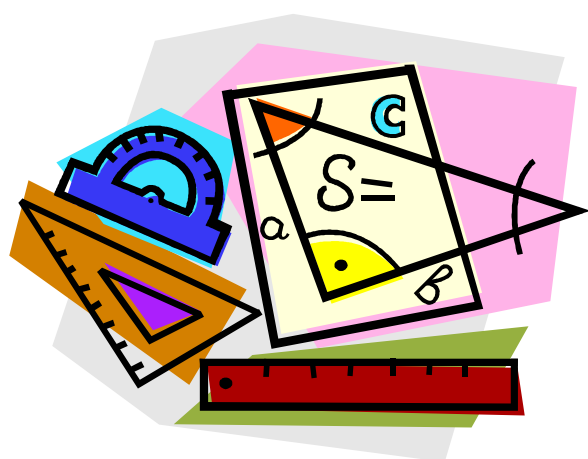


Level One



**Do NOT open until
you are told to do so.**

1. Evaluate $\left(\frac{1}{2+\sqrt{5}} + 2\right)^2$
 - a. $\frac{29}{7}$
 - b. $\frac{37}{9}$
 - c. 5
 - d. 6
 - e. none of these

2. Suppose the binary operator # is defined as $x\#y = \frac{x+y}{xy}$. Calculate $\frac{1}{x}\#\frac{1}{y}$.
 - a. $x + y$
 - b. $\frac{xy}{x+y}$
 - c. $\frac{x+y}{xy}$
 - d. $\frac{1}{x^2y} + \frac{1}{xy^2}$
 - e. none of these

3. Determine the sum of all real values of a for which the equation $\frac{x}{3} + \frac{x+a}{x+24} = 1$ has exactly one solution.
 - a. -24
 - b. 0
 - c. 48
 - d. 72
 - e. 96

4. Determine the sum of the solutions of the equation $||3x| - 3| - x = 2$
 - a. -4.5
 - b. -1
 - c. 0
 - d. 1
 - e. 4.5

5. An equilateral triangle and a square have equal areas. What is the ratio of a side length of the square to a side length of the triangle?
 - a. $\frac{\sqrt[4]{3}}{2}$
 - b. $\frac{2\sqrt[4]{27}}{3}$
 - c. $\frac{\sqrt[4]{3}}{4}$
 - d. $\frac{\sqrt{3}}{4}$
 - e. $\frac{4\sqrt{3}}{3}$

6. A class had 32 students enrolled. The average on the midterm was 75. The average of the four lowest scores was 26. What is the average of the other 28 students?
 - a. 80
 - b. 82
 - c. 84
 - d. 99
 - e. none of these

7. Suppose x and y are positive integers such that $x + y = 17$ and $x - y = 13$. Determine the sum of the digits in the result of the product xy .
 - a. 1
 - b. 2
 - c. 3
 - d. 4
 - e. 5

8. The lines $x = \frac{1}{4}y + a$ and $y = \frac{1}{4}x + b$ intersect at the point $(1,2)$. Calculate $a + b$.
 - a. 0
 - b. $\frac{3}{4}$
 - c. 1
 - d. 2
 - e. $\frac{9}{4}$

9. How many mL of a 30% acid solution would a chemist have to mix with 900 mL of a 40% acid solution to yield a 36% acid solution?
 - a. 450
 - b. 500
 - c. 550
 - d. 600
 - e. 650

