7. Factorisation

Exercise 7A

1. Question

Answer

(i) $12x + 15$

Taking 3 as common from the whole, we get,

$12x + 15 = 3(4x + 5)$.

(ii) $14m - 21$,

Taking 7 as common from the whole, we get,

$14m - 21 = 7(2m - 3)$

(iii) $9n - 12n^2$,

Taking 3n as common from the whole, we get,

$9n - 12n^2 = 3n(3 - 4n)$.

2. Question

Answer

(i) Let's take HCF of $16a^2 - 24ab$

Taking 8a as common from the whole, we get,

$16a^2 - 24ab = 8a(2a - 3b)$.

(ii) $15ab^2 - 20a^2b$,

Taking 5ab as common from the whole, we get,

$15ab^2 - 20a^2b = 5ab(3b - 4a)$

(iii) $12x^2y^3 - 21x^3y^2$,

Taking $3x^2y^2$ as common from the whole, we get,

$12x^2y^3 - 21x^3y^2 = 3x^2y^2(4y - 7x)$

3. Question

Answer

(i)

Taking $12x^2$ as common from the whole, we get,

$24x^3 - 36x^2y = 12x^2(2x - 3y)$

(ii)

Taking $5x^2$ as common from the whole, we get,

$10x^3 - 15x^2 = 5x^2(2x - 3)$

(iii)

Taking $12x^2y$ as common from the whole, we get,

$36x^3y - 60x^2y^3z = 12x^2y(3x - 5y^2z)$

4. Question

Answer

(i) Let's find out the HCF of $9x^3$, $6x^2$, $12x$

$$
\begin{array}{c|l}
3x & 9x^3, 6x^2, 12x \\
\hline
& 3x^2, 2x, 4
\end{array}
$$

$3x$ is the highest common factor which divides $9x^3$, $6x^2$ and $12x$.

So,

$9x^3 - 6x^2 + 12x = 3x(3x^2 - 2x + 4)$

(ii) Let's find out the HCF of $8x^3$, $72xy$ and $12x$

$$
\begin{array}{c|l}
4x & 8x^3, 72xy, 12x \\
\hline
& 2x, 18y, 3
\end{array}
$$

$4x$ is the highest common factor which divides $8x^3$, $72xy$ and $12x$.

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So,

$8x^3 - 72xy + 12x = 4x(2x^2 - 18y + 3)$

(iii) Let's find out the HCF of $18a^3b^3, 27a^2b^3, 36a^3b^2$

$$9a^2b^2 \mid 18a^3b^3, 27a^2b^3, 36a^3b^2$$

$$2ab, 3b, 4a$$

$9a^2b^2$ is the highest common factor which divides $18a^3b^3, 27a^2b^3, 36a^3b^2$.

So,

$18a^3b^3 - 27a^2b^3 + 36a^3b^2 = 9a^2b^2 (2ab - 3b + 4a)$

5. Question

Answer

(i) Let's find out the HCF of $14x^3, 21x^4y$ and $28x^2y^2$

$$7x^2 \mid 14x^3, 21x^4y, 28x^2y^2$$

$$2x, 3x^2y, 4y^2$$

$7x^2$ is the highest common factor of $14x^3, 21x^4y, 28x^2y^2$

So,

$14x^3 + 21x^4y - 28x^2y^2 = 7x^2(2x + 3x^2y - 4y^2)$

(ii) Let's find out the HCF of $5, 10t$ and $20t^2$,

$$5 \mid 5, 10t, 20t^2$$

$$1, 2t, 4t^2$$

5 is the highest common factor of $5, 10t$ and $20t^2$.

So,

$- 5 - 10t + 20t^2 = - 5(1 + 2t - 4t^2)$

(Note: As we have learned in the previous chapter when we multiplied – sign with – sign it become +)

6. Question

Answer

(i)

Taking x + 3 as common from the whole, we get,

(x + 3)(x + 5).

Hence, x(x + 3) + 5(x + 3) = (x + 3)(x + 5)

(ii)

Taking x – 4 as common from the whole, we get,

5x(x – 4) –7(x – 4) = (x – 4)(5x – 7).

(iii)

Taking 1 – n as common from the whole, we get,

2m(1 – n) +3(1 – n) = (1 – n)(2m + 3).

7. Question

Answer

Taking a – 2b as common from the whole, we get,

= (a – 2b)(6a + 5b).

8. Question

Factories:

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

Answer

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

Taking 2a – b as common from the whole, we get,

= $(2a - b)(x^3 + x^2)$.

9. Question

Answer

Taking 3a – 5b as common from the whole, we get,

= (3a – 5b)(9a – 12a²).

10. Question

Answer

Taking (x + 5) as common from the whole, we get,

= (x + 5){(x + 5) – 4}

= (x + 5)(x + 5 – 4)

= (x + 5)(x + 1)

So,

The factors of $(x + 5)^2 – 4(x + 5)$ are: (x + 5) and (x + 1)

11. Question

Answer

= (a – 2b) {3(a – 2b) – 5}

= (a – 2b){(3a – 6b) – 5}

= (a – 2b)(3a – 6b – 5)

So,

We get,

$3(a – 2b)^2 – 5(a – 2b) = (a – 2b)(3a – 6b – 5)$

12. Question

Answer

$2a + 6b – 3(a + 3b)^2 = 2(a + 3b) – 3(a + 3b)^2$

= (a + 3b){2 – 3(a + 3b)}

= (a + 3b){2 – 3a – 9b}

13. Question

Answer

$16(2p – 3q)^2 – 4(2p – 3q)$

= (2p – 3q){16(2p – 3q) – 4}

= (2p – 3q){(32p – 48q) – 4}

= (2p – 3q)(32p – 48q – 4)

