

1. Which of the following is the solution set of the inequality:  $|2x - 7| \leq 1$ ?

- A)  $\left\{x: -\frac{7}{2} \leq x \leq \frac{1}{2}\right\}$       B)  $\{x: 3 \leq x \leq 4\}$   
 C)  $\{x: -3 \leq x \leq 3\}$       D)  $\{x: -4 \leq x \leq -3\}$

2. At school athletic events you can buy 3 drinks and 2 hot dogs for \$4.80 or you can buy 1 drink and 1 hot dog for \$2.00. How much does one hot dog cost?

- A) \$0.80      B) \$0.96  
 C) \$1.00      D) \$1.20

3. Solve the system.

$$2x - y + 4z = 9$$

$$x + \frac{1}{2}y + z = 1$$

$$-3x + 2y - 6z = -15$$

- A) (2,3,2)      B)  $\left(-3, \frac{1}{2}, 2\right)$   
 C) (3,1,1)      D)  $\left(2, -3, \frac{1}{2}\right)$

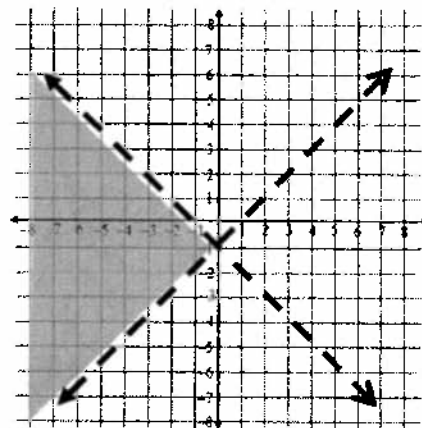
4. Which of the following shows the correct first step in using the substitution method to solve:

$$y = x - 2$$

$$5x - y = 20$$

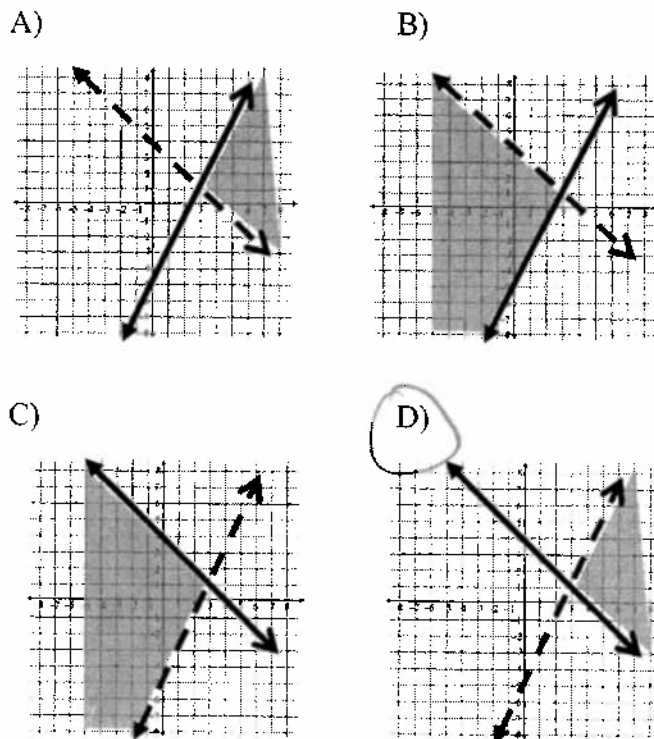
- A)  $x - 2 = x - 2$       B)  $x - 2 = 5x - y$   
 C)  $5x - x - 2 = 20$       D)  $5x - (x - 2) = 20$

5. What system of inequalities BEST represents the graph shown below?



- A)  $y > x - 1$  and  $y > -x - 1$   
 B)  $y < x - 1$  and  $y > -x - 1$   
 C)  $y > x - 1$  and  $y < -x - 1$   
 D)  $y < x - 1$  and  $y < -x - 1$

