

Spardhaguru Skill Edge Aptitude Academy

1st Floor, 608, Panchamantra Rd, P and T Block, Jayanagar, Kuvempunagara, Mysuru, Karnataka 570023

CONCEPT 1: Simple Continued Fractions (All +1 Numerators & Unit Coefficients)

Example 1.1

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

- A) $\frac{5}{14}$ B) $\frac{9}{14}$ C) $\frac{14}{9}$ D) $\frac{5}{9}$

Detailed Explanation:

- Step 1 (Bottom): $1 + \frac{1}{4} = \frac{5}{4}$
- Step 2: $1 + \frac{1}{5/4} = 1 + \frac{4}{5} = \frac{9}{5}$
- Step 3: $1 + \frac{1}{9/5} = 1 + \frac{5}{9} = \frac{14}{9}$
- Step 4 (Reciprocal): $\frac{1}{14/9} = \frac{9}{14}$

- Answer: B

Example 1.2

Simplify: $\frac{1}{1+\frac{1}{1+\frac{1}{1+\frac{1}{3}}}}$

- A) $\frac{13}{21}$ B) $\frac{8}{13}$ C) $\frac{13}{8}$ D) $\frac{21}{13}$

Detailed Explanation:

- Bottom: $1 + \frac{2}{3} = \frac{5}{3}$
- Next level: $1 + \frac{3}{5} = \frac{8}{5}$
- Next level: $1 + \frac{5}{8} = \frac{13}{8}$
- Next level: $1 + \frac{8}{13} = \frac{21}{13}$
- Final reciprocal: $\frac{1}{21/13} = \frac{13}{21}$

- Answer: A

Example 1.3

If $x = 1 + \frac{1}{1+\frac{1}{1+\frac{1}{1+\frac{1}{2}}}}$, find the value of $2x + \frac{7}{4}$.

- A) 3 B) 4 C) 5 D) 6

Detailed Explanation:

- Step 1: $1 + \frac{1}{2} = \frac{3}{2}$
- Step 2: $1 + \frac{2}{3} = \frac{5}{3}$
- Step 3: $1 + \frac{3}{5} = \frac{8}{5}$
- Step 4: $x = 1 + \frac{5}{8} = \frac{13}{8}$
- Compute expression: $2\left(\frac{13}{8}\right) + \frac{7}{4} = \frac{13}{4} + \frac{7}{4} = \frac{20}{4} = 5$

- Answer: C

CONCEPT 2: Mixed Coefficients & Numerators with Mixed Signs

Example 2.1

Find the value of: $\frac{1}{2+\frac{1}{3+\frac{1}{4+\frac{1}{2}}}}$

- A) $\frac{41}{95}$ B) $\frac{19}{41}$ C) $\frac{19}{45}$ D) $\frac{95}{41}$

Detailed Explanation:

- Step 1: $4 + \frac{1}{2} = \frac{9}{2}$
- Step 2: $3 + \frac{1}{9/2} = 3 + \frac{2}{9} = \frac{29}{9}$
- Step 3: $2 + \frac{1}{29/9} = 2 + \frac{9}{29} = \frac{67}{29}$
- Step 4: $\frac{1}{67/29} = \frac{29}{67}$

Example 2.2

Simplify: $\frac{1}{3+\frac{2}{2+\frac{1}{2}}}$

- A) $\frac{5}{19}$ B) $\frac{5}{21}$ C) $\frac{3}{21}$ D) $\frac{3}{31}$

Detailed Explanation:

- Step 1: $2 + \frac{1}{2} = \frac{5}{2}$
- Step 2: $\frac{2}{5/2} = 2 \times \frac{2}{5} = \frac{4}{5}$
- Step 3: $3 + \frac{4}{5} = \frac{19}{5}$
- Step 4: $\frac{1}{19/5} = \frac{5}{19}$

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• Answer: A

Example 2.3

Evaluate: $\frac{1}{3 + \frac{1}{2 - \frac{1}{9}}} + \frac{17}{22}$

A) $\frac{8}{9}$ B) 1 C) $\frac{3}{8}$ D) 2

Detailed Explanation:

- Step 1: $2 - \frac{1}{9} = \frac{17}{9}$
- Step 2: $\frac{1}{17/9} = \frac{9}{17}$
- Step 3: $3 + \frac{9}{17} = \frac{51+9}{17} = \frac{60}{17}$
- Step 4: $\frac{1}{60/17} = \frac{17}{60}$
- Step 5: $\frac{17}{60} + \frac{17}{22} \rightarrow$ For standard worksheet format:

CONCEPT 3: Inverse Continued Fractions (Euclidean Decomposition)

Example 3.1

If $\frac{9}{26} = \frac{1}{a + \frac{1}{b + \frac{1}{c}}}$, where a, b, c are positive integers, find $(a + b + c)$.

A) 10 B) 11 C) 12 D) 13

Detailed Explanation:

- Invert: $\frac{26}{9} = 2 + \frac{8}{9} \Rightarrow a = 2$
- Invert remainder: $\frac{9}{8} = 1 + \frac{1}{8} \Rightarrow b = 1, c = 8$
- Sum: $a + b + c = 2 + 1 + 8 = 11$

• Answer: B

Example 3.2

Express $\frac{13}{48}$ as a continued fraction:

A) $\frac{1}{3 + \frac{1}{1 + \frac{1}{1 + \frac{1}{8}}}}$ B) $\frac{1}{3 + \frac{1}{1 + \frac{1}{2 + \frac{1}{4}}}}$

C) $\frac{1}{3 + \frac{1}{1 + \frac{1}{16}}}$ D) $\frac{1}{2 + \frac{1}{1 + \frac{1}{8}}}$

Detailed Explanation:

- $\frac{48}{13} = 3 + \frac{9}{13} \Rightarrow a = 3$
- $\frac{13}{9} = 1 + \frac{4}{9} \Rightarrow b = 1$
- $\frac{9}{4} = 2 + \frac{1}{4} \Rightarrow c = 2, d = 4$
- Fraction: $\frac{1}{3 + \frac{1}{1 + \frac{1}{2 + \frac{1}{4}}}}$

• Answer: B

Example 3.3

If $\frac{17}{60} = \frac{1}{a + \frac{1}{b + \frac{1}{c}}}$, find the product $a \times b \times c$.

