Dick Schaff Math Superbowl XLIV
Level 3 Blitz: Secondary Math I – 2017

Directions: (1) Select the most correct answer for each question and mark it on your answer form.
(2) No calculators of any sort are allowed.
(3) Note that N.O.T. means "None of these."

1. Solve the following equation for k: $16 - 2(k-1) = 4(3-k)$

   a) $k = -3$ b) $k = -2$ c) $k = \frac{3}{2}$ d) $k = \frac{13}{8}$ e) N.O.T.

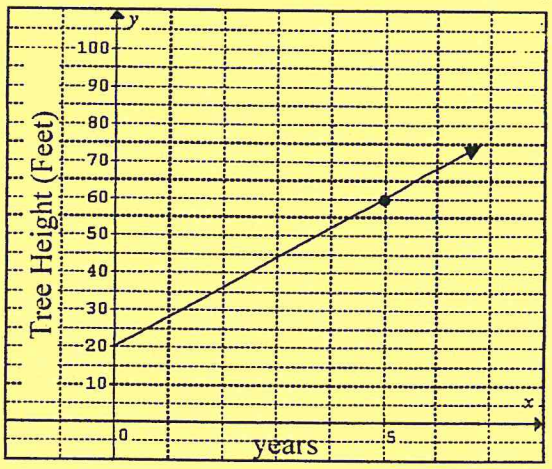
2. Modesto Irrigation District is dealing with power outages from a major storm. They start with 2500 customers without power. The number of customers without power is decreasing by 12% each hour. Which of the following expressions represent the number of customers without power in 4 hours?

   a) $2500 - 4(300)$ b) $2500(-0.12)^4$ c) $2500(0.88)^4$ d) $2500(0.88)^{-4}$ e) N.O.T.

3. Which of the following expressions is equal to $(2x-1)^2$?

   a) $4x^2 - 1$ b) $4x^2 + 2$ c) $4x^2 - 4x + 2$ d) $4x^2 - 4x + 1$ e) N.O.T.

4. A forest ranger is keeping track of the height of a tree based on the year. Using the graph of the line below, which is the best interpretation of the slope of this line?



   a) The tree is growing at a rate of 1.6 feet per year.
   b) The tree is growing at a rate of 8 feet per year.
   c) The tree is growing at a rate of 10 feet per year.
   d) The tree is growing at a rate of 12 feet per year.
   e) N.O.T.

5. Let $f(x) = 2(x-1)^2$. What is the value of $f(-2)$?

   a) -36 b) -18 c) 10 d) 18 e) N.O.T.

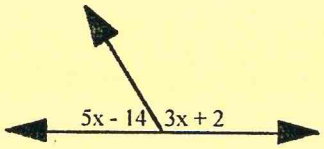
6. Enrico has been at camp for 3 days. Every day, he spends the same amount of money. At the end of the current day, he has \$227. At the end of 5 more days, camp will be over, and Enrico will have \$87 left. How much money did Enrico have at the start of camp?

a) \$227 b) \$255 c) \$311 d) \$367 e) N.O.T.

7. Solve the following equation: $\frac{3x+10}{2x-5} = \frac{4}{3}$.

a) $x = -50$ b) $x = -\frac{55}{6}$ c) $x = \frac{10}{3}$ d) $x = 10$ e) N.O.T.

8. Using the diagram below, solve for x.



a) 24 b) 21 c) 16 d) 8 e) N.O.T.

9. A phone company charges a flat rate of \$6.00. For each minute of use, an additional five cents is charged. An equation for the cost C in dollars based on the number m of minutes of use is:

a) $C = 5m + 6$ b) $C = 6m + 5$ c) $C = 0.05m + 6$ d) $C = 6m + 0.05$ e) N.O.T.

