Dick Schaff Math Superbowl XLIII
Level 2: 8^{th} Grade Blitz – 2016

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. What is the complement of a 57° angle?

   a) 3° b) 33° c) 57° d) 90° e) N.O.T.

2. The speed of sound traveling in dry air at 68° Fahrenheit is 1,125 ft/sec. Which number accurately gives the speed of sound in scientific notation?

   a) 0.1125×10^3 ft/sec b) 1.125×10^3 ft/sec
   c) 0.1125×10^4 ft/sec d) 1.125×10^4 ft/sec e) N.O.T.

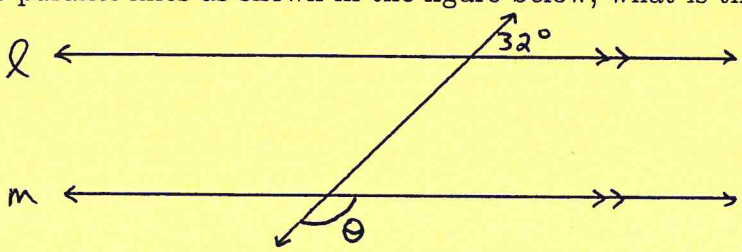
3. Which of the following does not represent a linear function?

   a) $y = 3^2 + 7x$ b) $y = \frac{-9x+2}{5}$ c) $y = 4(x + 11)$ d) $y = 3 - x^2$ e) N.O.T.

4. Ross wants to rent a car for one day. He contacts two companies to find their rental prices. Modesto Rent-a-Car charges \$20 plus \$3 per mile. Central Valley Rentals charges \$5 per mile. After how many miles will the total cost for both companies be the same?

   a) 10 b) 12 c) 4 d) 8 e) N.O.T.

5. If l and m are parallel lines as shown in the figure below, what is the measure of angle θ?



   a) 32° b) 58° c) 122° d) 212° e) N.O.T.

6. Which of the following fractions represents the number $2.\overline{66}$?

   a) 8/3 b) 8/5 c) 3/8 d) 8/5 e) N.O.T.

7. Simplify the following expression as much as possible: $\dfrac{4^3 \cdot 4^{-1} \cdot 7^{-2}}{4^4 \cdot 7^{-3} \cdot 7^0}$

   a) $\frac{7}{16}$ b) $\frac{4}{7}$ c) $\frac{49}{4}$ d) $\frac{16}{49}$ e) N.O.T.

8. What is the height of a cone whose volume is 50π cubic inches and whose radius is 5 inches?

a) 2 inches b) 3 inches c) 5 inches d) 6 inches e) N.O.T.

9. A basketball player scores a basket on 84% of her shots. If she attempted 25 shots, how many shots did the basketball player miss?

a) 16 b) 9 c) 4 d) 21 e) N.O.T.

10. Find the rate of change of the linear function that passes through the points $(14, -5)$ and $(10, 3)$.

a) -2 b) $-\frac{1}{2}$ c) $-\frac{15}{11}$ d) $-\frac{1}{3}$ e) N.O.T.

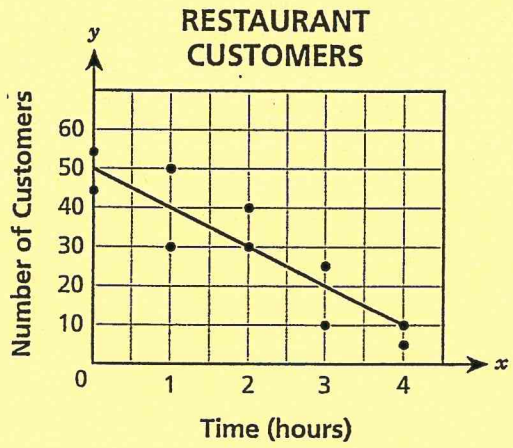
11. Calculate $\dfrac{1.8 \times 10^{33}}{7.2 \times 10^{12}}$, writing the final answer in scientific notation.

a) 2.5×10^{21} b) 4×10^{21} c) 2.5×10^{20} d) 4×10^{20} e) N.O.T.

12. Beginning in 2000, a local sports team increased its ticket price by a constant amount each year until 2010. A ticket in 2005 cost \$58, and a ticket in 2008 cost \$65.50. What was the price of such a ticket in 2000?

a) \$20.50 b) \$45.50 c) \$50.50 d) \$70.50 e) N.O.T.

13. The scatter plot below shows the numbers of customers in a restaurant over four hours of the dinner service on two different Saturday nights. The line shown models this relationship, and $x = 0$ represents 7 p.m. What does the value of the y-intercept represent?



a) The average number of customers at 7 p.m.

