SAT Cram Session: Math You Need to Know

Independent Practice Problems

I. Content

System of Equations: FAVORITE!

Calculation

Substitution and Elimination

$$x + y = 5$$

$$2x - y = 13$$

1. For the system of equations shown above, what is the value of x?

$$14x + 2y = 8$$

$$6x + y = 2$$

2. For the system of equations shown above, what is the value of y?

Elimination Is Necessary

$$2x - 7y = 3$$

$$6x + 5y = 35$$

3. What is the solution (x, y) for the system of equations shown above?

$$2y - 5x = 14$$

$$2x - 8y = 16$$

4. What is the solution (x, y) for the system of equations shown above?

Double Elimination

$$5x + 2y = -16$$

$$x - 8y = 22$$

5. What is the solution (x, y) for the system of equations above?

$$5x - 8y = 77$$

$$13x - 3y = 40$$

6. What is the solution (x, y) for the system of equations above?

One I have seen occurring with greater frequency:

$$2x + 3y = 8$$

$$x - 2y = 7$$

7. If (x, y) is the solution to the given system of equations, what is the value of $3x + y$?

Conceptual

"No Solution"

$$-wx + 5y = 40$$

$$-60x + 3y = 21$$

8. If *w* is a constant, for what value of *w* will the system of equations have no solution?

$$4y - 12x = 9$$

$$9x - ay = 11$$

9. If *a* is a constant, for what value of *a* will the system of equations have no solution?

"Infinite Solutions"

$$3x + 8y = 6$$

$$12x + 32y = 8b$$

10. For what value of *b* will the system of equations have an infinite number of solutions?

$$2y + 6x = 8$$

$$cx + 7y = 28$$

11. For what value of *c* will the system of equations have an infinite number of solutions?

Some Other Varieties of "No Solutions" and "Infinite Solutions"

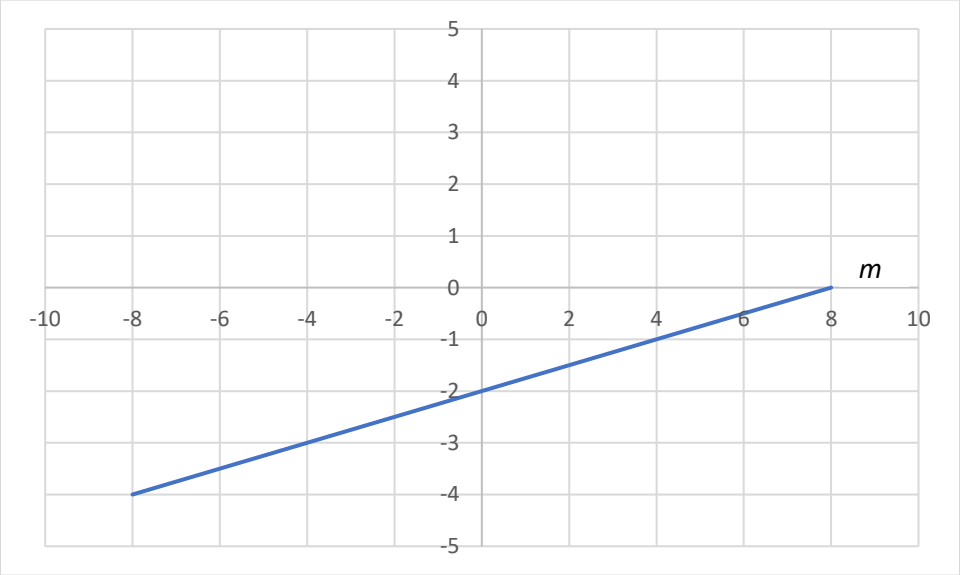
$$9x - 2y = 6$$

$$45x - 10y = 30$$

12. For the system of linear equations shown above, how many solutions does the system of equations have?

A) No solutions
B) 1 solution
C) 2 solutions
D) Infinite solutions

13.



If two lines, *m* and *n*, are in a system of equations (line m is shown in the graph above, line *n* is not shown), then which of the following must be the slope of line *n* if the system of equations has no solutions?