10. Jeff is going skiing. It costs \$65 to rent skis, and \$10 per hour to ski. He does not want to spend more than \$120, and the ski resort rules state you must pay for a full hour even if you do not ski for the whole hour. What is the maximum number of hours that Jeff can ski?

a) 4 hours b) 5 hours c) 5.5 hours d) 6 hours e) N.O.T.

11. Which ordered pair is in the solution set of $y < -2x + 9$ and $y \geq x + 6$?

a) $(1, 8)$ b) $(0, 0)$ c) $(-2, 4)$ d) $(-1, 3)$ e) N.O.T.

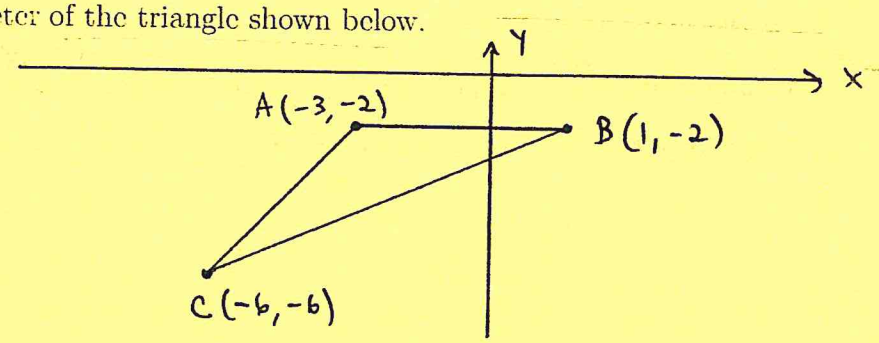
12. Let $g(x) = 3x + 1$. Find the value of x at which $g(x) = -8$.

a) $x = -23$ b) $x = -\frac{10}{3}$ c) $x = -3$ d) $x = 25$ e) N.O.T.

13. For a data set, if the first quartile is 22, the second quartile is 38, and the third quartile is 45, which of the following statements must be true?

a) Approximately half of the data values must be larger than 45.
b) The median of the data is greater than 38, but less than 45.
c) The interquartile range is 16.
d) Approximately one quarter of the data values must be smaller than 22.
e) N.O.T.

14. Determine the perimeter of the triangle shown below.



a) 14.5 b) $9+\sqrt{65}$ c) 12 d) $9+\sqrt{71}$ e) N.O.T.

For Questions 15 and 16, consider the line L given by $2x-3y=5$ and the point $P(3,-10)$.

15. Which of the following is an equation of the line parallel to L that passes through P?

a) $y+10=\frac{2}{3}(x-3)$ b) $y-3=-\frac{2}{3}(x+10)$

c) $y+10=\frac{3}{2}(x-3)$ d) $y-3=-\frac{3}{2}(x+10)$ e) N.O.T.

16. Which of the following is an equation of the line perpendicular to L that passes through P?

a) $y+10=\frac{2}{3}(x-3)$ b) $y-3=-\frac{2}{3}(x+10)$

c) $y+10=\frac{3}{2}(x-3)$ d) $y-3=-\frac{3}{2}(x+10)$ e) N.O.T.

17. Which of these sets is not a function?

a) $\{(2,4),(6,8),(0,0),(9,9)\}$ b) $\{(4,0),(4,1),(4,2),(4,3)\}$

c) $\{(0,1),(1,1),(2,1),(3,1)\}$ d) $\{(1,2),(3,4),(5,6),(7,8)\}$ e) N.O.T.

18. A triangle has vertices at points $F(-7,3)$, $G(2,6)$, and $H(3,5)$. What are the coordinates of each vertex if the triangle is reflected across the x-axis?

a) $F'(-7,-3)$, $G'(2,-6)$, and $H'(3,-5)$

b) $F'(7,-3)$, $G'(-2,-6)$, and $H'(-3,-5)$

c) $F'(7,3)$, $G'(-2,6)$, and $H'(-3,5)$

d) $F'(-7,-3)$, $G'(-2,-6)$, and $H'(-3,-5)$

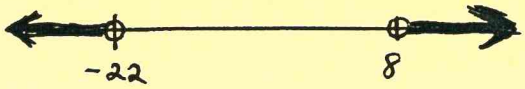
e) N.O.T.

