

College of Charleston
Math Meet 2003
Written Test – Level 1

1. Segment RS is a diameter of a circle with center O . If T is a point on the circle such that angle TRS measures 50 degrees, find the measure of angle OTS .
- (A) 40 degrees (B) 50 degrees (C) 60 degrees
(D) 90 degrees (E) none of these

2. If the length and the width of a rectangle are both tripled, the ratio of the area of the original rectangle to the area of the enlarged rectangle is
- (A) 1 : 18 (B) 1 : 9 (C) 1 : 6
(D) 1 : 3 (E) none of these

3. Which of the following correctly describes the solutions of the equation

$$x^3 + x^2 + 2x = 0$$

- (A) three real solutions: one rational solution and two irrational solutions
(B) three rational solutions
(C) one irrational solution and two solutions that are not real
(D) one rational solution and two solutions that are not real
(E) none of these
4. An athlete travels from point A directly to point B . If he runs $3/4$ of the way, walks $1/9$ of the way, and jogs the last 10 miles, what is the distance from point A to point B ?
- (A) 36 miles (B) 45 miles (C) 56 miles
(D) 72 miles (E) none of these
5. Find the distance from the point $(7, 9)$ to the line $x - y = 0$.
- (A) 1 (B) $\sqrt{2}$ (C) 2
(D) 10 (E) none of these
6. At which of the following x values does the curve $y = (x - 1)^2 - 4$ cross the x axis?
- (A) -5 (B) -3 (C) -1
(D) 4 (E) none of these
7. There are thirty-two combinations of how five voters can vote either YES or NO on an issue. In how many combinations is the vote either 2 YES to 3 NO or 3 YES to 2 NO.
- (A) 6 (B) 10 (C) 20
(D) 26 (E) none of these

8. A right angle XYZ is inscribed in a circle. Which of the following must be true?
 (A) segment YZ is shorter than segment ZX
 (B) angle $YXZ = 60$ degrees
 (C) angle $YXZ = 30$ degrees
 (D) angle XZY is an obtuse angle
 (E) none of these
9. If x and y are odd intergers, which of the following must be an odd interger?
 (A) $x + y$ (B) xy (C) x/y
 (D) $(xy + 1)^2$ (E) none of these
10. A farmer keeps three kinds of animals: cows, chickens and pigs. The quantities change from year to year. Last year, for instance, all but two of his animals were cows, all but two were chickens and all but two were pigs. How many different possibilities are there for the *total* number of animals he had on his farm last year?
 (A) There is only one possibility.
 (B) There are three different possibilities.
 (C) There are infinitely many possibilities.
 (D) None, there is no way this description could be accurate.
11. John was late for basketball practice and the coach made him run 5 laps around the basketball court before he could join the team for practice. The court measures 70 feet by 120 feet. John is anxious to join his teammates and cuts off each corner as he runs around. He runs along the sides of the court, except that when he is six feet from a corner of the court, he runs diagonally to the point that is on the next side and is six feet away from that corner. He does this on each of the four corners. How many feet does John cut from one lap? The correct answer is closest to
 (A) 7 feet (B) 14 feet (C) 34 feet
 (D) 48 feet (E) 240 feet
12. The graph of the equation $|x| + |y| = 4$ is a
 (A) ray (B) line (C) square
 (D) circle (E) none of these
13. How many of the first 1000 positive integers are divisible by 3, 4, 5, and 6?
 (A) 14 (B) 15 (C) 16 (D) 17 (E) 18
14. You are told that a paper bag is filled with two kinds of candies: lemon drops and mint drops. Each candy is wrapped in either red or white paper. You are told that when you randomly select a candy from the bag, the probability is 0.8 that it will have a red wrapper. Furthermore, you learn that the probability that a randomly selected candy from the bag is a mint drop with a red wrapper is 0.2. You reach in the bag and pull out a candy with a red wrapper. What is the probability that it is a mint drop?
 (A) $\frac{1}{2}$ (B) $\frac{1}{3}$ (C) $\frac{1}{4}$ (D) $\frac{1}{5}$ (E) 0

15. A toy manufacturer specializes in two action figures: Jumping Joe and Leaping Leon. There are 600 containers of plastic available per week to make the figures. Each Jumping Joe requires 3 containers of plastic and provides a profit of \$5. Each Leaping Leon requires 2 containers of plastic and provides a profit of \$2. The company must manufacture at least 100 Jumping Joes per week and at least 30 Leaping Leons per week. Let x be the number of Jumping Joes made per week and y be the number of Leaping Leons made per week that will maximize the profit. Find the value of $x - y$.