A) -4
B) $-\frac{1}{4}$
C) $\frac{1}{4}$
D) 4

Quadratics in General

14a. What are the solutions to the equation $x^2 - 3x - 28 = 0$?

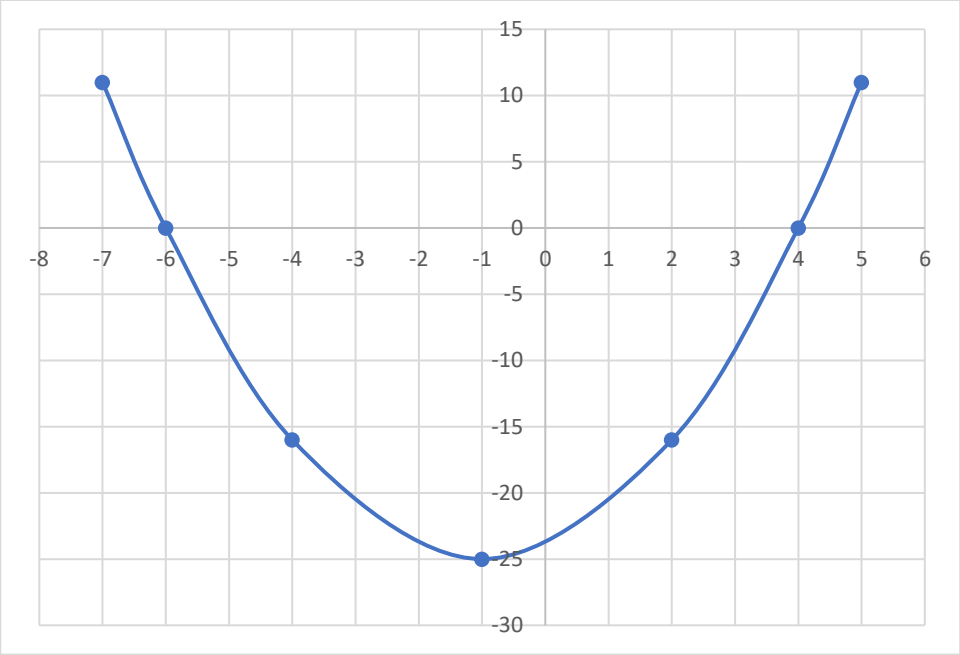
A) x = -7, 4
B) x = 3, 11
C) x = 7, -4
D) x = -3, -11

b. What is the x-coordinate of the vertex?

c. What is the y-intercept?

15. What values of x satisfy the equation (x – 12)(x + 8) = 0 ?

A. (4, 96)
B. (-4, -96)
C. (-12, 8)
D. (12, -8)



16. For the graph shown above, what is the minimum (x, y) value of the function?

A) (-6, 0)
B) (-1, -25)
C) (0, -24)
D) (4, 0)

17. What of the following points gives the y-intercept (*x*, *y*) for the equation y = -4x^2 – 18*x* -7 ?

A) (-18. -7)
B) (-4, 0)
C) (0, -7)
D) (4, 7)

18. What of the following expressions contains a y-intercept of (0, *k*) ?

A) y = x^2 + kx
B) y = x^2 – *x* + *k*
C) y = 3x^2 – *k*
D) y = 10x^2 – k*x* - 10

19. Which of the following are the x-intercepts of the function f(x) = -x^2 + 4x + 5 ?

A) (-1, 5)
B) (-4, -5)
C) (1, 5)
D) (4, 5)

20. If the function f(x) = x^2 + 9x + *g* has some constant *g*, which of the following must be the value of *g* if the zeroes are located at (-7, 0) and (-2, 0) ?