19. Evaluate the expression $4x^2-6x+1$ if $x=-2$.

a) 21 b) 5 c) -3 d) 29 e) N.O.T.

20. Which of the following displays the solution to $|2x + 7| > 15$ on a number line?

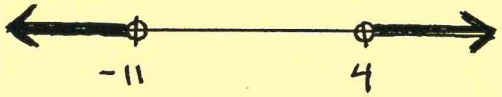
a)



b)

c)

d)



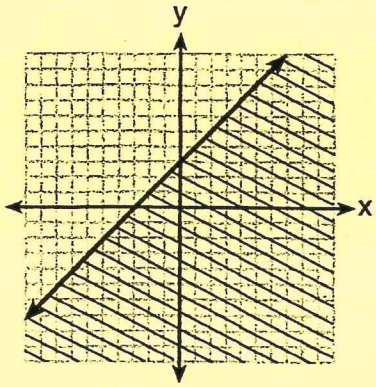
e) N.O.T.

21. Elizabeth works part-time to help pay for college. She has worked for the last 14 days without a day off for a total of 48 hours. Depending on her schedule, she either worked for 3 hours a day or for 4 hours a day. During the 14 day period, how many days did Elizabeth work for 4 hours a day?

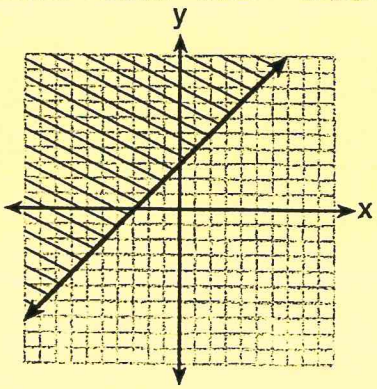
a) 2 days b) 4 days c) 6 days d) 8 days e) N.O.T.

22. Which of the following graphs represents the inequality $y \geq x + 3$?

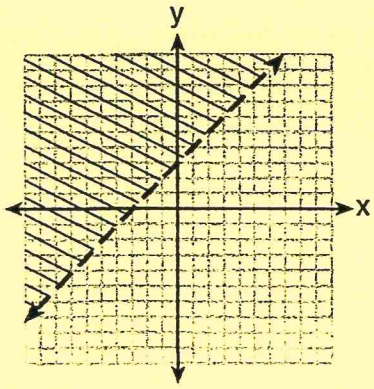
a)



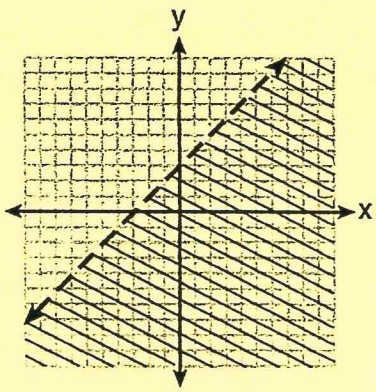
b)



c)

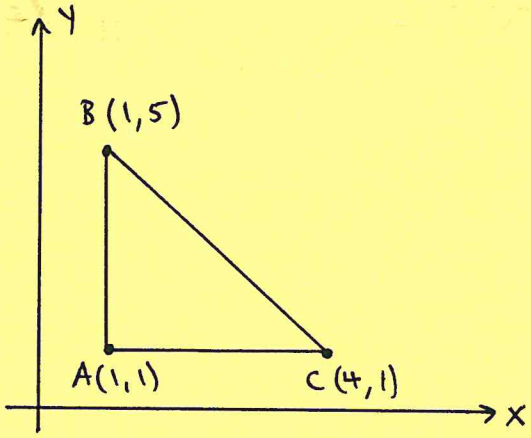


d)



e) N.O.T.