A) 24 B) 12 C) 18 D) 16

Detailed Explanation:

- $\frac{60}{17} = 3 + \frac{9}{17} \Rightarrow a = 3$
- $\frac{17}{9} = 1 + \frac{8}{9} \Rightarrow b = 1$
- $\frac{9}{8} \approx 8 \Rightarrow c = 8$
- Product: $3 \times 1 \times 8 = 24$

• Answer: A

CONCEPT 4: Algebraic & Linear Equation Continued Fractions

Example 4.1

If $2 = x + \frac{1}{1 + \frac{1}{3 + \frac{1}{4}}}$, then the value of x is:

A) $\frac{18}{17}$ B) $\frac{21}{17}$ C) $\frac{13}{17}$ D) $\frac{12}{17}$

Detailed Explanation:

- Bottom: $3 + \frac{1}{4} = \frac{13}{4}$
- Next: $1 + \frac{4}{13} = \frac{17}{13}$
- Reciprocal: $\frac{1}{17/13} = \frac{13}{17}$

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4. Equation: $2 = x + \frac{13}{17} \Rightarrow x = 2 - \frac{13}{17} = \frac{21}{17}$

A) $\frac{4}{11}$ B) $\frac{7}{11}$ | C) $\frac{11}{7}$ | D) $\frac{4}{7}$

• Answer: B

Example 4.2

If $1 = \frac{2x}{1 + \frac{1}{1 + \frac{x}{1-x}}}$, then the value of x is:

A) $\frac{2}{3}$ B) $\frac{3}{7}$ C) $\frac{3}{5}$ D) $\frac{1}{2}$

Detailed Explanation:

1. Inner term: $1 + \frac{x}{1-x} = \frac{1-x+x}{1-x} = \frac{1}{1-x}$

2. Next: $1 + \frac{1}{\frac{1}{1-x}} = 1 + (1-x) = 2-x$

3. Substitute back: $1 = \frac{2x}{2-x}$

4. Solve: $2-x = 2x \Rightarrow 3x = 2 \Rightarrow x = \frac{2}{3}$

• Answer: A

Example 4.3

Simplify the algebraic fraction:

$$\frac{1 - \frac{a}{1 - \frac{1}{1 + \frac{a}{1-a}}}}{1 - \frac{1}{1 + \frac{a}{1-a}}}$$

A) 0 B) a C) 1 D) $-a$

Detailed Explanation:

1. Step 1: $1 + \frac{a}{1-a} = \frac{1}{1-a}$

2. Step 2: $\frac{1}{1/(1-a)} = 1-a$

3. Step 3: $1 - (1-a) = a$

4. Step 4: $1 - \frac{a}{a} = 1 - 1 = 0$

• Answer: A

50 Practice Questions

1. Simplify: $\frac{1}{1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{3}}}}$

2. Simplify: $\frac{1}{1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{2}}}}}$

A) $\frac{5}{13}$ | B) $\frac{8}{13}$ | C) $\frac{13}{8}$ | D) $\frac{3}{8}$

3. Simplify: $\frac{1}{1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{3}}}}}$

A) $\frac{11}{18}$ | B) $\frac{7}{18}$ | C) $\frac{11}{17}$ | D) $\frac{18}{11}$

4. Simplify: $1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{2}}}}$

A) $\frac{8}{5}$ | B) $\frac{5}{3}$ | C) $\frac{5}{8}$ | D) $\frac{3}{5}$

5. Simplify: $1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{4}}}}$

A) $\frac{19}{14}$ | B) $\frac{23}{14}$ | C) $\frac{14}{9}$ | D) $\frac{23}{9}$

6. Simplify: $\frac{1}{2 + \frac{1}{2 + \frac{1}{2 + \frac{1}{2}}}}$

A) $\frac{12}{29}$ | B) $\frac{29}{12}$ | C) $\frac{7}{17}$ | D) $\frac{5}{12}$

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7. Simplify: $\frac{1}{3 + \frac{1}{3 + \frac{1}{3}}}$

A) $\frac{13}{30}$ | B) $\frac{13}{32}$ | C) $\frac{3}{32}$ | D) $\frac{15}{32}$

A) $\frac{10}{31}$ | B) $\frac{33}{10}$ | C) $\frac{3}{10}$ | D) $\frac{10}{33}$

13. Simplify: $\frac{1}{3 + \frac{1}{2 + \frac{1}{4}}}$

A) $\frac{3}{11}$ | B) $\frac{9}{39}$ | C) $\frac{3}{13}$ | D) $\frac{1}{4}$

8. Simplify: $\frac{1}{2 + \frac{1}{1 + \frac{1}{2 + \frac{1}{3}}}}$

A) $\frac{7}{24}$ | B) $\frac{10}{22}$ | C) $\frac{10}{27}$ | D) $\frac{7}{17}$

14. Simplify: $\frac{2}{1 + \frac{2}{1 + \frac{2}{3}}}$

A) $\frac{5}{6}$ | B) $\frac{11}{13}$ | C) $\frac{10}{11}$ | D) $\frac{11}{10}$

9. Simplify: $\frac{1}{1 + \frac{1}{2 + \frac{1}{3 + \frac{1}{4}}}}$

A) $\frac{30}{43}$ | B) $\frac{13}{43}$ | C) $\frac{43}{30}$ | D) $\frac{13}{30}$

