45th DICK SCHAFF MATH SUPERBOWL
April 21, 2018
Secondary Math 1 Huddle

Directions:
1. Select the most correct answer for each question and mark it on the Scantron® sheet.
2. ABSOLUTELY NO CALCULATING INSTRUMENTS ARE TO BE USED. This includes watch calculators.
3. Note that N.O.T. means "None of These."

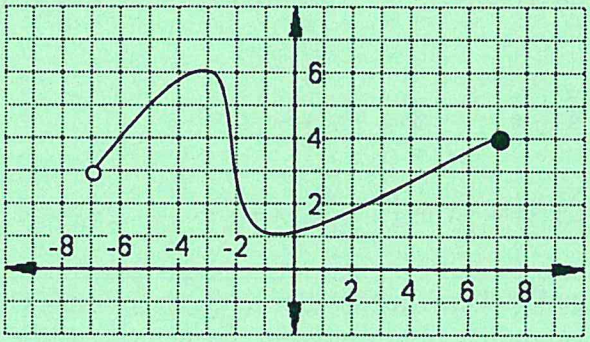
1. $(x-7)^2 =$

(A) x^2+49 (B) x^2-49 (C) $x^2-14x-49$ (D) $x^2-7x+49$ (E) N.O.T.

2. Find the value of $4 \times 9 - 8 \div 2$

(A) 32 (B) 14 (C) 28 (D) 34 (E) N.O.T.

3. What is the domain of the graph below?



(A) [1, 6] (B) (3,4] (C) (-7, 7] (D) [-7, 7) (E) N.O.T.

4. Given $f(x) = -x^2 - 3x + 3$, what is $f\left(\frac{1}{2}\right)$?

(A) 1 (B) $\frac{9}{2}$ (C) $\frac{5}{4}$ (D) $\frac{7}{4}$ (E) N.O.T.

5. Find the determinant of $\begin{bmatrix} 0 & 5 \\ -3 & 6 \end{bmatrix}$.

(A) -15 (B) -9 (C) -2 (D) 18 (E) N.O.T.

6. If $f(x) = g(x) - 4$, and $g(x) = 3 \cdot 5^x$, then $f(2) =$ _____

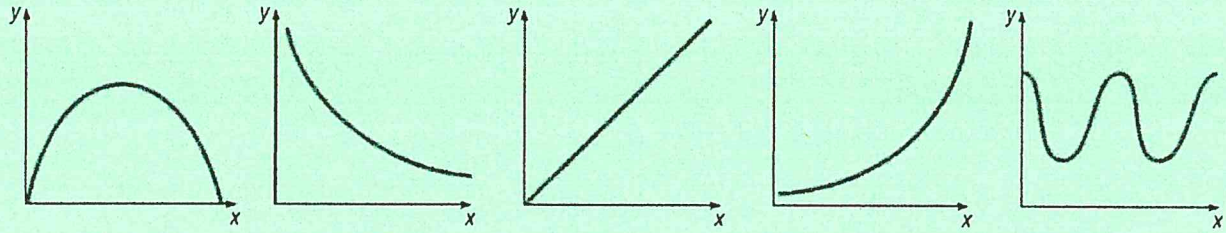
(A) 2 (B) 75 (C) -4 (D) 70 (E) N.O.T.

7. On a graph, the equation $g(x) = f(x-4)$ is the graph of $f(x)$ shifted ___ units _____.

(A) 4, left (B) 4, right (C) 4, up (D) 4, down (E) N.O.T.

8. Match each of the following options with the graph that best describes the situation.

(a) The temperature of a bowl of soup as a function of time
(b) The number of hours of daylight per day over a 2-year period
(c) The population of Florida as a function of time
(d) The distance traveled by a car going at a constant velocity as a function of time
(e) The height of a golf ball hit with a 7-iron as a function of time



1 2 3 4 5

(A) 5,3,2,1,4 (B) 2,5,4,1,3 (C) 2,5,3,4,1 (D) 2,4,5,3,1 (E) N.O.T.

9. Solve the following for y in terms of x $\quad x = \frac{2}{3}y - \frac{1}{3}$

(A) $y = \frac{3}{2}x + \frac{1}{2}$ (B) $y = \frac{2}{3}x + \frac{1}{3}$ (C) $y = \frac{3}{2}x + \frac{1}{3}$ (D) $y = \frac{3}{2}x - \frac{1}{2}$ (E) N.O.T.

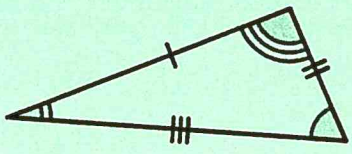
10. Two friends walk out of class together. One friend walks due east two miles to home; the other friend walks 1 mile north and three more miles west. How many miles apart are the friends?

