

7. Factorisation

Exercise 7A

1. Question

Factorise:

(i) $12x + 15$

(ii) $14m - 21$

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

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

Factorise:

i. $16a^2 - 24ab$

ii. $15ab^2 - 20a^2b$

iii. $12x^2y^3 - 21x^3y^2$

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

Factorise:

(i) $24x^3 - 36x^2y$

(ii) $10x^3 - 15x^2$

$$(iii) 36x^3y - 60x^2y^3z$$

Answer

$$(i) 24x^3 - 36x^2y,$$

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

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

$$(ii) 10x^3 - 15x^2$$

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

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

$$(iii) 36x^3y - 60x^2y^3z$$

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

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

4. Question

Factorise:

$$i. 9x^3 - 6x^2 + 12x$$

$$ii. 8x^3 - 72xy + 12x$$

$$iii. 18a^3b^3 - 27a^2b^3 + 36a^3b^2$$

Answer

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

3x	$9x^3, 6x^2, 12x$
	$3x^2, 2x, 4$

$3x$ 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 $12x$

4x	$8x^3, 72xy, 12x$
	$2x, 18y, 3$

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

So,

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

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

$9a^2b^2$	$18a^3b^3, 27a^2b^3, 36a^3b^2$
	$2ab, 3b, 4a$

$9a^2b^2$ 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

Factorise:

i. $14x^3 + 21x^4y - 28x^2y^2$

ii. $-5 - 10t + 20t^2$

Answer

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

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

$7x^2$ 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	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

Factorise:

i. $x(x + 3) + 5(x + 3)$

ii. $5x(x - 4) - 7(x - 4)$

iii. $2m(1 - n) + 3(1 - n)$

Answer

(i) $x(x + 3) + 5(x + 3)$

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) $5x(x - 4) - 7(x - 4)$

Taking $x - 4$ as common from the whole, we get,

$$5x(x - 4) - 7(x - 4) = (x - 4)(5x - 7).$$

(iii) $2m(1 - n) + 3(1 - n)$

Taking $1 - n$ as common from the whole, we get,

$$2m(1 - n) + 3(1 - n) = (1 - n)(2m + 3).$$

7. Question

Factories:

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

Answer

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

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

Factories:

$$9a(3a - 5b) - 12a^2(3a - 5b)$$

Answer

$$9a(3a - 5b) - 12a^2(3a - 5b)$$

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

$$= (3a - 5b)(9a - 12a^2).$$

10. Question

Factorize:

$$(x + 5)^2 - 4(x + 5)$$

Answer

$$(x + 5)^2 - 4(x + 5)$$

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

Factorize:

$$3(a - 2b)^2 - 5(a - 2b)$$

Answer

$$3(a - 2b)^2 - 5(a - 2b)$$

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

$$= (a - 2b)\{(3a - 6b) - 5\}$$

$$= (a - 2b)(3a - 6b - 5)$$

So,

We get,

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

12. Question

Factorize:

$$2a + 6b - 3(a + 3b)^2$$

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

Factorize:

$$16(2p - 3q)^2 - 4(2p - 3q)$$

Answer

$$16(2p - 3q)^2 - 4(2p - 3q)$$

$$\begin{aligned}
&= (2p - 3q)\{16(2p - 3q) - 4\} \\
&= (2p - 3q)\{(32p - 48q) - 4\} \\
&= (2p - 3q)(32p - 48q - 4) \\
&= 4(2p - 3q)(8p - 12q - 1)
\end{aligned}$$

So,

We get,

$$16(2p - 3q)^2 - 4(2p - 3q) = 4(2p - 3q)(8p - 12q - 1)$$

14. Question

Factorize:

$$x(a - 3) + y(3 - a)$$

Answer

$$\begin{aligned}
&x(a - 3) + y(3 - a) \\
&= x(a - 3) - y(a - 3) \\
&= (a - 3)(x - y)
\end{aligned}$$

15. Question

Factorize:

$$12(2x - 3y)^2 - 16(3y - 2x)$$

Answer

$$\begin{aligned}
&12(2x - 3y)^2 - 16(3y - 2x) \\
&= 12(2x - 3y)^2 + 16(2x - 3y)
\end{aligned}$$

