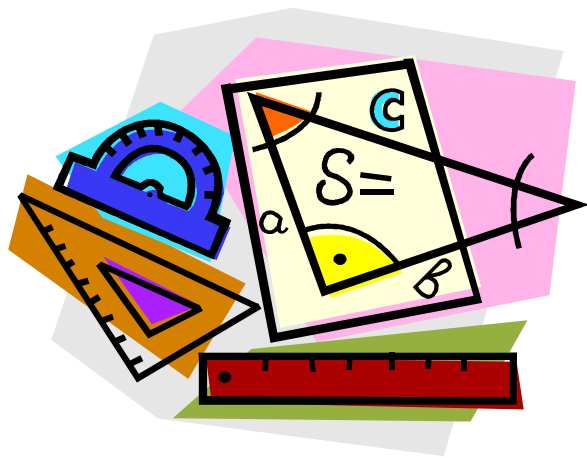


Level Two



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

1. A drawer contains 16 socks, 6 of which are orange. When three socks are drawn (without replacement) at random, what is the probability that at least one sock is orange?
 - a. $\frac{3}{8}$
 - b. $\frac{5}{8}$
 - c. $\frac{3}{14}$
 - d. $\frac{11}{14}$
 - e. $\frac{1}{28}$
2. 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
3. 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
4. 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. $\frac{9}{4}$
5. In triangle ABC , $AB = 2$, $BC = 1$. Suppose side AC and the median from vertex B to side AC have the same length. What is the value of $(AC)^2$?
 - a. $\frac{3}{2}$
 - b. 2
 - c. $\frac{9}{4}$
 - d. 3
 - e. none of these
6. 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
7. Siobhan and Nguyen have identical bags of marbles. They each contain five marbles – one pink, one purple, one brown, one gray, and one tan. Siobhan randomly selects a marble from Nguyen's bag and puts it in her bag. Then, Nguyen randomly selects a marble from Siobhan's bag and puts it in his bag. What is the probability that, after this process, the contents of the bags are still identical?
 - a. $\frac{1}{10}$
 - b. $\frac{1}{6}$
 - c. $\frac{1}{5}$
 - d. $\frac{1}{3}$
 - e. $\frac{1}{2}$
8. 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.

9. Right triangle ABC is such that angle B is a right angle and $BC = 60$. Let point D be on segment AB such that $AD = 1$. Segment BD is the diameter of a semicircle that is tangent to segment AC at point E . Determine the area of the semicircle.
- a. 30π b. 36π c. 60π d. 72π e. 144π
10. If the surface area of a sphere is doubled, by what factor does its volume increase?
- a. $\frac{3}{2}$ b. $\sqrt[3]{4}$ c. 3 d. $\sqrt{6}$ e. $2\sqrt{2}$
11. In a list of nine numbers, the average of the first five numbers in the list is 7 and the average of the last five numbers in the list is 11. Suppose the average of all nine numbers is 8. What number must be common to both the first five and the last five?
- a. 8 b. 11 c. 15 d. 18 e. 19
12. Each of two parallel chords in a circle is 8 cm in length. If the two chords are 6 cm apart, then how many centimeters long is the circumference?
- a. 5π b. 6π c. 8π d. 10π e. none of these
13. Twenty-two points are equally spaced on a circle. From these points a certain amount will be chosen at random. What is the minimum number of points that must be selected to guarantee that four vertices of at least one rectangle are chosen?
- a. 5 b. 11 c. 13 d. 15 e. 17
14. The populations of Treyville and Sethburg were equal in 1990. After 30 years of change, the populations were equal again in 2020. From 1990 to 2000, the population of Treyville increased by 80%. In the next decade, it increased by 60%. In the following decade, the population decreased by 40%. The population of Sethburg increased by the same percentage each decade. What was that percentage?
- a. 12.0% b. 20.0% c. 24.2% d. 57.6% e. 72.8%
15. If the graph of the line $y = 2x$ is shifted 3 units to the right, then rotated 90 degrees counterclockwise about the origin, and then reflected across the x -axis, what is the equation of the resulting line?
- a. $x - 2y = 6$ b. $x + 2y = 6$ c. $2x - y = 6$ d. $2x + y = 6$ e. none of these
16. 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

17. Let x be the tens digit and let y be the ones digit of 2024^{2024} . Determine the remainder when $10x + y$ is divided by 5.
a. 0 b. 1 c. 2 d. 3 e. 4
18. Suppose the expression $\sqrt[4]{a^3\sqrt{b\sqrt{c}}}$ is re-written in the form $\sqrt[24]{a^x b^y c^z}$, where a, b, c, x, y, z are positive integers. Determine the value of $x + y + z$.
a. 7 b. 9 c. 12 d. 24 e. 26
19. Calculate the sum of the solutions of the equation $(x + 2)^3 - 6(x + 2)^2 + 7(x + 2) - 9 = 0$
a. 0 b. 6 c. 8 d. 9 e. 12
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. Points B, C, D lie on circle A such that the length of segment AB , the length of arc BC , and the length of segment BD all equal 5, and the length of arc CD is less than 5. The exact radian measure of angle DAC can be expressed as $\frac{\pi}{x} - y$, where x and y are positive integers. Calculate the value of $x + y$.
67. Suppose right triangle ABC is such that all sides have positive integer lengths and one leg has length 16. Calculate the sum of all possible lengths of the hypotenuse.
68. Determine the positive solution of $(1 + \sqrt{x})^4 + (1 - \sqrt{x})^4 = 496$.
69. Ray AC intersects a circle at points B and C such that $AB = 3, BC = 13$. Ray AE intersects the same circle at points D and E such that $AD = 2$ and segment DC is perpendicular to segment CE . The area of the circle is $x\pi$ square units, where x is a whole number. What is the value of x ?
70. What three-digit number has a three-digit base-5 representation that is the reverse of its base-7 representation?

2024 Wake Tech HS Level Two Test.v2

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

66. 4

67. 119

68. 13

69. 121

70. 102