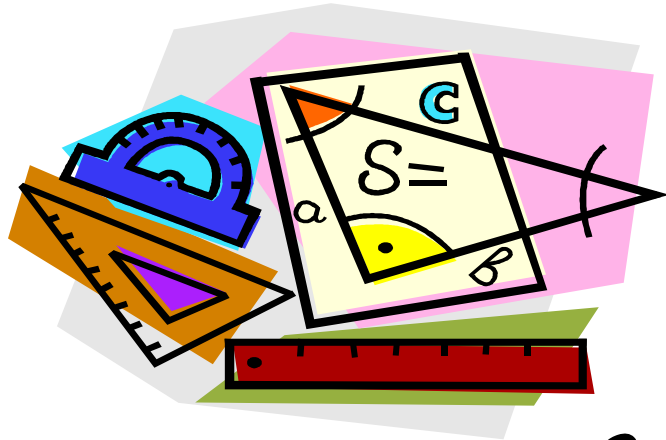


# Level II



**Do NOT open until  
you are told to do so.**

April 9, 2015

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1. According to a survey conducted by Parade magazine, the average American ate 405 savory snacks, 366 sweet snacks, and 357 healthier snacks in 2013. Since 2006, healthier snacks are up 14% while sweet snacks are down 6%. Using this data which of the following would best represent the number of healthier snacks consumed by the average American in 2006?
- a. 307                      b. 313                      c. 320                      d. 300                      e. 250
2. What is the number of hours from 5 pm Monday until 9 am Wednesday of the same week?
- a. 40                      b. 38                      c. 41                      d. 36                      e. 39
3. A final grade consists of the average of six tests grades. If the first four test grades are 82, 88, 93, and 87, what final two test grade average is needed to obtain a 90 final average?
- a. 93                      b. 94                      c. 95                      d. 96                      e. 97
4. Which number is the sum of the solutions to the equation  $3x^2 + 7x - 2 = (x + 1)^2$ ?
- a. 0                      b. -1.5                      c. 1.5                      d. -2.5                      e. 2.5
5. Consider the equation  $ax^2 + bx + c = 0$  for  $a, b, c > 0$ . If the solutions to the equation  $x^2 + bx + ac = 0$  are  $x = m$  and  $x = n$ , then which of the following are the solutions to the equation  $ax^2 + bx + c = 0$ ?
- a.  $x = m$  and  $x = n$                       b.  $x = am$  and  $x = an$                       c.  $x = \frac{m}{a}$  and  $x = \frac{n}{a}$
- d.  $x = \frac{cm}{a}$  and  $x = \frac{cn}{a}$                       e.  $x = \frac{am}{c}$  and  $x = \frac{an}{c}$
6. Let  $I$  be the number of integer ordered pair solutions to the system of inequalities  $\begin{cases} y \geq x + 1 \\ x - y \geq 0 \end{cases}$ .
- a.  $I = 0$                       b.  $I = 1$                       c.  $1 < I \leq 10$                       d.  $10 < I \leq 100$                       e.  $I > 100$

7. The owner of a bicycle shop took inventory of his bicycles and tricycles. He counted 197 wheels and 174 pedals. How many bicycles did he have?

- a. 58                      b. 60                      c. 62                      d. 23                      e. 64

8. In how many ways can 36 be written as the sum of two primes?

- a. 1                      b. 2                      c. 3                      d. 4                      e. 5

9. A formula in physics states  $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$ . What does  $R$  equal if  $R_1 = 6$  and  $R_2 = 4$ ?

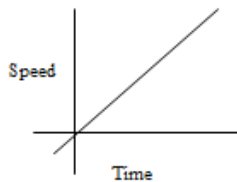
- a.  $\frac{5}{12}$                       b.  $\frac{1}{2}$                       c.  $\frac{6}{5}$                       d.  $\frac{14}{5}$                       e. 2.4

10. The algebraic expression  $\left(\frac{x^5 g^{-3} t^{-4}}{4x^{-4} g^2}\right)^{-2}$  can be rewritten as which of the following?

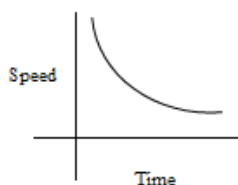
- a.  $-8t^8 g^{10} x^{18}$                       b.  $16g^{10} t^8 x^{18}$                       c.  $\frac{16g^2 t^8}{x^2}$                       d.  $\frac{g^{10} t^8}{16x^{18}}$                       e.  $\frac{16g^{10} t^8}{x^{18}}$

11. Which graph represents the average speed it takes to travel 100 miles as a function of your travel time?

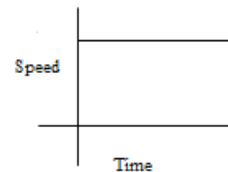
a.



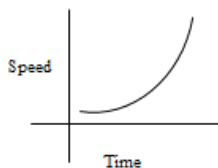
b.



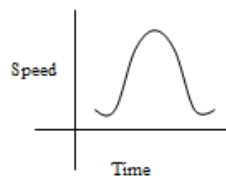
c.



d.



e.



