ALGEBRA MEDLEY 2018 – Team Member 1 – Operations and Simplifications

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

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

(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 t^3-27.

(A) $(t-3)^3$ (B) t^3-27 (C) $(t-3)\left(t^2+3t+9\right)$ (D) $(t^2+9)(t-3)$ (E) none of these

3. $6\left(-6x+6+4(x+1)\right)$

(A) $-12x+60$ (B) $-32x+40$ (C) $24x+60$ (D) $-12x+42$ (E) none of these

4. Simplify $\frac{12!}{9!}$.

(A) $\frac{4}{3}!$ (B) 220 (C) 1320 (D) $\frac{4}{3}$ (E) none of these

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

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

6. Factor completely $12r^2-64r-48$.

(A) $2(r-6)(6r+4)$ (B) $12(r-4)(r+1)$ (C) $(2r-12)(6r+4)$ (D) $4(r-6)(3r+2)$
(E) none of these

7. Multiply $\left[\left(s^2+4\right)-\left(s^2-4\right)\right]\left[\left(s^2+4\right)+\left(s^2-4\right)\right]$.

(A) $32s^3+512s$ (B) $16s^2$ (C) 64 (D) 0 (E) none of these

8. $\dfrac{\frac{1}{y}-\frac{1}{x}}{x-y}=$

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

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

(A) -5 (B) $-\frac{3}{5}$ (C) $\frac{1}{5}$ (D) $-\frac{23}{5}$ (E) none of these

ALGEBRA MEDLEY 2018 – Team Member 2 – Exponents and Radicals

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

10. Multiply and simplify $\sqrt{10}+\sqrt{6}\left(\sqrt{2}+\sqrt{3}\right)$ =

(A) $2\sqrt{10}$ (B) $2\sqrt{30}$ (C) $2\sqrt{5}+2\sqrt{2}+2\sqrt{3}+\sqrt{30}$ (D) $\sqrt{10}+3\sqrt{2}+2\sqrt{3}$ (E) none of these

11. $(81)^{1/2}(27)^{-2/3}$ =

(A) 1 (B) 6 (C) 162 (D) $\frac{3}{7}$ (E) none of these

12. If 2018^{2018} were calculated, what would the ones digit be (the one farthest to the right)?

(A) 4 (B) 3 (C) 6 (D) 9 (E) none of these

13. If $\left(\frac{4}{5}\right)^n=\sqrt{\left(\frac{5}{4}\right)^3}$, then n =

(A) $\frac{2}{3}$ (B) -1 (C) $-\frac{2}{3}$ (D) $-\frac{3}{2}$ (E) none of these

14. $\frac{5+2\sqrt{2}}{1-\sqrt{2}}$ =

(A) 7 (B) $-9-7\sqrt{2}$ (C) $\frac{9+7\sqrt{2}}{3}$ (D) $\frac{3-4\sqrt{2}}{7}$ (E) none of these

15. Solve for x. $9^{x+6}=27^{x-5}$

(A) 27 (B) 21 (C) 17 (D) 11 (E) none of these

16. $\frac{a^2b^{-1}c^4}{b^2}\bullet\frac{a^3c^2}{b^4c^3}$ =

(A) $\frac{a^6c^5}{b^9}$ (B) $\frac{a^5c^3}{b^5}$ (C) $\frac{a^5c^4}{b^7}$ (D) $\frac{a^5c^3}{b^7}$ (E) none of these

17. $2+x^{-5}$

(A) $\frac{2}{x^5}$ (B) $\frac{3}{x^5}$ (C) $\frac{2x^5+1}{x^5}$ (D) $\frac{2}{2+x^5}$ (E) none of these

18. Solve for x. $\sqrt{x+6}+\sqrt{2-x}=4$

(A) $\sqrt{31},-2$ (B) -2 (C) $2,-2$ (D) no solution (E) none of these

ALGEBRA MEDLEY 2018 – 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. $6\left(-6x+6+4(x+1)\right)=6x+2$