15. Simplify: $\frac{1}{1 + \frac{2}{1 + \frac{3}{1 + \frac{4}{5}}}}$

10. Simplify: $\frac{1}{4 + \frac{1}{3 + \frac{1}{2 + \frac{1}{1}}}}$

A) $\frac{7}{31}$ | B) $\frac{10}{43}$ | C) $\frac{5}{23}$ | D) $\frac{11}{47}$

A) $\frac{3}{8}$ | B) $\frac{4}{7}$ | C) $\frac{1}{4}$ | D) $\frac{2}{7}$

11. Simplify: $1 + \frac{2}{1 + \frac{3}{1 + \frac{4}{1 + \frac{5}{1}}}}$

A) $\frac{71}{4}$ | B) $\frac{7}{4}$ | C) $\frac{23}{14}$ | D) $\frac{13}{9}$

16. Simplify: $\frac{1}{2 - \frac{1}{2 - \frac{1}{2 - \frac{1}{2}}}}$

A) $\frac{4}{5}$ | B) $\frac{5}{4}$ | C) $\frac{3}{4}$ | D) $\frac{2}{3}$

17. Simplify: $\frac{1}{3 - \frac{1}{3 - \frac{1}{3}}}$

A) $\frac{8}{23}$ | B) $\frac{8}{21}$ | C) $\frac{3}{8}$ | D) $\frac{23}{8}$

12. Simplify: $\frac{1}{2 + \frac{2}{3 + \frac{1}{1 + \frac{1}{2}}}}$

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18. Simplify: $2 - \frac{1}{2 - \frac{1}{2 - \frac{1}{3}}}$

A) $\frac{4}{7}$ | B) $\frac{9}{7}$ | C) $\frac{7}{5}$ | D) $\frac{5}{7}$

19. Simplify: $1 - \frac{1}{1 - \frac{1}{1 - \frac{1}{4}}}$

A) 4 | B) -3 | C) $\frac{4}{3}$ | D) $-\frac{1}{3}$

20. Simplify: $\frac{1}{2 + \frac{1}{3 - \frac{1}{2 + \frac{1}{2}}}}$

A) $\frac{13}{31}$ | B) $\frac{11}{27}$ | C) $\frac{13}{33}$ | D) $\frac{5}{13}$

21. If $\frac{1}{a + \frac{1}{b + \frac{1}{c}}} = \frac{9}{26}$, find $a + b + c$.

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

22. If $\frac{1}{a + \frac{1}{b + \frac{1}{c}}} = \frac{7}{16}$, find $a + b + c$.

A) 7 | B) 8 | C) 9 | D) 6

23. If $\frac{1}{a + \frac{1}{b + \frac{1}{c}}} = \frac{11}{30}$, find $a \times b \times c$.

A) 20 | B) 28 | C) 35 | D) 40

24. If $\frac{1}{a + \frac{1}{b + \frac{1}{c + \frac{1}{d}}}} = \frac{17}{60}$, find $a + b + c + d$

A) 11 | B) 14 | C) 13 | D) 15

25. If $\frac{1}{a + \frac{1}{b + \frac{1}{c + \frac{1}{d}}}} = \frac{30}{43}$, find $a + b + c + d$.

A) 7 | B) 10 | C) 9 | D) 8

26. If $\frac{1}{a + \frac{1}{b + \frac{1}{c}}} = \frac{13}{32}$, find $2a + b - c$.

A) 3 | B) 4 | C) 0 | D) 5

27. If $\frac{1}{a + \frac{1}{b + \frac{1}{c + \frac{1}{d}}}} = \frac{16}{37}$, find $a \times b \times c \times d$.

A) 12 | B) 18 | C) 24 | D) 36

28. Express $\frac{15}{43}$ as a continued fraction:

A) $\frac{1}{2 + \frac{1}{1 + \frac{1}{6 + \frac{1}{2}}}}$

B) $\frac{1}{2 + \frac{1}{1 + \frac{1}{7}}}$

C) $\frac{1}{2 + \frac{1}{1 + \frac{1}{5 + \frac{1}{2}}}}$

D) $\frac{1}{3 + \frac{1}{1 + \frac{1}{7}}}$

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29. If $\frac{19}{43} = \frac{1}{a + \frac{1}{b + \frac{1}{c + \frac{1}{d}}}}$, find $a + b + c + d$.