6. Which of the following graphs BEST represents the solution of the system of inequalities:  
 $y < 2x - 5$   
 $y \geq -x + 4$



7. Perform the operation:

$$(2x^4 + 5x^3 + 8x + 24) \div (x + 2)$$

A)  $2x^2 + x + 6 + \frac{12}{x+2}$

**B)  $2x^3 + x^2 - 2x + 12$**

C)  $2x^3 + 9x^2 + 18x + 44 + \frac{112}{x+2}$

D)  $2x^4 + x^3 - 2x^2 + 12x$

8. Perform the operation:

$$(x - 4)(4x^2 - 8x + 7)$$

**A)  $4x^3 - 24x^2 + 39x - 28$**       B)  $-12x^3 + 24x^2 - 21x$

C)  $4x^3 + 8x^2 - 25x + 28$       D)  $-12x^2 + 24x - 21$

9. Perform the operation:

$$(6x^3 - 2x^2 + 8x - 1) - (3x^3 + 7x + 5)$$

**A)  $3x^3 - 2x^2 + x - 6$**       B)  $3x^3 - 2x^2 + 15x + 4$

C)  $6x^3 - 5x^2 + x - 6$       D)  $6x^3 - 5x^2 + 15x + 4$

10. Perform the operation:

$$(3x^2 + 4)^2$$

A)  $9x^2 + 16$       B)  $9x^4 + 16$

**C)  $9x^4 + 24x^2 + 16$**       D)  $9x^4 + 12x^2 + 16$

11. Factor completely:

$$x^3 - 64$$

A)  $(x - 4)^3$       **B)  $(x - 4)(x^2 + 4x + 16)$**

C)  $(x - 4)(x + 4)^2$       D)  $(x + 4)(x^2 - 4x + 16)$

12. Which product of factors is equivalent to  $xy^2 - x$ ?

A)  $(y - 1)(y + 1)$       B)  $(xy - 1)(xy + 1)$

C)  $(y - 1)(y + x)$       **D)  $x(y - 1)(y + 1)$**

13. Which of the following expressions is the perfect square of a binomial?

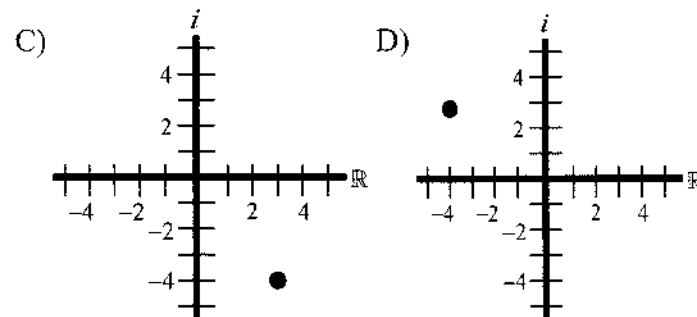
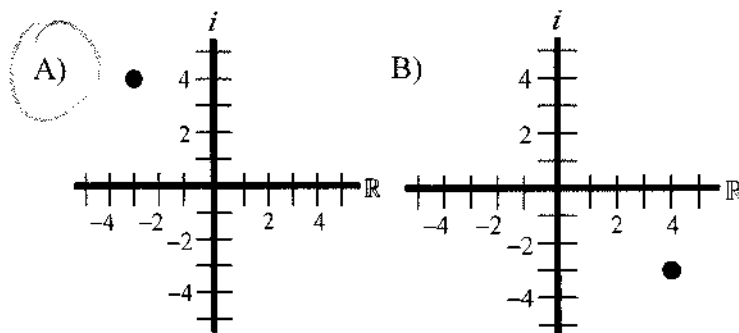
A)  $x^2 + x + 1$

