

## ALGEBRA 2

1. Which expression represents the standard form of  $3x(4 - 2x) = 5x + 9$  ?
- A.  $12x - 6x^2 = 5x + 9$
  - B.  $6x^2 - 7x + 9 = 0$
  - C.  $-6x^2 + 7x + 9 = 0$
  - D.  $6x^2 - 7x - 9 = 0$
2. Which of the following is a step in solving  $0 = 2x^2 + 7x + 6$  by the factoring method?
- A.  $2x + 3 = 0$  or  $x + 2 = 0$
  - B.  $2x + 2 = 0$  or  $x + 3 = 0$
  - C.  $2x + 1 = 0$  or  $x + 6 = 0$
  - D.  $2x + 6 = 0$  or  $x + 1 = 0$
3. What are the solutions to  $(x + 9)^2 = 25$ ? Select **all** that apply.
- A.  $x = -14$
  - B.  $x = -8$
  - C.  $x = -5$
  - D.  $x = -4$
  - E.  $x = 2$
  - F.  $x = 4$
  - G.  $x = 5$
  - H.  $x = 14$
4. What value goes in the blank to complete the perfect square trinomial:  $x^2 - 12x + \underline{\hspace{1cm}}$ ?
- A.  $-144$
  - B.  $-36$
  - C.  $36$
  - D.  $144$
5. What is the discriminant of  $2x^2 + 6x + 4 = 0$ ?
- A.  $-2$
  - B.  $4$
  - C.  $32$
  - D.  $0$
6. How many real zeros does an equation have if the value of the discriminant is  $-7$ ?
- A.  $0$
  - B.  $1$
  - C.  $2$
  - D. Not enough information

7. Solve  $3x^2 - 5x + 1 = 0$

- A.  $x = \frac{5 \pm \sqrt{13}}{6}$
- B.  $x = \frac{-5 \pm i\sqrt{13}}{6}$
- C.  $x = \frac{-5 \pm \sqrt{13}}{6}$
- D.  $x = \frac{5 \pm i\sqrt{13}}{6}$

8. What value of  $k$  will result in the quadratic having one rational solution if  $4x^2 + kx + 4 = 0$ ?

- A.  $k = 3$
- B.  $k = 0$
- C.  $k = -2$
- D.  $k = 8$

9. What are the solutions to  $2x^2 + 7x + 6 = 0$ ? Select **all** that apply.

- A.  $x = -6$
- B.  $x = -3$
- C.  $x = -2$
- D.  $x = -1.5$
- E.  $x = 1.5$
- F.  $x = 2$  and  $x = -1.5$
- G.  $x = 3$
- H.  $x = 6$

10. Simplify:  $(4 + 2i) - (3 - 5i)$

- A.  $7 + 7i$
- B.  $1 + 7i$
- C.  $7 - 3i$
- D.  $1 - 3i$

11. Simplify:  $(1 - 3i)^2$

- A.  $1 + 9i^2$
- B.  $-8$
- C.  $-8 - 6i$
- D.  $10 - 6i$

12. Simplify:  $i^{72}$

- A.  $i$
- B.  $-1$
- C.  $-i$
- D.  $1$

13. Rationalize the denominator:  $\frac{4i}{2-i}$

- A.  $\frac{12i}{5}$
- B.  $\frac{4+8i}{3}$
- C.  $\frac{-4+8i}{5}$
- D.  $\frac{4-8i}{3}$

14. Which of the following is the conjugate of:  $-2 - i$

- A.  $-2 + i$
- B.  $-2 - i$
- C.  $2 - i$
- D.  $2 + i$

15. What are the solutions to  $x^2 - 4x + 5 = 0$  ?

- A.  $x = 2 \pm i$
- B.  $x = \frac{2 \pm i}{2}$
- C.  $x = 5$  and  $x = -1$
- D.  $x = -5$  and  $x = 1$

16. Which equation has an  $x$ -intercept of  $(4,0)$  and a  $y$ -intercept of  $(0,-6)$ ?

- A.  $3x - 2y = 12$
- B.  $2x - 3y = 12$
- C.  $4x - 6y = 12$
- D.  $-3x + 2y = 12$

17. What is the equation of a line parallel to  $y - 6 = -\frac{4}{5}(x + 1)$  containing  $(3, -2)$ ?

- A.  $4x + 5y = 2$
- B.  $y - 2 = \frac{-4}{5}(x - 3)$
- C.  $4x - 5y = 22$
- D.  $y = \frac{-4}{5}(x - 3)$