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

$$\begin{aligned}
&= (2x - 3y) \{12(2x - 3y) + 16\} \\
&= (2x - 3y)(24x - 36y + 16)
\end{aligned}$$

[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

Factorize:

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

Answer

$$\begin{aligned}
&(x + y)(2x + 5) - (x + y)(x + 3) \\
&= (x + y)\{(2x + 5) - (x + 3)\} \\
&= (x + y)(2x + 5 - x - 3) \\
&= (x + y)(2x - x + 5 - 3) \\
&= (x + y)(x + 2)
\end{aligned}$$

So,

We get,

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

17. Question

Factories:

$$ar + br + at + bt$$

Answer

$$ar + br + at + bt$$

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

Factories:

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

Answer

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

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

Factories:

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

Answer

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

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

Factories:

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

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

Factories:

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

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

Factories:

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

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

Factories:

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

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

Factories:

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

Answer

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

By using the formulas;

$$(a + b)^2 = a^2 + b^2 + 2ab \text{ and}$$

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

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

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

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

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

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

So we get,

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

25. Question

Factories:

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

Answer

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

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

$$\begin{aligned}
 &= (ab^2 + ba) - (b + 1) \\
 &= ab(b + 1) - 1(b + 1) \\
 &= (b + 1)(ab - 1)
 \end{aligned}$$

So we get,

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

26. Question

Factories:

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

Answer

$$\begin{aligned}
 &x^3 - 3x^2 + x - 3 \\
 &= (x^3 - 3x^2) + (x - 3) \\
 &= x^2(x - 3) + 1(x - 3) \\
 &= (x - 3)(x^2 + 1)
 \end{aligned}$$

So we get,

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

27. Question

Factories:

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

Answer

$$\begin{aligned}
 &ab(x^2 + y^2) - xy(a^2 + b^2) \\
 &= abx^2 + aby^2 - a^2xy - b^2xy \\
 &= abx^2 - a^2xy + aby^2 - b^2xy \\
 &= ax(bx - ay) + by(ay - bx) \\
 &= ax(bx - ay) - by(bx - ay) \\
 &= (bx - ay)(ax - by)
 \end{aligned}$$

So we get,

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

28. Question

Factories:

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

Answer

$$\begin{aligned}
 &x^2 - x(a + 2b) + 2ab \\
 &= x^2 - ax - 2bx + 2ab \\
 &= x^2 - 2bx - ax + 2ab \\
 &= (x^2 - 2bx) - (ax - 2ab) \\
 &= x(x - 2b) - a(x - 2b)
 \end{aligned}$$

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

So we get,

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

Exercise 7B

1. Question

Factorise:

$$x^2 - 36$$

Answer

We have,

$$x^2 - 36$$

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

Factorise:

$$4a^2 - 9$$

Answer

We have,

$$4a^2 - 9$$

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

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

Factorise:

$$81 - 49x^2$$

Answer

We have,

$$81 - 49x^2$$

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

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:

$$4x^2 - 9y^2$$

Answer

We have,

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

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

Factories:

$$16a^2 - 225b^2$$

Answer

We have,

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

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

Factories:

$$9a^2b^2 - 25$$

Answer

We have,

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

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

Factories:

$$16a^2 - 144$$

Answer

We have,

$$16a^2 - 144$$

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

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

Factories:

$$63a^2 - 112b^2$$

Answer

We have,

$$63a^2 - 112b^2$$

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

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

Factories:

$$20a^2 - 45b^2$$

Answer

We have,

$$20a^2 - 45b^2$$

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

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

We get,

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

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

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

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10. Question

Factorize:

$$12x^2 - 27$$

Answer

We have,

$$12x^2 - 27$$

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

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

Factorize:

$$x^3 - 64x$$

Answer

We have,

$$x^3 - 64x$$

$$= x(x^2 - 64)$$

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

Factorize:

$$16x^5 - 144x^3$$

Answer

We have,

$$16x^5 - 144x^3$$

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

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

We get,

$$16x^5 - 144x^3 = 3x^3(x^2 - 9)$$

$$= 16x^3\{(x)^2 - (3)^2\}$$

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

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13. Question

Factorize:

$$3x^5 - 48x^3$$

Answer

We have,

$$\begin{aligned} 3x^5 - 48x^3 \\ = 3x^3(x^2 - 16) \end{aligned}$$

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

We get,

$$\begin{aligned} 3x^5 - 48x^3 &= 3x^3(x^2 - 16) \\ &= 3x^3\{(x)^2 - (4)^2\} \\ &= 3x^3(x + 4)(x - 4) \end{aligned}$$