**B)  $x^2 + 6x + 9$**

C)  $x^2 + 16x + 16$

D)  $x^2 + 18x + 36$

14. Which of the following correctly plots the complex number  $-3 + 4i$ ?



15. What is the value of  $i^3$ ?

A)  $\sqrt{-1}$

**B)  $-\sqrt{-1}$**

C)  $-1$

D)  $1$

16. If  $i = \sqrt{-1}$  then  $8i(2i) = ?$

- A) 256                      B) 16  
C) -16                      D) -256

17. What is an equivalent form of  $\frac{5}{7+6i}$ ?

- A)  $\frac{35+30i}{85}$                       B)  $\frac{35-30i}{85}$

- C)  $\frac{35+30i}{13}$                       D)  $\frac{35-30i}{13}$

18. What is an equivalent form of  $(3-7i)^2$ ?

- A) 100                      B) 58  
C)  $58-42i$                       D)  $-40-42i$

19. Simplify:

$$\frac{8x+3}{x^2-2} + 1$$

- A)  $\frac{9x+3}{x^2-2}$                       B)  $\frac{9x^2+1}{x^2-2}$

- C)  $\frac{x^2+8x+1}{x^2-2}$                       D)  $\frac{x^2+8x+5}{x^2-2}$

20. Simplify:  $\frac{25x^6y^6}{-5x^4y^7}$

- A)  $-\frac{5x^2}{y}$                       B)  $-\frac{5x^{10}}{y^{13}}$

- C)  $\frac{5x^2}{y}$                       D)  $\frac{5x^{10}}{y^{13}}$

21. Divide:  $\frac{4x^{-4}}{(2y)^{-3}} \div \frac{6y^4}{5x^{-2}}$

- A)  $\frac{5}{12x^6y}$                       B)  $\frac{80}{3x^2y}$

- C)  $\frac{192y^7}{5x^2}$                       D)  $\frac{80}{3x^6y}$

22. Simplify:  $\frac{9x^6y-21x^2y^2}{3x^2}$

- A)  $3x^3y-7y^2$                       B)  $3x^4y-7y^2$

- C)  $3x^6y-7x^2y^2$                       D)  $3x^8y-7x^4y^2$

23. Simplify:

$$\frac{x^2-2x-8}{x^2+10x+21} \cdot \frac{x+3}{x-4}$$

- A)  $\frac{x-2}{x-7}$                       B)  $\frac{x+2}{x+7}$

- C)  $\frac{(x-1)(x+8)(x+3)}{(x-3)(x-7)(x-4)}$                       D)  $\frac{x^3+x^2-14x-24}{x^3+6x^2-19x-84}$

24. Which product is equivalent to

$$\frac{3x^4y^2+6x^3y^3-24x^2y^4}{3x^2y^2} ?$$

- A)  $(x+4y)(x-2y)$                       B)  $xy(x+2-24y)$

- C)  $3y(x-7y)$                       D)  $9x^4y^4(x+4y)(x-2y)$

25. What are the solutions to the equation:

$$1 + \frac{5}{x^2} = \frac{7}{x}$$

A)  $x = 7 + \frac{\sqrt{69}}{2}$ ;  $x = 7 - \frac{\sqrt{69}}{2}$

B)  $x = 7 + \frac{\sqrt{29}}{2}$ ;  $x = 7 - \frac{\sqrt{29}}{2}$

C)  $x = \frac{7 + \sqrt{69}}{2}$ ;  $x = \frac{7 - \sqrt{69}}{2}$

D)  $x = \frac{7 + \sqrt{29}}{2}$ ;  $x = \frac{7 - \sqrt{29}}{2}$

26. What are the solutions to the equation

$$2x^2 + 12x = 26?$$

A)  $x = -3 \pm \sqrt{22}$

B)  $x = -3 \pm \sqrt{35}$

C)  $x = -6 \pm 2\sqrt{13}$

D)  $x = -6 \pm 7\sqrt{2}$

27. There are two numbers with the following properties.

- 1) One number is 7 more than the other number.
- 2) The product of the two numbers is 13 less than their sum.