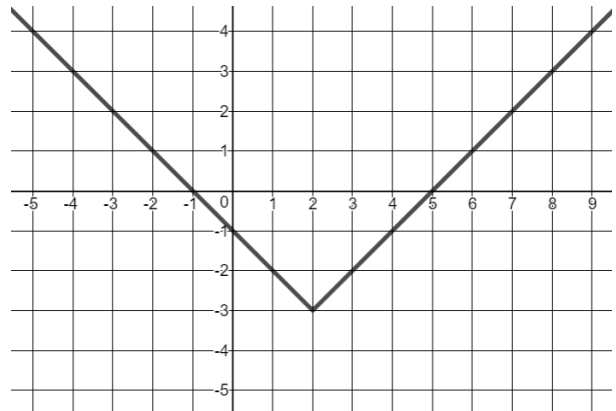
18. What is the slope of the line perpendicular to the line  $3x + 4y = 7$  ?

- A.  $-\frac{4}{3}$
- B.  $\frac{4}{3}$
- C.  $\frac{3}{4}$
- D.  $-\frac{3}{4}$

19. Write the following equation in Standard Form:  $y = -\frac{4}{5}x - \frac{1}{2}$ .

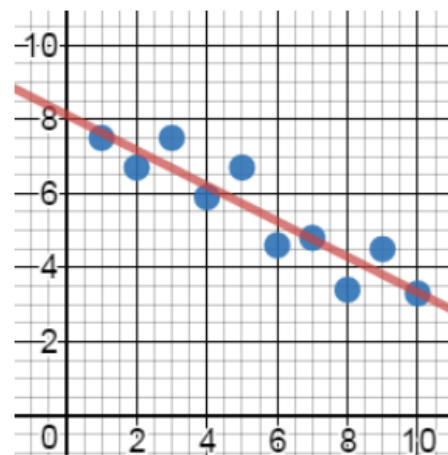
20. What is the axis of symmetry for the function graphed?

- A.  $x = -3$
- B.  $x = 3$
- C.  $x = -2$
- D.  $x = 2$



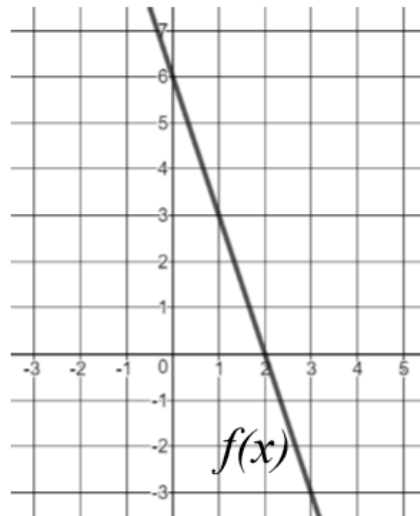
21. Examine the given data and line of best fit. Which of the following descriptions is most accurate if asked to predict the value at  $x = 4.8$  using the line of best fit?

- A. negative correlation; interpolation
- B. negative correlation; extrapolation
- C. positive correlation; interpolation
- D. positive correlation; extrapolation



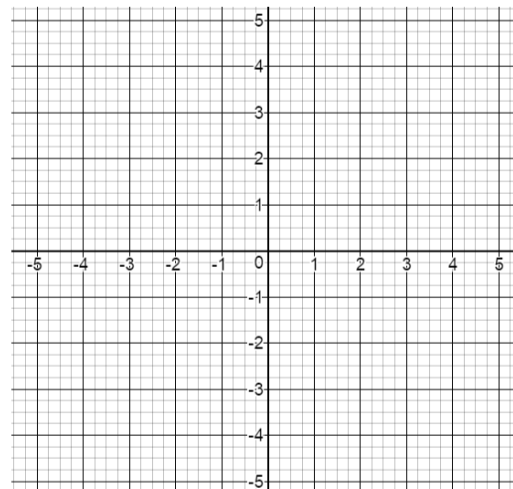
22. Use the graph to solve the inequality.

$$-3 \leq f(x) \leq x + 2$$



23. Graph the solution to the following system of linear inequalities.

$$y > \frac{1}{3}x + 1$$
$$y \leq -2x + 4$$



24. Determine which points are solutions to the linear inequality  $5x - 2y \geq 10$ . Select **all** that apply.

- A. (0,5)
- B. (-3, -4)
- C. (3,-5)
- D. (-2,4)
- E. (-1.5, 0)
- F. (3,1)

25. Determine the solutions to the absolute value inequality  $\left|\frac{4}{3}x - 5\right| \geq 3$ . Select **all** that apply.

