

College of Charleston
Math Meet 2008
Written Test – Level 1

1. Three equal fractions, such as $3/6=7/14=29/58$, use all nine digits 1, 2, 3, 4, 5, 6, 7, 8, 9 exactly one time. Using all digits exactly one time, the two-digit numbers ab and cd are such that $3/6=9/18=ab/cd$. Find the product of digit a and digit d .
(A) 8 (B) 10 (C) 28 (D) 38
2. There are eight furlongs in one mile. A rate of twelve furlongs in three minutes is equivalent to how many miles per hour?
(A) between 19 and 22 (B) between 23 and 25
(C) between 26 and 28 (D) between 29 and 32
(E) none of these
3. Fifteen people took part in a free-throw competition. The first participant scored x points, the second scored y points, the third scored the arithmetic mean of the number of points scored by the first two, and each subsequent competitor scored the arithmetic mean of the number of points scored by all previous ones. How many points did the last competitor score?
(A) $(x+y)/2$ (B) $12(x+y)/14$ (C) $13(x+y)/15$
(D) $14(x+y)/16$ (E) none of these
4. There are 9 members of a club, including 4 females. How many committees of 3 persons can be selected from the club if at least one female must be on any committee?
(A) 54 (B) 74 (C) 84
(D) 126 (E) none of these
5. The total paid for lunch by a group of 4 people was 60 dollars. The first person paid half of the sum of the amounts paid by the others. The second person paid one-third of the sum of the amounts paid by the others. The third person paid one-fourth of the sum of the amounts paid by the others. The second person paid how much more than the fourth person?
(A) 1 dollar (B) 2 dollars (C) 3 dollars
(D) 4 dollars (E) none of these
6. How many triangular faces does a pyramid with twelve edges have?
(A) 4 (B) 6 (C) 8
(D) 10 (E) none of these
7. The sum of the first three terms of a geometric sequence of positive terms is equal to seven times the first term, and the sum of the first four terms is forty-five. What is the fourth term of the sequence?
(A) 18 (B) 20 (C) 24
(D) 36 (E) none of these

8. Two opposite sides of a square are increased by twenty-five percent while the other two are decreased by forty percent. Find the percent of decrease in the area of the square.
- (A) 15% (B) 25% (C) 30%
(D) 32.5% (E) none of these
9. Michelle receives a 10 percent raise every year. Her salary after four such raises has gone up by what percent?
- (A) between 30 and 35 percent (B) between 35 and 40 percent
(C) between 40 and 45 percent (D) between 45 and 50 percent
(E) none of these
10. The sum of the square of 22 and the square of 19 equals the sum of the squares of two other two-digit numbers. Give the sum of four digits of the other two-digit numbers.
- (A) 11 (B) 12 (C) 18
(D) 21 (E) none of these
11. The square with vertices $(-1, -1)$, $(1, -1)$, $(-1, 1)$, and $(1, 1)$ is cut by the line $y = x/2 + 1$ into a triangle and a pentagon. What is the number of square units in the area of the pentagon?
- (A) less than 1.5 (B) between 1.5 and 2.5
(C) between 2.5 and 3.5 (D) between 3.5 and 4.5
(E) none of these
12. How many ways are possible to arrange the integers from 1 through 16 in a sequence so that the sum of any two adjacent terms is a perfect square and also that the first number is larger than the last number.
- (A) 0 (B) 1 (C) 2
(D) 3 (E) none of these
13. Find all positive integral solutions to $x^2y - y^3 = 105$ and give the sum of all possible x and y values.
- (A) 12 (B) 15 (C) 24 (D) 32
14. Debby has seven coins in her coin purse: 1 quarter, 2 dimes, 3 nickels, and 1 penny. If Debby shakes out three coins at random, what is the probability that the amount she has out is less than 25 cents?
- (A) 17/35 (B) 18/35 (C) 17/49
(D) 18/49 (E) none of these
15. Three open switches are in a row. The third switch can be opened or closed at will. The second switch can be opened or closed only if the third switch is closed. The first switch can be opened or closed only if the second switch is closed and the third switch is open. If all three switches are open, what will be the least number of switch changes to get all three in closed positions?
- (A) 2 (B) 3 (C) 4
(D) 5 (E) none of these