Quadratic Formula

21. What are the solutions to 5x^2 – 30x - 45 = 0?

A) $-3 \pm 3\sqrt{2}$
B) $-5 \pm 3\sqrt{5}$
C) $5 \pm 3\sqrt{5}$
D) $3 \pm 3\sqrt{2}$

22. What is the sum of the solutions to $\frac{2}{9}x^2 - \frac{1}{27}x - \frac{1}{3} = 0$?

A) $\frac{1}{12}$
B) $\frac{1}{6}$
C) $\frac{1}{4}$
D) $\frac{1}{3}$

Exponent Rules

23.

$$\frac{c^{\frac{3}{5}}d^{-8}}{c^{-9}d^{\frac{1}{11}}}$$

The expression above is equivalent to which of the following?

A) $\frac{c^9}{d^8}$
B) $\frac{\sqrt[5]{c^{12}}}{\sqrt[11]{d^8}}$
C) $\frac{c}{d}$
D) $\frac{c^9\sqrt[5]{c^3}}{d^8\sqrt[11]{d}}$

24. If $\frac{3^a}{3^b}$ = 27 for some constants *a* and b. If b = 2, then what's the value of a ?

A) 2
B) 3
C) 4
D) 5

25. For a function f(x), what is the y-intercept of the graph of f(x) = 12^x in the xy-plane?

A) (0, 0)
B) (0, 1)
C) (1, 12)
D) (2, 144)

26. Which of the following is equivalent to $n^{\frac{3}{7}} * \sqrt{n}$, for n > 1 ?

A) 1
B) $n^{\frac{3}{14}}$
C) $n^{\frac{13}{14}}$
D) n^3

Exponential Growth/Decay

27. An investment account earns a 12% annual return. If an investor deposits $10,000 into the account, which of the following best expresses the amount of money the investor can expect to have in the account after *t* years?

A) 10,000 $(1.12)^t$
B) 10,000 $(12)^t$
C) 10,000 $(.12)^t$
D) 10,000 $(1.2)^t$

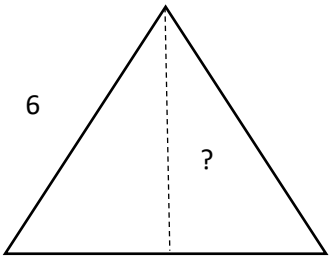
28. An unknown radioactive isotope is determined to have a half-life of 4 years (a half-life refers to the amount of time it takes for a radioactive element to lose half of its mass due to nuclear decay). If there is an initial sample of 180 g of this substance, which of the following functions best models the amount of the isotope R(t) that will remain of *t* years?

A) R(t) = 180 $(.50)^{\frac{t}{4}}$
B) R(t) = 180 $(1.50)^{\frac{t}{4}}$
C) R(t) = 180 $(.50)^{4t}$
D) R(t) = 180 $(1.50)^{4t}$

Geometry

29. In right triangle XYZ with right angle Y, sin X = $\frac{5}{13}$. Which of the following is a value for the cos X ?

A) $\frac{13}{12}$
B) $\frac{5}{13}$
C) $\frac{12}{13}$
D) $\frac{13}{5}$

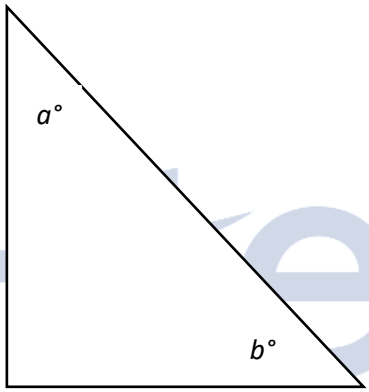


30. What is the height of an equilateral triangle with sides of length 6?

A) 3
B) $3\sqrt{3}$
C) $6\sqrt{2}$
D) 6

Sin $x°$ = Cos $(90 - x)°$

31. If the sin 30° = $\frac{1}{2}$, then the what is the value of x for the expression cos $x°$ = $\frac{1}{2}$?



32. For the right triangle shown above, which of the following expressions must be true?

A) sin $(a + b)°$ = *cos* $(a + b)°$
B) 1 – sin $a°$ = *sin* $a°$
C) tan $a°$ = *tan* $b°$
D) sin $a°$ = cos $b°$

