

48th Annual Dick Schaff Math Superbowl

2023 Level 2 Exam – 8th Grade Blitz

- Directions:
1. Select the most correct answer for each question and mark it on your Scantron™ form.
 2. Do not approximate for π unless instructed to.
 3. NO CALCULATORS OR ELECTRONIC DEVICES MAY BE USED.
 4. Note that N.O.T. means “none of these.”

1. A sphere has volume k cubic units and surface area k square units. What is the radius of this circle?
a) 1 unit b) 3 units c) k units d) π units e) N.O.T.
2. A cube has volume k cubic units and surface area k square units. What is the edge length of this cube?
a) 1 unit b) 3 units c) k units d) π units e) N.O.T.
3. Which of the following is an irrational number?
a) -2 b) 0.2 c) $\frac{1}{2}$ d) $\sqrt{2}$ e) N.O.T.
4. Consider the system of equations $\begin{cases} y = 2x + p \\ y = 2x + q \end{cases}$, where p and q are different numbers. What must be true about the solution(s) to this system?
a) The solution is exactly one ordered pair.
b) The solution is exactly two ordered pairs.
c) The solution is an infinite number of ordered pairs; the system is dependent.
d) There is no solution; the system is inconsistent
e) N.O.T.
5. Some homeowners decided to install a small swimming pool. They initially dug a rectangular pit twenty feet long, nine feet wide, and six feet deep. How many cubic yards of dirt did they remove?
a) 40 b) 120 c) 360 d) 1,080 e) N.O.T.
6. An equilateral triangle is inscribed within a unit circle with center P . What is the distance between P and the midpoint of any side of the triangle?
a) $\frac{1}{3}$ unit b) $\frac{1}{2}$ unit c) 1 unit d) π units e) N.O.T.

7. What number is in the units place of 3^{2023} ?
- a) 1 b) 3 c) 7 d) 9 e) N.O.T.
8. A pizza parlor sells pizzas with 12", 14", 16", and 18" diameter. Which of the following provides the most pizza?
- a) four 12" pizzas b) three 14" pizzas
c) two 16" pizzas d) one 18" pizza
e) N.O.T.
9. The radius of a right circular cylinder is increased by 10%, but the height is decreased by 20%. What is the volume of the new cylinder, as a percentage of the volume of the old cylinder?
- a) 76.8% b) 96.8% c) 100% d) 129.6% e) N.O.T.
10. A square has perimeter 40 cm. What is the area of this square?
- a) 100 mm² b) 1000 mm² c) 10000 mm² d) 1600 cm² e) N.O.T.
11. A photocopy machine costs \$3,000, plus an additional \$0.03 per copy. A fancy copy machine costs \$5000, but copies only cost an additional \$0.02 each. How many copies would you have to make before the costs are the same?
- a) 2,000 b) 20,000 c) 200,000 d) 2,000,000 e) N.O.T.
12. A line passes through the points (2, -4) and (6, -6). What is the equation of this line?
- a) $y = -\frac{1}{2}x - 4$ b) $y = -\frac{1}{2}x - 5$ c) $y = -\frac{1}{2}x - 6$ d) $y = -\frac{1}{2}x - 7$ e) N.O.T.
13. Solve $8(6 - 2x) = 9(5 - 3x)$ for x.
- a) $\frac{-11}{3}$ b) $\frac{-3}{11}$ c) $\frac{3}{11}$ d) $\frac{11}{3}$ e) N.O.T.
14. What is the solution to the system $\begin{cases} 2x + y = 5 \\ 3x + 7y = 5 \end{cases}$?
- a) $(\frac{-30}{11}, \frac{-5}{11})$ b) $(\frac{30}{11}, \frac{-5}{11})$ c) $(\frac{-30}{11}, \frac{5}{11})$ d) $(\frac{30}{11}, \frac{5}{11})$ e) N.O.T.

23. What is the solution set to the equation $3(2x + 6) = 2(3x + 9)$?
- a) $\{-3\}$ b) $\{0\}$ c) $\{\}$ d) \mathbb{R} e) N.O.T.
24. How many zeroes are at the end of $1 \times 2 \times 3 \times \dots \times 50$?
- a) 5 b) 10 c) 12 d) 50 e) N.O.T.
25. What is the slope of the line $0 = \frac{2}{3}x - 4$?
- a) 0 b) $\frac{2}{3}$ c) $\frac{3}{2}$ d) 4 e) N.O.T.
26. A dog is leashed to a tree. The trunk of the tree has a diameter of eight inches. The leash is twenty feet long. The dog runs clockwise around the tree until the entire leash is wound tightly around the trunk. How many complete revolutions did the dog make?
- a) 8 b) 9 c) 10 d) 11 e) N.O.T.
27. A square piece of cardboard is twelve inches long on a side. Squares of side length x inches are cut from the corners, and the sides are folded up to make an open-topped box. What is the volume of this box?
- a) 144 sq.in. b) $144x$ sq.in. c) $x(12 - x)^2$ sq.in. d) $4x(6 - x)^2$ sq.in. e) N.O.T.
28. A rectangular park is twice as long as it is wide, with an area of 5,000 square yards. Chris walks their dog around the perimeter of the park. How far did Chris walk?
- a) 450 feet b) 900 feet c) 1,800 feet d) 15,000 feet e) N.O.T.
29. Which of the following functions is not linear?
- a) $f(x) = 2x + 3$ b) $f(x) = 2x + \sqrt{3}$ c) $f(x) = 2x + \pi$ d) $f(x) = 2x^2 + 3$ e) N.O.T.
30. What is the mean of 6^2 and 6^3 ?
- a) $3^{2.5}$ b) $6^{2.5}$ c) 6^5 d) 252 e) N.O.T.
31. Which of these numbers is the largest?
- a) $3\sqrt{5}$ b) $5\sqrt{3}$ c) $2\sqrt{7}$ d) $7\sqrt{2}$ e) N.O.T.