(A) $3\sqrt{3}$ (B) $\sqrt{6}$ (C) 5 (D) $\sqrt{13}$ (E) N.O.T.

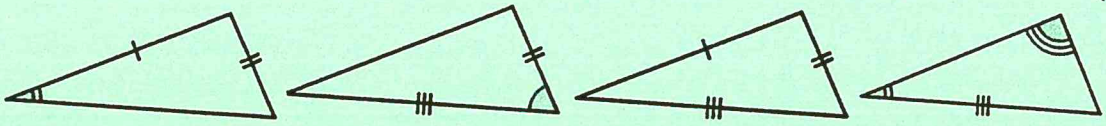
11. How many lines of symmetry does an isosceles trapezoid have?

(A) 0 (B) 1 (C) 2 (D) 4 (E) N.O.T.

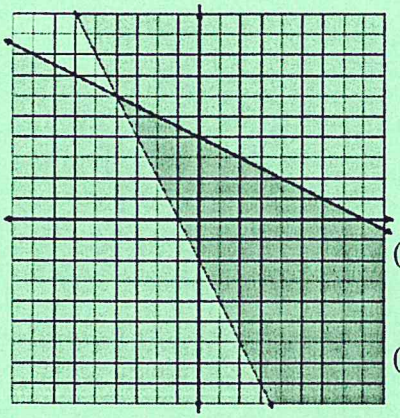
12. Which of the following triangles might *not* be congruent to this one:



(A) (B) (C) (D) (E) N.O.T.



13. Match the graph with the corresponding system.



(A) $\begin{cases} y \le -\frac{1}{2}x + 4 \\ y \le -2x - 2 \end{cases}$ (B) $\begin{cases} y \le -\frac{1}{2}x + 4 \\ y \ge -2x - 2 \end{cases}$ (C) $\begin{cases} y \ge -\frac{1}{2}x + 4 \\ y \le -2x - 2 \end{cases}$

(D) $\begin{cases} y \ge -\frac{1}{2}x + 4 \\ y \ge -2x - 2 \end{cases}$ (E) N.O.T.

14. Write an equation of the line perpendicular to the line given by $2x - 3y = 7$ and having the same y-intercept as the line given by $2x + 5y = 0$

(A) $y = \frac{3}{2}x$ (B) $y = -\frac{3}{2}x$ (C) $y = -\frac{2}{3}x - \frac{7}{3}$ (D) $y = \frac{2}{3}x + \frac{2}{5}$ (E) N.O.T.

15. Which pair of lines are *not* perpendicular?

(A) $\begin{matrix} y = 4x - 5, \\ 4y = 8 - x \end{matrix}$ (B) $\begin{matrix} y = -x + 7, \\ y - x = 3 \end{matrix}$ (C) $\begin{matrix} 4x - 3y = 8, \\ 7 - 12y = 9x \end{matrix}$

(D) $\begin{matrix} y = -3x + 1, \\ 6x + 7y = 8 \end{matrix}$ (E) N.O.T.

16. Find the next term in the sequence: $1, 1, 2, 3, 5, \ldots$

(A) 6 (B) 7 (C) 9 (D) 14 (E) N.O.T.

17. Find the next term in the sequence: $\frac{3}{2}, \frac{9}{4}, 3, \frac{15}{4}, \ldots$

(A) 8 (B) 9 (C) $\frac{19}{2}$ (D) $\frac{19}{4}$ (E) N.O.T.

18. The recursive function for the sequence: $\mathbf{4}, \frac{4m}{5}, \frac{4m^2}{25}, \frac{4m^3}{125}, \ldots$ is $f(0) = 4$ AND

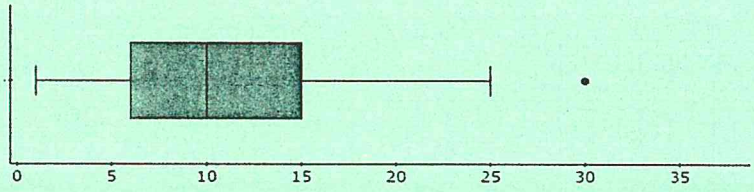
(A) $f(x) = f(x-1) \times m$ (B) $f(x) = f(x-1) \times \frac{1}{5}$ (C) $f(x) = f(x-1) \times \frac{m}{5}$

(D) $f(x) = f(x-1) \times \frac{5}{m}$ (E) N.O.T.

19. An equilateral triangle is inscribed in a circle of radius 6. Find the length of a side of the equilateral triangle.

(A) $\sqrt{3}$ (B) $2\sqrt{3}$ (C) $6\sqrt{3}$ (D) $3\sqrt{3}$ (E) N.O.T.