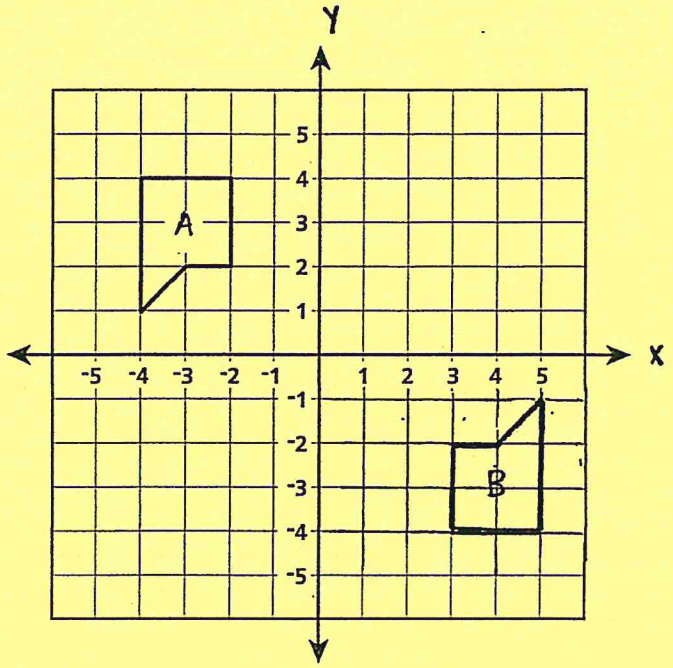
b) The average number of customers at 11 p.m.

c) The average number of customers per hour.

d) The average change in the number of customers during the four hours of the dinner service.

e) N.O.T.

14. Figure A and figure B are shown on the coordinate grid below. Which statement about figures A and B must be true?



a) A sequence of translations will transform figure A to B, and the figures will be congruent.

b) A 180° clockwise rotation will transform figure A to B, and the figures will be congruent.

c) A sequence of translations will transform figure A to B, but the figures will not be congruent.

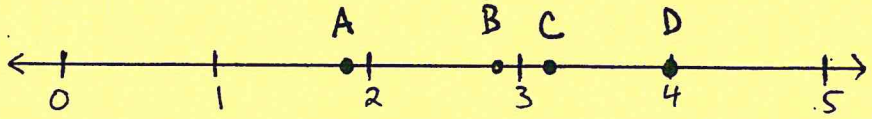
d) A 180° clockwise rotation will transform figure A to B, but the figures will not be congruent.

e) N.O.T.

15. A line contains the points $(4, 2)$ and $(0, -1)$. What is the equation of the line?

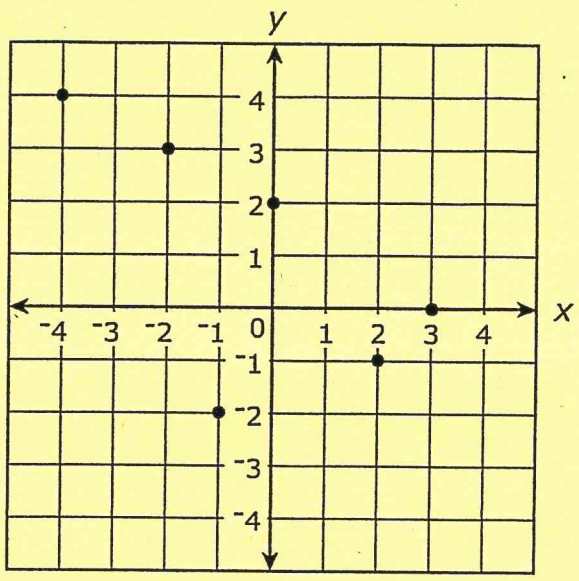
a) $y = 2x - 6$ b) $y = \frac{3}{4}x - 1$ c) $y = \frac{1}{2}x - 1$ d) $y = \frac{4}{3}x - \frac{10}{3}$ e) N.O.T.

16. Which point on the given number line is approximately $\sqrt{8}$?



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

17. The graph below represents y as a function of x. Which additional point can be plotted so that the graph continues to represent y as a function of x ?



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

18. One type of ant weighs about 3×10^{-3} grams. This ant can carry about 1.5×10^{-1} gram of food on its back. The amount of food, in grams, an ant can carry on its back is about how many times its own body weight, in grams?

a) 50 b) 5 c) 0.5 d) 0.05 e) N.O.T.