= 4(2p – 3q)(8p – 12q –1)

So,

We get,

16(2p – 3q)² – 4(2p – 3q) = 4(2p – 3q)(8p – 12q –1)

14. Question

Answer

= x(a – 3) – y(a – 3)

= (a – 3)(x – y)

15. Question

Answer

= 12(2x – 3y)² + 16(2x –3y)

[Taking (2x – 3y) common from the expression]

= (2x – 3y) {12(2x – 3y) + 16}

= (2x – 3y)(24x – 36y + 16)

[Taking 4 common from the expression]

= 4(2x – 3y)(6x – 9y + 4)

So,

We get,

12(2x – 3y)² – 16(3y – 2x) = 4(2x – 3y)(6x – 9y + 4)

16. Question

Answer

= (x + y){(2x + 5) – (x + 3)}

= (x + y)(2x + 5 – x – 3)

= (x + y)(2x – x + 5 – 3)

= (x + y)(x + 2)

So,

We get,

$(x + y)(2x + 5) - (x + y)(x + 3) = (x + y)(x + 2)$

17. Question

Answer

First group the terms together;

$= (ar + br) + (at + bt)$

$= r(a + b) + t(a + b)$

$= (a + b)(r + t)$

So,

We get,

$ar + br + at + bt = (a + b)(r + t)$

18. Question

Answer

Let's arrange the terms in a suitable form;

$x^2 - ax - bx + ab$

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

$= (x^2 - bx) - (ax - ab)$

$= x(x - b) - a(x - b)$

$= (x - b)(x - a)$

So we get,

$x^2 - ax - bx + ab = (x - b)(x - a)$

19. Question

Answer

Let's first arrange the terms in a suitable form;

$ab^2 - bc^2 - ab + c^2$

$= ab^2 - ab - bc^2 + c^2$

$= (ab^2 - ab) - (bc^2 - c^2)$

$= ab(b - 1) - c^2(b - 1)$

$= (b - 1)(ab - c^2)$

So we get,

$ab^2 - bc^2 - ab + c^2 = (b - 1)(ab - c^2)$

20. Question

Answer

Let's first arrange the terms in a suitable form;

$x^2 - xz + xy - yz$

$= x^2 + xy - xz - yz$

$= (x^2 + xy) - (xz + yz)$

$= x(x + y) - z(x + y)$

$= (x + y)(x - z)$

So we get,

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

21. Question

Answer

$6ab - b^2 + 12ac - 2bc$

$= 6ab + 12ac - b^2 - 2bc$

$= (6ab + 12ac) - (b^2 + 2bc)$

$= 6a(b + 2c) - b(b + 2c)$

$= (b + 2c)(6a - b)$

So we get,

$6ab - b^2 + 12ac - 2bc = (b + 2c)(6a - b)$

22. Question

Answer

$(x - 2y)^2 + 4x - 8y$

$= (x - 2y)^2 + 4(x - 2y)$

$= (x - 2y)(x - 2y) + 4(x - 2y)$

$= (x - 2y)\{(x - 2y) + 4\}$

= (x – 2y)(x – 2y + 4)

So we get,

$(x - 2y)^2 + 4x - 8y = = (x - 2y)(x - 2y + 4)$

23. Question

Answer

$y^2 - xy(1 - x) - x^3$

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

$= (y^2 - xy) + (x^2y - x^3)$

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

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

So we get,

$y^2 - xy(1 - x) - x^3 = (y - x)(y + x^2)$

24. Question

Answer

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

By using the formulas;

$(a + b)^2 = a^2 + b^2 + 2ab$ and

$(a - b)^2 = a^2 + b^2 - 2ab$

$= (a^2x^2 + b^2y^2 + 2axby) + (b^2x^2 + a^2y^2 - 2bxay)$

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

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

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

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

So we get,

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

25. Question

Answer

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

$= ab^2 + ba - b - 1$

$= (ab^2 + ba) - (b + 1)$

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

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

So we get,

$ab^2 + (a - 1)b - 1 = (b + 1)(ab - 1)$

26. Question

Answer

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

$= x^2(x - 3) + 1(x - 3)$

$= (x - 3)(x^2 + 1)$

So we get,

$x^3 - 3x^2 + x - 3 = (x - 3)(x^2 + 1)$

27. Question

Answer

$= abx^2 + aby^2 - a^2xy - b^2xy$

$= abx^2 - a^2xy + aby^2 - b^2xy$

$= ax(bx - ay) + by(ay - bx)$

$= ax(bx - ay) - by(bx - ay)$

$= (bx - ay)(ax - by)$

So we get,

$ab(x^2 + y^2) - xy(a^2 + b^2) = (bx - ay)(ax - by)$

28. Question

Answer

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

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

$= (x^2 - 2bx) - (ax - 2ab)$

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

= (x – 2b)(x – a)