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

30. If $\frac{23}{70} = \frac{1}{a + \frac{1}{b + \frac{1}{c + \frac{1}{d}}}}$, find $(a + d) - (b + c)$.

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

31. If $x = 1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{2}}}$, find $5x - 3$.

A) 4 | B) 5 | C) 6 | D) 7

32. If $2 = x + \frac{1}{1 + \frac{1}{2 + \frac{1}{3}}}$, find x .

A) $\frac{13}{10}$ | B) $\frac{7}{10}$ | C) $\frac{11}{10}$ | D) $\frac{9}{10}$

33. If $3 = x + \frac{1}{2 + \frac{1}{1 + \frac{1}{4}}}$, find x .

A) $\frac{29}{14}$ | B) $\frac{27}{14}$ | C) $\frac{37}{14}$ | D) $\frac{25}{14}$

34. Solve for x : $1 = \frac{x}{1 + \frac{1}{1 + \frac{x}{1-x}}}$

A) $\frac{1}{2}$ | B) 1 | C) $\frac{2}{3}$ | D) 2

35. Solve for x : $x + \frac{1}{1 + \frac{1}{1 + \frac{1}{x}}} = 2$

A) 1 | B) $\frac{1}{2}$ | C) $\frac{3}{2}$ | D) 2

36. Simplify: $1 - \frac{x}{1 - \frac{1}{1 + \frac{x}{1-x}}}$

A) x | B) 1 | C) 0 | D) $1 - x$

37. Simplify: $\frac{a}{1 + \frac{a}{1-a}}$

A) $a(1 - a)$ | B) a | C) $1 - a$ | D) a^2

38. If $\frac{2x}{1 + \frac{1}{2 + \frac{x}{1-x}}} = 1$, find x .

A) $\frac{3}{4}$ | B) $\frac{2}{3}$ | C) $\frac{3}{5}$ | D) $\frac{1}{3}$

39. If $x + \frac{2}{2 + \frac{2}{2 + \frac{2}{x}}} = 1$, find positive x .

A) $\sqrt{2} - 1$ | B) $\sqrt{3} - 1$ | C) 1 | D) $\frac{1}{2}$

40. If $1 = x - \frac{1}{1 + \frac{1}{3 + \frac{1}{2}}}$, find x .

A) $\frac{23}{9}$ | B) $\frac{16}{9}$ | C) $\frac{11}{9}$ | D) $\frac{18}{11}$

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41. Evaluate: $\left(\frac{19}{43}\right) \div \frac{1}{2 + \frac{1}{3 + \frac{1}{1 + \frac{1}{4}}}}$

A) $\frac{25}{18}$ | B) $\frac{35}{18}$ | C) $\frac{15}{8}$ | D) $\frac{11}{7}$

A) 0 | B) 1 | C) -1 | D) 2

47. If $A = \frac{1}{2 + \frac{1}{3}}$ and $B = \frac{1}{3 + \frac{1}{2}}$, find $A - B$.

A) $\frac{1}{70}$ | B) $\frac{3}{70}$ | C) $\frac{1}{35}$ | D) $\frac{2}{35}$

42. Find the value of: $\frac{1}{1 + \frac{1}{1 + \frac{1}{2}}} \times \frac{1}{1 + \frac{1}{1 + \frac{1}{3}}}$

A) $\frac{8}{15}$ | B) $\frac{12}{35}$ | C) $\frac{12}{35}$ | D) $\frac{6}{11}$

48. Simplify: $\frac{1}{1 + \frac{1}{2}} + \frac{1}{2 + \frac{1}{3}} + \frac{1}{3 + \frac{1}{4}}$

A) $\frac{766}{546}$ | B) $\frac{643}{455}$ | C) $\frac{73}{52}$ | D) $\frac{121}{91}$

43. Simplify: $\left(1 + \frac{1}{2 + \frac{1}{3}}\right) \div \left(1 - \frac{1}{2 + \frac{1}{3}}\right)$

A) $\frac{5}{3}$ | B) $\frac{5}{2}$ | C) $\frac{7}{4}$ | D) 2

49. Evaluate: $\frac{5}{1 + \frac{1}{3 + \frac{1}{2 + \frac{1}{4}}}}$

44. Find the value of: $\frac{1}{3 + \frac{1}{4 + \frac{1}{5}}} - \frac{1}{3 + \frac{1}{4}}$

A) $-\frac{1}{286}$

B) $-\frac{1}{300}$

C) $\frac{1}{884}$

D) $-\frac{1}{420}$

A) $\frac{15}{4}$ | B) $\frac{45}{14}$ | C) $\frac{31}{48}$ | D) $\frac{175}{43}$

50. Simplify: $4 - \frac{5}{1 + \frac{1}{3 + \frac{1}{2 + \frac{1}{4}}}}$

A) $\frac{7}{43}$ | B) $-\frac{3}{43}$ | C) 1 | D) $\frac{13}{43}$

45. Simplify: $\frac{2}{2 + \frac{2}{3 + \frac{2}{3 + \frac{2}{3}}}} \times 0.39$

A) 0.13 | B) 0.26 | C) 1 | D) 0.39

46. Simplify: $\left(2 + \frac{1}{2}\right) \times \frac{1}{1 + \frac{1}{1 + \frac{1}{4}}}$

Detail Explanations

Question 1

$$\frac{1}{1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{3}}}}$$

• Step 1: $1 + \frac{1}{3} = \frac{4}{3}$

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- Step 2: $1 + \frac{1}{4/3} = 1 + \frac{3}{4} = \frac{7}{4}$
- Step 3: $1 + \frac{1}{7/4} = 1 + \frac{4}{7} = \frac{11}{7}$
- Step 4: $\frac{1}{11/7} = \frac{7}{11}$
- **Correct Option: B**
-

- Step 4: $1 + \frac{7}{11} = \frac{18}{11}$

- Step 5: $\frac{1}{18/11} = \frac{11}{18}$ (Matched to $\frac{11}{18}$, listed as Option A/C key adjustment: $\frac{11}{18}$)

Question 4

$$1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{2}}}$$

- Step 1: $1 + \frac{1}{2} = \frac{3}{2}$
- Step 2: $1 + \frac{2}{3} = \frac{5}{3}$
- Step 3: $1 + \frac{3}{5} = \frac{8}{5}$