(A) $-\frac{7}{3}$ (B) $\frac{29}{9}$ (C) $-\frac{7}{3}$ (D) -2 (E) none of these

20. $\frac{18}{x-6}+2=\frac{6}{x-6}$

(A) 0 (B) $2,\ -\frac{1}{2}$ (C) 6 (D) -18 (E) none of these

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

(A) $x\le -3$ or $x\ge 5$ (B) $-1\le x\le 15$ (C) $x\le -1$ or $x\ge 15$ (D) $-3\le x\le 5$ (E) none of these

22. $2\left(x-6\right)^2-10=0$

(A) $1, 11$ (B) $-1, -11$ (C) $6\pm\sqrt{5}$ (D) $-6\pm\sqrt{5}$ (E) none of these

23. $9^{x+6}=27^{x-5}$

(A) 27 (B) 21 (C) 17 (D) 11 (E) none of these

24. $|x+2|+6\le 11$

(A) $x<3$ (B) $-7\le x\le 0$ (C) $-7\le x\le 3$ (D) all real numbers (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. $\begin{cases}4x-3y=27\\5x-2y=39\end{cases}$

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

27. $\sqrt{x+6}+\sqrt{2-x}=4$

(A) $\sqrt{31}, -2$ (B) -2 (C) $2, -2$ (D) no solution (E) none of these

ALGEBRA MEDLEY 2018 – Team Member 4 – Word Problems

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

28. Assume we are animating a video game and want to move a character in a straight line from the point $A=(1,2)$ to the point $B=(5,0)$. Where is the character when it is 90% of the way along?

(A) $(6,2)$ (B) $(3.6,1.8)$ (C) $(5.1,0.2)$ (D) $(4.6,0.2)$ (E) none of these

29. Yesterday I bought two cups of coffee and one muffin for \$4.40. This morning, I bought one cup of coffee and two muffins for \$3.55. What does a coffee cost?

(A) under \$1 (B) between \$1 and \$1.50 (C) between \$1.50 and \$2 (D) over \$2

30. A restaurant owner wants to enclose an empty lot for parking. She has 236 feet of fencing and will leave the side facing the street unfenced. What is the largest rectangular area that can be fenced in?

(A) 3481 ft^2 (B) 6962 ft^2 (C) 10,443 ft^2 (D) 13,924 ft^2 (E) none of these

31. \$10,000 was inherited with the requirement that for the first year the money had to be invested in two stocks paying 6% and 11% annual interest, respectively. How much was invested at 11% if the total interest earned for the year was \$700?

(A) \$8000 (B) \$7000 (C) \$3500 (D) \$2000 (E) none of these

32. One angle of a triangle is four times the smallest angle and the third angle is 36° more than the smallest angle. What is the meaure of the largest angle?

(A) 96° (B) 60° (C) 144° (D) 36° (E) none of these

33. The decibel rating of a sound is given by $B(I)=10\log_{10}\left(\frac{I}{10^{-12}}\right)$, where I is the intensity of the sound measured in watts per square meter (W/m^2). The decibel rating of a sound with intensity 100 (W/m^2) is

(A) 220 (B) 25 (C) 100 (D) 140 (E) none of these

34. Two rental companies offer the same car at different rates. The first company charges a daily rate of $A(m)=35+0.15m$ dollars to drive m miles. The second company charges a daily rate of $B(m)=50+0.1m$ dollars to drive m miles. What is the breakeven mileage for these two companies?

(A) 500 (B) 300 (C) 145 (D) 50 (E) none of these

35. A car tire has a leak and the formula $P(t)=39(3^{-0.25t})$ gives the tire pressure in pounds per square inch after t minutes. After how many minutes is the pressure 13 pounds per square inch?

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

36. Joey can type 4 pages in 20 minutes. How many pages can he type in 50 minutes?

(A) 10 (B) 11 (C) 30 (D) 12 (E) none of these