

Conceptual Multiple Choice Questions: Partial Fractions (Exercise 5.1)

Class 11 Mathematics (Chapter 5)

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MCQs

1. **(Low)** A proper rational fraction has:
 - (a) Degree of numerator less than degree of denominator
 - (b) Degree of numerator equal to degree of denominator
 - (c) Degree of numerator greater than degree of denominator
 - (d) No common factors between numerator and denominator
2. **(Low)** The partial fraction form of $\frac{1}{(x-1)(x+1)}$ includes terms with denominators:
 - (a) $(x-1), (x+1)$
 - (b) $(x-1)^2, (x+1)^2$
 - (c) $x, (x-1)$
 - (d) (x^2-1)
3. **(Low)** For $\frac{x}{(x-1)(x-2)(x-3)}$, the number of partial fraction terms is:
 - (a) 3
 - (b) 2
 - (c) 4
 - (d) 1
4. **(Low)** To resolve an improper fraction like $\frac{x^4}{x^2-1}$, the first step is:
 - (a) Polynomial division
 - (b) Factor the numerator
 - (c) Set up partial fractions directly
 - (d) Equate coefficients
5. **(Medium)** The coefficient A in $\frac{1}{(x-1)(x+1)} = \frac{A}{x-1} + \frac{B}{x+1}$ when $x = 1$ is:
 - (a) $-\frac{1}{2}$
 - (b) $\frac{1}{2}$
 - (c) 1
 - (d) -1
6. **(Medium)** The partial fraction of $\frac{2}{(x+1)(x-1)}$ is:

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

(b) $\frac{1}{x+1} + \frac{1}{x-1}$

(c) $\frac{-2}{x+1} + \frac{2}{x-1}$

(d) $\frac{1}{x+1} - \frac{1}{x-1}$

7. (Medium) For $\frac{2x+1}{(x-1)(x+2)(x+3)}$, the coefficient A when $x = 1$ is:

(a) $\frac{1}{4}$

(b) 1

(c) $-\frac{1}{4}$

(d) $\frac{3}{4}$

8. (Medium) The polynomial part of $\frac{6x^3+5x^2-7}{2x^2-x-1}$ after division is:

(a) $3x + 4$

(b) $2x + 3$

(c) $x + 1$

(d) $3x - 4$

9. (Medium) The coefficient B in $\frac{7x-3}{(x-1)(2x+1)} = \frac{A}{x-1} + \frac{B}{2x+1}$ when $x = -\frac{1}{2}$ is:

(a) $\frac{13}{3}$

(b) $\frac{4}{3}$

(c) $-\frac{13}{3}$

(d) $-\frac{4}{3}$

10. (Medium) The partial fraction of $\frac{x}{(x-1)(x-2)(x-3)}$ includes a term:

(a) $\frac{3}{2(x-1)}$

(b) $\frac{-1}{x-2}$

(c) $\frac{1}{x-3}$

(d) $\frac{2}{x-1}$

11. (High) The coefficient A in $\frac{x}{(x-a)(x-b)(x-c)} = \frac{A}{x-a} + \frac{B}{x-b} + \frac{C}{x-c}$ is:

(a) $\frac{a}{(a-b)(a-c)}$

(b) $\frac{a}{(b-a)(c-a)}$

(c) $\frac{b}{(a-b)(a-c)}$

(d) $\frac{c}{(a-c)(b-c)}$

12. (High) The remainder after dividing $\frac{x^3-9x^2+23x-15}{x^3-12x^2+44x-48}$ is:

(a) $3x^2 - 21x + 33$

(b) $x^2 - 3x + 5$

(c) $2x + 3$

(d) $x - 1$

13. (High) The coefficient C in $\frac{3x^2-21x+33}{(x-2)(x-4)(x-6)} = \frac{A}{x-2} + \frac{B}{x-4} + \frac{C}{x-6}$ when $x = 6$ is:

(a) $\frac{15}{8}$

(b) $\frac{3}{8}$

(c) $\frac{3}{4}$

(d) $\frac{1}{8}$

14. (High) The partial fraction form of $\frac{1}{(1-2x)(1-3x)(1-4x)}$ includes a term:

(a) $\frac{4}{(1-2x)}$

(b) $\frac{9}{2(1-3x)}$

(c) $\frac{16}{3(1-4x)}$

(d) $\frac{1}{(1-2x)}$

15. (High) The coefficient A in $\frac{x^2+1}{(x^2+4)(x^2+9)(x^2+16)}$ after substituting $y = x^2$ is:

(a) $\frac{1-4}{(9-4)(16-4)}$

(b) $\frac{1-9}{(4-9)(16-9)}$

(c) $\frac{1-16}{(4-16)(9-16)}$

(d) $\frac{1}{(4)(9)}$

16. (High) The partial fraction of $\frac{6x^3+5x^2-7}{2x^2-x-1}$ includes:

(a) $3x + 4 + \frac{4}{3(x-1)} + \frac{13}{3(2x+1)}$

(b) $3x + 4 + \frac{1}{x-1} + \frac{1}{2x+1}$

(c) $2x + 3 + \frac{2}{x-1} + \frac{3}{2x+1}$

(d) $3x + 4 + \frac{13}{3(x-1)} + \frac{4}{3(2x+1)}$

17. (Medium) The denominator factorization for $\frac{3x^2-4x-5}{(x-2)(x^2+7x+10)}$ is:

(a) $(x-2)(x+2)(x+5)$

(b) $(x-2)(x-2)(x+5)$

(c) $(x-2)(x+7)(x+10)$

(d) $(x-2)(x+1)(x+5)$

18. (Medium) The coefficient B in $\frac{-2x+3}{x(x-1)(2x+3)} = \frac{A}{x} + \frac{B}{x-1} + \frac{C}{2x+3}$ when $x = 1$ is:

(a) $\frac{1}{5}$

(b) $-\frac{1}{5}$

(c) $\frac{8}{5}$

(d) -1

19. (Low) An improper fraction example is:

(a) $\frac{x^3}{x^2-1}$

(b) $\frac{1}{x^2+1}$

(c) $\frac{2x-3}{x^3+4}$

(d) $\frac{5}{x-2}$

20. (Low) The method to solve for constants in partial fractions is:

(a) Substitution or equating coefficients

(b) Factoring the numerator

(c) Synthetic division

(d) Completing the square

Answers and Explanations

1. Answer: a

Explanation: A proper rational fraction has the degree of the numerator less than the degree of the denominator (page 343). Option (a) is correct; others describe improper fractions or unrelated properties.

2. Answer: a

Explanation: For $\frac{1}{(x-1)(x+1)}$, partial fractions have denominators $(x-1)$ and $(x+1)$ (Q.1, page 344). Option (a) is correct; others include incorrect or repeated factors.

3. Answer: a

Explanation: Three distinct linear factors $(x-1)(x-2)(x-3)$ yield three partial fraction terms (Q.6, page 349). Option (a) is correct; others are incorrect counts.

4. Answer: a

Explanation: Improper fractions require polynomial division first (Q.2, page 345). Option (a) is correct; others are incorrect initial steps.

5. Answer: b

Explanation: Set $x = 1$: $1 = 2A \Rightarrow A = \frac{1}{2}$ (Q.1, page 344, note sign error in original). Option (b) is correct; others do not match.

6. Answer: a

Explanation: For $\frac{2}{(x+1)(x-1)}$, solve: $2 = A(x-1) + B(x+1)$. Set $x = 1$: $2 = 2B \Rightarrow B = 1$. Set $x = -1$: $2 = -2A \Rightarrow A = -1$. Result: $\frac{-1}{x+1} + \frac{1}{x-1}$. Option (a) is correct (Q.2, page 345).

7. Answer: a

Explanation: Set $x = 1$: $3 = 12A \Rightarrow A = \frac{1}{4}$ (Q.3, page 346). Option (a) is correct; others do not match.

8. Answer: a

Explanation: Division yields $3x + 4 + \frac{7x-3}{2x^2-x-1}$ (Q.7, page 350). Option (a) is correct; others are incorrect polynomials.

9. Answer: a

Explanation: Set $x = -\frac{1}{2}$: $-\frac{13}{2} = -\frac{3}{2}B \Rightarrow B = \frac{13}{3}$ (Q.7, page 351). Option (a) is correct; others do not match.

10. Answer: b

Explanation: Solve: $x = A(x-2)(x-3) + B(x-1)(x-3) + C(x-1)(x-2)$. Set $x = 2$: $2 = -B \Rightarrow B = -1$. Term: $\frac{-1}{x-2}$. Option (b) is correct (Q.6 variant).

11. Answer: a

Explanation: Set $x = a$: $a = A(a-b)(a-c) \Rightarrow A = \frac{a}{(a-b)(a-c)}$ (Q.6, page 349). Option (a) is correct; others are incorrect substitutions.

12. Answer: a

Explanation: Division yields $1 + \frac{3x^2-21x+33}{x^3-12x^2+44x-48}$ (Q.9, page 354). Option (a) is correct; others are incorrect remainders.

13. Answer: a

Explanation: Set $x = 6$: $15 = 8C \Rightarrow C = \frac{15}{8}$ (Q.9, page 355). Option (a) is correct; others do not match.

14. Answer: b

Explanation: Solve: $1 = A(1-3x)(1-4x) + B(1-2x)(1-4x) + C(1-2x)(1-3x)$. Set $x = \frac{1}{3}$: $1 = \frac{2}{9}B \Rightarrow B = \frac{9}{2}$. Term: $\frac{9}{2(1-3x)}$. Option (b) is correct (Q.10, page 356).

15. Answer: a

Explanation: Let $y = x^2$: $\frac{y+1}{(y+4)(y+9)(y+16)}$. Set $y = -4$: $-3 = A(5)(12) \Rightarrow A = \frac{-3}{60} = \frac{1-4}{(9-4)(16-4)}$. Option (a) is correct (Q.11, page 357).

16. Answer: a

Explanation: Result is $3x + 4 + \frac{4}{3(x-1)} + \frac{13}{3(2x+1)}$ (Q.7, page 352). Option (a) is correct; others have incorrect coefficients.

17. Answer: a

Explanation: Factor: $x^2 + 7x + 10 = (x+2)(x+5)$. Denominator: $(x-2)(x+2)(x+5)$ (Q.4, page 347). Option (a) is correct; others are incorrect factorizations.

18. Answer: a

Explanation: Set $x = 1$: $1 = 5B \Rightarrow B = \frac{1}{5}$ (Q.8, page 353). Option (a) is correct; others do not match.

19. Answer: a

Explanation: $\frac{x^3}{x^2-1}$ has degree 3 in numerator, 2 in denominator (page 344). Option (a) is correct; others are proper fractions.

20. Answer: a

Explanation: Constants are found by substitution or equating coefficients (all questions, e.g., Q.1). Option (a) is correct; others are unrelated methods.