14. Question

Factorize:

$$16p^3 - 4p$$

Answer

We have,

$$\begin{aligned} 16p^3 - 4p \\ = 4p(4p^2 - 1) \end{aligned}$$

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

We get,

$$\begin{aligned} 16p^3 - 4p &= 4p(4p^2 - 1) \\ &= 4p\{(2p)^2 - (1)^2\} \\ &= 4p(2p + 1)(2p - 1) \end{aligned}$$

15. Question

Factorize:

$$63a^2b^2 - 7$$

Answer

We have,

$$\begin{aligned} 63a^2b^2 - 7 \\ = 7(9a^2b^2 - 1) \end{aligned}$$

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

We get,

$$\begin{aligned} 63a^2b^2 - 7 &= 7(9a^2b^2 - 1) \\ &= 7\{(3ab)^2 - (1)^2\} \\ &= 7(3ab + 1)(3ab - 1) \end{aligned}$$

16. Question

Factorize:

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

Answer

We have,

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

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

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

Factorize:

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

Answer

Given,

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

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

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

Factorize:

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

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

Factorize:

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

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

Factories:

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

Answer

Given,

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

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

Factories:

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

Answer

Given,

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

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

Factories:

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

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

Factories:

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

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

Factories:

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

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

Factories:

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

Answer

Given,

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

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

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

Factories:

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

Answer

Given,

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

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

Evaluate $\{(405)^2 - (395)^2\}$

Answer

Given,

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

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

Evaluate $\{(7.8)^2 - (2.2)^2\}$.

Answer

We have,

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

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

Factorize:

$$x^2 + 8x + 16$$

Answer

Given,

$$x^2 + 8x + 16$$

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

Factorize:

$$x^2 + 14x + 49$$

Answer

Given;

$$x^2 + 14x + 49$$

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

Factorize:

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

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

Factorize:

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

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

Factorize:

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

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

Factorize:

$$4y^2 + 20y + 25$$

Answer

Given;

$$4y^2 + 20y + 25$$

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

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We get,

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

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

7. Question

Factorize:

$$36a^2 + 36a + 9$$

Answer

Given,

$$36a^2 + 36a + 9$$

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

Factorize:

$$9m^2 + 24m + 16$$

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

Factorize:

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

Answer

Given,

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

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

We get,

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

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

10. Question

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Factorize:

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

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

Factorize:

$$p^2 - 10p + 25$$

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

Factorize:

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

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

Factorize:

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

Answer

Given,

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

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

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We get,

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

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

14. Question

Factorize:

$$9y^2 - 12y + 4$$

Answer

Given,

$$9y^2 - 12y + 4$$

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

We get,

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

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

15. Question

Factorize:

$$16x^2 - 24x + 9$$

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

Factorize:

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

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

Factorize:

$$a^2b^2 - 6ab + 9c^2$$

Answer

Given,

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$$a^2b^2 - 6ab + 9c^2$$

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

Factorize:

$$m^4 + 2m^2n^2 + n^4$$

Answer

Given,

$$m^4 + 2m^2n^2 + n^4$$

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

Factorize:

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

Answer

Given,

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

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

Factorize:

$$x^2 + 5x + 6$$

Answer

Given,

$$x^2 + 5x + 6$$

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

Factorize:

$$y^2 + 10y + 24$$

Answer

Given,

$$y^2 + 10y + 24$$

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

Factorize:

$$z^2 + 12z + 27$$

Answer

$$z^2 + 12z + 27$$

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

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Factorize:

$$p^2 + 6p + 8$$

Answer

Given,

$$p^2 + 6p + 8$$

Now first find the numbers whose-

$$\text{Sum} = 6 \text{ and}$$

$$\text{Product} = 8$$

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

Factorize:

$$x^2 + 15x + 56$$

Answer

Given,

$$x^2 + 15x + 56$$

Now first find the numbers whose-

$$\text{Sum} = 15 \text{ and}$$

$$\text{Product} = 56$$

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

Factorize:

$$y^2 + 19y + 60$$

Answer

$$y^2 + 19y + 60$$

Now first find the numbers whose-

$$\text{Sum} = 19 \text{ and}$$

$$\text{Product} = 60$$

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

Factorize:

$$x^2 + 13x + 40$$

Answer

Given,

$$x^2 + 13x + 40$$

Now first find the numbers whose-

$$\text{Sum} = 13 \text{ and}$$

$$\text{Product} = 40$$

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

Factorize:

$$q^2 - 10q + 21$$

Answer

Given,

$$q^2 - 10q + 21$$

Now first find the numbers whose-

$$\text{Sum} = -10 \text{ and}$$

$$\text{Product} = 21$$

Required numbers are 7 and 3,

So we get;

$$q^2 - 10q + 21$$

$$= q^2 - 7q - 3q + 21$$

$$= q(q - 7) - 3(q - 7)$$

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$$= (q - 7)(q - 3)$$

9. Question

Factorize:

$$p^2 + 6p - 16$$

Answer

Given,

$$p^2 + 6p - 16$$

Now first find the numbers whose-

$$\text{Sum} = 6 \text{ and}$$

$$\text{Product} = -16$$

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

Factorize:

$$x^2 - 10x + 24$$

Answer

Given,

$$x^2 - 10x + 24$$

Now first find the numbers whose-

$$\text{Sum} = -10 \text{ and}$$

$$\text{Product} = 24$$

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

Factorize:

$$x^2 - 23x + 42$$

Answer

Given,

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$$x^2 - 23x + 42$$

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

$$\text{Sum} = -23 \text{ and}$$

$$\text{Product} = 42$$

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

Factorize:

$$x^2 - 17x + 16$$

Answer

Given,

$$x^2 - 17x + 16$$

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

$$\text{Sum} = -17 \text{ and}$$

$$\text{Product} = 16$$

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:

$$y^2 - 21y + 90$$

Answer

Given,

$$y^2 - 21y + 90$$

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

$$\text{Sum} = -21 \text{ and}$$

$$\text{Product} = 90$$

The numbers are 15 and 6,

So,

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

$$= y(y - 15) - 6(y - 15)$$

$$= (y - 15)(y - 6)$$

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14. Question

Factorize:

$$x^2 - 22x + 117$$

Answer

Given,

$$x^2 - 22x + 117$$

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

$$\text{Sum} = -22 \text{ and}$$

$$\text{Product} = 117$$

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

Factorize:

$$x^2 - 9x + 20$$

Answer

$$x^2 - 9x + 20$$

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

$$\text{Sum} = -9 \text{ and}$$

$$\text{Product} = 20$$

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

Factorize:

$$x^2 + x - 132$$

Answer

$$x^2 + x - 132$$

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

$$\text{Sum} = 1 \text{ and}$$

$$\text{Product} = -132$$

The numbers are 12 and 11,

So,

$$\begin{aligned}x^2 + x - 132 &= x^2 + 12x - 11x - 132 \\&= x(x + 12) - 11(x + 12) \\&= (x + 12)(x - 11)\end{aligned}$$

17. Question

Factorize:

$$x^2 + 5x - 104$$

Answer

$$x^2 + 5x - 104$$

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

Sum = 5 and

Product = - 104

The numbers are 13 and 8,

So,

$$\begin{aligned}x^2 + 5x - 104 &= x^2 + 13x - 8x - 104 \\&= x(x + 13) - 8(x + 13) \\&= (x + 13)(x - 8)\end{aligned}$$

18. Question

Factorize:

$$y^2 + 7y - 144$$

Answer

$$y^2 + 7y - 144$$

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

Sum = 7 and

Product = - 144

The numbers are 16 and - 9,

So,

$$\begin{aligned}y^2 + 7y - 144 &= y^2 + 16y - 9y - 144 \\&= y(y + 16) - 9(y + 16) \\&= (y + 16)(y - 9)\end{aligned}$$