- A.  $\frac{3}{2} \leq x \leq 6$
- B.  $x \leq \frac{3}{2}$  or  $x \geq 6$
- C.  $\left[\frac{3}{2}, 6\right]$
- D.  $\left(\frac{3}{2}, 6\right)$
- E.  $(-\infty, \frac{3}{2}] \cup [6, \infty)$
- F.  $(-\infty, \frac{3}{2}) \cup (6, \infty)$
- G. All real numbers
- H. No solution

26. A bag of Chippy's Potato Chips should be filled with 4.5 oz. of chips. At the factory, an acceptable weight is within 0.2 oz. of the desired weight. Which equation can be used to find the heaviest and lightest acceptable weights for Chippy's Potato Chips?

- A.  $|x + 4.5| = 0.2$
- B.  $|x - 0.2| = 4.5$
- C.  $|x - 4.5| = 0.2$
- D.  $|x + 4.5| = -0.2$

27. Solve and graph the equation  $\left|\frac{4x-5}{3}\right| - 6 = -1$ , if possible.

28. Which of the following is not a function?

- A.  $y = -2x^2 - 3$
- B.  $y^2 = -3x - 4$
- C.  $x = y + 2$
- D.  $2x + 3y = 4$

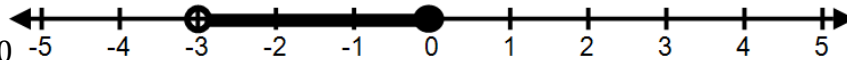
29. Which of the following is **inequality** notation for the number line below?

A.  $[-3, 0)$

B.  $(-3, 0]$

C.  $-3 < x \leq 0$

D.  $-3 \leq x < 0$



30. Given  $h(x) = \sqrt{5-x}$ , the range of  $h$ , in interval notation, is

A.  $[0, \infty)$

B.  $(-\infty, 0]$

C.  $(-\infty, 5]$

D.  $(5, \infty)$

31.  $g(x) = \frac{x-1}{1-x^2}$ . What is the domain of  $g$ ? **Select all that apply.**

A.  $(-\infty, -1) \cup (-1, 1) \cup (1, \infty)$

B.  $(-\infty, 0) \cup (0, \infty)$

C.  $(-\infty, \infty), x \neq 0$

D.  $(-\infty, \infty), x \neq 1 \text{ or } -1$

32. Given:  $f(x) = 3x^2 - 2$ ,  $g(x) = 4 - x$ , and  $h(x) = f(x) - g(x)$ . Find  $h(4)$ :

A. 142

B. 46

C. 40

D. 32

33. Given:  $f(x) = 3x^2$ ,  $g(x) = 4 - 2x$ , and  $h(x) = f(x)/g(x)$ . Find  $h(4)$ :

A. -142

B. -35.5

C. -12

D. 35.5

34. Given  $f(x) = (3x - 1)^2 - 4$ ,  $g(x) = 5 - 4x$ , and  $h(x) = f(x) \cdot g(x)$ . Find  $h(4)$ :

A. -1287

B. -29.25

C. 29.24

D. 1287

35. Given:  $f(x) = 3x^2 - 2$ ,  $g(x) = 4 - x$ , and  $h(x) = g(f(x))$ . Find  $h(2a + 1)$ :

- A.  $-12a^2 - 12a + 3$
- B.  $25 - 36a + 12a^2$
- C.  $-6a^2 + 5$
- D.  $12a^2 + 3$

36. Given:  $f(x) = 2x^3 - 2$ . Find  $f^{-1}(14)$ :

- A. 5486
- B.  $\frac{1}{5486}$
- C.  $\frac{1}{2}$
- D. 2

37. Given  $f(x) = 2x^3 - 2$  and  $f^{-1}(a) = -2$ , find  $a$ .

- A. -18
- B.  $-\sqrt[3]{18}$
- C. 0
- D. *undefined*

38. Which of the following is a domain restriction that will make  $\frac{2x^2 - 3x - 5}{x^2 - 6x - 7}$  truly equal to  $\frac{2x - 5}{x - 7}$ ?