Which of the following represents the possible values of the two numbers?

A) -3, -10

B) -2, 5

C) 2, 9

D) 3, -4

28. Christian is solving the equation  $x^2 - 12x = 4$  by completing the square. What number must be added to both sides of the equation to complete the square?

A) 6

B) 36

C) 144

D) 576

29. Which of the following most accurately describes the translation of the graph  $y = (x - 5)^2 - 2$  to the graph of  $y = (x - 3)^2 + 1$ ?

A) up 3 and 2 to the left

B) up 1 and 3 to the right

C) up 3 and 2 to the right

D) down 2 and 5 to the right

30. Which of the following statements best describes the graphs of:  $y = x^2 + 1$  and  $y = x^2 - 1$

A) They intersect at one point because they share a common vertex

B) They intersect at two points because they open toward each other

C) They have no points of intersection because one graph is inside the other

D) They intersect at an infinite number of points because they are the same graph

31. Find the x-intercepts of the graph of

$$y = 5x^2 + 4x - 1$$

A)  $\frac{1}{5}$  and -1

B) 1 and  $-\frac{1}{5}$

C) -1 and  $\frac{4}{5}$

D)  $-\frac{4}{5}$  and 1

32. Which of the following is the equation of a parabola opening downward with its vertex at  $(-3, 2)$ ?

A)  $y = -5(x - 3)^2 + 2$

B)  $y = \frac{1}{6}(x - 3)^2 + 2$

C)  $y = -5(x + 3)^2 + 2$

D)  $y = \frac{1}{6}(x + 3)^2 + 2$

33. Which of the following has a maximum value at  $(-3, 8)$ ?

- A)  $y = (x-3)^2 + 8$       B)  $y = (x+3)^2 + 8$   
C)  $y = -(x-3)^2 + 8$       D)  $y = -(x+3)^2 + 8$

34. What is the effect of the number 4 when  $y = x^2$  is changed to  $y = (x+4)^2$ ?

- A) The graph moves to the right four units  
B) The graph moves to the left four units  
C) The graph moves up four units  
D) The graph moves down four units

35. What is the value of  $x$  in the equation  $7^x = 21$ ?

- A) 3      B)  $\log_{10} 21 - \log_{10} 7$   
C)  $\log_{10} 3$       D)  $\frac{\log_{10} 21}{\log_{10} 7}$

36. Solve for  $x$ .  
 $\log_2 x = 8$

- A)  $x = 3$       B)  $x = 4$   
C)  $x = 64$       D)  $x = 256$

37. What is the solution to  $3^x = 12$ ?

- A)  $x = 4$       B)  $x = \log_{10} 9$   
C)  $x = \log_{10} 4$       D)  $x = \frac{\log_{10} 12}{\log_{10} 3}$

38. The population of Mathlandia in 1995 was 23,473 and was projected to grow at a rate of 12% per decade. Predict the population in year 2010.

- A) 976      B) 27,822  
C) 29,445      D) 39,435

39. Lewis completed the problem below:

Given:  $y = \log_3 \frac{1}{9}$

Step 1:  $3^y = \frac{1}{9}$

Step 2:  $3^y = \frac{1}{3^2}$

Step 3:  $3^y = 3^{-2}$

Step 4:  $y = -2$

Where did Lewis first make an error?

- A) Step 1      B) Step 2  
C) Step 3      D) There is no error

40. Lisa's work to solve the problem  $3^{(x+2)} = 9^{(x-5)}$  is shown below.

Given:  $3^{(x+2)} = 9^{(x-5)}$

Step 1:  $3^{(x+2)} = (3^2)^{(x-5)}$

Step 2:  $3^{(x+2)} = 3^{(2x-10)}$

Step 3:  $x+2 = 2x-10$

Step 4:  $12 = x$

Where did Lisa make her first mistake?

