ALGEBRA MEDLEY 2016 – Team Member 1 – Operations and Simplifications

Shade the letter of the **simplest** correct answer in the appropriate space on the answer sheet.

1. Expand $(2x-3)^3$.

(A) $8x^3-27$ (B) $8x^3-12x^2+18x-27$ (C) $8x^3-3x^2+3x-27$ (D) $8x^3-36x^2+54x-27$

(E) none of these

2. Factor completely r^4-256.

(A) r^4-256 (B) $(r-4)(r+4)(r^2+16)$ (C) $(r-4)^4$ (D) $(r^2+16)(r^2-16)$ (E) none of these

3. $4x^2-\left\{2x^3-\left[5x^2-3x\left(2x^2-x\right)-4x^2\right]\right\}-6x^3$

(A) $-14x^3-2x^2$ (B) $-2x^3+16x^2$ (C) $-14x^3+8x^2$ (D) $4x^3-12x^2$ (E) none of these

4. Simplify $\dfrac{12!}{8!4!}$.

(A) 495   (B) 2970   (C) 1   (D) $\dfrac{3}{8}$ (E) none of these

5. If $f(x)=x^2+5$ and $h(x)=2x+1$, then $f(h(3))=$

(A) 54   (B) 14   (C) 98   (D) 29   (E) none of these

6. Factor completely $6x^2+15x-9$.

(A) $(x-3)(6x+3)$ (B) $(3x-3)(2x+3)$ (C) $(6x-3)(x+3)$ (D) $3(2x-1)(x+3)$

(E) none of these

7. $\dfrac{x}{2x+4}-\dfrac{2}{x^2+3x+2}$

(A) $\dfrac{x-2}{-2x}$ (B) $\dfrac{1}{(x+1)}$ (C) $\dfrac{x^2+2x+24}{2(x+2)(x+1)}$ (D) $\dfrac{x^2+x-4}{2(x+1)(x+2)}$ (E) none of these

8. $\dfrac{x+1}{x^2-9}\div\dfrac{3x+3}{9x-27}=$

(A) $\dfrac{-6}{x-9}$ (B) $\dfrac{3}{x+3}$ (C) $\dfrac{3}{x}$ (D) $\dfrac{3}{x-3}$ (E) none of these

9. If $x=\dfrac{1}{6}$, then $x+\dfrac{1}{x}-5=$

(A) -4 (B) $\dfrac{7}{6}$ (C) $\dfrac{1}{6}$ (D) $-\dfrac{29}{6}$ (E) none of these

ALGEBRA MEDLEY 2016 – Team Member 2 – Exponents and Radicals

Shade the letter of the **simplest** correct answer in the appropriate space on the answer sheet.

10. For positive x and y, $\sqrt{27\sqrt{9x^8y^{10}}} =$

(A) $9x^2y^2\sqrt{y}$ (B) $9x^4y^5\sqrt{3}$ (C) $3x^4y^5$ (D) $27x^2y^2\sqrt{y}$ (E) none of these

11. $(-1)^{-2016} + (-1)^{2016} =$

(A) 0 (B) -1^0 (C) -2^{4020} (D) 2 (E) none of these

12. If 2016^{102} were calculated, what would the ones digit be (the one farthest to the right)?
    (A) 2   (B) 3   (C) 6   (D) 9   (E) none of these

13. $8^{\frac{1}{3}}16^{\frac{3}{4}} =$

(A) $\dfrac{1}{16}$ (B) 32   (C) 4   (D) 16   (E) none of these

14. $\dfrac{5}{\sqrt{x}-2} =$

(A) $\dfrac{25}{x-4}$ (B) $\dfrac{5\sqrt{x}+10}{x-4}$ (C) $5\sqrt{x}+6$ (D) $\dfrac{25}{x+4}$ (E) none of these

15. Solve for x. $8^{2x-3} = 16^{1-x}$

(A) $\dfrac{13}{10}$ (B) $\dfrac{1}{3}$ (C) -1 (D) $\dfrac{10}{7}$ (E) none of these

16. Simplify $\dfrac{x^3+27}{x+3}$

(A) x^2+9 (B) x^2+24 (C) x^2+3x+9 (D) x^2-3x+9 (E) none of these

17. If $x<5$, then $|5-x| =$

(A) $-5+x$ (B) $5+x$ (C) $5-x$ (D) 0 (E) none of these

18. Solve for b. $\sqrt{b+2}-1<3$
    (A) $-18<x<14$ (B) $-2 \le x <14$ (C) $-2<x<0$ (D) no solution
    (E) none of these

ALGEBRA MEDLEY 2016 – Team Member 3 – Equations and Inequalities

Solve each of the following for real numbers x. Shade the letter of the **simplest** correct answer in the appropriate space on the answer sheet.