- A.  $x \neq 7$
- B.  $x \neq 1$
- C.  $x \neq -1$
- D.  $x \neq \frac{5}{2}$

39. Solve:  $\frac{5}{6x} + \frac{3}{5} = \frac{-1}{3x}$

40. Simplify:  $\frac{x^2 + 11x + 18}{x^2 - 81} \cdot \frac{x^2 - 12x + 36}{x^2 - 8x + 12}$

- A.  $\frac{(x + 2)(x - 6)}{(x - 9)(x - 2)}$
- B.  $\frac{(x + 2)(x + 3)}{(x - 4)(x - 3)}$
- C.  $\frac{x - 3}{x - 6}$
- D.  $\frac{x + 2}{x - 4}$



41. Simplify  $\frac{6m^4n^7}{10m^8n^9} \div \frac{9m^4n^2}{8m^3n^7}$

A.  $\frac{27}{40m^3n^7}$

B.  $\frac{8m^5}{15n^{11}}$

C.  $\frac{8n^3}{15m^5}$

D.  $\frac{27n^{11}}{40m^3}$

42. Simplify:  $\frac{3}{2x^2} - \frac{25}{6}$

A.  $\frac{(3 - 5x)^2}{6x^2}$

B.  $\frac{9 - 5x^2}{6x^2}$

C.  $\frac{-16}{6}$

D.  $\frac{(3 - 5x)(3 + 5x)}{6x^2}$

### 43. Part A

The volume of a cone varies jointly to its height and the square of the radius of its base. What is the constant of variation if  $V = 27\pi$  when  $h = 9$  and  $r = 3$ ?

A.  $k = \frac{1}{3}$

B.  $k = 3\pi$

C.  $k = \frac{1}{3}\pi$

D.  $k = 9$

### Part B

What is the radius when  $V = 48\pi$  and  $h = 4$ ?

**44. Part A**

The function  $h(x) = \frac{-5x+11}{x-2}$  is a transformation of the reciprocal function. Which of the following functions is its equal?

- A.  $h(x) = -5 + \frac{1}{x-2}$
- B.  $h(x) = 5 + \frac{1}{x-2}$
- C.  $h(x) = 2 + \frac{1}{x-5}$
- D.  $h(x) = -5 + \frac{1}{-5x+11}$

**Part B**

What is the domain and range of  $h(x)$ ?

45. Solve:  $\frac{4}{x-3} = \frac{7}{x+3}$

- A. 33
- B. 11
- C. -11
- D. no solution

46. Solve:  $\frac{2}{x^2-4} + \frac{3}{x^2+x-6} = \frac{4}{x^2+5x+6}$

- A. -20
- B. -14
- C. -7
- D. no solution

47. Solve:  $\frac{x}{x^2-9} + \frac{3}{x-3} = \frac{4}{x+3}$

**48.** A teacher's assistant can grade homework papers by herself in 1 hour. If the teacher helps, the grading can be completed in 20 minutes. How long would it take the teacher to grade the papers working alone?

**49.** Given  $7^x = 343$ , find the value of  $x$ .

- A. 49
- B. 3
- C. 336
- D. 4

**50.** In the following equations,  $t$  represents time in hours and  $m$  represents mass in mg. Which of them (if any) would have a mass less than 50mg after 2 hours? Select all that apply.

- A.  $y = 100(0.5)^x$
- B.  $y = 500(0.3)^x$
- C.  $y = 80(2)^x$
- D.  $y = 10(1.2)^x$
- E.  $y = 30(1.5)^x$
- F.  $y = 80(0.2)^x$
- G.  $y = 100(2)^x$