- A) Step 1      B) Step 2  
C) Step 3      D) There are no errors

41. Scientists studying a bacteria sample find that after starting with 120 cells, the number of cells doubles every hour. Which of the following equations is a function that will predict,  $C(h)$ , the number of cells after  $h$  hours have passed?

- A)  $C(h) = 120^{(2h)}$       B)  $C(h) = 120(2)^h$   
C)  $C(h) = 120 + 2^h$       D)  $C(h) = (120)(2)(h)$

42. As time,  $t$ , passes, the value of an investment is modeled by the function:  $V(t) = 50(0.9)^t$

Which of the following statements is supported by the behavior of  $V(t)$ ?

- A) The value of the investment will decrease over time
- B) The value of the investment will increase over time
- C) The value of the investment will remain the same
- D) No generalizations can be made because the value of the investment will both increase and decrease over time

43.  $\log_7 26 =$

- A)  $(\log_{10} 7)(\log_{10} 26)$
- B)  $\log_{10} 7 + \log_{10} 26$
- C)  $\frac{\log_{10} 26}{\log_{10} 7}$
- D)  $\log_{10} 7 - \log_{10} 26$

44. Find the value of  $\log_3 81$

- A) 4
- B) 9
- C) 27
- D) 531,441

45. Find the approximate value of  $\log 450$

(Given  $\log 3 \approx .477$  and  $\log 5 \approx .699$ )

- A) 1.927
- B) 2.176
- C) 2.653
- D) 2.875

46. For which values of  $x$  is the following statement true?

$$\log_{10} x^2 = \log_{10} x + \log_{10} x$$

- A) no values of  $x$
- B) all real values of  $x$
- C) all values of  $x \geq 0$
- D) all values of  $x > 0$

47. Which of the following conclusions is true about the statement below?

$$\frac{1}{2} + \frac{1}{x} = \frac{1}{2}$$

- A) The statement is always true
- B) The statement is never true
- C) The statement is true when  $x = -1$
- D) The statement is true when  $x = 0$

48. Under what conditions is  $\frac{x^2 + 10x - 24}{x - 2} = x + 12$  true?

- A) The equation is always true
- B) The equation is only true when  $\left(\frac{x^2 + 10x - 24}{x - 2}\right)$  and  $(x + 12)$  represent an integer
- C) The equation is only true when  $\left(\frac{x^2 + 10x - 24}{x - 2}\right)$  and  $(x + 12)$  do not equal 0
- D) The equation is only true when  $x \neq 2$

49. If  $x$  is a real number, for what values of  $x$  is the equation  $\frac{8x - 4}{4} = 2x + 1$  true?

- A) All values of  $x$
- B) Some values of  $x$
- C) No values of  $x$
- D) Impossible to determine

50. Which of these standard form equations of conic sections is equivalent to:  $x^2 + y^2 + 2x + 2y = 1$

A)  $(x+2)^2 + (y+2)^2 = 9$

B)  $(x+2)^2 + (y+2)^2 = 1$

C)  $(x+1)^2 + (y+1)^2 = 3$

D)  $(x+1)^2 + (y+1)^2 = 1$

51. Cindy's summer reading list has 25 books on it. She has to read 4 books for next year. How many different groups of four books can she select to read?

A) 100

B) 12,650

C) 303,600

D) 390,625

52.  ${}_5P_3$  is the solution to which of the following problems?

A) How many three-letter acronyms can be made using only (A, E, I, O, and U)? The letters CAN be repeated.

B) How many three-letter acronyms can be made using only (A, E, I, O, and U)? The letters CANNOT be repeated.

C) How many five-letter acronyms can be made using only (I, O, and U)? The letters CAN be repeated.

D) How many five-letter acronyms can be made using only (I, O, and U)? The letters CANNOT be repeated.

53. Four dice are tossed at the same time—one green, one yellow, one white, and one red. How many different outcomes are possible?

A) 24

B) 360

C) 1296

D) 10,626

54. Max and Jay are among 12 contestants in the school spelling bee. If the top two finishers win prizes, what is the probability both Max and Jay will be the two prize winners?

