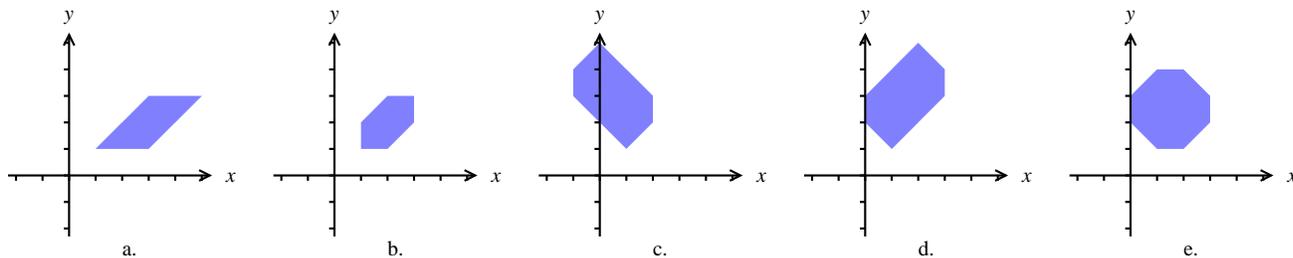




7. When Rohn tries to throw a football, his aim is poor but very predictable. See the top figure below. If he stands on the dot  $\bullet$  and throws in the direction of the arrow, the ball will always land in the shaded parallelogram.



- (A) Figure a.      (B) Figure b.      (C) Figure c.      (D) Figure d.      (E) Figure e.

8. Which of these polynomials is **not** a factor of  $x^{10} - 1$ ?

- (A)  $x^5 - 1$       (B)  $x^9 + x^8 + x^7 + \dots + x + 1$   
 (C)  $x^9 - x^8 + x^7 - \dots + x - 1$       (D)  $x^8 + x^6 + x^4 + x^2 + 1$   
 (E)  $x^8 - x^6 + x^4 - x^2 + 1$

9. In a sales effectiveness seminar, representatives tried two different approaches to selling an HDTV to a customer, the aggressive approach and the passive approach. The table below contains the results for 1160 customers. Suppose that one of these customers is selected at random. Let  $S$  represent the event that the customer purchased an HDTV and let  $A$  represent the event that the sales approach was aggressive.

	Sale	No Sale	Total
Aggressive	270	310	580
Passive	416	164	580
Total	686	474	1160

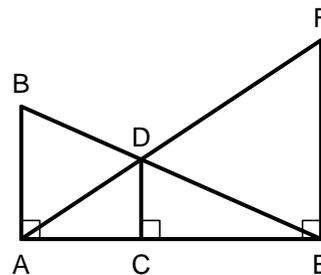
Which of these statements correctly characterizes the relationship between events  $S$  and  $A$ ?

- (A) they are disjoint and independent  
 (B) they are independent but not disjoint  
 (C) they are disjoint but not independent  
 (D) they are neither disjoint nor independent  
 (E) they have the same probability

10. Which of these is a simpler way to write the number  $\frac{\frac{1}{c-1} + 1}{\frac{1}{c} - \frac{1}{c-1}}$ ?

- (A)  $-2c$       (B)  $2c$       (C)  $c - c^2$       (D)  $c^2 - c$       (E)  $-c^2$

11. If the distance AB is 10 and EF is 15, find the distance CD.



- (A) 9  
 (B) 8  
 (C) 7.5  
 (D) 6  
 (E) Not enough information to determine CD

12. In a Sudoku puzzle, one must place a digit (1,2,...,9) in each of the  $1 \times 1$  squares so that each row, each column, and each of the  $3 \times 3$  grids outlined in bold contains all 9 digits. Find the digit that must go in the shaded square.

			<b>7</b>		<b>9</b>			
	<b>3</b>	<b>2</b>				<b>5</b>	<b>1</b>	
<b>4</b>								<b>9</b>
		<b>5</b>	<b>3</b>		<b>1</b>	<b>8</b>		
	<b>1</b>						<b>9</b>	
		<b>7</b>	<b>9</b>		<b>8</b>	<b>2</b>		
<b>7</b>								<b>2</b>
	<b>5</b>	<b>4</b>				<b>1</b>	<b>8</b>	
			<b>5</b>		<b>4</b>			

- (A) 2      (B) 3      (C) 6      (D) 7      (E) 9

13. A factory assembly line produces a certain item, and on average 10% of the items are defective. Suppose a random sample of 10 items is taken. What is the probability that exactly 3 items in the sample are defective?