**51.** In the equation  $y = 20(4^x)$ , what value does the 20 represent? Select all that apply.

- A.  $y$ -intercept
- B. starting value
- C. growth factor
- D. growth rate

**52.** Given the equation  $y = 3(2^x)$  if  $x = 6$ , what is the value of  $y$ ?

53. A function is modeled by the following data. What is the  $y$  –intercept of the relationship?

$x$	1	2	3	4	5
$y$	15	45	135	405	1215

- A. 3
- B. 15
- C. 0
- D. 5

54. A function is modeled by the following data. What is the  $y$  –intercept of the relationship?

$x$	1	2	3	4	5
$y$	60	120	240	480	960

55. What is the growth factor in the following relationship?

$x$	2	3	4	5	6
$y$	7.29	19.68	53.14	143.49	387.42

- A. 2.6
- B. 3
- C. 2.7
- D. 12.39

56. Which of the following equation(s) show exponential growth? Select all that apply.

- A.  $y = 3^x$
- B.  $y = 5x + 2$
- C.  $y = x^4 + 1$
- D.  $y = 2^3 + x$

57. If the growth rate is 8%, what is the growth factor?

- A. 8
- B. 1.08
- C. 1.8
- D. 80

58. If the growth factor is 1.9, what is the growth rate?

- A. 9%
- B. 90%
- C. 19%
- D. 190%

59. Which of the following is/are polynomial functions (select all that apply):

A.  $f(x) = 7x^{-2} + 5x - 4$

B.  $g(x) = \frac{3}{2}x^2 + 7x - \frac{1}{3}$

C.  $h(x) = 4^{2x}$

D.  $p(x) = \frac{9}{x^2+1}$

60. The degree of the polynomial  $5x^8y^2 + 9x^3y^4$  is:

A. 10

B. 17

C. 8

D. 11

61. A pool that is 20 ft by 30 ft is going to have a deck ( $x$ ) ft wide added all the way around the pool. Write an expression in simplified form for the area of the deck.

A.  $(50x + 4x^2)\text{ft}^2$

B.  $(100x + 4x^2)\text{ft}^2$

C.  $(200 + 50x + 4x^2)\text{ft}^2$

D.  $(200 + 100x + 4x^2)\text{ft}^2$

62. Simplify:  $(8d^3 + 7d - 4) - (6d^3 + 3d^2 - 4d - 5) - (-4d)$

A.  $2d^3 + 3d^2 + 7d + 1$

B.  $2d^3 - 3d^2 + 15d + 1$

C.  $2d^3 - 3d^2 - d - 9$

D.  $2d^3 + 3d^2 + 15d + 1$

63.  $\frac{8m^2n^3p^4 + 6mn^4p^2}{2mn^2p}$  is equivalent to

A.  $\frac{7m^3n^7p^6}{mn^2p}$

B.  $7m^3n^7p^6$

C.  $6mnp^3 + 4n^2p$

D.  $4mnp^3 + 3n^2p$

64. Let the zeros of  $6d^2 + 19d - 7$  be given by  $A$  and  $B$ . What is the value of  $A + B$ ?

- A.  $-\frac{19}{6}$
- B.  $-\frac{23}{6}$
- C. 3
- D.  $\frac{11}{6}$

65.  $(4a^4 - 2a^2 + 4) \div (a - 2)$

- A.  $4a^3 - a - 2$
- B.  $4a^3 - a^2 - 2$
- C.  $4a^3 + 8a^2 + 14a + 28 + \frac{60}{a-2}$
- D.  $4a^3 + 8a^2 + 14a + 28 - \frac{60}{a-2}$

66. A box has volume of  $(2x^2 - 4x - 16) \text{ cm}^3$  and a height of  $(x - 4) \text{ cm}$ . Find the area of the base of the box.

- A.  $(4x + 4) \text{ cm}^2$
- B.  $(4x - 4) \text{ cm}^2$
- C.  $(2x + 4) \text{ cm}^2$
- D.  $(2x - 4) \text{ cm}^2$

67. If  $(x - 1)$  is a factor of the polynomial  $x^3 - ax^2 - x + 7$ , what is the value of  $a$ ?

- A. 9
- B. 7
- C. 5
- D. -7

68. Simplify:  $\sqrt{48x^3y^6}$

- a.  $4|x|y^3\sqrt{3x}$
- b.  $4x|y^3|\sqrt{3x}$
- c.  $2xy^3\sqrt{6x}$
- d.  $2|y^3|x\sqrt{6x}$