19. One of the solutions of $x^2 + 4x = -20$ is

(A) $4i$ (B) - 20   (C) $-2+4i$ (D) 2   (E) none of these

20. If for all values of x, $(x-c)^2 = c^2 + 2x + x^2$, then $c =$

(A) 0   (B) 2 or $-\dfrac{1}{2}$ (C) 1   (D) -1 (E) none of these

21. $x^2 - 14x \leq 15$

(A) $x \leq -3$ or $x \geq 5$ (B) $-1 \leq x \leq 15$ (C) $x \leq -1$ or $x \geq 15$ (D) $-3 \leq x \leq 5$

(E) none of these

22. $\log_{10} x = 5$

(A) $\dfrac{5}{10}$ (B) 10,000   (C) $\dfrac{1}{100,000}$ (D) 100,000   (E) none of these

23. Solve for x. $8^{2x-3} = 16^{1-x}$

(A) $\dfrac{13}{10}$ (B) $\dfrac{1}{3}$ (C) -1 (D) $\dfrac{10}{7}$ (E) none of these

24. $|x+3|-2 \leq 1$

(A) $x < 6$ (B) $-6 \leq x \leq 0$ (C) $-6 \leq x \leq 2$ (D) $x \leq 2$ (E) none of these

25. If $f(x) = x^2 - cx - 2$ and $f(2) = 8$, then $c =$

(A) -3 (B) 3   (C) -5 (D) 8   (E) none of these

26. Find the value of y in the solution. $\begin{cases} 4x - 3y = 39 \\ 5x - 2y = 33 \end{cases}$

(A) $\dfrac{7}{3}$ (B) 3   (C) -9 (D) 9   (E) none of these

27. $9^x = 10$

(A) $\dfrac{10}{9}$ (B) no solution   (C) $\log_{10}\left(\dfrac{10}{9}\right)$ (D) $\log_9 10$ (E) none of these

Shade the letter of the **simplest** correct answer in the appropriate space on the answer sheet.

28. A book is opened. The sum of the page numbers on the facing pages is 281. What is the larger page number?

(A) 200   (B) 140   (C) 141   (D) 199   (E) none of these

29. If the perimeter of a rectangle is 36 feet and one side is 8 feet, the area of the rectangle is

(A) 9 feet   (B) 80 feet   (C) 64 feet   (D) 288 feet   (E) none of these

30. A collection of coins has nickels, dimes and quarters. The number of nickels is three times the number of quarters, and there are one-half as many dimes as nickels. The total collection is valued at $3.30. Find the number of quarters in the collection.

(A) 6   (B) 9   (C) 18   (D) 1   (E) none of these

31. A gaming company hired a market researcher to find out how to price a new video game app. The researcher reported that if the app costs $5, then 8000 people a month will buy it, but if it costs $10, then 4000 people a month will buy it. What is the lowest price at which nobody will buy the app?

(A) $100   (B) $38   (C) $21.25   (D) $15   (E) none of these

32. A word processor determines the width of the body of text on a page for a margin of x inches. If the page is 7.25 inches wide with equal side margins, the width of the body of text is given by

(A) $7.25 - 2x$ (B) $2x + 7.25$ (C) $7.25 - x$ (D) $2x - 7.25$ (E) none of these

33. Joe has made 20 out 35 free throws so far this basketball season. He wants to end the season with at least a 70% average. If he has 25 more attempts in the rest of the season, how many successful free throws must he make?

(A) 22   (B) 25   (C) 13   (D) 10   (E) none of these

34. On Monday, Tuesday and Wednesday, a total of 115 books are sold. On Monday and Friday, a total of 70 books are sold. On Tuesday and Thursday, a total of 90 books are sold. On Wednesday and Thursday, a total of 85 books are sold. On Thursday and Friday, a total of 80 books are sold. Find the number of books sold on Tuesday.

(A) 50   (B) 45   (C) 40   (D) 24   (E) none of these

35. A car tire has a leak and the formula $P(t) = 36(3^{-0.2t})$ gives the tire pressure in pounds per square inch after t minutes. After how many minutes is the pressure 12 pounds per square inch?

(A) $\dfrac{4}{5}$ (B) 60   (C) 4   (D) 5   (E) none of these

36. The ratio of pink marbles to purple marbles in a box is two to five. Ten purple marbles are added to the box. How many pink marbles must be added to keep the ratio the same?

(A) 10   (B) 4   (C) 30   (D) 2   (E) none of these