

College of Charleston
Math Meet 2005
Written Test – Level 1

1. A professor distributes 20 sample mathematics problems and says there will be ten problems on the test from these twenty. What is the minimum number of these sample problems a student must know how to do in order to guarantee that they will pass the test with at least a grade of 60%?
(A) twenty questions (B) eighteen questions
(C) sixteen questions (D) fourteen questions
(E) none of the above
2. Let S be the set of all numbers which are the sum of the squares of three consecutive integers. Then we can say that
(A) No member of S is divisible by 2
(B) No member of S is divisible by 3
(C) No member of S is divisible by 5
(D) No member of S is divisible by 7
(E) For any prime number N there is an element of S divisible by N
3. A speaker lectured to an audience for an hour. During that hour, ten percent slept through the entire lecture and twenty percent heard the entire lecture. Half of the remainder of the audience heard one-third of the lecture, and the other half heard two-thirds of the lecture. What was the average number of minutes of the lecture heard by the members of the audience?
(A) 24 (B) 30 (C) 33
(D) 36 (E) none of these
4. A bathroom tub will fill in 12 minutes with both faucets open and the stopper in place. With both faucets closed and the stopper removed, the tub will empty in 20 minutes. How long will it take for the tub to fill if both faucets are open and the stopper removed?
(A) 30 minutes (B) 60 minutes (C) 20 minutes
(D) 45 minutes (E) 15 minutes
5. Each Sunday, a newspaper agency sells copies of a certain newspaper for one dollar per copy. The cost to the agency of each newspaper is fifty cents. The agency pays a fixed cost for storage, delivery and so on, of one hundred dollars per Sunday. What is the profit to the agency if five thousand copies are sold?
(A) \$2400 (B) \$2500 (C) \$3000 (D) \$4500 (E) \$2000
6. A pyramid has a rectangular base with area 100 square inches, and its other four faces are equilateral triangles. What is the height, in inches, of the pyramid?
(A) $5\sqrt{2}$ (B) $5\sqrt{3}$ (C) 10 (D) $10\sqrt{2}$ (E) $10\sqrt{3}$
7. How many positive integers between 100 and 999 (inclusive) do not contain three identical digits?
(A) 889 (B) 890 (C) 891 (D) 892 (E) 991

8. Bill invested part of his allowance. The first week he tripled his money, but then lost \$20. The next week he invested that money and doubled it, but then lost \$30. The following week, he quadrupled the balance and ended with \$200. How much did Bill initially invest?
- (A) \$15 (B) \$20 (C) \$25
 (D) \$30 (E) none of these
9. An encryption scheme encodes information as a sequence of twelve zeros and ones. How many of these sequences contain exactly two ones?
- (A) 64 (B) 66 (C) 120 (D) 132
10. An equilateral triangle ACD with each side length x units, is inscribed in a circle. What is the length of the radius of this circle?
- (A) $\frac{x\sqrt{3}}{3}$ (B) $4x\sqrt{3}$ (C) $7x\sqrt{3}$
 (D) $\frac{x\sqrt{3}}{2}$ (E) none of these
11. When a company sells x ultra-deluxe dishwashers, its weekly profit is modeled by $P(x) = -2x^2 + 40x - 150$. The maximum weekly profit for this company is
- (A) less than \$20 (B) between \$20 and \$40
 (C) between \$40 and \$100 (D) between \$100 and \$500
 (E) none of these
12. The mathematics department at the College of Charleston has 25 full time faculty members. Randomly a team of five faculty members was chosen to go on an all expenses paid world tour for a secret mission to improve mathematics education. What is the probability that both the chair of the department Dr. C and Math Meet director Dr. K wind up in the group?
- (A) 1/3 (B) 1/30 (C) 2/30 (D) 2/25 (E) 2/23
13. At the College of Charleston Mathematics department 60% of the faculty members are male, 25% are foreign born, and 8% are foreign born females. If a faculty member is selected at random, what is the probability that the faculty member is foreign born or female?
- (A) 0.77
 (B) 0.65
 (C) 0.48
 (D) 0.57
 (E) Not enough information is given to calculate the answer and the answer MUST be in %.

