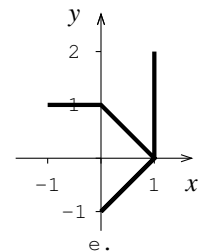
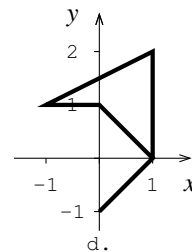
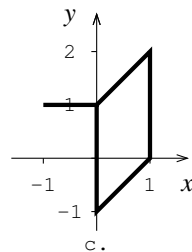
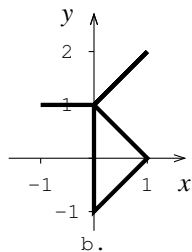
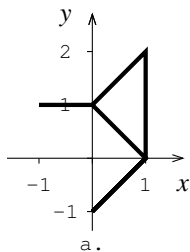
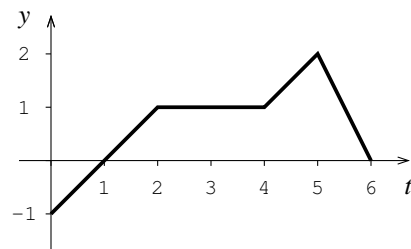
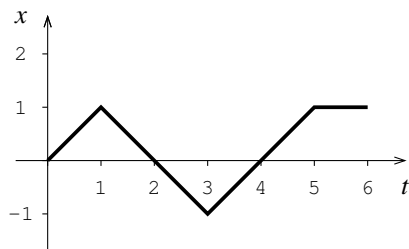


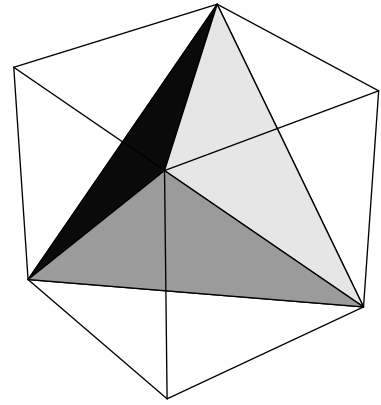
# College of Charleston Math Meet 2016 Written Test – Level 1

1. An insect crawled about on the  $x$ - $y$  plane for six seconds, and as it did, I plotted its  $x$  and  $y$  coordinates as functions of time  $t$ . Which  $x$ - $y$  graph shows the path of the insect?



- (A) figure a.      (B) figure b.      (C) figure c.      (D) figure d.      (E) figure e.
2. Find the number of real solutions to the equation
- $$x^5 + x^4 + x^3 + x^2 + x + 1 = 0.$$
- (A) 5                  (B) 4                  (C) 3                  (D) 2                  (E) 1
3. How many different numbers can be written in the form  $x + y$  where  $x$  and  $y$  are in  $\{1, 2, 4, \dots, 2^{11}\}$ ?
- (A) 21                  (B) 32                  (C) 66                  (D) 78                  (E) 121
4. A box contains five red balls and seven blue balls. A ball is selected at random and discarded. A second ball is then selected at random from the remaining balls. The probability that this second selection is a blue ball is
- (A)  $7/11$                   (B)  $5/11$                   (C)  $7/12$   
(D)  $5/12$                   (E) none of these

5. The shaded solid in the picture is a tetrahedron inscribed in a cube with side length one. As shown, two of the tetrahedron's vertices are the corners at the top of the cube in the front and the back and the other two vertices are the corners at the bottom of the cube at left and right. Pick the answer that is closest to the volume of this tetrahedron.



- (A) .1                      (B) .2                      (C) .3                      (D) .4                      (E) .5

6. For which values of  $x$  is  $\frac{x + 16}{2x - 2000} > 1$ ?

- (A)  $x > 1000$                       (B)  $x < 1000$                       (C)  $x > 2016$   
 (D)  $x < 2016$                       (E)  $1000 < x < 2016$

7.  $\lfloor x \rfloor$  denotes the greatest integer which is less than or equal to  $x$ . For example,  $\lfloor 6.25 \rfloor = 6$ ,  $\lfloor 4 \rfloor = 4$ , and  $\lfloor \pi \rfloor = 3$ . What can you say about the integer solutions  $n$  of the following equation?

$$\lfloor \sqrt[4]{1} \rfloor + \lfloor \sqrt[4]{2} \rfloor + \lfloor \sqrt[4]{3} \rfloor + \cdots + \lfloor \sqrt[4]{n} \rfloor = 2n$$

- (A) There are no solutions.                      (B) There is more than one solution.  
 (C) The only solution is  $n = 85$                       (D) The only solution is  $n = 90$   
 (E) The only solution is  $n = 95$

8. How many whole numbers are between  $\sqrt{8}$  and  $\sqrt{80}$ ?

- (A) 5                      (B) 6                      (C) 7                      (D) 8                      (E) 9

9. A jar is filled with two types of candies: lemon drops and mint drops. Each piece of candy is wrapped either in red paper or white paper.

