

## CHAPTER 14

# FACTORISATION

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### Key Facts

Factorisation using following methods and identities :

- (i) Regrouping method
- (ii)  $a^2 + 2ab + b^2 = (a + b)^2$
- (iii)  $a^2 - 2ab + b^2 = (a - b)^2$
- (iv)  $a^2 - b^2 = (a + b)(a - b)$
- (v)  $x^2 + (a + b)x + ab = (x + a)(x + b)$

The general relation for division is –

$$\text{Dividend} = \text{Divisor} \times \text{Quotient} + \text{Remainder}$$

When Remainder = 0

$$\text{Dividend} = \text{Divisor} \times \text{Quotient}$$

Which shows if one factor is known, then other can be found by dividing the original expression by that factor.

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### QUESTIONS

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1. Find all the factors of  $14xy^2$ .
2. Give the factors which are common in  $6xyz$  and  $9yz^2$
3. Factorize the expression  $2xy + 6y^2$
4. Which is the factor common in all terms?  $3xy + 15x^2y + 9xy^2 + 21y^3$
5. Give the two factors of  $x^2 + 6x + 5$ .
6. Find two numbers  $A$  and  $B$  so that  $A + B = 12$  and  $AB = 27$ .
7. Factorise  $x^2 + 12x + 35$
8. Find two numbers 'a' and 'b' so that  $ab = 36$  and  $(a - b) = 5$ .

9. Factorize  $6x^3 - 4x^2$ .
10. Simplify  $[10^2 - 18 \times 10 + 81]$
11. Put appropriate sign in the place of boxes :
- $$(x^2 - 5x - 36) \square (x \square 9) = (x + 4).$$
12.  $(x + 1)^2 - (x - 1)^2 = \underline{\hspace{2cm}}$ .
13. Simplify :  $\frac{(x^2 + 11x + 28)}{(x + 4)}$ .
14. Find the product :  $(a - b - c)(a - b + c)$
15. Find  $x$  if  $x(y - z) = \frac{(4y^2 - 4z^2)}{(y + z)}$ .
16. Factorize :  $6xy - 2y + 3 - 9x$ .
17. Express  $y^2 - 9y + 20$  as product of two expressions.
18. Simplify :  $\frac{4m^2 - 169n^2}{2m + 13n}$ .
19. Complete it  $(a^3 + b^3)(a^3 - b^3) = \underline{\hspace{2cm}}$ .
20. Find the value of  $3^4 - 1^4$  using the identity  $x^4 - y^4 = (x + y)(x - y)(x^2 + y^2)$ .
21. Factorize :  $x^2 - 11x - 96$ .
22. Find two numbers so that their product is 56 and difference is 10.
23. Simplify :  $x^2 - 10x - 96$ .
24. Simplify :  $\frac{x^2 - 13x + 40}{(x - 8)}$ .
25.  $x^2 - x - 12 = (x - 4) \times \underline{\hspace{2cm}}$ .
26. Find  $x$  and  $y$  that  $xy = 72$ ,  $x + y = 17$ .
27. Factorize :  $x^2 + 4x - 21$ .
28. Simplify :  $\frac{x^2 - 12x - 45}{x^2 + 4x + 3}$ .
29. Express as product of two linear factors.  $x^2 - 17x + 16$ .
30. Find the remainder in the following :  $(x^4 - a^4) \div (x^2 + a^2)$ .
31. Simplify :  $\frac{(0.87)^2 - (0.13)^2}{(0.87 - 0.13)}$ .

32. Find dividend, when

$$\text{Divisor} = x + 3, \quad \text{Quotient} = x + 2, \quad \text{Remainder} = 0.$$

33. Find Quotient if

$$\text{Dividend} = x^2, \quad \text{Divisor} = x - 3, \quad \text{Remainder} = 9.$$