19. Solve for x: $9(3 - 2x) = 2(10 - 8x)$.

a) $\frac{7}{10}$ b) $-\frac{7}{6}$ c) $\frac{7}{2}$ d) $-\frac{7}{16}$ e) N.O.T.

20. Which of these statements are true about the following system of equations? $\begin{cases} y = 2x + 2 \\ y = 6x + 2. \end{cases}$

a) The graph of the system consists of lines that have no points of intersection.

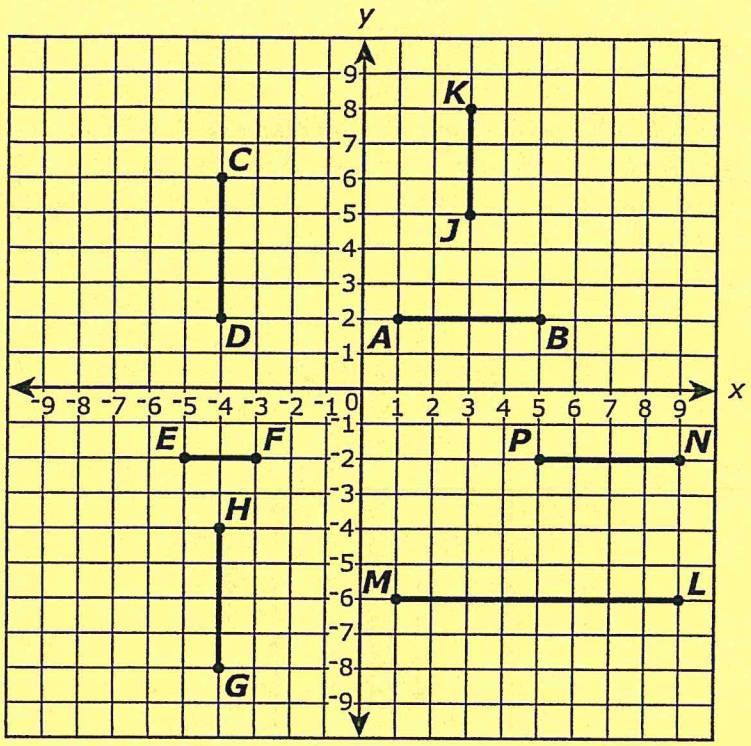
b) The graph of the system consists of lines that have exactly one point of intersection.

c) The graph of the system consists of lines that have exactly two points of intersection.

d) The graph of the system consists of two identical lines.

e) N.O.T.

21. Seven line segments are shown on the coordinate plane below. Which of the following segments could be the image of segment EF after a sequence of reflections, rotations, and/or translations?



a) CD b) PN c) JK d) ML e) N.O.T.

22. Which of the following expressions is not equivalent to $\frac{5^3}{5^5}$?

a) $\frac{1}{5^2}$ b) $\frac{1}{25}$ c) 5^{-2} d) 5^8 e) N.O.T.

23. When the input to a function is -6, the output is 17. Which of the following statements about this function must be true?

a) An input of -6 has infinitely many possible outputs.

b) An input of -6 has exactly one possible output.

c) An output of 17 must have infinitely many inputs.

d) An output of 17 has exactly one input.

e) N.O.T.

24. Find the volume of a ball whose diameter is 4 inches.

a) $\frac{256\pi}{3}$ cubic inches

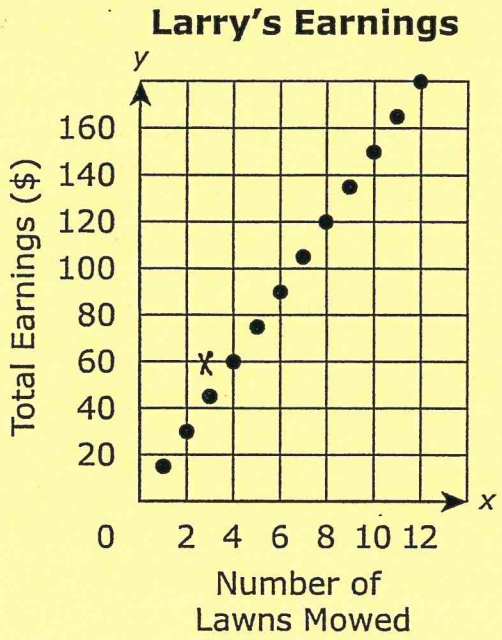
b) $\frac{128\pi}{3}$ cubic inches

c) $\frac{16\pi}{3}$ cubic inches

d) $\frac{64\pi}{3}$ cubic inches

e) N.O.T.

