

**Recursion**

- 1 Find  $x$  given the following:  $x = \sqrt{30 - \sqrt{30 - \sqrt{30 - \sqrt{30 - \dots}}}}$
- A. -5    B. 5    C.  $\{-5, 5\}$   
D.  $\phi$      E. NOTA
- 2 Evaluate  $\frac{1}{1 \cdot 2 \cdot 3} + \frac{2}{2 \cdot 3 \cdot 4} + \frac{3}{3 \cdot 4 \cdot 5} + \dots + \frac{98}{98 \cdot 99 \cdot 100}$ . Express your answer as a fraction in simplest form  $\frac{b}{a}$ . Find  $a + b$
- A. 149     B. 24749     C. 14851  
D. 194     E. NOTA
- 3 Express the number  $7.4\overline{7}$  as a fraction in simplest form. Now give the reciprocal of the ratio of the denominator to the numerator.
- A.  $\frac{90}{673}$      B.  $\frac{100}{747}$      C.  $\frac{747}{100}$   
D.  $\frac{673}{90}$      E. NOTA
- 4  $\sqrt{20 + \sqrt{20 + \sqrt{20 + \sqrt{20 + \dots}}}}$
- A. -5    B. 5    C. -4  
D. 4    E. NOTA
- 5 If the table below defines certain values of a function  $f$ , then what is  $f(f(f(f(5))))$ ?
- |        |   |   |   |   |   |
|--------|---|---|---|---|---|
| $x$    | 1 | 2 | 3 | 4 | 5 |
| $f(x)$ | 4 | 1 | 4 | 0 | 2 |
- A. 0    B. 1    C. 2  
D. 4     E. NOTA
- 6 Given:  $f(x) = x^3$   
 $g(x) = x + 1$   
Find:  $(f \circ g)(2)$
- A. -2     B. 3     C. 9  
D. 27    E. NOTA
- 7 What is the 5<sup>th</sup> term of an arithmetic sequence with a common difference of 5 and first term of 2?
- A. 13     B. 15     C. 22  
D. 27    E. NOTA



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13  $4 - \frac{4}{4 - \frac{4}{4 - \dots}}$

A. 1                                  B. 2                                  C.  $3.\bar{8}$   
D. 16                                  E. NOTA

14 Find the unit's digit of  $1 + 9 + 9^2 + 9^3 + \dots + 9^{n-1} + \dots + 9^{1988} + 9^{1989}$

A. 0                                  B. 1                                  C. 7  
D. 9                                  E. NOTA

15 If  $f$  is a linear function and  $f(f(x)) = 2x + 4$ , find the positive value of  $f(1)$

A.  $\sqrt{2}$                               B. 4                                  C.  $4(\sqrt{2} - 1)$   
D.  $5\sqrt{2} - 4$                       E. NOTA

16 Evaluate as a common fraction:

$$1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{4}}}$$

A.  $\frac{5}{6}$                                   B.  $\frac{11}{6}$                                   C. 2                                  D.  $\frac{11}{5}$                                   E. NOTA

17  $x = \sqrt{210 + \sqrt{210 + \sqrt{210 + \dots}}}$

A. 14                                  B. 15                                  C. 224  
D. 225                                  E. NOTA

18 If  $f(x) = \frac{1}{2}x + 1$  and  $g(x) = -\frac{2}{3}x - 4$ , then the slope of  $f(g(x))$  is ?.

(A)  $-\frac{1}{3}$                               (B)  $-\frac{1}{6}$                               (C)  $\frac{7}{6}$                               (D) -3                              (E) nota

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$$\sqrt{42 - \sqrt{42 - \sqrt{42 - \dots}}} = N. \text{ Find the value of } N.$$

- (A) 5                      (B) 6                      (C) 7                      (D)  $\sqrt{42}$                       (E) nota

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Find the value of  $\frac{1}{2 - \frac{1}{2 - \frac{1}{2 - \frac{1}{2}}}}$

- A.  $\frac{3}{4}$                       B.  $\frac{4}{5}$                       C.  $\frac{5}{6}$   
 D. 1                      E. NOTA

21 The functions  $f$  and  $g$  are inverses, both with domains of all real numbers. If  $f(2) = 5$  and  $g(3) = 6$ , then  $g(5) + f(6) =$

- A. -11                      B. 5                      C. 0  
 D. cannot be determined                      E. NOTA

22 If  $f(x) = 9x + 6$  and  $g(x) = 3x^2$  then which is equal to  $g(f(1))$ ?

- A. 2025                      B. 675                      C. 45  
 D. 33                      E. NOTA

23 If  $f(x+2) = x^2 + 4x$ , then which is equal to  $f(5)$ ?

- A. 45                      B. 43                      C. 21  
 D. 9                      E. NOTA

24 Find the absolute value of the difference of the solutions for the equation

$$(x+3)^2 + (x+3) - 2 = 0$$

- A. 0                      B. 1                      C. 3  
 D. 7                      E. NOTA

25 When simplified, the product

$$\left(1 - \frac{1}{3}\right)\left(1 - \frac{1}{4}\right)\left(1 - \frac{1}{5}\right)\dots\left(1 - \frac{1}{n}\right) \text{ equals}$$

- A.  $\frac{1}{n}$                       B.  $\frac{2}{n}$                       C.  $\frac{2(n-1)}{n}$   
 D.  $\frac{2}{n(n+1)}$                       E. NOTA

26 If  $f(x) = x^2 - 4$  and  $g(x) = x^2 - 9$ , what is the value of  $f(g(f(\sqrt{7})))$ ?

- A. -4                      B. -2                      C. 0  
 D. 4                      E. NOTA

## Recursion

- 27 Find the exact value of the expression  $\sqrt{2+3\sqrt{2+3\sqrt{2+\dots}}}$
- A. 1  
B.  $\frac{3+\sqrt{17}}{2}$   
C. 2  
D.  $2+3\sqrt{5}$   
E. NOTA
- 28 If  $f(x) = \sqrt[3]{x^2 - 2x}$ , what is the positive value of the inverse of  $f$  at  $x = 2$ ?
- A. 2  
B. 4  
C. 8  
D. 10  
E. NOTA
- 29 Given that  $f(x)$  is the inverse of  $g(x)$ , if  $f(x) = \frac{3x}{x+2}$ , what is  $g(1) + g(2)$ ?
- A. 2.5  
B. 5  
C. 6  
D. 7  
E. NOTA
- 30 If  $2f(x) = xf(x+1) + 6$ , what is  $f(-4)$ ?
- A. 3  
B.  $\frac{3}{2}$   
C.  $\frac{3}{4}$   
D.  $-\frac{3}{4}$   
E. NOTA

## Recursion

### ANSWERS

1. B
2. A
3. D
4. B
5. A
6. D
7. C
8. C
9. A  $\frac{f(2004)f(2003) \cdot f(2002)f(2001)}{f(2003)f(2002)} = \frac{2001 \cdot 2003}{2002}$
10. E 4
11. C
12. B
13. B
14. A
15. E  $5\sqrt{2} - 4$
16. B
17. B
18. A
19. B
20. B
21. B
22. B
23. C
24. C
25. B
26. A
27. B
28. B
29. B
30. B