23. Four students are working in a group and are asked to find the length of $\overline{BC}$ in the figure below. Which two students set up the problem correctly?



Juan: $x = \sqrt{(5-1)^2 + (1-4)^2}$

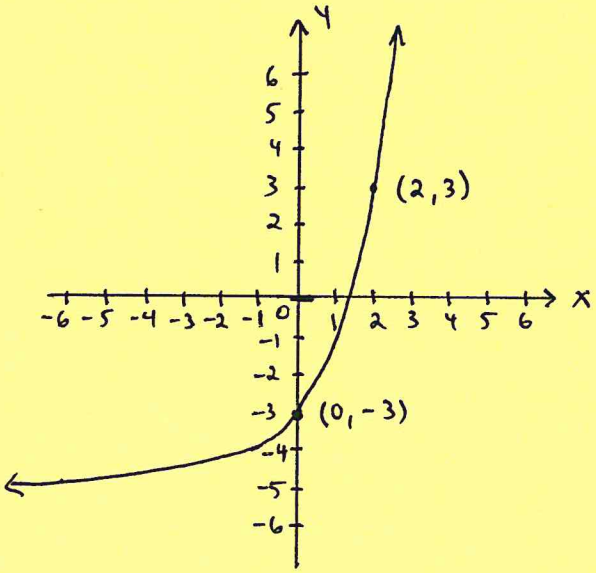
Jennifer: $x = 3 + 4$

Emily: $x^2 = 3^2 + 4^2$

Katia: $x = \sqrt{(5-1)^2 - (1-4)^2}$

a) Juan and Katia
b) Jennifer and Emily
c) Juan and Emily
d) Jennifer and Katia
e) N.O.T.

24. The function $f(x) = 2(2)^x$ was replaced with $f(x) + k$, resulting in the function graphed below. What is the value of k?

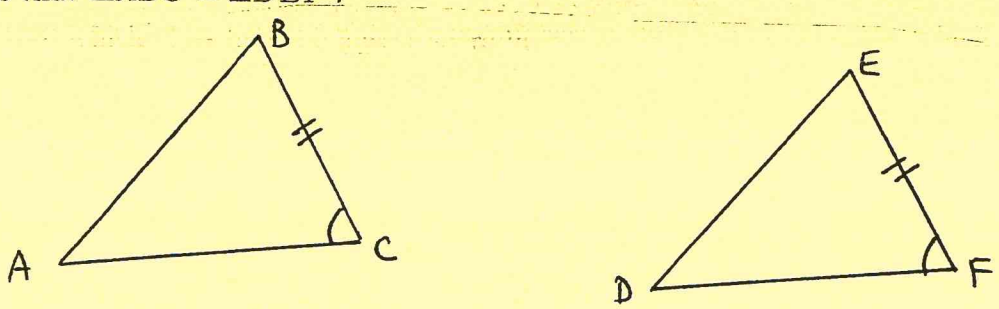


a) $k = -4$
b) $k = -3$
c) $k = 1$
d) $k = 3$
e) N.O.T.

25. Solve the following equation: $|2x + 7| - 4 = 23$.

a) $x = 10$ or $x = -17$
b) $x = 8$ or $x = -15$
c) $x = -\frac{51}{8}$
d) No solution
e) N.O.T.

26. In the figure below, $\overline{BC} \cong \overline{EF}$, and $\angle C \cong \angle F$. Which additional information would be enough to prove that $\Delta ABC \cong \Delta DEF$?



a) $\overline{AC} \cong \overline{DF}$ b) $\overline{AB} \cong \overline{BC}$ c) $\overline{AB} \cong \overline{DE}$ d) $\overline{AB} \cong \overline{DF}$ e) N.O.T.

