' and A?

TB2 How many times will Monday occur in a leap year that begins on a Sunday?

TB3 Find the value of  $\frac{ac}{de}$  rounded to the nearest whole number given the following:

$a$  = the fifth digit of  $\pi$

$c$  = the units digit of the 15<sup>th</sup> Fibonacci number

$d$  =  $1101_2$  in base 10

$e$  = 2.71828182890459023