25. Larry and Andrea each mow lawns in their neighborhoods. For both Larry and Andrea, the number of dollars earned is proportional to the number of lawns mowed. Andrea earns \$60 for mowing three lawns, and she earns \$300 for mowing 15 lawns. Larry's earnings are shown on the graph below. Which statement correctly compares the amount of money Larry and Andrea each earn per lawn?



a) Larry earns \$5 less than Andrea earns per lawn.

b) Larry earns \$2 more than Andrea earns per lawn.

c) Larry earns \$10 more than Andrea earns per lawn.

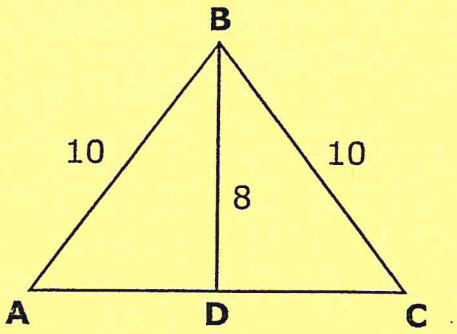
d) Larry earns \$15 less than Andrea earns per lawn.

e) N.O.T.

26. The graph of which equation is a horizontal line that intersects the y-axis at 9?

a) $y = x + 9$ b) $y = 9x$ c) $x = 9$ d) $y = x - 9$ e) N.O.T.

27. In ΔABC, BD is perpendicular to AC. The dimensions are shown in centimeters. What is the length of AC?



a) 10 cm b) 12 cm c) 16 cm d) 18 cm e) N.O.T.

28. Which of the following is an irrational number?

a) 34.567 b) $\frac{14}{101}$ c) $\sqrt{45}$ d) 0 e) N.O.T.

Questions 29, 30, and 31 use the following information: Ms. Lopez conducted a random survey of 7^{th} and 8^{th} grade students at her school to find out if each student exercised less than five hours last week or five or more hours last week.The results are shown below.

	Less Than 5 Hours	5 or More Hours
Grade 7 Students	16	24
Grade 8 Students	30	10

29. How many students were surveyed in all?

a) 34 b) 40 c) 46 d) 80 e) N.O.T.

30. What is the relative frequency that a 7^{th} grade student exercised for five or more hours last week?

a) 24% b) 25% c) 40% d) 60% e) N.O.T.

31. Which of the following statements must be true?

a) More than 50% of all students surveyed exercised less than 5 hours last week.

b) Less than 50% of all students surveyed exercised less than 5 hours last week.

c) More than 50% of all students surveyed will exercise less than 5 hours next week.

d) Less than 50% of all students surveyed will exercise less than 5 hours next week.

e) N.O.T.

32. Marissa is building a rectangular sandbox for her younger brother. The length of the sandbox is 1 foot longer than twice the width of the sandbox. The perimeter of the sandbox is 31 feet. Which of the following equations could be used to determine w, the width in feet of the sandbox?

a) $w + w + 2 = 31$ b) $w + 2w + 1 = 31$

c) $2w + 2(w + 2) = 31$ d) $2w + 2(2w + 1) = 31$ e) N.O.T.

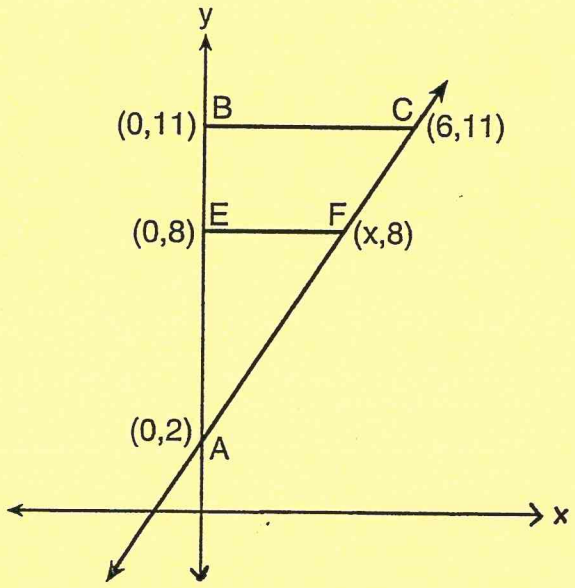
33. A large square park has an area of 36 square kilometers. If you walk around the entire edge of the park, what is the total distance that you would have walked?

a) 6 km b) 24 km c) 12 km d) 36 km e) N.O.T.

34. A triangle is plotted on a coordinate system so that its vertices are at $(-3, 2)$, $(3, 9)$ and $(9, 2)$. If the triangle is reflected over the x-axis, which of the following would be coordinates of one vertex of the new triangle?

a) $(3, 2)$ b) $(-3, -9)$ c) $(9, 2)$ d) $(-9, 2)$ e) N.O.T.