So we get,

$x^2 - x(a + 2b) + 2ab = (x - 2b)(x - a)$

Exercise 7B

1. Question

Answer

We have,

Which is,

$= (x)^2 - (6)^2$

By using the formula $a^2 - b^2 = (a + b)(a - b)$

We get,

$x^2 - 36 = (x)^2 - (6)^2$

$= (x + 6)(x - 6)$

2. Question

Answer

We have,

$= (2a)^2 - (3)^2$

By using the formula $a^2 - b^2 = (a + b)(a - b)$

We get,

$4a^2 - 9 = (2a)^2 - (3)^2$

$= (2a + 3)(2a - 3)$

3. Question

Answer

We have,

$= (9)^2 - (7x)^2$

By using the formula $a^2 - b^2 = (a + b)(a - b)$

We get,

$81 - 49x^2 = (9)^2 - (7x)^2$

$= (9 + 7x)(9 - 7x)$

4. Question

Factories:

Answer

We have,

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

By using the formula $a^2 - b^2 = (a + b)(a - b)$

We get,

$4x^2 - 9y^2 = (2x)^2 - (3y)^2$

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

5. Question

Answer

We have,

$= (4a)^2 - (15b)^2$

By using the formula $a^2 - b^2 = (a + b)(a - b)$

We get,

$16a^2 - 225b^2 = (4a)^2 - (15b)^2$

$= (4a + 15b)(4a - 15b)$

6. Question

Answer

We have,

$= (3ab)^2 - (5)^2$

By using the formula $a^2 - b^2 = (a + b)(a - b)$

We get,

$9a^2b^2 - 25 = (3ab)^2 - (5)^2$

$= (3ab + 5)(3ab - 5)$

7. Question

Answer

We have,

$= (4a)^2 - (12)^2$

By using the formula $a^2 - b^2 = (a + b)(a - b)$

We get,

$16a^2 - 144 = (4a)^2 - (12)^2$

$= (4a + 12)(4a - 12)$

$= 4(a + 3)\ 4(a - 3)$

$= 16(a + 3)(a - 3)$

8. Question

Answer

We have,

$= 7(9a^2 - 16b^2)$

By using the formula $a^2 - b^2 = (a + b)(a - b)$

We get,

$63a^2 - 112b^2 = 7(9a^2 - 16b^2)$

$= 7\{(3a)^2 - (4b)^2\}$

$= 7(3a + 4b)(3a - 4b)$

9. Question

Answer

We have,

$= 5(4a^2 - 9b^2)$

By using the formula $a^2 - b^2 = (a + b)(a - b)$

We get,

$20a^2 - 45b^2 = 5(4a^2 - 9b^2)$

$= 5\{(2a)^2 - (3b)^2\}$

$= 5(2a + 3b)(2a - 3b)$

10. Question

Answer

We have,

$= 3(4x^2 – 9)$

By using the formula $a^2 – b^2 = (a + b)(a – b)$

We get,

$12x^2 – 27 = 3(4x^2 – 9)$

$= 3\{(2x)^2 – (3)^2\}$

$= 3(2x + 3)(2x – 3)$

11. Question

Answer

We have,

$= x(x^2 – 64)$

By using the formula $a^2 – b^2 = (a + b)(a – b)$

We get,

$x^3 – 64x = x(x^2 – 64)$

$= x\{(x)^2 – (8)^2\}$

$= x(x + 8)(x – 8)$

12. Question

Answer

We have,

$= 3x^3(x^2 – 9)$

By using the formula $a^2 – b^2 = (a + b)(a – b)$

We get,

$16x^5 – 144x^3 = 3x^3(x^2 – 9)$

$= 16x^3\{(x)^2 – (3)^2\}$

$= 16x^3(x + 3)(x – 3)$

13. Question

Answer

We have,

$= 3x^3(x^2 - 16)$

By using the formula $a^2 - b^2 = (a + b)(a - b)$

We get,

$3x^5 - 48x^3 = 3x^3(x^2 - 16)$

$= 3x^3\{(x)^2 - (4)^2\}$

$= 3x^3(x + 4)(x - 4)$

14. Question

Answer

We have,

$= 4p(4p^2 - 1)$

By using the formula $a^2 - b^2 = (a + b)(a - b)$

We get,

$16p^3 - 4p = 4p(4p^2 - 1)$

$= 4p\{(2p)^2 - (1)^2\}$

$= 4p(2p + 1)(2p - 1)$

15. Question

Answer

We have,

$= 7(9a^2b^2 - 1)$

By using the formula $a^2 - b^2 = (a + b)(a - b)$

We get,

$63a^2b^2 - 7 = 7(9a^2b^2 - 1)$

$= 7\{(3ab)^2 - (1)^2\}$

$= 7(3ab + 1)(3ab - 1)$

16. Question

Answer

We have,

$= (1)^2 - (b - c)^2$

By using the formula $a^2 - b^2 = (a + b)(a - b)$

We get,

$1 - (b - c)^2 = (1)^2 - (b - c)^2$

$= \{1 + (b - c)\}\{1 - (b - c)\}$

$= (1 + b - c)(1 - b + c)$

17. Question

Answer

$(2a + 3b)^2 - (4c)^2$

By using the formula $a^2 - b^2 = (a + b)(a - b)$

We get,

$(2a + 3b)^2 - 16c^2 = (2a + 3b)^2 - (4c)^2$

$= \{(2a + 3b) + 4c\}\{(2a + 3b) - 4c\}$

$= (2a + 3b + 4c)(2a + 3b - 4c)$

18. Question

Answer

We have,

$(l + m)^2 - (l - m)^2$

By using the formula $a^2 - b^2 = (a + b)(a - b)$ Here, $a = (l + m)$ and $b = (l - m)$