Radians

33. If an angle has a measure of $\frac{2\pi}{9}$ radians, then what is the measure of the angle in degrees?

34. If 390° = $q\pi$ radians, then which of the following is the measure of q ?

A) $\frac{1}{2}$
B) $\frac{7}{4}$
C) $\frac{13}{12}$
D) $\frac{27}{2}$

Equation of a Circle

$$(x - 10)^2 + (y + 2)^2 = 64$$

35. For the equation above, what is the coordinate point for the center of the circle as well as the circle's radius?

A) Center: (10, -2), Radius: 64
B) Center: (-10, 2), Radius: 64
C) Center: (10, -2), Radius: 8
D) Center: (-10, 2), Radius: 8

36. Find the equation of a circle with center (11, -13) and a radius of 4:

A) $(x - 11)^2 + (y + 13)^2 = 4$
B) $(x - 11)^2 + (y + 13)^2 = 16$
C) $(x + 11)^2 + (y - 13)^2 = 4$
D) $(x + 11)^2 + (y - 13)^2 = 16$

$$x^2 + 10x + y^2 - 16y = -8$$

37. The graph of the equation shown above is a circle. What is the radius of the circle?

A) 9
B) 10
C) 11
D) 12

Probability and Statistics

Standard Deviation

38. A biologist collects toads from Swamp A and Swamp B and measures the masses of each toad. The recorded masses, measured in grams, are shown below:

Swamp A

29	35	41	55
57	43	32	40
36	26	45	52

Swamp B

48	37	36	38
39	40	42	35
44	35	40	36

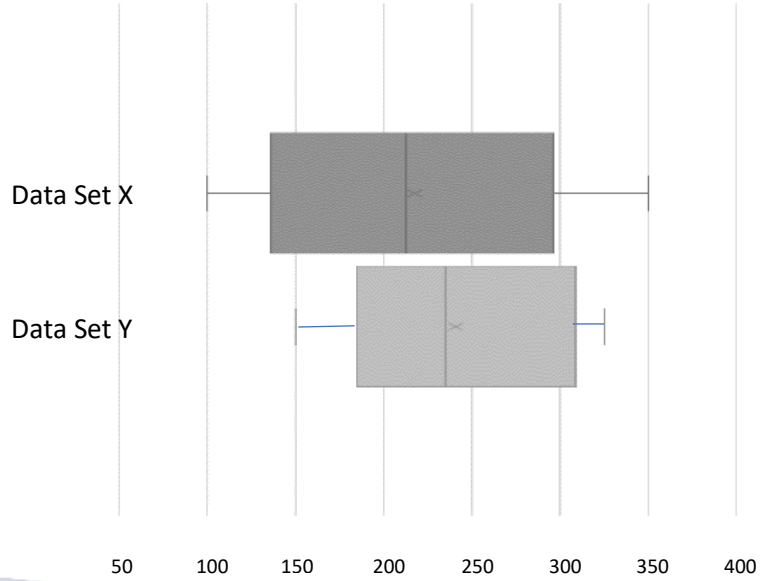
For the data shown in the tables above, which of the following is true?

A) standard deviation Swamp A = standard deviation Swamp B
B) standard deviation Swamp A < standard deviation Swamp B
C) standard deviation Swamp A > standard deviation Swamp B
D) The standard deviations for either swamp cannot be determined

39. For two classrooms at an elementary school, one class is an art class that has a mixture of children in grades 1 – 5 while the other class is a math class that has only 3rd grade students. Which of the following can be said for the ages of the students in the two classes?