35. In the coordinate plane shown below, ΔABC is similar to ΔAEF. What is the value of x?



a) 3 b) 4 c) 2 d) 3.5 e) N.O.T.

36. Emilio and his family took a trip to Hawaii. Their hotel stay was \$650, plus a 15% tourism tax. How much is the tourism tax for Emilio's hotel stay?

a) \$150.00 b) \$97.50 c) \$15.00 d) \$9.75 e) N.O.T.

37. The table below shows the cost of different numbers of soda bottles at a local grocery store. The cost is a linear function of the number of soda bottles purchased.

Number of Soda Bottles	2	4	7	9
Cost	\$3.00	\$6.00	\$10.50	\$13.50

Which statement describes the rate of change of this function?

a) The cost increases \$13.50 each time 3 soda bottles are added.

b) The cost increases \$3.00 each time 1 soda bottle is added.

c) The cost increases \$1.50 each time 1 soda bottles is added.

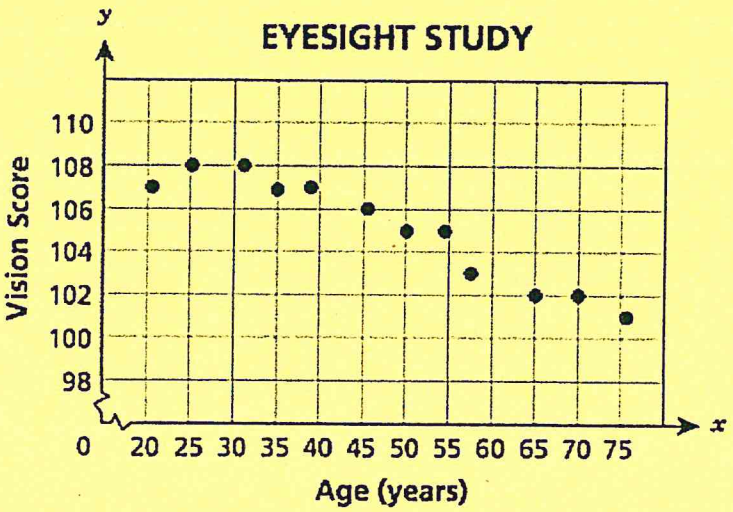
d) The cost increases \$6.00 each time 2 soda bottles are added.

e) N.O.T.

38. Solve the following system of equations: $\begin{cases} 3x + 4y = 15 \\ x + y = 4. \end{cases}$

a) $(9, -3)$ b) $(5, 0)$ c) $\left(\frac{11}{7}, \frac{39}{7}\right)$ d) $(1, 3)$ e) N.O.T.

39. A researcher studied the eyesight of people at different ages. She calculated a vision score for each person in the study and plotted the data on the graph below.



The researcher used the line $y = -0.1x + 110$ to model the data. When she substituted the value $x = 65$ into the equation, what did the result tell her?

a) The exact value for the vision score of a 65-year-old.

b) The predicted value for the vision score of a 65-year-old.

c) The minimum possible value for the vision score of a 65-year-old.

d) The maximum possible value for the vision score of a 65-year-old.

e) N.O.T.

40. Simplify the following: $(x^8)^{-4}(x^{-6})^{-5}$.

a) x^{-4} b) x^{-7} c) x^{-960} d) x^{34} e) N.O.T.

41. Triangle ΔABC is dilated with the origin as the center of the dilation. If point C has coordinates $(5, 2)$, which ordered pair could represent the image of C after the dilation?

a) $(2.5, 1)$ b) $(5, -2)$ c) $(7.5, 4.5)$ d) $(-1, -4)$ e) N.O.T.

42. Suppose the time was 4 p.m. three hours ago. What time will it be 52 hours from now?

a) 8 p.m. b) 11 p.m. c) 12 a.m. d) 2 a.m. e) N.O.T.

43. On the coordinate plane, what is the distance between $(0, 0)$ and $(8, 15)$?

a) 7 units b) 8 units c) 17 units d) 23 units e) N.O.T.

44. A sequence of transformations was applied to a square in a coordinate plane. The transformations used were rotations, reflections, and translations. Which statement about the resulting figure is true?

a) It must be a square with the same side lengths as the original square.

b) It must be a square, but the side lengths may differ from the original square.

c) It may be a rectangle and not a square, and all the side lengths may differ from the original square.

d) It may be a rectangle and not a square, with at least one side the same length as a side in the original square.

e) N.O.T.

45. What is the last digit of 3^{2016}?

a) 1 b) 3 c) 7 d) 9 e) N.O.T.