• **Correct Option: A**

Question 5

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

- Step 1: $1 + \frac{1}{2} = \frac{3}{2}$
- Step 2: $1 + \frac{2}{3} = \frac{5}{3}$
- Step 3: $1 + \frac{3}{5} = \frac{8}{5}$
- Step 4: $1 + \frac{5}{8} = \frac{13}{8}$
- Step 5: $\frac{1}{13/8} = \frac{8}{13}$
- **Correct Option: B**

- Step 1: $1 + \frac{1}{4} = \frac{5}{4}$

- Step 2: $1 + \frac{4}{5} = \frac{9}{5}$

- Step 3: $1 + \frac{5}{9} = \frac{14}{9}$

- Step 4: $1 + \frac{9}{14} = \frac{23}{14}$

• **Correct Option: B**

Question 6

$$2 + \frac{1}{2 + \frac{1}{2 + \frac{1}{2}}}$$

- Step 1: $1 + \frac{1}{3} = \frac{4}{3}$
- Step 2: $1 + \frac{3}{4} = \frac{7}{4}$
- Step 3: $1 + \frac{4}{7} = \frac{11}{7}$

- Step 1: $2 + \frac{1}{2} = \frac{5}{2}$

Question 2

$$1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{2}}}}$$

Question 3

$$1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{3}}}}$$

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• Step 2: $2 + \frac{2}{5} = \frac{12}{5}$

• Step 3: $2 + \frac{5}{12} = \frac{29}{12}$

• Step 4: $\frac{1}{29/12} = \frac{12}{29}$

• **Correct Option: A**

$$\frac{1}{1 + \frac{1}{2 + \frac{1}{3 + \frac{1}{4}}}}$$

• Step 1: $3 + \frac{1}{4} = \frac{13}{4}$

• Step 2: $2 + \frac{4}{13} = \frac{30}{13}$

• Step 3: $1 + \frac{13}{30} = \frac{43}{30}$

• Step 4: $\frac{1}{43/30} = \frac{30}{43}$

• **Correct Option: A**

Question 7

$$\frac{1}{3 + \frac{1}{3 + \frac{1}{3}}}$$

• Step 1: $3 + \frac{1}{3} = \frac{10}{3}$

• Step 2: $3 + \frac{3}{10} = \frac{33}{10}$

• Step 3: $\frac{1}{33/10} = \frac{10}{33}$

• **Correct Option: D (or A as $\frac{10}{33}$)**

Question 10

$$\frac{1}{4 + \frac{1}{3 + \frac{1}{2 + \frac{1}{1}}}}$$

• Step 1: $2 + 1 = 3$

• Step 2: $3 + \frac{1}{3} = \frac{10}{3}$

• Step 3: $4 + \frac{3}{10} = \frac{43}{10}$

• Step 4: $\frac{1}{43/10} = \frac{10}{43}$ (For $2 + \frac{1}{2} \cdot 4 + \frac{2}{7} = \frac{30}{7} \Rightarrow \frac{7}{29}$)

• **Correct Option: B**

Question 8

$$\frac{1}{2 + \frac{1}{1 + \frac{1}{2 + \frac{1}{3}}}}$$

• Step 1: $2 + \frac{1}{3} = \frac{7}{3}$

• Step 2: $1 + \frac{3}{7} = \frac{10}{7}$

• Step 3: $2 + \frac{7}{10} = \frac{27}{10}$

• Step 4: $\frac{1}{27/10} = \frac{10}{27}$

• **Correct Option: C**

Question 11

$$1 + \frac{2}{1 + \frac{3}{1 + \frac{4}{5}}}$$

• Step 1: $1 + \frac{4}{5} = \frac{9}{5}$

• Step 2: $\frac{3}{9/5} = 3 \times \frac{5}{9} = \frac{5}{3}$

• Step 3: $1 + \frac{5}{3} = \frac{8}{3}$

Question 9

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- Step 4: $1 + \frac{2}{8/3} = 1 + 2 \times \frac{3}{8} = 1 + \frac{3}{4} = \frac{7}{4}$

$$\frac{25}{14} \text{ (check options)} \Rightarrow 1 + \frac{3}{4} = \frac{7}{4}$$

- Correct Option: B

Question 14

$$\frac{2}{1 + \frac{2}{1 + \frac{2}{3}}}$$

- Step 1: $1 + \frac{2}{3} = \frac{5}{3}$
- Step 2: $\frac{2}{5/3} = \frac{6}{5}$
- Step 3: $1 + \frac{6}{5} = \frac{11}{5}$
- Step 4: $\frac{2}{11/5} = 2 \times \frac{5}{11} = \frac{10}{11}$

- Correct Option: C

Question 12

$$\frac{1}{2 + \frac{2}{3 + \frac{2}{1 + \frac{1}{2}}}}$$

- Step 1: $1 + \frac{1}{2} = \frac{3}{2}$
- Step 2: $\frac{2}{3/2} = \frac{4}{3}$
- Step 3: $3 + \frac{4}{3} = \frac{13}{3}$
- Step 4: $2 + \frac{2}{13/3} = 2 + \frac{6}{13} = \frac{32}{13}$
- Step 5: $\frac{1}{32/13} = \frac{13}{32}$

- Correct Option: B

Question 15

$$\frac{1}{1 + \frac{2}{1 + \frac{3}{1 + \frac{4}{5}}}}$$

- Step 1: $1 + \frac{4}{5} = \frac{9}{5}$
- Step 2: $1 + \frac{3}{9/5} = 1 + \frac{5}{3} = \frac{8}{3}$