27. Connie participated in a local charity walk. Her mother initially donated \$14 and then pledged an additional \$7 for each mile that Connie completed during the three-hour walk. If n represents the number of miles that Connie walked, which of the following expressions represents the total amount of money that Connie's mother donated?

a) $7 + 14n$ b) $3 + 14 + 7n$ c) $14 + 3n$ d) $14 + 7n$ e) N.O.T.

28. Solve $d = vt + \frac{1}{2}at^2$ for a.

a) $a = \frac{2d}{vt^3}$ b) $a = \frac{d - vt}{t^2}$ c) $a = \frac{2(d - vt)}{t^2}$ d) $a = \frac{2d - vt}{t^2}$ e) N.O.T.

29. A local kids' soccer team consists of seven 8-year-olds, six 9-year-olds, five 10-year-olds, and three 11-year-olds. If a child is picked from this team at random, what is the probability that the child's age is even?

a) $\frac{2}{4}$ b) $\frac{12}{18}$ c) $\frac{12}{9}$ d) $\frac{5}{21}$ e) N.O.T.

30. A sequence is defined recursively with $g(1) = 100$ and $g(n) = g(n-1) - 8n$. What is the value of $g(4)$?

a) 76 b) 60 c) 28 d) 22 e) N.O.T.

31. The current population of a town is 10,000 people. If the population P increases by 20% each year, which equation could be used to find the population after t years?

a) $P = 10000(0.2)^t$ b) $P = 10000(0.8)^t$
c) $P = 10000(1.2)^t$ d) $P = 10000(1.8)^t$ e) N.O.T.

32. Which of the following correlation coefficients represents the weakest linear relationship?

a) 0.75 b) -0.42 c) -0.86 d) 0.23 e) N.O.T.

33. David and Tom are comparing their classes' scores on a math test. Both of their classes had mean scores of 80 on the test, but David's class had a range of 6 while Tom's class had a range of 30. If the highest possible score was 100, which class had the lowest score in it?

a) David's class had the lowest score in it.
b) Tom's class had the lowest score in it.
c) The lowest score occurred in both classes.
d) There is not enough information to determine this.
e) N.O.T.

34. How many cubes with 5-inch sides will completely fill a cube that is 10 inches on a side?

a) 4 b) 8 c) 20 d) 50 e) N.O.T.

35. An ice cream stand offers three flavors of soft-serve ice cream: vanilla, chocolate, and strawberry. They also offer two types of cones (sugar and waffle) and three types of toppings (nuts, cookie crumbs, and sprinkles). If Danica does not order vanilla ice cream, how many different choices can she make that have one flavor of ice cream, one type of cone, and one topping?

a) 7 b) 8 c) 12 d) 18 e) N.O.T.

36. A table of values of a function $y = f(x)$ is given below. If this function is linear, what is the value of $f(3)$?

x	-4	-2	5	9
$f(x)$	15	12	1.5	-4.5

a) 4.5 b) 4 c) -6 d) 0 e) N.O.T.

37. For the table in Question 36, compute the average rate of change of the function f from $x = -2$ to $x = 9$?

a) 11 b) -16.5 c) -1.5 d) -19.5 e) N.O.T.

38. Which of the following relationships can best be described as causal?

a) Height and intelligence.
b) Shoe size and running speed.
c) Number of students in a class and number of students with brown hair.
d) Number of correct answers on a test and test score.
e) N.O.T.

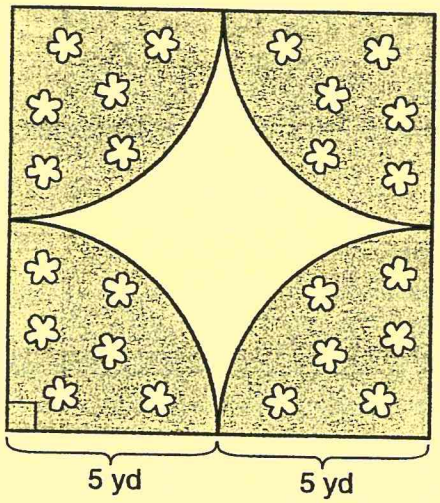
39. How many prime numbers are divisible by 4?

a) 1 b) 2 c) 3 d) 4 e) N.O.T.