10. Aziza runs a dragon fruit delivery service. She charges \$4 for each dragon fruit and a \$1 delivery fee. Aziza creates data set A from how many dragon fruit were ordered in each delivery, and data set B from how much she charged for each delivery. What is the ratio of the standard deviation of data set B to the standard deviation of data set A?
- a. 1 b. 2 c. 4 d. 5 e. none of these
11. Bob drove to work from home at an average speed of 51 mph. On the way home, he hit traffic and drove an average of 34 mph. His total time in the car was 40 minutes. How far does Bob live from work?
- a. 9.6 miles b. 12.3 miles c. 13.3 miles d. 13.6 miles e. 15.3 miles
12. The sum of two positive numbers is 6 times their difference. What is the ratio of the larger number to the smaller number?
- a. $\frac{7}{5}$ b. $\frac{8}{5}$ c. $\frac{5}{3}$ d. 2 e. $\frac{11}{6}$
13. Ms. McMath promised that anyone who got all the multiple-choice questions right on the upcoming exam would receive an A on the exam. Which of these statements follows logically?
- a. If Lewis did not receive an A, then he got all of the multiple-choice questions wrong.
b. If Lewis did not receive an A, then he got at least one of the multiple-choice questions wrong.
c. If Lewis got at least one of the multiple-choice questions wrong, then he did not receive an A.
d. If Lewis received an A, then he got all of the multiple-choice questions right.
e. If Lewis received an A, then he got at least one of the multiple-choice questions right.
14. What is the remainder when $x^{50} + 50$ is divided by $x + 1$?
- a. -1 b. 0 c. 1 d. 49 e. 51
15. Which of the following is the sum of the additive inverse and the multiplicative inverse of $\frac{3x}{y}$?
- a. $\frac{y^2 - 9x^2}{3xy}$ b. $\frac{3y^2 - 3x^2}{xy}$ c. 0 d. $\frac{9x^2 - y^2}{3xy}$ e. $\frac{3x^2 - 3y^2}{xy}$
16. Let x be a 2024-digit base-two number where each digit is a 1. Suppose x is quintupled. How many digits would the resulting base-two number have?
- a. 2025 b. 2026 c. 2027 d. 2028 e. 2029
17. One pump working alone empties half of a full swimming pool in 30 minutes. A second pump is added and the pool is emptied totally after 10 more minutes. If the second pump had been working alone from the beginning, how long would it have taken to empty the full pool?
- a. 20 minutes b. 30 minutes c. 40 minutes d. 50 minutes e. 60 minutes

18. At a high school, 25% of the students are in 9th grade, and half of the high school students eat the cafeteria food. If 20% of the students who eat the cafeteria food are in 9th grade, then what proportion of students in the 9th grade eat the cafeteria food?
- a. 20% b. 25% c. 30% d. 40% e. 50%
19. Suppose the product of the solutions of $(x + 1)^2 + (x + 2)^2 + (x + 3)^2 = a$ equals 3, where a is a positive integer. Determine the value of a .
- a. 3 b. 5 c. 6 d. 7 e. 9
20. In a magical swamp there are two species of talking amphibians: toads, whose statements are always true, and frogs, whose statements are always false. Four amphibians Alpha, Beta, Delta, and Epsilon live together in the swamp. They make the following statements:
- Alpha: "There is at least one frog."
Beta: "Delta is a frog."
Delta: "If you ask Beta, Beta would say that Epsilon is a frog."
Epsilon: "Alpha is a toad or Delta is a toad."
- How many of the amphibians are frogs?
- a. 0 b. 1 c. 2 d. 3 e. 4

SHORT ANSWER

Place the answer in the appropriate space.

66. Let $m(x) = \begin{cases} x & \text{if } x \geq 1 \\ 1 & \text{if } x < 1 \end{cases}$. Recursively define the sequence: $y_{n+2} = \frac{m(y_{n+1})}{y_n}$, $y_1 = 1, y_2 = 2$.
Determine the value of y_{2024} .

67. How many positive divisors of $8!$ are perfect squares?
(The mark $!$ indicates factorial. For instance, $4! = 4 \times 3 \times 2 \times 1$.)

68. Suppose x is a perfect square. Adding 70 to x yields a number that is one more than a perfect square. Adding 70 again results in a perfect square. Determine the value of \sqrt{x} .

69. The sum of seven distinct positive integers is 29. What is the product of these integers?

70. A new number is created by writing the decimal expansion of the numbers 2^{2024} and 5^{2024} one after the other. How many digits are in this new number?

2024 Wake Tech HS Level One Test.v2

1. C
2. A
3. E
4. D
5. A
6. B
7. C
8. E
9. D
10. C
11. D
12. A
13. B
14. E
15. A
16. C
17. B
18. D
19. B
20. B

66. 1

67. 8

68. 34

69. 5760

70. 2025