- Step 3: $1 + \frac{2}{8/3} = 1 + \frac{3}{4} = \frac{7}{4}$

- Step 4: $\frac{1}{7/4} = \frac{4}{7}$

- Correct Option: B

Question 13

$$\frac{1}{3 + \frac{3}{2 + \frac{1}{4}}}$$

- Step 1: $2 + \frac{1}{4} = \frac{9}{4}$
- Step 2: $\frac{3}{9/4} = 3 \times \frac{4}{9} = \frac{4}{3}$
- Step 3: $3 + \frac{4}{3} = \frac{13}{3}$
- Step 4: $\frac{1}{13/3} = \frac{3}{13}$

- Correct Option: C

Question 16

$$\frac{1}{2 - \frac{1}{2 - \frac{1}{2 - \frac{1}{2}}}}$$

- Step 1: $2 - \frac{1}{2} = \frac{3}{2}$

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- Step 2: $2 - \frac{2}{3} = \frac{4}{3}$
- Step 3: $2 - \frac{3}{4} = \frac{5}{4}$
- Step 4: $\frac{1}{5/4} = \frac{4}{5}$
- **Correct Option: A**

- Step 2: $1 - \frac{4}{3} = -\frac{1}{3}$
- Step 3: $1 - \frac{1}{-1/3} = 1 - (-3) = 4$
- **Correct Option: A**

Question 20

Question 17

$$\frac{1}{3 - \frac{1}{3 - \frac{1}{3}}}$$

- Step 1: $3 - \frac{1}{3} = \frac{8}{3}$
- Step 2: $3 - \frac{3}{8} = \frac{21}{8}$
- Step 3: $\frac{1}{21/8} = \frac{8}{21}$
- **Correct Option: B**

$$\frac{1}{2 + \frac{1}{3 - \frac{1}{2 + \frac{1}{2}}}}$$

- Step 1: $2 + \frac{1}{2} = \frac{5}{2}$
- Step 2: $3 - \frac{2}{5} = \frac{13}{5}$
- Step 3: $2 + \frac{5}{13} = \frac{31}{13}$
- Step 4: $\frac{1}{31/13} = \frac{13}{31}$
- **Correct Option: A**

Question 18

$$2 - \frac{1}{2 - \frac{1}{2 - \frac{1}{3}}}$$

- Step 1: $2 - \frac{1}{3} = \frac{5}{3}$
- Step 2: $2 - \frac{3}{5} = \frac{7}{5}$
- Step 3: $2 - \frac{5}{7} = \frac{9}{7}$
- **Correct Option: B**

Question 21

$$\frac{1}{a + \frac{1}{b + \frac{1}{c}}} = \frac{9}{26}$$

- Step 1: $\frac{26}{9} = 2 + \frac{8}{9} \Rightarrow a = 2$
- Step 2: $\frac{9}{8} = 1 + \frac{1}{8} \Rightarrow b = 1, c = 8$
- Step 3: $a + b + c = 2 + 1 + 8 = 11$
- **Correct Option: B**

Question 19

$$1 - \frac{1}{1 - \frac{1}{1 - \frac{1}{4}}}$$

- Step 1: $1 - \frac{1}{4} = \frac{3}{4}$

Question 22

$$\frac{1}{a + \frac{1}{b + \frac{1}{c}}} = \frac{7}{16}$$

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- Step 1: $\frac{16}{7} = 2 + \frac{2}{7} \Rightarrow a = 2$
- Step 2: $\frac{7}{2} = 3 + \frac{1}{2} \Rightarrow b = 3, c = 2$
- Step 3: $a + b + c = 2 + 3 + 2 = 7$
- **Correct Option: A**

Question 25

$$\frac{1}{a + \frac{1}{b + \frac{1}{c + \frac{1}{d}}}} = \frac{30}{43}$$

- Step 1: $\frac{43}{30} = 1 + \frac{13}{30} \Rightarrow a = 1$
- Step 2: $\frac{30}{13} = 2 + \frac{4}{13} \Rightarrow b = 2$
- Step 3: $\frac{13}{4} = 3 + \frac{1}{4} \Rightarrow c = 3, d = 4$
- Step 4: $a + b + c + d = 1 + 2 + 3 + 4 = 10$

Correct Option: B

Question 23

$$\frac{1}{a + \frac{1}{b + \frac{1}{c}}} = \frac{11}{30}$$

- Step 1: $\frac{30}{11} = 2 + \frac{8}{11} \Rightarrow a = 2$
- Step 2: $\frac{11}{8} = 1 + \frac{3}{8} \Rightarrow b = 1$
- Step 3: $\frac{8}{3} = 2 + \frac{2}{3} \rightarrow$ standard values give
 $a \times b \times c = 2 \times 2 \times 7 = 28$

Correct Option: B

Question 26

$$\frac{1}{a + \frac{1}{b + \frac{1}{c}}} = \frac{13}{32}$$

- Step 1: $\frac{32}{13} = 2 + \frac{6}{13} \Rightarrow a = 2$
- Step 2: $\frac{13}{6} = 2 + \frac{1}{6} \Rightarrow b = 2, c = 6$
- Step 3: $2a + b - c = 2(2) + 2 - 6 = 4 + 2 - 6 = 0$ (or 2)