69. Simplify:  $\sqrt{-8a^2b^4}$

- A.  $-2|a|b^2\sqrt{2}$
- B.  $2|a|b^2\sqrt{2}$
- C.  $4ab$

D.  $2ab^2i\sqrt{2}$

70. Simplify:  $x\sqrt[4]{\frac{x^8}{625}}$

a.  $\frac{x^2}{25}$

b.  $\frac{x^3}{15}$

c.  $\frac{|x^3|}{25}$

d.  $\frac{x^3}{25}$

71. Simplify  $\sqrt[3]{64a^{15}b^{12}c^5}$

a.  $8a^5b^4c\sqrt{c^2}$

b.  $8|a^5|b^4c^3\sqrt{c^2}$

c.  $4a^5b^4c^2$

d.  $4a^5b^4c\sqrt[3]{c^2}$

72. Simplify  $3x\sqrt[3]{24x^{12}}$

a.  $3x^5\sqrt[3]{3}$

b.  $6x^4\sqrt{6}$

c.  $3x^4\sqrt{6}$

d.  $6x^5\sqrt[3]{3}$

73. A rectangle has length  $6\sqrt{3} + 3\sqrt{5}$  feet and width  $4\sqrt{5} + 5\sqrt{3}$  feet, what is the perimeter?

a.  $10\sqrt{5} + 8\sqrt{3}$  feet

b.  $14\sqrt{5} + 22\sqrt{3}$  feet

c.  $20\sqrt{5} + 16\sqrt{3}$  feet

d.  $18\sqrt{8}$  feet

74. A rectangle has length  $4\sqrt{5} + 5\sqrt{3}$  feet and width  $4\sqrt{5} + 5\sqrt{3}$  feet, what is the area?

a.  $155 \text{ ft}^2$

b.  $(155+20\sqrt{15})\text{ft}^2$

c.  $(155 + 40\sqrt{15})\text{ft}^2$

d.  $(155 + 25\sqrt{15})\text{ft}^2$

75. Rationalize the denominator:  $\frac{3}{2 - \sqrt{3}}$

- A.  $\frac{3}{2 + \sqrt{3}}$
- B.  $\frac{6 + 3\sqrt{3}}{7}$
- C.  $\frac{9 + 2\sqrt{3}}{5}$
- D.  $6 + 3\sqrt{3}$

76. Simplify:  $\sqrt{-36x^3} \cdot \sqrt{-4x^4}$

- A.  $12x^3i\sqrt{x}$
- B.  $-12x^3\sqrt{x}$
- C.  $8x^2\sqrt{x}$
- D.  $-24x^3\sqrt{x}$

77. Write the following as a radical:  $m^{\frac{2}{3}}n^{\frac{3}{4}}$

- A.  $\sqrt[12]{m^8n^9}$
- B.  $\sqrt[3]{m^2n^3}$
- C.  $\sqrt[4]{m^3n^2}$
- D.  $\sqrt[7]{m^2n^3}$

78. Simplify:  $\left(p^{\frac{2}{3}}\right)^{-\frac{9}{2}}$

- A.  $p^3$
- B.  $-p^3$
- C.  $-\frac{p^{\frac{1}{3}}}{p}$
- D.  $\frac{1}{p^3}$



**79.** If  $3^a = 9^b$ , what is  $ab$ ?

- A. 3
- B. 4
- C. 6
- D. 8

**80.** Which function below is equivalent to  $f(x)$ ?

$$f(x) = 3(4^{-2x}) - 16^{-x}$$

- A.  $g(x) = \frac{3}{4^x} - \frac{1}{16^x}$
- B.  $g(x) = \frac{3}{16^x} - \frac{1}{16^x}$
- C.  $g(x) = 3(16)^x - (16)^x$
- D.  $g(x) = (48)^x - (16)^x$

**81.** Suppose you want to buy a used car from a dealer for \$5000. If you plan to pay the total amount after 5 years at 10% simple interest per year, calculate the amount of interest you would pay.

- A. \$2,500.00
- B. \$3,052.55
- C. \$7,500.00
- D. \$8,052.55

**82.** Which equation describes your bank account balance if \$2,165 earns 6% annual interest, compounded annually for 5 years?

A.  $A(5) = 2165(1 + 0.06 * 5)$

B.  $A(5) = 2165(1.06)^5$

C.  $A(5) = 2165 \left(1 + \frac{0.06}{12}\right)^{12(5)}$

D.  $A(5) = 2165e^{0.06(5)}$

**83.** The half-life of caffeine is approximately 6 hours. If you consume an energy drink that has 111 mg of caffeine, how much caffeine will remain in your system after 15 hours?

A. 1.7 mg

B. 3.5 mg

C. 19.6 mg

D. 55.5 mg