- (A)  $\frac{10!}{7!3!}(0.9)^7(0.1)^3$       (B)  $(0.9)^7(0.1)^3$       (C)  $\frac{10!}{7!}(0.9)^7(0.1)^3$   
 (D)  $\frac{10!}{7!3!}(0.9)^3(0.1)^7$       (E)  $(0.9)^3(0.1)^7$

14. In the binomial  $(x - y)^{16}$ , the coefficient of  $x^4y^{11}$  is

- (A) 0      (B) 420      (C) 560      (D) 1820      (E)  $-3360$

15. Consider the set  $S = \{1, 2, \dots, 2004\}$ . How many subsets of  $S$  are there such that the sum of their elements equals 2,009,000?  
 (A) 8                      (B) 10                      (C) 16                      (D) 1002                      (E)  $2^{2000}$
16. A pharmacist working the night shift at a hospital receives a call from the operating room that they have an urgent need for 2 liters of 74% alcohol solution. She looks in the alcohol vault and finds that they only have 90% and 70% solutions in stock, which she will have to mix together to get the 74% solution. How much of the 70% solution should she use?  
 (A) 1.3 liters              (B) 1.4 liters              (C) 1.5 liters              (D) 1.6 liters              (E) 1.7 liters
17. Some of the people in a group of  $x$  people are divided into  $y$  teams of equal size. No one is on more than one team. If there are  $z$  people left over, which of the following represents the number of people on each team?  
 (A)  $x - yz$                       (B)  $x/y + z$                       (C)  $(x - y)/z$   
 (D)  $(x - z)/y$                       (E) none of these
18. Which statement is correct?  
 (A) If  $x^2 > 0$  then  $x > 0$ .      (B) If  $x^2 > x$  then  $x > 0$ .      (C) If  $x < 0$  then  $x^2 > x$ .  
 (D) If  $x^2 > x$  then  $x < 0$ .      (E) If  $x < 1$  then  $x^2 < x$ .
19. A closed rectangular box has a volume of 288 cubic inches. If the base of the box is a square with one foot long sides, what is the external surface area of the box (in square inches)?  
 (A) 96                      (B) 168                      (C) 240                      (D) 384                      (E) 1,153
20. Statistics cited in a recent magazine revealed that the averaged (combined) weekly spending of a teenage boy and girl amounts to \$49.04. Of this total, on average, girls spend \$25.75 per week. Boys spend an average of \$5.90 each week on entertainment. Finally, \$37.89 of the amount spent each week is spent on things other than entertainment. Determine how much money boys spend each week on things other than entertainment.  
 (A) \$11.49                      (B) \$17.39                      (C) \$22.64  
 (D) \$23.29                      (E) none of these
21. There are some marbles in a bag. Amanda says: "There are exactly three marbles in the bag and they are all black". Joe says: "There are two black marbles and two red marbles in the bag". Bill says: "There are only black marbles in the bag".  
 If you know that only one person lies, how many marbles are there?  
 (A) 1                      (B) 2                      (C) 3  
 (D) 4                      (E) Not enough information
22. If  $\frac{a + 13b}{3a - b}$  equals 3, then  $\frac{a^3}{b^3}$  equals  
 (A) 64                      (B) 27                      (C) 8                      (D)  $\frac{127}{64}$                       (E) 1
23. Five candidates—Aay, Bee, Cee, Dea, and Ewa—compete for the Wojcicka Medal in mathematics at the College of Charleston. Each candidate earns between 1 and 5 points in each of five areas—algebra, analysis, topology, discrete math, and logic—and the candidate with the most points wins the medal. There were no ties in any subject, and no ties in overall point totals. Aay came in first with 24 points, Bee came in second, Cee third, Dea fourth, and Ewa fifth. Ewa earned five points in analysis and three points in algebra.  
 How many points did Cee earn altogether?  
 (A) 11                      (B) 12                      (C) 13                      (D) 14                      (E) 15

24. An interior point of an equilateral triangle is at distances 5, 7 and 8 from the three sides of the triangle. What is the common length of the sides of the triangle?
- (A) It cannot be determined                      (B) The given configuration cannot exist  
(C) 20    (D)  $14\sqrt{3}$

(E)  $\frac{40}{3}\sqrt{3}$

25. 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

## 2019 Answers / Level 1 Test

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