40. Which value of x is in the solution set of the inequality $-2(x-5) < 4$?

a) $x = 0$ b) $x = 2$ c) $x = 3$ d) $x = 5$ e) N.O.T.

41. A landscaper plans to create a garden, as shown in the diagram below. The garden consists of four quarter-circles of equal size inside a square. The landscaper wants to place fencing around both the inside and the outside of the garden.



Which expression represents the amount of fencing, in yards, that the landscaper will use for this garden?

a) $40 + 10\pi$ b) $40 + 25\pi$ c) $100 + 10\pi$ d) $100 + 25\pi$ e) N.O.T.

42. Which of the following equations represents a line that passes through the point $(-2, 5)$ and is parallel to the x-axis?

a) $x = -2$ b) $y = -2x + 5$ c) $y = -2$ d) $y = 5x - 2$ e) N.O.T.

43. Consider the data set $4, 5, 6, 6, 7, 9, 12$. Which of the following statements is true?

a) mean = mode b) mode = median c) mean < median d) mode > mean e) N.O.T.

44. The cost of three notebooks and four pencils is \$8.50. The cost of five notebooks and eight pencils is \$14.50. Which of the following systems of equations could be used to find the cost N of one notebook and the cost P of one pencil?

a) $\begin{cases} 3N + 4P = 8.50 \\ 5N + 8P = 14.50 \end{cases}$

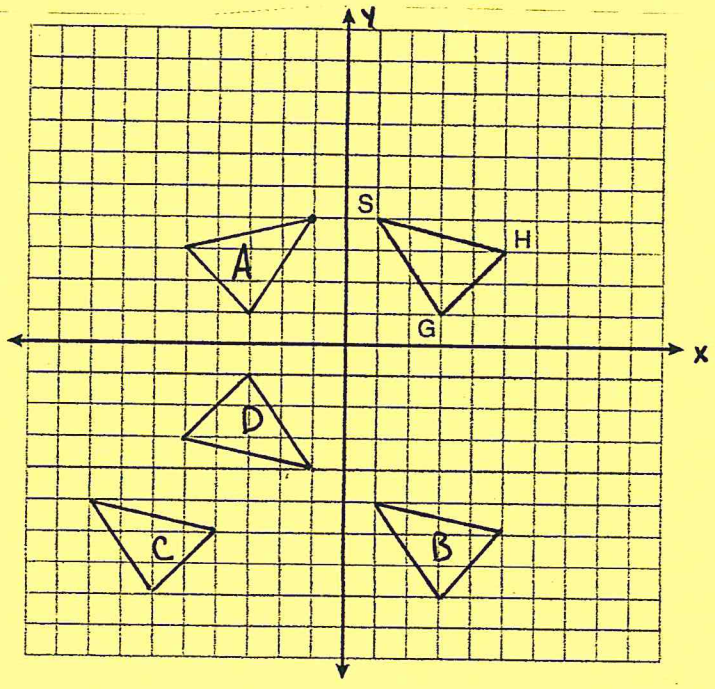
b) $\begin{cases} 8.50N + 14.50P = 11 \\ 14.50N + 8.50P = 9 \end{cases}$

c) $\begin{cases} N + P = 14.50 \\ 8N + 12P = 23 \end{cases}$

d) $\begin{cases} N + P = 8.50 \\ 8N + 12P = 23 \end{cases}$

e) N.O.T.

45. On the axes below, ΔGHS is to be reflected across the y-axis, and the resulting triangle is to be reflected across the x-axis. Which of the following triangles shows the final position of the original triangle after these reflections are applied?



a) Triangle A b) Triangle B c) Triangle C d) Triangle D e) N.O.T.