

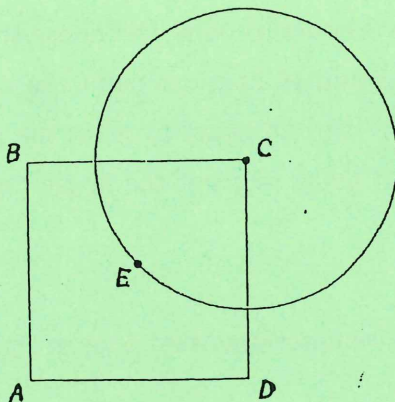
Dick Schaff Math Superbowl XLVIII
2023 Level 3 Exam: Secondary Math I Blitz

- 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."

- Find the value of $12 \div 4 - 7 \times 2$.
a) -2 b) -8 c) 84 d) -11 e) N.O.T.
- Given $f(x) = -x^2 - 5x + 4$, what is the value of $f\left(\frac{1}{2}\right)$?
a) $\frac{5}{4}$ b) 0 c) $\frac{27}{4}$ d) $-\frac{7}{4}$ e) N.O.T.
- Solve for y in terms of x for the equation $x = \frac{2}{3}y - \frac{1}{3}$.
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.
- Two friends walk out of class together. One friend walks due east three miles to home. The other friend walks 1 mile north and two more miles west to home. How many miles apart are the friends when they reach their homes?
a) 6 b) $\sqrt{13}$ c) 5 d) $\sqrt{6}$ e) N.O.T.
- The graph of $g(x) = f(x + 5)$ is the graph of $f(x)$ shifted 5 units in which direction?
a) Up b) Down c) To the left d) To the right e) N.O.T.
- Which of the following is an equation of the line perpendicular to the line $2x - 3y = 7$ and also has the same y -intercept as the line $2x + 5y = 0$?
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.
- Which of the following is an equation of the line parallel to the line $2x - 3y = 7$ and also has the same y -intercept as the line $2x + 5y = 0$?
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.
- Find all solutions of the equation $|x + 5| = 12$.
a) $x = 7$ only b) $x = -7$ or 7 c) $x = -17$ or 7 d) $x = -17$ only e) N.O.T.
- Compute $601^2 - 599^2$.
a) 2400 b) 4 c) 1200 d) 600 e) N.O.T.

17. It takes Juanita three hours to drive to her uncle's house at an average speed of 50 miles per hour. If she takes the same route home, but her average speed is 60 miles per hour, what is the time it takes for Junaita to drive home?
- a) 2 hours and 5 minutes b) 2 hours and 30 minutes
 c) 2 hours and 45 minutes d) 3 hours e) N.O.T.

18. Square $ABCD$ and a circle with center C intersect as shown. If point E is the center of $ABCD$ and if the radius of the circle is r , then what is the area of $ABCD$ in terms of r ?



- a) $\frac{\pi r^2}{2}$ b) πr^2 c) r^2 d) $2r^2$ e) N.O.T.

19. If the value of the expression shown below is to be halved by doubling exactly one of a , b , c , d , x , or y , which should be doubled?

$$\frac{a + \frac{bc}{d}}{\frac{x}{y}}$$

- a) a b) b c) c d) d e) N.O.T.

20. Which statement must be true about the line $4x + 9y = 22$?

- a) A perpendicular line will have slope $\frac{9}{4}$.
 b) A parallel line will have slope $-\frac{9}{4}$.
 c) The given line is a vertical line.
 d) The given line has a y -intercept at the point $(0, \frac{11}{2})$.
 e) N.O.T.

21. Which of these sets is a function?

- a) $\{(4, 5), (4, 6), (4, 7), (4, 8)\}$ b) $\{(7, 8), (8, 9), (9, 10), (7, 5)\}$
 c) $\{(5, 4), (6, 4), (7, 4), (8, 4)\}$ d) $\{(1, 3), (5, 9), (1, 7), (10, 12)\}$ e) N.O.T.

22. When is $-x$ greater than x ?

a) When x is positive.

b) When x is negative.

c) When x is zero.

d) Never

e) N.O.T.

23. Jacob and Rosalyn own a house painting company. Rosalyn can paint a particular house in 8 hours, while Jacob needs 16 hours to paint the same house. If Rosalyn and Jacob work together, which of the following must be true about the time needed to paint this house together?

a) It will take them less than 8 hours to paint the house together.

b) It will take them between 8 and 16 hours to paint the house together.

c) It will take them between 16 and 24 hours to paint the house together.

d) It will take them exactly 24 hours to paint the house together.

e) N.O.T.

24. If two lines are graphed and we determine that they are parallel, then which of the following must be true?

a) The equations of the lines will have a common solution of $(0, 0)$.

b) The lines will have slopes which are negative reciprocals.

c) Both lines will have positive slopes.

d) The lines will have an infinite number of points in common.

e) N.O.T.

25. A local deli charges a fixed delivery fee. On Monday, they delivered three dozen bagels to an office at a total cost of \$21. On Tuesday, four dozen bagels were delivered at a total cost of \$30. Which system of equations could be used to find the cost of a dozen bagels, b , if the delivery fee is f ?

a)
$$\begin{cases} b + 3f = 21 \\ b + 4f = 30 \end{cases}$$

b)
$$\begin{cases} 3b + f = 21 \\ b + 4f = 30 \end{cases}$$

c)
$$\begin{cases} b + 3f = 21 \\ 4b + f = 30 \end{cases}$$

d)
$$\begin{cases} b + f = 21 \\ 3b + 4f = 30 \end{cases}$$

e) N.O.T.

