

**College of Charleston**  
**Math Meet 2015**  
**Written Test – Level 1**

1.  $\frac{1}{4}$  of  $\sqrt[3]{32}$  equals  
(A)  $\frac{1}{\sqrt[3]{2}}$       (B)  $2^{-3}$       (C) 2      (D)  $\sqrt[3]{4}$       (E)  $2\sqrt[3]{2}$
2.  $L$  and  $K$  are perpendicular lines in the  $xy$ -plane. The three lines  $L$ ,  $K$ , and  $y = 4 - x$  intersect at a single point.  $L$ 's  $y$ -intercept is 7, and  $K$ 's  $x$ -intercept is 1. Find the sum of the slopes of  $L$  and  $K$ .  
(A) 0      (B)  $2/3$       (C)  $-3/2$       (D)  $-2/3$       (E)  $3/2$
3. A coin is biased so that the probabilities of heads and tails are  $2/3$  and  $1/3$  respectively. A second coin is biased so that the probabilities of heads and tails are  $3/5$  and  $2/5$  respectively. If both coins are tossed, find the probability of at least one head.  
(A)  $\frac{13}{15}$       (B)  $\frac{2}{5}$       (C)  $\frac{8}{15}$   
(D)  $\frac{3}{5}$       (E) None of the above
4. A spherical melon has diameter 8 inches. You cut it in half through the center, and then scoop out the seeds, leaving a 4-inch diameter hemispherical hollow in each half. After you've quartered the melon (that is, cut each half in half again to produce four equal congruent pieces), what is the total surface area of all the pieces?  
(A)  $128\pi$       (B)  $132\pi$       (C)  $176\pi$       (D)  $224\pi$       (E)  $(932/3)\pi$
5. Professor Calini always tells the truth, except on the weekend (Saturday and Sunday), when she lies all the time. On how many days of the week can Professor Calini say "*If I did not tell the truth yesterday, then I will not lie tomorrow?*"  
(A) 0      (B) 1      (C) 3      (D) 5      (E) 7
6. Solve the inequality  $4 - 8(x - 2) > 2(x + 1) - 7x$ .  
(A)  $x < 6$       (B)  $x > -6$       (C)  $x < -18$   
(D)  $x > 6$       (E) none of these
7. When the base of a triangle is increased by 10% and the altitude to this base is decreased by 10%, the change in area is  
(A) 1% increase      (B) 1/2% increase      (C) no change  
(D) 1/2% decrease      (E) 1% decrease
8. Three congruent adjacent squares are arranged in a row to form an outer rectangle  $ABCD$ . The perimeter of rectangle  $ABCD$  is 80 cm. Find the area of rectangle  $ABCD$ .  
(A) 240 sq cm      (B) 300 sq cm      (C) 320 sq cm  
(D) 640 sq cm      (E) none of these

9. Let  $C$  be the circle  $x^2 + y^2 = 27$ . No point on  $C$  has integer coordinates (meaning  $x$  and  $y$  can't both be integers). What is the distance from  $C$  to the nearest point with integer coordinates?
- (A)  $\frac{1}{\sqrt{27}}$                       (B)  $\frac{1}{3}$                       (C)  $\sqrt{3} - \sqrt{2}$   
 (D)  $\sqrt{27} - \sqrt{26}$                       (E) none of these
10. If 70% of the population of North America have seen the Atlantic Ocean and 60% have seen the Pacific Ocean, what is the smallest possible value for the percentage of North Americans who have seen both oceans?
- (A) 42%                      (B) 60%                      (C) 70%                      (D) 30%                      (E) 20%
11. Simplify  $\frac{a^{-1} - b^{-1}}{a^{-1} + b^{-1}}$ .
- (A)  $\frac{a - b}{a + b}$                       (B)  $\frac{b - a}{a + b}$                       (C)  $\frac{a + b}{b - a}$   
 (D)  $\frac{a + b}{a - b}$                       (E) None of the above
12. A professor distributes 20 sample mathematics problems and says that the test will consist of 10 problems chosen from these 20. What is the minimum number of these sample problems that 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
13. If you roll an ordinary six-sided die three times, what is the probability that you will get three consecutive integers in increasing order?
- (A)  $\frac{1}{216}$                       (B)  $\frac{1}{108}$                       (C)  $\frac{1}{72}$                       (D)  $\frac{1}{54}$                       (E)  $\frac{5}{216}$
14. If  $p$ ,  $q$ , and  $r$  are three real numbers,  $p \times (q + r) = (p \times q) + (p \times r)$  is always true. In which cases is  $p + (q \times r) = (p + q) \times (p + r)$  also true?
- (A) if and only if  $p = q = r = \frac{1}{3}$  or  $p = 0$   
 (B) if and only if  $p = q = r$   
 (C) Never  
 (D) if and only if  $p + q + r = 1$  or  $p = 0$   
 (E) if and only if  $p = q = r = 0$
15. A speaker lectured to an audience for an hour. During that hour, ten percent of the audience 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



22. A man leaves his horses to his six children in his will. To the youngest child he leaves one horse and one seventh of the rest. To the next child he leaves two horses and one seventh of the rest. To the third child he leaves three horses and one seventh of the rest. Similarly, the fourth child receives four and one seventh of the rest and the fifth receives five and one seventh of the rest. Finally, the sixth and eldest child receives all of the horses that are left after the others have taken theirs.  
If they all received the same number of horses, how many were there to start with?
- (A) 23                      (B) 29                      (C) 36                      (D) 42                      (E) 701
23. A parade is two miles long and moves with constant speed. A person who is at the end starts walking towards the front of the parade, moves forward with a constant speed until he reaches the front, and then turns around and walks at the same speed until he reaches the end of the parade. By this time the parade has moved two miles forward. What distance has the person walked?
- (A) 4                      (B) 2                      (C)  $2(1 + \sqrt{3})$                       (D)  $2(1 + \sqrt{2})$                       (E)  $3(1 + \sqrt{2})$
24. Patrick starts with a cup of cocoa, drinks half of it, and then adds milk to the cup to fill it again. After stirring and drinking another half-cup of the mixture, he again fills the cup with milk. He continues in this way until he has consumed three cups of the liquid. How much of the original cocoa remains in the cup?
- (A)  $1/8$  cup                      (B)  $1/16$  cup                      (C)  $1/32$  cup                      (D)  $1/64$  cup                      (E)  $1/128$  cup
25. A pharmacist has 8 liters of a 15 percent solution of acid. How much distilled water must she add to reduce the concentration of acid to 10 percent?
- (A) 4 liters                      (B) 5 liters                      (C) 6 liters  
(D) 7 liters                      (E) None of the above

## 2015 Answers / Level 1 Test

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