7/10 of the candy is in red paper.

3/10 of the candy consist of mint drops wrapped in red paper.

3/5 of the candy is lemon drops.

If you pull a mint drop from the jar, what's the probability that it is wrapped in white paper?

- (A) 1                      (B) 4/5                      (C) 1/2                      (D) 2/5                      (E) 1/4

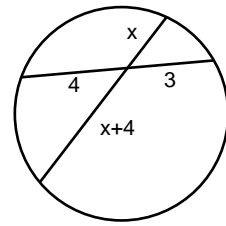
10. Which of these equations involving square roots is *not* true?

(A)  $2\sqrt{2} = \sqrt{18} - \sqrt{2}$                       (B)  $\left(\sqrt{2} + \frac{\sqrt{15}}{3}\right)(\sqrt{6} - \sqrt{5}) = \frac{1}{3}$

(C)  $\sqrt{16\sqrt{2} + 16} = 4\sqrt{\sqrt{2} + 1}$                       (D)  $\sqrt{2} - \sqrt{3} = \frac{-1}{\sqrt{2} + \sqrt{3}}$

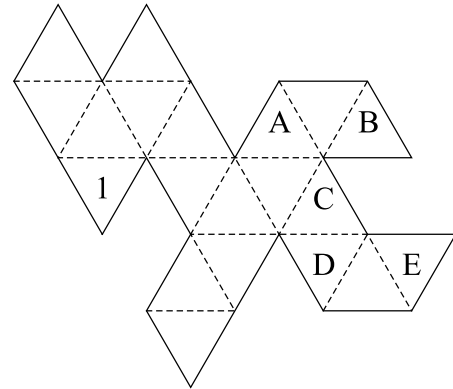
(E)  $\sqrt{14 + 6\sqrt{5}} = 3 + \sqrt{5}$

11. A *chord* is a line segment whose endpoints lie on a circle. Two chords lie in the same circle. If the first divides the second into lengths 3 and 4, and the second divides the first into lengths  $x$  and  $x+4$ , find  $x$ .



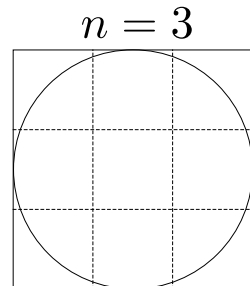
(drawing not to scale)

- (A) 2                      (B)  $-1 + \sqrt{13}$     (C)  $2 + \sqrt{5}$             (D)  $3 - \sqrt{5}$             (E)  $5 - \sqrt{2}$
12. The figure to the right could be folded up to form an icosahedron. Which face would be opposite the face labeled 1?



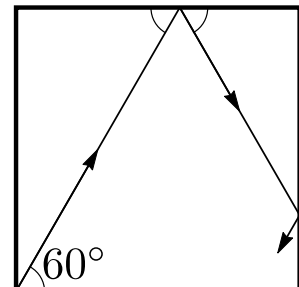
- (A) A                      (B) B                      (C) C                      (D) D                      (E) E

13. Start with a big square  $S$ . Using equally spaced lines parallel to its sides, divide it into  $n^2$  congruent small squares. If we inscribe a circle in  $S$ , what's the largest value of  $n$  for which each of these small squares includes a point inside the circle?



- (A) 5                      (B) 6                      (C) 7  
(D) 8                      (E) none of these

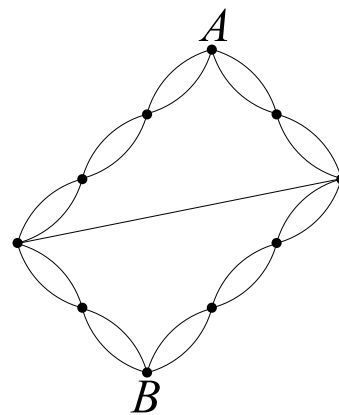
14. A beam of light leaves a vertex of a unit square at an angle of  $60^\circ$  to one of the sides. Every time the beam of light hits one of the sides of the square, it reflects back into the square. What distance will the beam of light travel before it next hits a vertex?



- (A)  $\sqrt{5}$                       (B)  $2\sqrt{3}$   
(C) 4                          (D)  $\sqrt{17}$   
(E) It will never again hit a vertex.



24. In the picture to the right, each dot represents a city, and each path (curved or straight) connecting dots represents a way to get directly from one city to another. If we impose the restriction that we may visit a city at most once, how many different ways are there to get from city  $A$  to city  $B$ ?



- (A) 4                                      (B) 64                                      (C) 144  
(D) 2048                                      (E) none of these
25. 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

## 2016 Answers / Level 1 Test

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