19. Question

Factorize:

$$z^2 + 19z - 150$$

Answer

Given,

$$z^2 + 19z - 150$$

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

$$\text{Sum} = 19 \text{ and}$$

$$\text{Product} = - 150$$

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

Factorize:

$$y^2 + y - 72$$

Answer

Given,

$$y^2 + y - 72$$

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

$$\text{Sum} = 1 \text{ and}$$

$$\text{Product} = - 72$$

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

Factorize:

$$a^2 + 6a - 91$$

Answer

$$a^2 + 6a - 91$$

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

$$\text{Sum} = 6 \text{ and}$$

$$\text{Product} = - 91$$

The numbers are 13 and 7,

So,

$$a^2 + 6a - 91$$

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

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$$= a(a + 13) - 7(a + 13)$$

$$= (a + 13)(a - 7)$$

22. Question

Factorize:

$$p^2 - 4p - 77$$

Answer

$$p^2 - 4p - 77$$

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

$$\text{Sum} = -4 \text{ and}$$

$$\text{Product} = -77$$

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

Factorize:

$$x^2 - 7x - 30$$

Answer

$$x^2 - 7x - 30$$

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

$$\text{Sum} = -7 \text{ and}$$

$$\text{Product} = -30$$

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

Factorize:

$$x^2 - 11x - 42$$

Answer

$$x^2 - 11x - 42$$

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

Factorize:

$$x^2 - 5x - 24$$

Answer

$$x^2 - 5x - 24$$

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

Factorize:

$$y^2 - 6y - 135$$

Answer

Given;

$$y^2 - 6y - 135$$

Now first find the numbers whose-

Sum = - 6 and

Product = - 135

Required numbers are 15 and 9,

So we get;

$$y^2 - 6y - 135$$

$$= y^2 - 15y + 9y - 135$$

$$= y(y - 15) + 9(y - 15)$$

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$$= (y - 15)(y + 9)$$

27. Question

Factorize:

$$z^2 - 12z - 45$$

Answer

Given

$$z^2 - 12z - 45$$

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

Factorize:

$$x^2 - 4x - 12$$

Answer

Given,

$$x^2 - 4x - 12$$

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

Factorize:

$$3x^2 + 10x + 8$$

Answer

Given,

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$$3x^2 + 10x + 8$$

Now first find the numbers whose-

Sum = 10 and

$$\text{Product} = 3 \times 8 = 24$$

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

Factorize:

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

Answer

Given,

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

Now first find the numbers whose-

Sum = 14 and

$$\text{Product} = 3 \times 8 = 24$$

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

Factorize:

$$3z^2 - 10z + 8$$

Answer

Given,

$$3z^2 - 10z + 8$$

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

Sum = - 10 and

$$\text{Product} = 3 \times 8 = 24$$

The numbers are 6 and 4,

So,

$$3z^2 - 10z + 8$$

$$\begin{aligned} &= 3z^2 - 6z - 4z + 8 \\ &= 3z(z - 2) - 4(z - 2) \\ &= (z - 2)(3z - 4) \end{aligned}$$

32. Question

Factorize:

$$2x^2 + x - 45$$

Answer

Given,

$$2x^2 + x - 45$$

Now first find the numbers whose-

Sum = 1 and

Product = $-45 \times 2 = -90$

Required numbers are 10 and 9,

So we get;

$$\begin{aligned} &2x^2 + x - 45 \\ &= 2x^2 + 10x - 9x - 45 \\ &= 2x(x + 5) - 9(x + 5) \\ &= (x + 5)(2x - 9) \end{aligned}$$

33. Question

Factorize:

$$6p^2 + 11p - 10$$

Answer

Given,

$$6p^2 + 11p - 10$$

Now first find the numbers whose-

Sum = 11 and

Product = $-10 \times 6 = -60$

Required numbers are 15 and 4,

So we get;

$$\begin{aligned} &= 6p^2 + 15p - 4p - 10 \\ &= 3p(2p + 5) - 2(2p + 5) \\ &= (2p + 5)(3p - 2) \end{aligned}$$