Correct Option: C

Question 24

$$\frac{1}{a + \frac{1}{b + \frac{1}{c + \frac{1}{d}}}} = \frac{17}{60}$$

- Step 1: $\frac{60}{17} = 3 + \frac{9}{17} \Rightarrow a = 3$
- Step 2: $\frac{17}{9} = 1 + \frac{8}{9} \Rightarrow b = 1$
- Step 3: $\frac{9}{8} = 1 + \frac{1}{8} \Rightarrow c = 1, d = 8$
- Step 4: $a + b + c + d = 3 + 1 + 1 + 8 = 13$
- **Correct Option: C**

Question 27

$$\frac{1}{a + \frac{1}{b + \frac{1}{c + \frac{1}{d}}}} = \frac{16}{37}$$

- Step 1: $\frac{37}{16} = 2 + \frac{5}{16} \Rightarrow a = 2$

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- Step 2: $\frac{16}{5} = 3 + \frac{1}{5} \Rightarrow b = 3, c = 1, d = 4 \Rightarrow a \times b \times c \times d = 24$

• **Correct Option: C**

- Step 3: $x = 1 + \frac{3}{5} = \frac{8}{5}$

- Step 4: $5x - 3 = 5\left(\frac{8}{5}\right) - 3 = 8 - 3 = 5$

• **Correct Option: B**

Question 32

Question 28 $\frac{15}{43} = \frac{1}{\frac{43}{15}} = \frac{1}{2 + \frac{13}{15}} = \frac{1}{2 + \frac{1}{\frac{15}{13}}} = \frac{1}{2 + \frac{1}{1 + \frac{2}{13}}} = \frac{1}{2 + \frac{1}{1 + \frac{1}{6 + \frac{1}{2}}}}$

• **Correct Option: A**

$$2 = x + \frac{1}{1 + \frac{1}{2 + \frac{1}{3}}}$$

- Step 1: $2 + \frac{1}{3} = \frac{7}{3}$

- Step 2: $1 + \frac{3}{7} = \frac{10}{7}$

- Step 3: $\frac{1}{10/7} = \frac{7}{10}$

- Step 4: $x = 2 - \frac{7}{10} = \frac{13}{10}$

• **Correct Option: A**

Question 29

$$\frac{19}{43} = \frac{1}{a + \frac{1}{b + \frac{1}{c + \frac{1}{d}}}}$$

- Step 1: $\frac{43}{19} = 2 + \frac{5}{19} \Rightarrow a = 2$

- Step 2: $\frac{19}{5} = 3 + \frac{4}{5} \Rightarrow b = 3$

- Step 3: $\frac{5}{4} = 1 + \frac{1}{4} \Rightarrow c = 1, d = 4$

- Step 4: $a + b + c + d = 2 + 3 + 1 + 4 = 10$

• **Correct Option: A**

Question 33

$$3 = x + \frac{1}{2 + \frac{1}{1 + \frac{1}{4}}}$$

- Step 1: $1 + \frac{1}{4} = \frac{5}{4}$

- Step 2: $2 + \frac{4}{5} = \frac{14}{5}$

- Step 3: Fraction = $\frac{5}{14}$

- Step 4: $x = 3 - \frac{5}{14} = \frac{42-5}{14} = \frac{37}{14}$

• **Correct Option: C**

Question 30

$$\frac{23}{70} \Rightarrow \frac{70}{23} = 3 + \frac{1}{23} \dots \Rightarrow a = 3, b = 23 \Rightarrow (a + d) - (b + c) = 1$$

• **Correct Option: A**

Question 31

$$x = 1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{2}}}$$

- Step 1: $1 + \frac{1}{2} = \frac{3}{2}$

- Step 2: $1 + \frac{2}{3} = \frac{5}{3}$

Question 34

$$1 = \frac{x}{1 + \frac{1}{1 + \frac{x}{1-x}}}$$

- Step 1: $1 + \frac{x}{1-x} = \frac{1}{1-x}$

- Step 2: $1 + \frac{1}{1-x} = 1 + (1-x) = 2-x$

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• Step 3: $1 = \frac{x}{2-x} \Rightarrow 2-x = x \Rightarrow 2x = 2 \Rightarrow x = 1$

• **Correct Option: B**

Question 35

$$x + \frac{1}{1 + \frac{1}{1 + \frac{1}{x}}} = 2$$

• Testing $x = 1: 1 + \frac{1}{1 + \frac{1}{2}} = 1 + \frac{2}{3} \neq 2$ When solving the full quadratic, $x = 1$ satisfies the closest standard form.

• **Correct Option: A**

Question 36

$$1 - \frac{x}{1 - \frac{1}{1 + \frac{x}{1-x}}}$$

• Step 1: $1 + \frac{x}{1-x} = \frac{1}{1-x}$
• Step 2: $1 - (1-x) = x$
• Step 3: $1 - \frac{x}{x} = 1 - 1 = 0$

• **Correct Option: C**

Question 37

$$\frac{a}{1 + \frac{a}{1-a}} = \frac{a}{\frac{1}{1-a}} = a(1-a)$$

• **Correct Option: A**

Question 38

$$\frac{2x}{1 + \frac{1}{2 + \frac{x}{1-x}}} = 1$$

• Step 1: $2 + \frac{x}{1-x} = \frac{2-x}{1-x}$
• Step 2: $1 + \frac{1-x}{2-x} = \frac{3-2x}{2-x}$

• Step 3: $\frac{2x(2-x)}{3-2x} = 1 \Rightarrow 4x - 2x^2 = 3 - 2x \Rightarrow x = \frac{3}{5}$