12. In a basketball game, there were at all times 5 players on the court and 3 reserves on the bench for one of the teams (players may be interchanged with reserves at any time). Each of the eight members of this team was on the court for the same amount of time. How many minutes did each team member play if the game lasted 48 minutes?
- a. 6 min                      b. 24 min                      c. 30 min                      d. 32 min                      e. 36 min
13. Let  $A$  and  $B$  be two cubes such that the ratio of the volume of  $A$  to the volume of  $B$  is 8:1. What is the ratio of the surface area of  $A$  to the surface area of  $B$ ?
- a. 1:1                      b. 2:1                      c. 4:1                      d.  $2\sqrt{2}:1$                       e. 8:1
14. Which of the following is the inverse of "If I do all my homework, then I will get a good grade."?
- a. If I get a good grade, then I did all my homework.  
b. If I do not do all my homework, then I will not get a good grade.  
c. If I do not get a good grade, then I did not do all my homework.  
d. If I do not do some of my homework, then I will not get a good grade.  
e. If I do not get a good grade, then I did not do some of my homework.
15. The manufacturers of a certain pen claim that it can draw a line 1 km long before it runs dry. If the line it draws is 0.4 mm wide, then what is the area, in square decimeters, that the pen is expected to cover?
- a. 4000 dm<sup>2</sup>                      b. 400 dm<sup>2</sup>                      c. 40 dm<sup>2</sup>                      d. 4 dm<sup>2</sup>                      e. 0.4 dm<sup>2</sup>
16. Let  $N$  be a positive integer such that  $1000 \leq N \leq 9999$ . If the digit in the thousands place is the same as the digit in the ones place and the digit in the tens place is the same as the digit in the hundreds place, which of the following is true?
- a.  $N$  is an even number.                      b.  $N$  is divisible by 3.                      c.  $N$  is divisible by 7.  
d.  $N$  is divisible by 11.                      e. None of these

17. If  $a - b = 6$  and  $a^2 + b^2 = 9$ , then what is the value of  $a^3 - b^3$ ?
- a.  $-27$                       b.  $36$                       c.  $21$                       d.  $-21$                       e.  $-36$
18. The admission fee to a mathematics exhibition was \$10. When the fee was reduced, the (nonzero) number of customers per day went up by 25% and the amount of money collected per day went up by 20%. What was the reduced fee?
- a. \$9.60                      b. \$8.50                      c. \$9                      d. \$8.40                      e. \$9.50
19. For how many pairs of positive integers  $(x, y)$  is  $2x + y = 50$ ?
- a. 50                      b. 25                      c. 18                      d. 24                      e. 27
20. Andy did a survey of the students in his math class and found that 8 students walk to school, 16 students ride the bus to school, 7 students drive to school, and 9 students ride to school with their parents. When he made a pie graph of the data, what was the degree measure of the sector representing the students who walk to school?
- a.  $8^\circ$                       b.  $36^\circ$                       c.  $45^\circ$                       d.  $72^\circ$                       e.  $80^\circ$
21. Only four sentences are found on a card:
- On this card exactly one statement is true.  
On this card exactly two statements are false.  
On this card exactly three statements are false.  
On this card exactly four statements are true.
- Exactly how many of the sentences are false?
- a. 0                      b. 1                      c. 2                      d. 3                      e. 4

22. Let 5, 9, and  $c$  be the lengths of the sides of a triangle. If  $c$  is an integer, then what is the difference between the largest and smallest possible value of  $c$ ?
- a. 4                      b. 5                      c. 6                      d. 7                      e. 8
23. George has 20 coins consisting of nickels and dimes. If his nickels were dimes and his dimes were nickels, his coins would be worth 70 cents more. How much are his coins worth?
- a. \$1.80                      b. \$1.15                      c. \$1.20                      d. \$1.85                      e. \$1.90
24. What is the maximum number of pieces into which a circular pizza can be cut by making 4 straight cuts?
- a. 11                      b. 8                      c. 12                      d. 10                      e. 9
25. The top three finishers in a recent math contest were Greg, Tonya, and Stephen. These three students attended three different high schools named North, West, and Central. The student from Central High School finished in second place. Two times Greg's score minus the score of the student from West HS equaled the score of the first place finisher. Tonya scored a 106 on the contest, but did not finish in first place. The difference between first place and second place was four points. What was the sum of the top three scores?
- a. 324                      b. 330                      c. 320                      d. 336                      e. 322

**SHORT ANSWER**

Place the answer in the appropriate space.

66. If  $f(x) = x^2 + bx + c$ ,  $f(1) = 9$ , and  $f(3) - f(2) = 8$ . Determine  $f(4)$ .

67. Let  $S = \{11, 12, 17, 18, 23, 29, 30\}$ . If you remove one of the elements of  $S$  the average decreases by 1.5. Which element is it?

68. Which of the following five numbers is the largest:  $\{5\sqrt{2}, 3\sqrt{7}, 3\pi - 2, 7, 1 + \sqrt{42}\}$ ?

69. What is the sum of the solutions of the equation  $4 - \frac{1}{x} = \sqrt{4 - \frac{1}{x}}$ ?

70. A palindromic number is a number that remains the same when its digits are reversed. How many palindromic numbers are there between 10 and 100,000?

**Answer Key**

1. b
2. a
3. c
4. d
5. c
6. a
7. e
8. d
9. e
10. e
11. b
12. c
13. c
14. b
15. c
16. d
17. a
18. a
19. d
20. d
21. e
22. e
23. b
24. a
25. b

66. 33

67. 29

68.  $3\sqrt{7}$

69.  $\frac{7}{12}$

70. 1089