(A) 50 (B) 70 (C) 150
(D) 200 (E) none of these

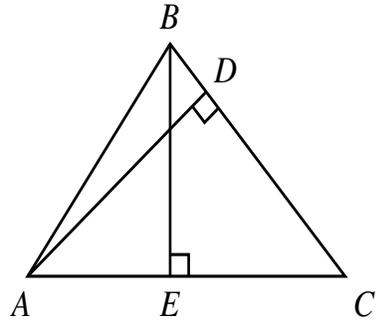
16. If, in the previous problem, we drop the requirement that x be at least 100 and y be at least 30, find the values of x and y that will maximize the profit and give the value of $x - y$.

(A) 50 (B) 70 (C) 150
(D) 200 (E) none of these

17. Nestor flips a fair coin eight times. What is the probability that the resulting sequence of heads and tails looks the same when viewed from either the beginning or from the end? (For example, HHHTTHHH is one such sequence.)

(A) $\frac{1}{32}$ (B) $\frac{1}{16}$ (C) $\frac{3}{16}$ (D) $\frac{3}{64}$ (E) $\frac{3}{32}$

18. If the measure of AC is 12, the measure of BC is 10, and the measure of AD is 9, then the measure of BE is



(A) between 6 and 7 (B) between 7 and 8
(C) between 8 and 9 (D) between 9 and 10
(E) none of these

19. The data below can be modeled by a linear equation.

x	-2	-1	1	2
y	2.1	2.6	3.6	4.1

Find the value of x when $y = 5.4$.

(A) 4.6 (B) 3.37 (C) 0.8
(D) -5.4 (E) none of these

20. When a sphere of radius 1 is totally submerged in a cylindrical tank of radius 2, the water level in the tank rises a distance of h . What is the value of h ?

(A) $1/12$ (B) $1/4$ (C) $1/3$
(D) $2/3$ (E) none of these

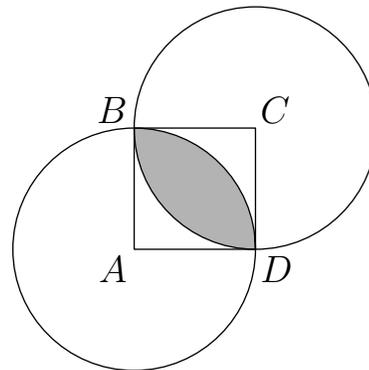
21. In a race of 1000 meters, **A** beats **B** by 200 meters and **A** beats **C** by 500 meters. Assuming that the contestants run at constant speeds, by how many meters does **B** beat **C**?
- (A) 300 (B) 375 (C) 450 (D) 500 (E) 625
22. Three friends jog regularly in a park: Anna jogs every 10 days, Barbara jogs every 15 days, and Jo jogs every 14 days. One Sunday they happen to jog together. After how many days will the three friends jog together again?
- (A) 150 (B) 210 (C) 350 (D) 420 (E) Never
23. If $x = 100!$, $y = 100!/60!$, and $z = 100^{40}$, find the true statement.
- (A) $x < y < z$ (B) $y < x < z$ (C) $y < z < x$
 (D) $z < x < y$ (E) $z < y < x$

24. Given below are three sets of points.
- I. $\{(-1, 0), (-2, 1), (-1, 3)\}$
 II. $\{(3, -6), (3, -3), (4, -3)\}$
 III. $\{(1, 1), (4, 3), (-3, 7)\}$

Which, if any of these sets, represent the vertices of a right triangle?

- (A) I only (B) II only (C) II and III only
 (D) I and II and III (E) none of these

25. The square $ABCD$ in the figure has sides of length 1. Both of the circles pass through the points B and D , but one is centered at A and the other at C . What is the area of the intersection of the two circles (the shaded region in the figure)?



- (A) $\frac{\pi}{4}$ (B) $1 - \frac{\pi}{4}$ (C) $\frac{\pi}{2} - 1$
 (D) $\frac{3\pi}{4} - 1$ (E) $\frac{1}{3}$

Answers

1. a
2. b
3. d
4. d
5. b
6. c
7. c
8. a
9. b
10. a
11. b
12. c
13. c
14. c
15. c
16. d
17. b
18. b
19. a
20. c
21. b
22. b
23. c
24. c
25. c