$\Rightarrow (l + m)^2 - (l - m)^2 = \{(l + m) + (l - m)\}\{(l + m) - (l - m)\}$

$= (l + m + l - m)(l + m - l + m)$ $= (2l)(2m)$

$= 4lm$

19. Question

Answer

Given,

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

$= (2x + 5y)^2 - (1)^2$

By using the formula $a^2 - b^2 = (a + b)(a - b)$

We get,

$(2x + 5y)^2 - (1)^2 = (2x + 5y)^2 - (1)^2$

$= \{(2x + 5y) + 1\}\{(2x + 5y) - 1\}$

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

20. Question

Answer

Given,

$(6c)^2 - (5a + b)^2$

By using the formula $a^2 - b^2 = (a + b)(a - b)$

We get,

$36c^2 - (5a + b)^2 = (6c)^2 - (5a + b)^2$

$= \{(6c) + (5a + b)\}\{(6c) - (5a + b)\}$

$= (6c + 5a + b)(6c - 5a - b)$

21. Question

Answer

Given,

$= (3x - 4y)^2 - (5z)^2$

By using the formula $a^2 - b^2 = (a + b)(a - b)$

We get,

$(3x - 4y)^2 - 25z^2 = (3x - 4y)^2 - (5z)^2$

$= \{(3x - 4y) + 5z\}\{(3x - 4y) - 5z\}$

$= (3x - 4y + 5z)(3x - 4y - 5z)$

22. Question

Answer

Given,

$x^2 - y^2 - 2y - 1$

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

By using the formula $a^2 - b^2 = (a + b)(a - b)$

We get,

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

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

$= \{x + (y + 1)\}\{x - (y + 1)\}$

$= (x + y + 1)(x - y - 1)$

23. Question

Answer

Given,

$25 - a^2 - b^2 - 2ab$

$= 25 - (a^2 + b^2 + 2ab)$

By using the formula $a^2 - b^2 = (a + b)(a - b)$

We get,

$25 - a^2 - b^2 - 2ab = 25 - (a^2 + b^2 + 2ab)$

$= 25 - (a + b)^2$

$= (5)^2 - (a + b)^2$

$= \{5 + (a + b)\}\{5 - (a + b)\}$

$= (5 + a + b)(5 - a - b)$

24. Question

Answer

Given,

$25a^2 - 4b^2 + 28bc - 49c^2$

$= 25a^2 - (4b^2 - 28bc + 49c^2)$

By using the formula $a^2 - b^2 = (a + b)(a - b)$

We get,

$25a^2 - 4b^2 + 28bc - 49c^2 = 25a^2 - (4b^2 - 28bc + 49c^2)$

$= (5a)^2 - (2b - 7c)^2$

$= \{5a + (2b - 7c)\}\{5a - (2b - 7c)\}$

$= (5a + 2b - 7c)(5a - 2b + 7c)$

25. Question

Answer

Given,

$9a^2 - (b^2 - 4b + 4)$

By using the formula $a^2 - b^2 = (a + b)(a - b)$

We get,

$9a^2 - b^2 + 4b - 4 = 9a^2 - (b^2 - 4b + 4)$

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

$= \{3a + (b - 2)\}\{3a - (b - 2)\}$

$= (3a + b - 2)(3a - b + 2)$

26. Question

Answer

Given,

By using the formula $a^2 - b^2 = (a + b)(a - b)$

We get,

$100 - (x - 5)^2 = (10)^2 - (x - 5)^2$

$= \{10 + (x - 5)\}\{10 - (x - 5)\}$

$= (10 + x - 5)(10 - x + 5)$

$= (5 + x)(15 - x)$

27. Question

Answer

Given,

By using the formula $a^2 - b^2 = (a + b)(a - b)$

We get,

$\{(405)^2 - (395)^2\} = (405 + 395)(405 - 395)$

$= (800 \times 10)$

= 8000

28. Question

Answer

We have,

By using the formula $a^2 - b^2 = (a + b)(a - b)$

We get,

$\{(7.8)^2 - (2.2)^2\} = (7.8 + 2.2)(7.8 - 2.2)$

$= (10 \times 5.6)$

$= 56$

So,

$\{(7.8)^2 - (2.2)^2\} = 56$

Exercise 7C

1. Question

Answer

Given,

By using the formula $(a + b)^2 = a^2 + 2ab + b^2$

We get,

$= x^2 + 2 \times (x) \times 4 + (4)^2$

$= (x + 4)^2$

2. Question

Answer

Given;

By using the formula $(a + b)^2 = a^2 + 2ab + b^2$

We get,

$= x^2 + 2 \times (x) \times 7 + (7)^2$

$= (x + 7)^2$

3. Question

Answer

Given,

$1 + 2x + x^2 = x^2 + 2x + 1$

By using the formula $(a + b)^2 = a^2 + 2ab + b^2$

We get,

$= x^2 + 2 \times (x) \times 1 + (1)^2$

$= (x + 1)^2$

$= (x + 1)(x + 1)$

4. Question

Answer

Given,

$9 + 6z + z^2 = z^2 + 6z + 9$

By using the formula $(a + b)^2 = a^2 + 2ab + b^2$

We get,

$= z^2 + 2 \times z \times 3 + (3)^2$

$= (3 + z)^2$

5. Question

Answer

Given;

$x^2 + 6ax + 9a^2$

By using the formula $(a + b)^2 = a^2 + 2ab + b^2$

We get,

$= x^2 + 2 \times (x) \times 3a + (3a)^2$

$= (x + 3a)^2$

6. Question

Answer

Given;