32. Let $a > b$ and $b = c - 1$. Which of the following MUST be true?
a) $a = c$ b) $a > c$ c) $a < c$ d) $a \neq c$ e) N.O.T.
33. Which of the following fractions represents $0.\overline{81}$?
a) $\frac{81}{100}$ b) $\frac{8}{9}$ c) $\frac{9}{11}$ d) $\frac{9}{8}$ e) N.O.T.
34. A farm has seventeen horses. Each horse needs four shoes. Each shoe needs seven nails. Horseshoe nails come in packages of 50. How many packages of nails would you buy to shoe all of these horses?
a) 196 b) 476 c) 9 d) 10 e) N.O.T.
35. Alex has to sort through a comic book collection, deciding what to keep and what to sell. On the first day Alex was enthusiastic about the project, so Alex sorted through 56 comic books. Alex's enthusiasm waned after that, so for Alex only sorted through 28 comic books per day after that. Which of the following formulas models the total number of comic books sorted (N), as a function of days (d)?
a) $N = 28d + 56$ b) $N = 28d - 56$ c) $N = 28(d + 2)$ d) $N = 28(d + 1)$ e) N.O.T.
36. Which two integers does $\sqrt{180}$ fall between?
a) 12 and 13 b) 13 and 14 c) 14 and 15 d) 15 and 16 e) N.O.T.
37. Set is four years older than Miles. In a year Set will be three times as old as Miles. How old is Set?
a) 5 b) 8 c) 11 d) 14 e) N.O.T.
38. Bobby pays \$26.19 for a used video game. This includes 8% sales tax. What was the price of the game before tax?
a) \$24.25 b) \$24.50 c) \$24.75 d) \$26.11 e) N.O.T.
39. A rectangular garden has a perimeter of twenty feet. The length of the garden is two feet less than three times the width. Which of the following equations could be used to determine the width of the garden?
a) $20 = 2(3w + 2) + 2w$ b) $20 = 2(2w + 3) + 2w$
c) $20 = 2(3w - 2) + 2w$ d) $20 = 2(2w - 3) + 2w$
e) N.O.T.

40. Alex was driving along the highway at a speed of 65 mph at 1:00 p.m. Alex's speed slowly increased; at 1:20 p.m. Alex was driving 68 mph. If Alex's acceleration stayed constant, how fast was Alex driving at 3:00 p.m.?
- a) 71 mph b) 74 mph c) 83 mph d) 95 mph e) N.O.T.
41. What is the last digit of the sum $1! + 2! + 3! + \dots + 2023!$
- a) 1 b) 2 c) 3 d) 4 e) N.O.T.
42. Two adults take five children to a small zoo. They pay \$27.50 for tickets. Adult tickets cost \$5 each. How much does a child's ticket cost?
- a) \$3.00 b) \$3.50 c) \$4.50 d) \$5.50 e) N.O.T.
43. Alex earned a 92% on a 50-question test. How many questions did Alex get wrong?
- a) 92 b) 46 c) 8 d) 4 e) N.O.T.
44. Let $f(x) = x^2 + 1$. Find $f(f(f(3)))$.
- a) 10,102 b) 10,202 c) 10,302 d) 10,402 e) N.O.T.
45. What is the product of two numbers whose GCF is 20 and whose LCM is 200?
- a) 10 b) 2000 c) 4000 d) 8000 e) N.O.T.
46. Erin makes a smoothie for breakfast. Erin uses eight ounces of orange juice, six ounces of frozen strawberries, two ounces of frozen peaches, and two ounces of apple juice. To the nearest full percent, what percent of this smoothie is frozen fruit?
- a) 11% b) 33% c) 44% d) 45% e) N.O.T.
47. Solve for x: $16^{x+1} = 8^{x+2}$.
- a) -2 b) -1 c) 0 d) 1 e) N.O.T.

48. Simplify $((-2^0)^3)^5$.

a) -1

b) 0

c) 1

d) 2^{15}

e) N.O.T.

49. Which of the following is equivalent to $\frac{8^5}{8^3}$?

a) 1^2

b) 2^2

c) 2^5

d) 2^6

e) N.O.T.

50. Let $5 + 4(3x + 2) = 1$. What is the value of $3x + 2$?

a) -1

b) -2

c) $\frac{-2}{3}$

d) $\frac{-3}{2}$

e) N.O.T.