A) The standard deviation for the ages of the art students is less than the standard deviation for the ages of the math students
B) The standard deviation for the ages of the art students versus the standard deviation for the ages of the math students cannot be determined
C) The standard deviation for the ages of the art students is equivalent to the than the standard deviation for the ages of the math students
D) The standard deviation for the ages of the art students is greater than the standard deviation for the ages of the math students

Box Plots



40. For the box plots shown above, which of the following has the greater median?

A) Data Set X
B) Data Set Y
C) The two data sets have the same median
D) The median cannot be determined for the two data sets

Test-taking Strategy

Using Your Answers with Algebra

41. The function *f(x)* is defined by f(x) = $2x^2$ – 4x - 15. What is the value of *f(5)*?

A) 15
B) 30
C) 45
D) 85

42. If $\frac{x}{6} = 7$, then what is the value of *x* ?

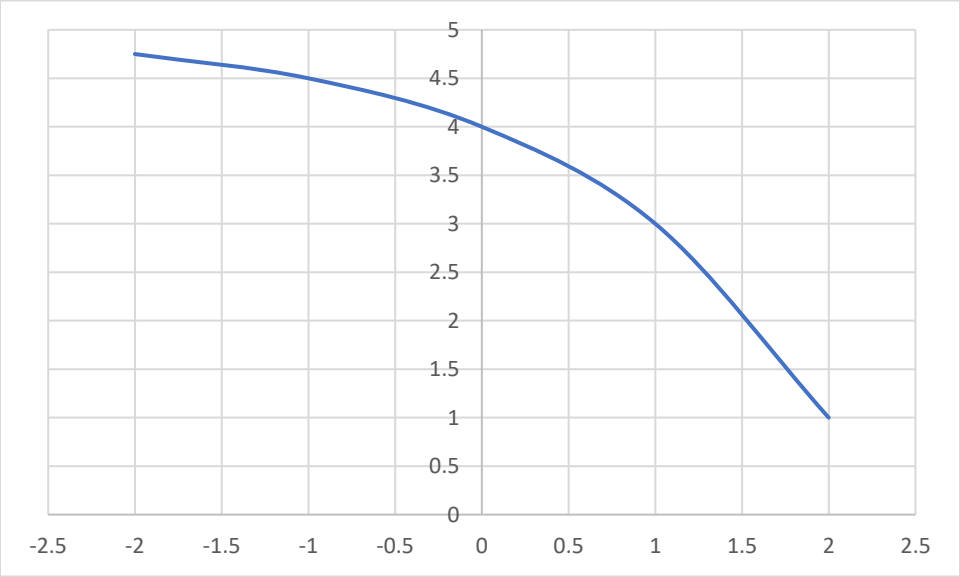
A) $\frac{6}{7}$
B) $\frac{7}{6}$
C) 42
D) 76

43. If $3(x + 2) + 4(x - 1) = 2x + 7$, then which of the following is the value of x?

A) 0
B) 1
C) 2
D) 3

Solving Problems Involving Graphs and Data Tables

Graphs:



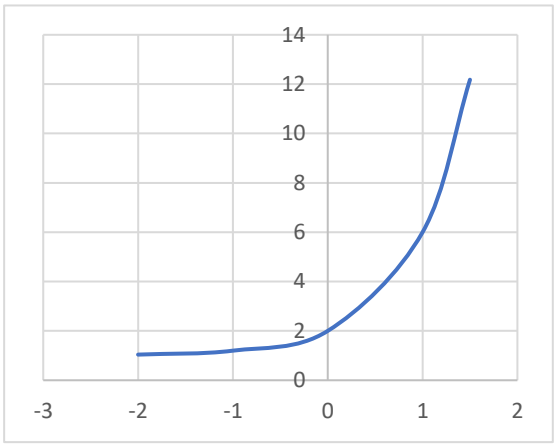
44. Which of the following equations represents the graph shown above?

A. $y = -2^x + 4$
B. $y = -5^x + 4$
C. $y = -(5^x) + 5$
D. $y = -(2^x) + 5$

45. What is the graph for the equation y = 5^x + 1 ?

A

B



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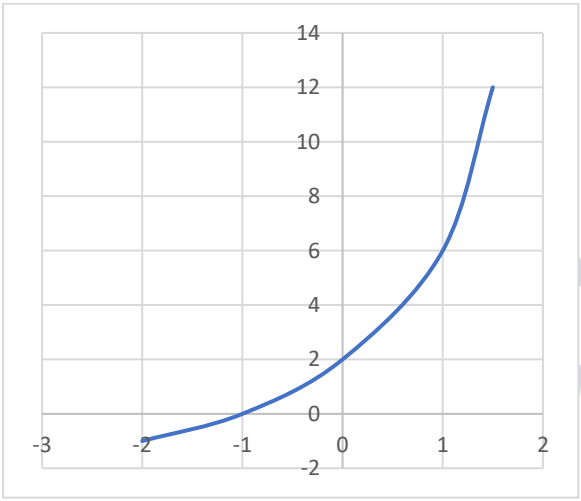