26. A student painted a 2-foot by 3-foot bulletin board in 15 minutes. To the nearest tenth of a minute, how long did it take the student to paint 1 square foot?

a) 1.6 minutes

b) 2.5 minutes

c) 5 minutes

d) 7.5 minutes

e) N.O.T.

27. The distance between the points $(2, -1)$ and $(-7, -3)$ is

a) $\sqrt{41}$

b) $\sqrt{29}$

c) $\sqrt{97}$

d) $\sqrt{85}$

e) N.O.T.

28. Solve the following inequality: $8 > |-3x + 2|$

a) $x > \frac{10}{3}$ or $x < -2$

b) $-2 < x < \frac{10}{3}$

c) $x < -\frac{10}{3}$ or $x > 2$

d) $-\frac{10}{3} < x < 2$

e) N.O.T.

29. What is the average rate of change of the function $f(x) = x^2 - x - 6$ from $x = 1$ to $x = 5$?

a) 4

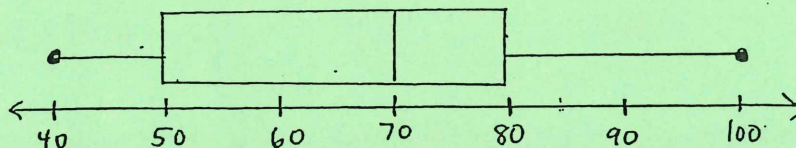
b) -5

c) 5

d) 20

e) N.O.T.

30. For the box plot shown below, which statement is false?



a) The IQR is 30.

b) The median score is 70.

c) The third quartile is 80.

d) The range is 60.

e) N.O.T.

31. Maya hiked a long trail. After hiking 60% of the length of the trail, she had 8 km left to go. What is the length of the trail?

a) 20 km

b) 11.2 km

c) $13\frac{1}{3}$ km

d) 28 km

e) N.O.T.

32. Which of the following triples of numbers could represent the lengths of the sides of a triangle?

a) 2, 2, 5

b) 1, 4, 6

c) 3, 3, 6

d) 3, 7, 11

e) N.O.T.

33. Which of the following functions represents the sequence 2, 5, 8, 11, 14, 17, ...?

a) $f(n) = 2 + 3n$, for $n \geq 1$

b) $f(n) = 2 + 3^n$, for $n \geq 1$

c) $f(n) = -1 + 3n$, for $n \geq 1$

d) $f(n) = -1 + 3^n$, for $n \geq 1$

e) N.O.T.

34. The table below lists the number of people attending the first five games of a local high school football team last year. If the attendance for the second game was increased by 30, what effect would this have on the values of the mean and median attendance?

Game	1	2	3	4	5
Attendance	308	122	287	290	345

a) Both the mean and median would not change.

b) The mean would decrease, but the median would increase.

c) The mean would increase, but the median would decrease.

d) The mean would increase, but the median would not change.

e) N.O.T.

35. An equation equivalent to $\frac{1}{a} + \frac{1}{b} = \frac{1}{c}$ is

- a) $c = a + b$ b) $c = a - b$ c) $c = \frac{ab}{a+b}$ d) $c = \frac{a+b}{a-b}$ e) N.O.T.

36. The vertices of $\triangle ABC$ are $(0, -2)$, $(3, 1)$, and $(0, 5)$. Find the area of $\triangle ABC$.

- a) 21 b) 10.5 c) 10 d) $12 + 3\sqrt{2}$ e) N.O.T.

37. The vertices of $\triangle ABC$ are $(0, -2)$, $(3, 1)$, and $(0, 5)$. Find the perimeter of $\triangle ABC$.

- a) 21 b) 10.5 c) 10 d) $12 + 3\sqrt{2}$ e) N.O.T.

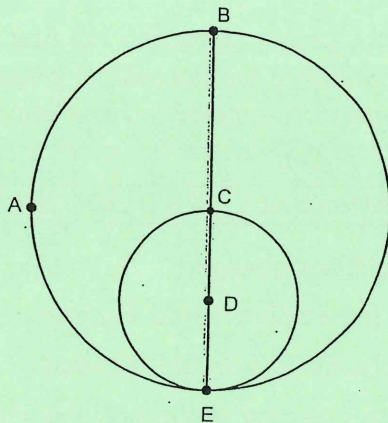
38. A triangle on the coordinate plane is translated 7 units horizontally, reflected across the y -axis, and rotated by 90° counterclockwise. Which of the following must be true about the triangle obtained after this sequence of transformations?

- a) The new triangle is congruent to the original triangle.
b) The new triangle is similar but not congruent to the original triangle.
c) The new triangle must be a right triangle.
d) The new triangle must have a side length of 7 units.
e) N.O.T.

39. Solve the following system of equations: $\begin{cases} x + 2y = 8 \\ 5x - 2y = 4 \end{cases}$

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

40. A circle with center D is drawn inside the circle with center C so that the inside circle passes through point C . Both circles pass through point E . If the length of CD is 3, what is the area of semicircle EAB ?



- a) $\frac{9\pi}{2}$ b) 9π c) 18π d) 12 e) N.O.T.