20. Which statement is true for this data set?



(A) mean < 5 (B) mean < 10 (C) mean =10 (D) mean > 10 (E) N.O.T.

21. Find the circumference, in terms of π, of a circle whose ratio of area to circumference is 2018.

(A) 2018π (B) 4036π (C) 6054π (D) 8072π (E) N.O.T.

22. Find the sum of the solutions to the equation:

$$(3x^2 + 8x + 5)\big((2018x^2) - 1\big)(3x^2 - 8x + 5) = 0$$

(A) 6 (B) 4 (C) 2 (D) 0 (E) N.O.T.

23. What is the *multiplicative identity* of the matrix $\begin{bmatrix} 1 & 1 \\ 0 & -2 \end{bmatrix}$?

(A) $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ (B) $\begin{bmatrix} 1 & -1 \\ 0 & 2 \end{bmatrix}$ (C) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ (D) $\begin{bmatrix} -2 & -1 \\ 0 & 1 \end{bmatrix}$ (E) N.O.T.

24. Evaluate $\left(3\frac{13}{36}\right)^{-\frac{1}{2}}$ as a common fraction.

(A) $-\frac{6}{11}$ (B) $\frac{6}{11}$ (C) $\frac{11}{6}$ (D) $-\frac{11}{6}$ (E) N.O.T.

25. Simplify: $\frac{-3^{-6}}{18^{-3}}$

(A) -2 (B) 2 (C) 8 (D) -8 (E) N.O.T.

26. Solve the system of equations: $\begin{cases} \frac{x}{2}+\frac{5y}{8}=\frac{1}{2} \\ -\frac{x}{3}+\frac{y}{2}=\frac{3}{2} \end{cases}$

(A) $\left(\frac{3}{4},-2\right)$ (B) $\left(-\frac{3}{4},\ 2\right)$ (C) $\left(\frac{3}{2},-2\right)$ (D) $\left(\frac{3}{2},\ 2\right)$ (E) N.O.T.

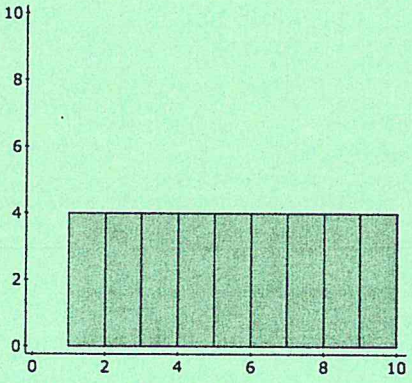
27. Find the x-intercept of the line containing the points $(-5a, 0), (0, 3a), (2, -4)$.

(A) $\left(\frac{26}{5},0\right)$ (B) $\left(-\frac{26}{3},\ 0\right)$ (C) $\left(-\frac{26}{5},0\right)$ (D) $\left(\frac{26}{3},\ 0\right)$ (E) N.O.T.

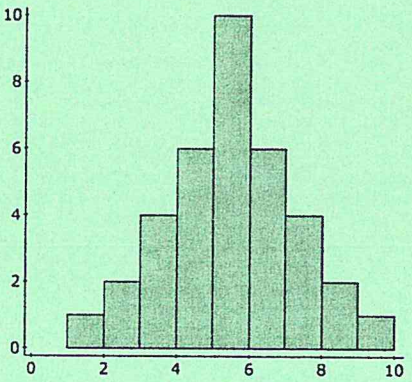
28. If $2(2^x+2^x+2^x+2^x)2^x2^x2^x2^x = 2^{2018}$, what is the sum of the digits of x?

(A) 9 (B) 7 (C) 5 (D) 11 (E) N.O.T.

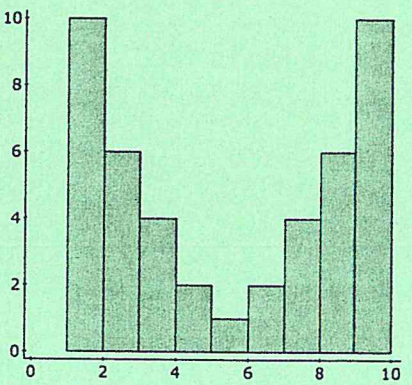
29. Order the data sets from the least spread to the most spread.



Graph I



Graph II



Graph III

(A) I, II, III (B) II, III, I (C) II, I, III (D) I, III, II (E) N.O.T.

30. What number is $\frac{1}{8}$ of the way from $\frac{1}{6}$ to $\frac{3}{4}$?

(A) $\frac{23}{96}$ (B) $\frac{43}{96}$ (C) $\frac{3}{8}$ (D) $\frac{75}{96}$ (E) N.O.T.