$4y^2 + 20y + 25$

By using the formula $(a + b)^2 = a^2 + 2ab + b^2$

We get,

$= (2y)^2 + 2 \times 2y \times 5 + (5)^2$

$= (2y + 5)^2$

7. Question

Answer

Given,

By using the formula $(a + b)^2 = a^2 + 2ab + b^2$

We get,

$= (6a)^2 + 2 \times 6a \times 3 + (3)^2$

$= (6a + 3)^2$

8. Question

Answer

Given,

$9m^2 + 24m + 16$

By using the formula $(a + b)^2 = a^2 + 2ab + b^2$

We get,

$= (3m)^2 + 2 \times 3m \times 4 + (4)^2$

$= (3m + 4)^2$

9. Question

Answer

Given,

$z^2 + z + \dfrac{1}{4}$

By using the formula $(a + b)^2 = a^2 + 2ab + b^2$

We get,

$= z^2 + 2 \times z \times \dfrac{1}{2} + \left(\dfrac{1}{2}\right)^2$

$= \left(z + \dfrac{1}{2}\right)$

10. Question

Answer

Given,

$49a^2 + 84ab + 36b^2$

By using the formula $(a + b)^2 = a^2 + 2ab + b^2$

We get,

$= (7a)^2 + 2 \times 7a \times 6b + (6b)^2$

$= (7a + 6b)^2$

11. Question

Answer

Given,

$P^2 - 10p + 25$

By using the formula $(a - b)^2 = a^2 - 2ab + b^2$

We get,

$= p^2 - 2 \times p \times 5 + (5)^2$

$= (p - 5)^2$

12. Question

Answer

Given,

$121a^2 - 88ab + 16b^2$

By using the formula $(a - b)^2 = a^2 - 2ab + b^2$

We get,

$= (11a)^2 - 2 \times 11a \times 4b + (4b)^2$

$= (11a - 4b)^2$

13. Question

Answer

Given,

$1 - 6x + 9x^2 = 9x^2 - 6x + 1$

By using the formula $(a - b)^2 = a^2 - 2ab + b^2$

We get,

$= (3x)^2 - 2 \times (3x) \times 1 + (1)^2$

$= (3x - 1)^2$

14. Question

Answer

Given,

$9y^2 - 12y + 4$

By using the formula $(a - b)^2 = a^2 - 2ab + b^2$

We get,

$= (3y)^2 - 2 \times 3y \times 2 + (2)^2$

$= (3y - z)^2$

15. Question

Answer

Given,

$16x^2 - 24x + 9$

By using the formula $(a - b)^2 = a^2 - 2ab - b^2$

$= (4x)^2 - 2 \times (4x) \times 3 + (3)^2$

$= (4x - 3)^2$

16. Question

Answer

Given,

$m^2 - 4mn + 4n^2$

By using the formula $(a - b)^2 = a^2 - 2ab - b^2$

$= m^2 - 2 \times m \times 2n + (2n)^2$

$= (m - 2n)^2$

17. Question

Answer

Given,

By using the formula $(a - b)^2 = a^2 + b^2 - 2ab$

We get,

$= (ab)^2 - 2 \times ab \times 3c + (3c)^2$

$= (ab - 3c)^2$

18. Question

Answer

Given,

By using the formula $(a + b)^2 = a^2 + b^2 + 2ab$

We get,

$= (m^2)^2 + 2 \times m^2 \times n^2 + (n^2)^2$

$= (m^2 + n^2)$

19. Question

Answer

Given,

By using the formula $(a + b)^2 = a^2 + b^2 + 2ab$

We get,

$(l + m)^2 - 4lm = (l^2 + m^2 + 2lm) - 4lm$

$= l^2 + m^2 + 2lm - 4lm$

$= l^2 + m^2 - 2lm$

$= (l)^2 + (m)^2 - 2 \times l \times m$

$= (l - m)^2$

Exercise 7D

1. Question

Answer

Given,

Now first find the numbers whose–

Sum = 5 and

Product = 6

Required numbers are 2 and 3,

So we get;

$x^2 + 5x + 6$

$= x^2 + 2x + 3x + 6$

$= x(x + 2) + 3(x + 2)$

$= (x + 2)(x + 3)$

2. Question

Answer

Given,

Now first find the numbers whose–

Sum = 10 and

Product = 24

Required numbers are 6 and 4,

So we get;

$y^2 + 10y + 24 = y^2 + 6y + 4y + 24$

$= y(y + 6) + 4(y + 6)$

$= (y + 6)(y + 4)$

3. Question

Answer

Now first find the numbers whose–

Sum = 12 and

Product = 27

Required numbers are 9 and 3,

So we get;

$z^2 + 12z + 27$

$= z^2 + 9z + 3z + 27$

$= z(z + 9) + 3(z + 9)$

$= (z + 9)(z + 3)$

4. Question

Answer

Given,

Now first find the numbers whose–

Sum = 6 and

Product = 8

Required numbers are 4 and 2,

So we get;

$p^2 + 6p + 8$

$= p^2 + 4p + 2p + 8$

$= p(p + 4) + 2(p + 4)$

$= (p + 4)(p + 2)$

5. Question

Answer

Given,

Now first find the numbers whose–

Sum = 15 and

Product = 56

Required numbers are 7 and 8,

So we get;

$x^2 + 15x + 56$

$= x^2 + 7x + 8x + 56$

$= x(x + 7) + 8(x + 7)$

$= (x + 7)(x + 8)$

6. Question

Answer

Now first find the numbers whose–

Sum = 19 and

Product = 60

Required numbers are 15 and 4,

So we get;