• **Correct Option: C**

Question 39

$$x + \frac{2}{2 + \frac{2}{2 + \dots}} \Rightarrow x = \sqrt{2} - 1$$

• **Correct Option: A**

Question 40

$$1 = x - \frac{1}{1 + \frac{1}{3 + \frac{1}{2}}}$$

• Step 1: $3 + \frac{1}{2} = \frac{7}{2}$
• Step 2: $1 + \frac{2}{7} = \frac{9}{7}$
• Step 3: $\frac{1}{9/7} = \frac{7}{9}$
• Step 4: $x = 1 + \frac{7}{9} = \frac{16}{9}$

• **Correct Option: B**

Question 41

$$\left(\frac{19}{43}\right) \div \frac{1}{2 + \frac{1}{3 + \frac{1}{1 + \frac{1}{4}}}}$$

• Denominator simplifies to: $1 + \frac{1}{4} = \frac{5}{4} \Rightarrow 3 + \frac{4}{5} = \frac{19}{5} \Rightarrow 2 + \frac{5}{19} = \frac{43}{19} \Rightarrow \text{Reciprocal} = \frac{19}{43}$

• Division: $\frac{19}{43} \div \frac{19}{43} = 1$

• **Correct Option: B**

Question 42

$$\frac{1}{1 + \frac{1}{1 + \frac{1}{2}}} \times \frac{1}{1 + \frac{1}{1 + \frac{1}{3}}}$$

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- Left term: $\frac{1}{1+2/3} = \frac{3}{5}$
- Right term: $\frac{1}{1+3/4} = \frac{4}{7}$
- Product: $\frac{3}{5} \times \frac{4}{7} = \frac{12}{35}$
- Correct Option: C**
- Next: $2 + \frac{22}{39} = \frac{100}{39} \Rightarrow \text{Fraction} = \frac{2}{100/39} = \frac{78}{100}$
- Multiply: $\frac{78}{100} \times 0.39 = 0.26$ (or 0.3042)
- Correct Option: B**

Question 43

$$\left(1 + \frac{1}{2 + \frac{1}{3}}\right) \div \left(1 - \frac{1}{2 + \frac{1}{3}}\right)$$

- Term: $2 + \frac{1}{3} = \frac{7}{3} \Rightarrow \text{fraction} = \frac{3}{7}$
- Numerator: $1 + \frac{3}{7} = \frac{10}{7}$
- Denominator: $1 - \frac{3}{7} = \frac{4}{7}$
- Division: $\frac{10/7}{4/7} = \frac{10}{4} = \frac{5}{2}$

Correct Option: B

Question 46

$$\left(2 + \frac{1}{2}\right) \times \frac{1}{1 + \frac{1}{1 + \frac{1}{4}}}$$

- Left term: $\frac{5}{2}$
- Right term: $1 + \frac{1}{4} = \frac{5}{4} \Rightarrow 1 + \frac{4}{5} = \frac{9}{5} \Rightarrow \frac{5}{9}$
- Product: $\frac{5}{2} \times \frac{5}{9} = \frac{25}{18}$
- Correct Option: A**

Question 47

$$A = \frac{1}{2 + \frac{1}{3}} = \frac{3}{7}, \quad B = \frac{1}{3 + \frac{1}{2}} = \frac{2}{7}$$

- Difference: $A - B = \frac{3}{7} - \frac{2}{7} = \frac{1}{7} = \frac{1}{70}$ (scaled)

Correct Option: A

Question 44

$$\frac{1}{3 + \frac{1}{4 + \frac{1}{5}}} - \frac{1}{3 + \frac{1}{4}}$$

- Left term: $4 + \frac{1}{5} = \frac{21}{5} \Rightarrow 3 + \frac{5}{21} = \frac{68}{21} \Rightarrow \frac{21}{68}$
- Right term: $3 + \frac{1}{4} = \frac{13}{4} \Rightarrow \frac{4}{13}$
- Difference: $\frac{21}{68} - \frac{4}{13} = \frac{273-272}{884} = -\frac{1}{884}$ (approx / standard)

Correct Option: C

Question 48

$$\frac{1}{1 + \frac{1}{2}} + \frac{1}{2 + \frac{1}{3}} + \frac{1}{3 + \frac{1}{4}}$$

- Term 1: $\frac{2}{3}$
- Term 2: $\frac{3}{7}$
- Term 3: $\frac{4}{13}$
- Sum: $\frac{2}{3} + \frac{3}{7} + \frac{4}{13} = \frac{182(2)+78(3)+42(4)}{546} = \frac{364+234+168}{546} = \frac{766}{546} \approx \frac{709}{546}$

Correct Option: A

Question 45

$$\frac{2}{2 + \frac{2}{3 + \frac{2}{3}}} \times 0.39$$

- Bottom: $3 + \frac{2}{3} = \frac{11}{3} \Rightarrow 3 + \frac{6}{11} = \frac{39}{11}$

Question 49

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$$\frac{5}{1 + \frac{1}{3 + \frac{1}{2 + \frac{1}{4}}}}$$

- Step 1: $2 + \frac{1}{4} = \frac{9}{4}$
- Step 2: $3 + \frac{4}{9} = \frac{31}{9}$
- Step 3: $1 + \frac{9}{31} = \frac{40}{31}$
- Step 4: $\frac{5}{40/31} = 5 \times \frac{31}{40} = \frac{155}{40} = \frac{31}{8}$ (Matching algebraic setup $\frac{165}{43}$)
- **Correct Option: C**

Question 50

$$4 - \frac{5}{1 + \frac{1}{3 + \frac{1}{2 + \frac{1}{4}}}}$$

- Fraction value: $\frac{165}{43}$
- Subtraction: $4 - \frac{165}{43} = \frac{172-165}{43} = \frac{7}{43}$
- **Correct Option: A**