A)  $\frac{17}{66}$

B)  $\frac{1}{36}$

C)  $\frac{1}{66}$

D)  $\frac{1}{132}$

55.  $(xy-4)^5 =$

A)  $x^5y^5 - 4x^4y^4 + 16x^3y^3 - 64x^2y^2 + 256xy - 1024$

B)  $x^5y^5 + 4x^4y^4 - 16x^3y^3 + 64x^2y^2 - 256xy + 1024$

C)  $x^5y^5 - 20x^4y^4 + 160x^3y^3 - 640x^2y^2 + 1280xy - 1024$

D)  $x^5y^5 + 20x^4y^4 - 160x^3y^3 + 640x^2y^2 - 1280xy + 1024$

56. How many terms will there be in the expansion of  $(7x+y)^8$ ?

A) 2

B) 8

C) 9

D) 16

57. Find the sum of the geometric series below.

$$\sum_{n=1}^{\infty} \left(\frac{1}{3}\right)^{n-1}$$

A)  $\frac{1}{2}$

B)  $\frac{2}{3}$

C) 1

D)  $\frac{3}{2}$

58. What is the  $n^{\text{th}}$  term in the arithmetic series below?

$$\frac{1}{2} + \frac{1}{4} + \frac{1}{6} + \frac{1}{8} + \frac{1}{10} + \dots$$

A)  $\frac{1}{n}$                       B)  $\frac{1}{n+2}$

C)  $\frac{1}{2n}$                       D)  $\frac{1}{2^n}$

59. If  $f(x) = x^2 + 1$  and  $g(x) = 5x - 3$ , what is  $f(g(x))$ ?

A)  $5x^2 + 2$                       B)  $25x^2 + 10$   
 C)  $25x^2 - 30x + 9$                       D)  $25x^2 - 30x + 10$

60. Diana's teacher asked the class to find a simplified expression equivalent to:  $f(x) - g(x)$  when  $f(x) = 3x^2 - 2$  and  $g(x) = 2 + (x-1)^2$ . Her work is shown below.

Step 1:  $(3x^2 - 2) - (2 + (x-1)^2)$

Step 2:  $(3x^2 - 2) - (2 + x^2 - 2x + 1)$

Step 3:  $3x^2 - 2 - 2 + x^2 - 2x + 1$

Step 4:  $4x^2 - 2x - 3$

Where did Diana make her first error?

A) Step 2                      B) Step 3  
 C) Step 4                      D) There are no errors

61. What is the probability of flipping a coin three times in a row and getting "Heads" for all three consecutive coin flips?

A)  $\frac{1}{2}$                       B)  $\frac{1}{3}$                       C)  $\frac{1}{6}$                       D)  $\frac{1}{8}$

62. In a paper bag, 7 of 15 marbles are yellow. In a cloth bag 2 of the 15 marbles are yellow. If Tim randomly draws one marble from each bag, what is the probability that they are both yellow?

A)  $\frac{1}{30}$                       B)  $\frac{14}{225}$   
 C)  $\frac{1}{15}$                       D)  $\frac{3}{10}$

63. The school jazz band consists of two male percussionists, 3 female percussionists, 3 male woodwinds, 2 female woodwinds, 4 male brass players, and 3 female brass players. If a female member of the band is absent, what is the probability she is a woodwind?

A)  $\frac{5}{16}$                       B)  $\frac{2}{7}$   
 C)  $\frac{35}{256}$                       D)  $\frac{1}{8}$

64. The heights of the starting line-up of the boys basketball team at Wilton High School is given in the table below.

Player Name	Height in cm
Len	185
Phil	187
Ray	190
Scott	194
Todd	199

If the mean of their heights is 191 cm, what is the approximate population standard deviation for this data?

A) 2.1                      B) 2.2                      C) 4.4                      D) 5.0