16. An escalator moves up at a rate of x steps per second. Walter walks up the escalator at the rate of one step per second and reaches the top in twenty seconds. The next day Walter's rate was two steps per second, and he reached the top in sixteen seconds. How many steps does the escalator have?
- (A) 40 (B) 50 (C) 60
(D) 80 (E) none of these
17. Two circles are concentric. A chord x units long cuts across the larger circle and is tangent to the smaller circle. Express the area of the region outside of the smaller circle, but inside the larger circle, in terms of x
- (A) $x\pi/2$ (B) $2x\pi$ (C) $2x^2\pi$
(D) $x^2\pi/4$ (E) none of these
18. A stock market analyst sold a monthly magazine to 500 subscribers at the price of ten dollars an issue. The analyst discovered that for each twenty-five cents increase in the monthly price of the magazine, she would lose two subscribers. For what price should she sell each issue to bring in the greatest total monthly gross income?
- (A) between 25 and 29 dollars (B) between 29 and 33 dollars
(C) between 33 and 37 dollars (D) between 37 and 41 dollars
(E) none of these
19. Alex poked a big hole in Levin's raft, and water started coming at a rate of 10 gallons per minute. Levin's raft officially sinks with 30 gallons. If Levin paddles to shore $1/2$ mile away at a rate of 4 miles per hour, how fast must Alex bail out water so that their trip to shore will not include swimming?
- (A) 6 gallons per minute (B) 8 gallons per minute
(C) 10 gallons per minute (D) 12 gallons per minute
(E) none of these
20. A circle of radius 10 is inscribed in an ellipse. The area of the ellipse is twice the area of the circle. What is the length of the major axis of the ellipse?
- (A) 20 (B) 30 (C) 40
(D) 60 (E) none of these
21. Pat's bicycle has 28-inch diameter wheels and Jennifer's has 14-inch diameter wheels. Pat's wheel rotates twice for every three rotations of the pedals; Jennifer's wheel rotates three times for every two rotations of the pedals. Pat rotates the pedals twice as quickly as Jennifer. Jennifer takes 8 minutes to bicycle one mile. How much time will Pat take?
- (A) 3.5 (B) 4.5 (C) 5.5
(D) 6.5 (E) none of these

22. A regular octagon $ABCDEFGH$ has sides of length 1 and center at Q . Given that R is a point on side CD and that QR is perpendicular to CD , Find the sum of the lengths of segments AE and QR .
- (A) between 3.0 and 3.5 (B) between 3.5 and 4.0
(C) between 4.0 and 4.5 (D) between 4.5 and 5.0
(E) none of these
23. An integer between 1 and 1,000,000 inclusive is randomly chosen and found to be a perfect square. What is the probability that it is also a perfect cube?
- (A) 0.01 (B) 0.05 (C) 0.10
(D) 0.20 (E) none of these
24. An isosceles trapezoid with bases 8 and 22 cm long has an inscribed circle. Find the length of the diameter of the circle.
- (A) between 10 and 11 cm (B) between 11 and 12 cm
(C) between 12 and 13 cm (D) between 13 and 14 cm
(E) none of these
25. In square $ABCD$, points E and F are the midpoints of sides AB and BC , respectively. If the length of a side of the square is x , then find the length of the altitude drawn from point E to DF .
- (A) $3x/2\sqrt{5}$ (B) $3x\sqrt{2}/4$ (C) $3x\sqrt{2}/2$
(D) $x\sqrt{6}/2$ (E) none of these

2008 Answers / Level 1 Test

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