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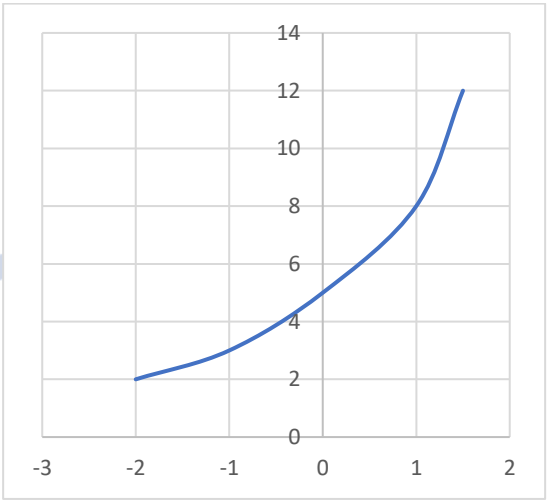

Tables:

x	0	1	2	3	4
f (x)	1	3	9	19	33

46. For the data table above, which of the following defines f (x) for the values listed?

A) $2x^2 + 1$
B) $2x^2 + 2$
C) $x^2 + 2$
D) $3x^2 - 3$

Size (square feet)	Cost (dollars)
3000	350
5000	550
10000	1050
20000	2050

47. The table shown above gives some values for the size of a yard *x*, in square feet, and the monthly cost for a landscaping company to maintain that yard *f(x)*, in dollars. Which of the following equations appropriately models this relationship?

A) $\frac{1}{10}$x -50
B) x - 50
C) x + 50
D) $\frac{1}{10}$x + 50

Using Answers to Get the Answer

$$14c^3 + 17c^2 + 3c + 6c^3 - 40c^2 - 18c$$

48. Which of the following is equivalent to the expression given above?

A) $8c^3 - 57c^2 - 21c$
B) $20c^3 - 23c^2 - 15c$
C) $42c^3 - 21c^2 - 54c$
D) $-18c^3 - 2c^2 - 18c$

$$a = \frac{b-2}{c}$$

49. For the expression shown above, which of the following gives *b* in terms of *a* and *c* ?

A) $a - \frac{2a}{c}$
B) $a + \frac{2a}{c}$
C) $ac + 2$
D) $ac - 2$

Algebra and "Equivalent"

50. Which of the following is equivalent to the expression $(4x + 3) + (7x + 14)$?

A) $-3x - 11$
B) $11x + 42$
C) $11x + 17$
D) $28x^2 + 17x + 42$

51. Which expression is equivalent to $(5x^2 + 8x + 11) - (3x^2 - 6x + 10)$?

A) $2x^2 + 14x + 1$
B) $8x^2 + 2x + 21$
C) $-15x^2 + 48x - 110$
D) $15x^4 - 48x^2 + 110$

52. Which of the following expressions is equivalent to $\frac{10x^2+11x}{5x+3}$?

A) x
B) $2x + 1 - \frac{3}{5x+3}$
C) $2x + 3 - \frac{5}{5x-3}$
D) $5x - 2 - \frac{11}{5x+3}$

53. Which of the following is equivalent to the expression $\frac{a^2}{4} + \frac{ab}{4} + \frac{b^2}{16}$?

A) $(\frac{ab}{2})^2$
B) $(\frac{a^2}{2} + \frac{b^2}{4})^2$
C) $(\frac{a+b}{2})^2$
D) $(\frac{a}{2} + \frac{b}{4})^2$