

EXERCISE 7.4

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Factorize each of the following expressions:

1. $qr - pr + qs - ps$

Solution:

We have,

$$qr - pr + qs - ps$$

By grouping similar terms we get,

$$qr + qs - pr - ps$$

$$q(r + s) - p(r + s)$$

$$(q - p)(r + s)$$

2. $p^2q - pr^2 - pq + r^2$

Solution:

We have,

$$p^2q - pr^2 - pq + r^2$$

By grouping similar terms we get,

$$p^2q - pq - pr^2 + r^2$$

$$pq(p - 1) - r^2(p - 1)$$

$$(p - 1)(pq - r^2)$$

3. $1 + x + xy + x^2y$

Solution:

We have,

$$1 + x + xy + x^2y$$

$$1(1 + x) + xy(1 + x)$$

$$(1 + x)(1 + xy)$$

4. $ax + ay - bx - by$

Solution:

We have,

$$ax + ay - bx - by$$

$$a(x + y) - b(x + y)$$

$$(a - b)(x + y)$$

5. $xa^2 + xb^2 - ya^2 - yb^2$

Solution:

We have,

$$xa^2 + xb^2 - ya^2 - yb^2$$

$$x(a^2 + b^2) - y(a^2 + b^2)$$
$$(x - y)(a^2 + b^2)$$

6. $x^2 + xy + xz + yz$

Solution:

We have,

$$x^2 + xy + xz + yz$$
$$x(x + y) + z(x + y)$$
$$(x + y)(x + z)$$

7. $2ax + bx + 2ay + by$

Solution:

We have,

$$2ax + bx + 2ay + by$$

By grouping similar terms we get,

$$2ax + 2ay + bx + by$$
$$2a(x + y) + b(x + y)$$
$$(2a + b)(x + y)$$

8. $ab - by - ay + y^2$

Solution:

We have,

$$ab - by - ay + y^2$$

By grouping similar terms we get,

$$ab - ay - by + y^2$$
$$a(b - y) - y(b - y)$$
$$(a - y)(b - y)$$

9. $axy + bcxy - az - bcz$

Solution:

We have,

$$axy + bcxy - az - bcz$$

By grouping similar terms we get,

$$axy - az + bcxy - bcz$$
$$a(xy - z) + bc(xy - z)$$
$$(a + bc)(xy - z)$$

10. $lm^2 - mn^2 - lm + n^2$

Solution:

We have,

$$lm^2 - mn^2 - lm + n^2$$

By grouping similar terms we get,

$$lm^2 - lm - mn^2 + n^2$$

$$lm(m - 1) - n^2(m - 1)$$

$$(lm - n^2)(m - 1)$$

11. $x^3 - y^2 + x - x^2y^2$

Solution:

We have,

$$x^3 - y^2 + x - x^2y^2$$

By grouping similar terms we get,

$$x^3 + x - y^2 - x^2y^2$$

$$x(1 + x^2) - y^2(1 + x^2)$$

$$(x - y^2)(1 + x^2)$$

12. $6xy + 6 - 9y - 4x$

Solution:

We have,

$$6xy + 6 - 9y - 4x$$

By grouping similar terms we get,

$$6xy - 4x - 9y + 6$$

$$2x(3y - 2) - 3(3y - 2)$$

$$(2x - 3)(3y - 2)$$

13. $x^2 - 2ax - 2ab + bx$

Solution:

We have,

$$x^2 - 2ax - 2ab + bx$$

By grouping similar terms we get,

$$x^2 + bx - 2ax - 2ab$$

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

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

14. $x^3 - 2x^2y + 3xy^2 - 6y^3$

Solution:

We have,

$$x^3 - 2x^2y + 3xy^2 - 6y^3$$

By grouping similar terms we get,

$$\begin{aligned} & x^3 + 3xy^2 - 2x^2y - 6y^3 \\ & x(x^2 + 3y^2) - 2y(x^2 + 3y^2) \\ & (x - 2y)(x^2 + 3y^2) \end{aligned}$$

15. $abx^2 + (ay - b)x - y$

Solution:

We have,

$$abx^2 + (ay - b)x - y$$

$$abx^2 - ayx - bx - y$$

By grouping similar terms we get,

$$abx^2 - bx - ayx - y$$

$$bx(ax - 1) + y(ax - 1)$$

$$(bx + y)(ax - 1)$$

16. $(ax + by)^2 + (bx - ay)^2$

Solution:

We have,

$$(ax + by)^2 + (bx - ay)^2$$

$$a^2x^2 + b^2y^2 + 2axby + b^2x^2 + a^2y^2 - 2axby$$

$$a^2x^2 + b^2y^2 + b^2x^2 + a^2y^2$$

By grouping similar terms we get,

$$a^2x^2 + a^2y^2 + b^2y^2 + b^2x^2$$

$$a^2(x^2 + y^2) + b^2(x^2 + y^2)$$

$$(a^2 + b^2)(x^2 + y^2)$$

17. $16(a - b)^3 - 24(a - b)^2$

Solution:

We have,

$$16(a - b)^3 - 24(a - b)^2$$

$$8(a - b)^2 [2(a - b) - 3]$$

$$8(a - b)^2 (2a - 2b - 3)$$

18. $ab(x^2 + 1) + x(a^2 + b^2)$

Solution:

We have,

$$ab(x^2 + 1) + x(a^2 + b^2)$$

$$abx^2 + ab + xa^2 + xb^2$$

By grouping similar terms we get,

$$abx^2 + xa^2 + ab + xb^2$$

$$ax (bx + a) + b (bx + a) \\ (ax + b) (bx + a)$$

19. $a^2x^2 + (ax^2 + 1)x + a$

Solution:

We have,

$$a^2x^2 + (ax^2 + 1)x + a$$

$$a^2x^2 + ax^3 + x + a$$

$$ax^2 (a + x) + 1 (x + a)$$

$$(x + a) (ax^2 + 1)$$

20. $a (a - 2b - c) + 2bc$

Solution:

We have,

$$a (a - 2b - c) + 2bc$$

$$a^2 - 2ab - ac + 2bc$$

$$a (a - 2b) - c (a - 2b)$$

$$(a - 2b) (a - c)$$

21. $a (a + b - c) - bc$

Solution:

We have,

$$a (a + b - c) - bc$$

$$a^2 + ab - ac - bc$$

$$a (a + b) - c (a + b)$$

$$(a + b) (a - c)$$

22. $x^2 - 11xy - x + 11y$

Solution:

We have,

$$x^2 - 11xy - x + 11y$$

By grouping similar terms we get,

$$x^2 - x - 11xy + 11y$$

$$x (x - 1) - 11y (x - 1)$$

$$(x - 11y) (x - 1)$$

23. $ab - a - b + 1$

Solution:

We have,

$$ab - a - b + 1$$
$$a(b - 1) - 1(b - 1)$$
$$(a - 1)(b - 1)$$

24. $x^2 + y - xy - x$

Solution:

We have,

$$x^2 + y - xy - x$$

By grouping similar terms we get,

$$x^2 - x + y - xy$$

$$x(x - 1) - y(x - 1)$$

$$(x - y)(x - 1)$$