14. Suppose you have a collection of coins from five different countries. Each of those countries has five different denominations of coins, and you have one of each. Your coins are distributed into five boxes so that each box contains coins from exactly two countries and no box contains all of the coins from any of the countries. What is the smallest number of boxes you need to open to be certain to find all five coins from at least one country?
- (A) 5 (B) 4 (C) 1 (D) 2 (E) 3
15. There are 2 jars, one jar contains 200 red beads and another contains 200 blue beads. You take out 36 blue beads from the jar containing blue beads and mix them with the red beads in the jar with red beads. Then you take out the same number (36) of beads from the mixed color jar and add them in the jar with blue beads. Note both jars again have 200 beads but they have mixed colors. What is the relationship between the number of blue beads in one jar with the number of red beads in the second jar?
- (A) Number of blue beads is more in first jar than number of red beads in second
(B) Number of blue beads is less in first jar than number of red beads in second
(C) Either A or B are possible
(D) Only one of the above choices A or B is possible.
(E) the number of blue beads in first jar equal the number of red beads in second
16. How many positive integers between 100 and 999 are divisible by 7?
- (A) 126 (B) 127 (C) 128 (D) 129 (E) 130
17. A vertical pole is x feet high. When the pole bends at one point, the top of the pole reaches the ground y feet from the bottom of the remaining vertical part. Represent the height at which the pole was bent.
- (A) $x^2 + y^2 - 2x$ (B) $(x^2 - y^2)/2x$ (C) $x^2 - y^2$
(D) $x^2 + y^2$ (E) none of these
18. A 38 pound bag of Economy brand cement mix contains 25 percent cement and 75 percent sand. Approximately how much pure cement must be added to produce a cement mix that is 30 percent cement?
- (A) 2.35 pounds (B) 3.25 pounds (C) 2.34 pounds
(D) 2.71 pounds (E) 1.75 pounds
19. A search plane has a cruising speed of 250 miles per hour and carries enough fuel for at most 5 hours of flying. If there is a wind that averages 30 miles per hour and the direction of search is with the wind one way and against it the other, how far can the search plane travel?
- (A) 616 miles (B) 1232 miles (C) 678 miles
(D) 500 miles (E) 1263 miles

20. A restaurant has a fixed price menu of \$36 for a complete dinner. The average number of customers per night is 200. The owner estimates that for each dollar increase in price, there will be, on average, four fewer customers per night. Estimate the price for a dinner that will produce the maximum amount the owner can expect to receive.
- (A) \$38 (B) \$43
(C) \$40 (D) \$45
(E) None of the above
21. A house is x feet tall. Its shadow is y feet long. At the same time, the building nearby has a shadow z feet long. Represent the height of the building in terms of x , y , and z .
- (A) $(xz)/y$ (B) xyz (C) $x/(yz)$
(D) $yz - x$ (E) none of these
22. Suppose you are in charge of arranging places for six knights around the Round Table. If Sir Lancelot can't sit next to Sir Gawain, Sir Gawain must sit next to Sir Kay, and Sir Kay can't sit across from Sir Tristan (but Sirs Bob and Doug don't care where they sit), how many ways can the six knights be seated? (If two seating arrangements differ only by rotation, you should count them as the same.)
- (A) 14 (B) 24 (C) 28 (D) 36 (E) 42
23. The longer base of an isosceles trapezoid has a length equal to that of one of its diagonals. The shorter base has length equal to that of the altitude of the trapezoid. If all of these lengths are positive integers, find the smallest possible area of such a trapezoid.
- (A) 6 (B) 12 (C) 15
(D) 30 (E) none of these
24. A staircase has twelve steps. You can take one or two steps at a time. In how many different ways can you go up the staircase?
- (A) 116 (B) 228 (C) 233
(D) 427 (E) none of these
25. If a certain number x is divided by n , the remainder is $n - 1$, for any positive integer n less than or equal to 10. Assuming that x is less than 3000, what is true about the value of x ?
- (A) x is between 0 and 100 (B) x is between 300 and 600
(C) x is between 1000 and 1500 (D) x is between 2000 and 3000
(E) none of these

2005 Answers / Level 1 Test

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