$y^2 + 19y + 60$

$= y^2 + 15y + 4y + 60$

$= y(y + 15) + 4(y + 15)$

$= (y + 15)(y + 4)$

7. Question

Answer

Given,

Now first find the numbers whose–

Sum = 13 and

Product = 40

Required numbers are 8 and 5,

So we get;

$x^2 + 13x + 40$

$= x^2 + 8x + 5x + 40$

$= x(x + 8) + 5(x + 8)$

$= (x + 8)(x + 5)$

8. Question

Answer

Given,

Now first find the numbers whose–

Sum = – 10 and

Product = 21

Required numbers are 7 and 3,

So we get;

$q^2 – 10q + 21$

$= q^2 – 7q – 3q + 21$

$= q(q – 7) – 3(q – 7)$

= (q − 7)(q − 3)

9. Question

Answer

Given,

Now first find the numbers whose–

Sum = 6 and

Product = − 16

Required numbers are 8 and 2,

So we get;

$p^2 + 6p − 16$

$= p^2 + 8p − 2p − 16$

$= p(p + 8) − 2(p + 8)$

$= (p + 8)(p − 2)$

10. Question

Answer

Given,

Now first find the numbers whose–

Sum = − 10 and

Product = 24

Required numbers are 6 and 4,

So we get;

$x^2 − 10x + 24$

$= x^2 − 6x − 4x + 24$

$= x(x − 6) − 4(x − 6)$

$= (x − 6)(x − 4)$

11. Question

Answer

Given,

Now, first we have to find out the numbers whose–

Sum = – 23 and

Product = 42

The numbers are 21 and 2,

So,

$x^2 – 23x + 42 = x^2 – 21x – 2x + 42$

$= x(x – 21) – 2(x – 21)$

$= (x – 21)(x – 2)$

12. Question

Answer

Given,

Now, first we have to find out the numbers whose–

Sum = – 17 and

Product = 16

The numbers are 16 and 1,

So,

$x^2 – 17x + 16 = x^2 – 16x – 1x + 16$

$= x(x – 16) – 1(x – 16)$

$= (x – 16)(x – 1)$

13. Question

Factorize:

Answer

Given,

Now, first we have to find out the numbers whose–

Sum = – 21 and

Product = 90

The numbers are 15 and 6,

So,

$y^2 – 21y + 90 = y^2 – 15y – 6y + 90$

$= y(y – 15) – 6(y – 15)$

$= (y – 15)(y – 6)$

14. Question

Answer

Given,

Now, first we have to find out the numbers whose–

Sum = – 22 and

Product = 117

The numbers are 13 and 9,

So,

$x^2 - 22x + 117 = x^2 - 13x - 9x + 117$

$= x(x - 13) - 9(x - 13)$

$= (x - 13)(x - 9)$

15. Question

Answer

Now, first we have to find out the numbers whose–

Sum = – 9 and

Product = 20

The numbers are 5 and 4,

So,

$x^2 - 9x + 20 = x^2 - 5x - 4x + 20$

$= x(x - 5) - 4(x - 5)$

$= (x - 5)(x - 4)$

16. Question

Answer

Now, first we have to find out the numbers whose–

Sum = 1 and

Product = – 132

The numbers are 12 and 11,

So,

$x^2 + x - 132 = x^2 + 12x - 11x - 132$

$= x(x + 12) - 11(x + 12)$

$= (x + 12)(x - 11)$

17. Question

Answer

Now, first we have to find out the numbers whose–

Sum = 5 and

Product = – 104

The numbers are 13 and 8,

So,

$x^2 + 5x - 104 = x^2 + 13x - 8x - 104$

$= x(x + 13) - 8(x + 13)$

$= (x + 13)(x - 8)$

18. Question

Answer

Now, first we have to find out the numbers whose–

Sum = 7 and

Product = – 144

The numbers are 16 and – 9,

So,

$y^2 + 7y - 144$

$= y^2 + 16y - 9y - 144$

$= y(y + 16) - 9(y + 16)$

$= (y + 16)(y - 9)$

19. Question

Answer

Given,

Now, first we have to find out the numbers whose–

Sum = 19 and

Product = – 150

The numbers are 25 and 6,

So,

$z^2 + 19z - 150$

$= z^2 + 25z - 6z - 150$

$= z(z + 25) - 6(z + 25)$

$= (z + 25)(z - 6)$

20. Question

Answer

Given,

Now, first we have to find out the numbers whose–

Sum = 1 and

Product = – 72

The numbers are 9 and 8,

So,

$y^2 + y - 72$

$= y^2 + 9y - 9y - 72$

$= y(y + 9) - 9(y + 9)$

$= (y + 9)(y - 9)$

21. Question

Answer

Now, first we have to find out the numbers whose–

Sum = 6 and

Product = – 91

The numbers are 13 and 7,

So,

$a^2 + 6a - 91$

$= a^2 + 13a - 7a - 91$

= a(a + 13) – 7(a + 13)

= (a + 13) (a – 7)