34. Factorize :  $3x^2 - 10x + 8$ .

35. Complete it :  $x^2 + 25x + 84 = (x + 21) \times \underline{\hspace{2cm}}$ .

36. Complete it :  $x^2 - x - 156 = (\underline{\hspace{2cm}}) \times (x + 12)$ .

37. Factorize :  $x^2 - 30x - 216$ .

38. Find  $x^2 - y^2$  if  $x = 5, y = 7$ .

39. Find two numbers  $m$  and  $n$  so that

$$m + n = 19$$

$$mn = 70$$

40. Find  $y$  if,  $(2x + 7)(2x - 7) + y = 4x^2$

41. Find the value of :  $(3a + b)^2 - (3a - b)^2$ .

42. Find  $z$  if,  $(x + 4)(x - 5) - z = x(x - 1)$

43. Find the value of  $81x^2 + 36xy + 4y^2$  if  $x = \frac{1}{9}, y = \frac{-1}{2}$ .

44. Put appropriate sign in the place of boxes

$$(x^2 \square 10x - 56) \div (x \square 4) = x - 14$$

45. Factorize :  $4x^2 - 12xy + 9y^2$ .

46. Factorize :  $(x + y)^2 - (x - y)^2$ .

47. Divide  $100abc(3a - 12)(6b - 36)$  by  $9(a - 4)(b - 6)$ .

48. Find the quotient :  $z(4y^2 - 64) \div 4z(y - 4)$

49. Complete the brackets -

$$(x + a)(x + b) = x^2 + (\quad)x + (\quad)$$

50. The sum and product of two numbers is same and both equal to 4. Find the numbers.

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## ANSWERS

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|--|---------------------|
| 1. $2 \times 7 \times x \times y \times y$ | 2. $3yz$            |
| 3. $2y(x + 3y)$                            | 4. $3y$             |
| 5. $(x + 1)(x + 5)$                        | 6. $A = 9, B = 3$ . |
| 7. $(x + 5)(x + 7)$                        | 8. $a = 9, b = 4$ . |
| 9. $2x^2(3x - 2)$                          | 10. $1$             |
| 11. $\div, -$                              | 12. $4x$            |

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|-----------------------|-----------------------------|
| 13. $x + 7$           | 14. $a^2 - 2ab + b^2 - c^2$ |
| 15. 4                 | 16. $(3x - 1)(2y - 3)$      |
| 17. $(y - 4)(y - 5)$  | 18. $2m - 13n$              |
| 19. $a^6 - b^6$       | 20. 80                      |
| 21. $(x - 15)(x + 4)$ | 22. 14, 4                   |
| 23. $(x - 16)(x + 6)$ | 24. $x - 5$                 |
| 25. $x + 3$           | 26. $x = 9, y = 8.$         |
| 27. $(x + 7)(x - 3)$  | 28. $\frac{x - 15}{x + 1}$  |
| 29. $(x - 16)(x - 1)$ | 30. 0                       |
| 31. 1                 | 32. $x^2 + 5x + 6$          |
| 33. $x + 3$           | 34. $(x - 2)(3x - 4)$       |
| 35. $(x + 4)$         | 36. $(x - 13)$              |
| 37. $(x - 36)(x + 6)$ | 38. -24                     |
| 39. $m = 14, n = 5.$  | 40. $y = 49$                |
| 41. $12ab$            | 42. -20                     |
| 43. 0                 | 44. -, +.                   |
| 45. $(2x - 3y)^2$     | 46. $4xy$                   |
| 47. $200abc$          | 48. $y + 4$                 |
| 49. $a + b, ab$       | 50. 2, 2                    |

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### TEST YOUR KNOWLEDGE

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- Factorize :  $x^2(y + 5) - 4(y + 5)$
- Find  $(x^4 + y^4)(x^4 - y^4)$  if  $x = 1, y = 1.$
- Factorize :  $16x^2 + 40xy + 25y^2$
- Divide  $121x^5y^4z^3$  by  $11x^3y^2z.$
- Complete it :  $(x + 3)(x - 5) = x^2 + ( \quad )x + ( \quad ).$
- Simplify :  $\frac{(1.9)^2 - (1.1)^2}{3}$
- Factorize :  $x^2 - 3x + 2.$
- Find the value of  $25^2 - 24^2.$
- Find the common factor in  $7x^2y + 49xy^2 + 343x^3y^2.$
- Find the value of  $\frac{x^3y - xy^3}{xy}$  as a product of two factors.

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## ANSWERS

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1.  $(y + 5)(x + 2)(x - 2)$

2. 0

3.  $(4x + 5y)^2$

4.  $11x^2y^2z^2$

5. -2, -15.

6. 0.8

7.  $(x - 2)(x - 1)$

8. 49

9.  $7xy$

10.  $(x + y)(x - y)$ .