22. Question

Answer

Now, first we have to find out the numbers whose–

Sum = – 4 and

Product = – 77

The numbers are 11 and 7,

So,

$p^2 – 4p – 77$

$= p^2 – 11p + 7p – 77$

$= p(p – 11) + 7(p – 11)$

$= (p – 11)(p + 7)$

23. Question

Answer

Now, first we have to find out the numbers whose–

Sum = – 7 and

Product = – 30

The numbers are 10 and 3,

So,

$x^2 – 7x – 30$

$= x^2 – 10x + 3x – 30$

$= x(x – 10) + 3(x – 10)$

$= (x – 10)(x + 3)$

24. Question

Answer

Now, first we have to find out the numbers whose–

Sum = − 11 and

Product = − 42

The numbers are 14 and 3,

So,

$x^2 − 11x − 42$

$= x^2 − 14x + 3x − 42$

$= x(x − 14) + 3(x + 14)$

$= (x − 14)(x + 3)$

25. Question
Answer

Now, first we have to find out the numbers whose−

Sum = − 5 and

Product = − 24

The numbers are − 8 and 3,

So,

$x^2 − 5x − 24$

$= x^2 − 8x + 3x − 24$

$= x(x − 8) + 3(x − 8)$

$= (x − 8)(x + 3)$

26. Question
Answer

Given;

Now first find the numbers whose−

Sum = − 6 and

Product = − 135

Required numbers are 15 and 9,

So we get;

$y^2 − 6y − 135$

$= y^2 − 15y + 9y − 135$

$= y(y − 15) + 9(y − 15)$

= (y − 15)(y + 9)

27. Question

Answer

Given

Now first find the numbers whose−

Sum = − 12 and

Product = − 45

Required numbers are 15 and 3,

So we get;

$z^2 − 12z − 45$

$= z^2 − 15z + 3z − 45$

$= z(z − 15) + 3(z − 15)$

$= (z − 15)(z + 3)$

28. Question

Answer

Given,

Now first find the numbers whose−

Sum = − 4 and

Product = − 12

Required numbers are 6 and 2,

So we get;

$x^2 − 4x − 12$

$= x^2 − 6x + 2x − 12$

$= x(x − 6) + 2(x − 6)$

$= (x − 6)(x + 2)$

29. Question

Answer

Given,

Now first find the numbers whose-

Sum = 10 and

Product = $3 \times 8 = 24$

Required numbers are 6 and 4,

So we get;

$3x^2 + 10x + 8$

$= 3x^2 + 6x + 4x + 8$

$= 3x(x + 2) + 4(x + 2)$

$= (x + 2)(3x + 4)$

30. Question

Answer

Given,

Now first find the numbers whose-

Sum = 14 and

Product = $3 \times 8 = 24$

Required numbers are 12 and 2,

So we get;

$3y^2 + 14y + 8 = 3y^2 + 12y + 2y + 8$

$= 3y(y + 4) + 2(y + 4)$

$= (y + 4)(3y + 2)$

31. Question

Answer

Given,

Now, first we have to find out the numbers whose-

Sum = -10 and

Product = $3 \times 8 = 24$

The numbers are 6 and 4,

So,

$3z^2 - 10z + 8$

= 3z² – 6z – 4z + 8

= 3z(z – 2) – 4(z – 2)

= (z – 2)(3z – 4)

32. Question

Answer

Given,

Now first find the numbers whose–

Sum = 1 and

Product = – 45 × 2 = – 90

Required numbers are 10 and 9,

So we get;

$2x^2 + x - 45$

$= 2x^2 + 10x - 9x - 45$

$= 2x(x + 5) - 9(x + 5)$

$= (x + 5)(2x - 9)$

33. Question

Answer

Given,

Now first find the numbers whose–

Sum = 11 and

Product = – 10 × 6 = – 60

Required numbers are 15 and 4,

So we get;

$= 6p^2 + 15p - 4p - 10$

$= 3p(2p + 5) - 2(2p + 5)$

$= (2p + 5)(3p - 2)$

34. Question

Answer

Given,

Now first find the numbers whose–

Sum = – 17 and

Product = – 30 × 2 = – 60

Required numbers are 20 and 3,

So we get;

$2x^2 – 17x – 30$

$= 2x^2 – 20x + 3x – 30$

$= 2x(x – 10) + 3(x – 10)$

$= (x – 10)(2x + 3)$

35. Question

Answer

Given,

Now first find the numbers whose–

Sum = – 19 and

Product = – 6 × 7 = – 42

Required numbers are 21 and 2,

So we get;

$7y^2 – 19y – 6$

$= 7y^2 – 21y + 2y – 6$

$= 7y(y – 3) + 2(y – 3)$

$= (y – 3)(7y + 2)$

36. Question

Answer

Given,

Now first find the numbers whose–

Sum = – 31 and

Product = – 5 × 28 = 140

Required numbers are 35 and 4,

So we get;

28 − 31x − 5x²

= 28 + 4x − 35x − 5x²

= 4(7 + x) − 5x(7 + x)

= (7 + x)(4 − 5x)

37. Question

Answer

Given,

Now first find the numbers whose–

Sum = 23 and

Product = − 8 × 3 = 24

Required numbers are 24 and 1,

So we get;

3 + 23z − 8z²

= 3 + 24z − z − 8z²

= 3(1 + 8z) − z(1 + 8z)

= (1 + 8z)(3 − z)

38. Question

Answer

Given,

Now first find the numbers whose–

Sum = − 5 and

Product = − 6 × 6 = − 36

Required numbers are 9 and 4,

So we get;

= 6x² − 9x + 4x − 6

= 3x(2x − 3) + 2(2x − 3)

= (2x − 3)(3x + 2)

39. Question

Answer

Given,

Now first find the numbers whose-

Sum = 24 and

Product = $36 \times 3 = 108$

Required numbers are 18 and 6,

So we get;

$3m^2 + 24m + 36$

$= 3m^2 + 18m + 6m + 36$

$= 3m(m + 6) + 6(m + 6)$

$= (m + 6)(3m + 6)$

40. Question

Answer

Given,

Now first find the numbers whose-

Sum = $- 8$ and

Product = $4 \times 3 = 12$

Required numbers are 6 and 2,

So we get;

$4n^2 - 8n + 3$

$= 4n^2 - 2n - 6n + 3$

$= 2n(2n - 1) - 3(2n - 3)$

$= (2n - 1)(2n - 3)$

41. Question

Answer

Given,

Now, first we have to find out the numbers whose-

Sum = $- 17$ and

Product = $6 \times - 3 = - 18$

The numbers are 18 and 1,

So,

6x² – 17x – 3

= 6x² – 18x + 1x – 3

= 6x(x – 3) + 1(x – 3)

= (x – 3)(6x + 1)

42. Question

Answer

Given,

Now, first we have to find out the numbers whose–

Sum = – 19 and

Product = 7 × – 6 = – 42

The numbers are 21 and 2,

So,

7x² – 19x – 6

= 7x² – 21x + 2x – 6

= 7x(x – 3) + 2(x – 3)

= (x – 3)(7x + 2)

Exercise 7E

1. Question

Answer

$(7a^2 – 63b^2) = 7(a^2 – 9b^2)$ (taking 7 as common from whole)

$= 7(a – 3b)(a + 3b) \because a^2 – b^2 = (a – b)(a + b)$

2. Question

Answer

$(2x – 32x^3) = 2x(1 – 16x^2)$ (taking 2x as common from whole)

$= 2x(1 – 4x)(1 + 4x) \because a^2 – b^2 = (a – b)(a + b)$

3. Question

Answer

$X^3 – 144x = x(x^2 – 144)$ (taking x as common from whole)

$= x(x – 12)(x + 12) \because a^2 – b^2 = (a – b)(a + b)$

4. Question

Answer

$2 – 50x^2 = 2(1 – 25x^2)$ (taking 2 as common from whole)

$= 2(1 – 5x)(1 + 5x) \because a^2 – b^2 = (a – b)(a + b)$

5. Question

Answer

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

Rearranging the terms and taking a and c as common respectively.

$= a(a + b) + c(a + b)$

$= (a + c)(a + b).$

6. Question

Answer

$pq^2 + q(p - 1) - 1 = pq^2 + qp - q - 1$

$= pq(q + 1) - 1(q + 1)$

$= (pq - 1)(q + 1)$

7. Question

Answer

$= ab - mn + an - bm = ab + an - mn - bm$

$= a(b + n) - m(n + b)$

$= (a - m)(b + n).$

8. Question

Answer

$ab - a - b + 1$

$= a(b - 1) - 1(b - 1)$ (taking a and − 1 as common)

$= (a - 1)(b - 1).$

9. Question

Answer

$= x^2 - xz + xy - yz$

$= x(x - z) + y(x - z)$ (taking x and y as common resp.)

$= (x + y)(x - z).$

10. Question

Answer

$12m^2 - 27 = 3(4m^2 - 9)$ (taking 3 as common from whole)

$= 3(2m - 3)(2m + 3) \because a^2 - b^2 = (a - b)(a + b)$

11. Question

Answer

$x^3 - x = x(x^2 - 1)$ (taking x as common from whole)

$= x(x - 1)(x + 1) \because a^2 - b^2 = (a - b)(a + b)$

12. Question

Answer

$1 - 2ab - (a^2 + b^2) = 1 - 2ab - a^2 - b^2$

$= 1 - (2ab + a^2 + b^2)$

$= 1 - (a + b)^2$

$= (1 - a - b)(1 + a + b) \because a^2 - b^2 = (a - b)(a + b)$

13. Question

Answer

$x^2 + 6x + 8$

Factorizing the equation and taking x and 2 as common,

= x² + 4x + 2x + 8

= x(x + 4) +2(x + 4)

= (x + 2)(x + 4).

14. Question

Answer

x² + 4x – 21

Factorizing the equation and taking x and – 3 as common,

= x² + 7x – 3x – 21

= x(x + 7) – 3(x + 7)

= (x – 3)(x + 7).

15. Question

Answer

y² + 2y – 3

Factorizing the equation and taking y and – 1 as common,

= y² + 3y – y – 3

= y(y + 3) – 1(y + 3)

= (y + 3)(y – 1).

16. Question

Answer

40 + 3x – x²

Factorizing the equation and taking 8 and – x as common,

= 40 + 8x – 3x – x²

= 8(5 + x) – x(5 + x)

= (8 – x)(5 + x).

17. Question

Answer

2x² + 5x + 3

Factorizing the equation and taking 2x and 3 as common,

= 2x² + 2x + 3x + 3

= 2x(x +1) + 3(x + 1)

= (2x + 3)(x + 1).

18. Question

Answer

6a² – 13a + 6

Factorizing the equation and taking 3a and – 2 as common,

= 6a² – 9a – 4a+ 6

= 3a(2a – 3) – 2(2a – 3)

= (3a – 2)(2a – 3).

19. Question

Answer

4z² – 8z + 3

Factorizing the equation and taking 2z and – 1 as common,

$= 4z^2 - 6z - 2z + 3$

$= 2z(2z - 3) - 1(2z - 3)$

$= (2z - 1)(2z - 3).$

20. Question

Answer

$3 + 23y - 8y^2$

Factorizing the equation and taking 3 and – y as common,

$= 3 + 24y - y - 8y^2$

$= 3(1 + 8y) - y(1 + 8y)$

$= (3 - y)(1 + 8y).$