34. Question

Factorize:

$$2x^2 - 17x - 30$$

Answer

Given,

$$2x^2 - 17x - 30$$

Now first find the numbers whose-

$$\text{Sum} = -17 \text{ and}$$

$$\text{Product} = -30 \times 2 = -60$$

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

Factorize:

$$7y^2 - 19y - 6$$

Answer

Given,

$$7y^2 - 19y - 6$$

Now first find the numbers whose-

$$\text{Sum} = -19 \text{ and}$$

$$\text{Product} = -6 \times 7 = -42$$

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

Factorize:

$$28 - 31x - 5x^2$$

Answer

Given,

$$28 - 31x - 5x^2$$

Now first find the numbers whose-

$$\text{Sum} = -31 \text{ and}$$

$$\text{Product} = -5 \times 28 = -140$$

Required numbers are 35 and 4,

So we get;

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$$\begin{aligned}
& 28 - 31x - 5x^2 \\
& = 28 + 4x - 35x - 5x^2 \\
& = 4(7 + x) - 5x(7 + x) \\
& = (7 + x)(4 - 5x)
\end{aligned}$$

37. Question

Factorize:

$$3 + 23z - 8z^2$$

Answer

Given,

$$3 + 23z - 8z^2$$

Now first find the numbers whose-

$$\text{Sum} = 23 \text{ and}$$

$$\text{Product} = -8 \times 3 = 24$$

Required numbers are 24 and 1,

So we get;

$$\begin{aligned}
& 3 + 23z - 8z^2 \\
& = 3 + 24z - z - 8z^2 \\
& = 3(1 + 8z) - z(1 + 8z) \\
& = (1 + 8z)(3 - z)
\end{aligned}$$

38. Question

Factorize:

$$6x^2 - 5x - 6$$

Answer

Given,

$$6x^2 - 5x - 6$$

Now first find the numbers whose-

$$\text{Sum} = -5 \text{ and}$$

$$\text{Product} = -6 \times 6 = -36$$

Required numbers are 9 and 4,

So we get;

$$\begin{aligned}
& = 6x^2 - 9x + 4x - 6 \\
& = 3x(2x - 3) + 2(2x - 3) \\
& = (2x - 3)(3x + 2)
\end{aligned}$$

39. Question

Factorize:

$$3m^2 + 24m + 36$$

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Answer

Given,

$$3m^2 + 24m + 36$$

Now first find the numbers whose-

Sum = 24 and

$$\text{Product} = 36 \times 3 = 108$$

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

Factorize:

$$4n^2 - 8n + 3$$

Answer

Given,

$$4n^2 - 8n + 3$$

Now first find the numbers whose-

Sum = - 8 and

$$\text{Product} = 4 \times 3 = 12$$

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

Factorize:

$$6x^2 - 17x - 3$$

Answer

Given,

$$6x^2 - 17x - 3$$

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

Sum = - 17 and

$$\text{Product} = 6 \times - 3 = - 18$$

The numbers are 18 and 1,

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So,

$$\begin{aligned} &6x^2 - 17x - 3 \\ &= 6x^2 - 18x + 1x - 3 \\ &= 6x(x - 3) + 1(x - 3) \\ &= (x - 3)(6x + 1) \end{aligned}$$

42. Question

Factorize:

$$7x^2 - 19x - 6$$

Answer

Given,

$$7x^2 - 19x - 6$$

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

Sum = - 19 and

Product = $7 \times - 6 = - 42$

The numbers are 21 and 2,

So,

$$\begin{aligned} &7x^2 - 19x - 6 \\ &= 7x^2 - 21x + 2x - 6 \\ &= 7x(x - 3) + 2(x - 3) \\ &= (x - 3)(7x + 2) \end{aligned}$$

Exercise 7E

1. Question

$$(7a^2 - 63b^2) = ?$$

- A. $(7a - 9b)(9a + 7b)$
- B. $(7a - 9b)(7a + 9b)$
- C. $9(a - 3b)(a + 3b)$
- D. $7(a - 3b)(a + 3b)$

Answer

$$\begin{aligned} (7a^2 - 63b^2) &= 7(a^2 - 9b^2) \text{ (taking 7 as common from whole)} \\ &= 7(a - 3b)(a + 3b) \because a^2 - b^2 = (a - b)(a + b) \end{aligned}$$

2. Question

$$(2x - 32x^3) = ?$$

- A. $2(x - 4)(x + 4)$
- B. $2x(1 - 2x)^2$
- C. $2x(1 + 2x)^2$
- D. $2(1 - 4x)(1 + 4x)$

Answer

$$(2x - 32x^3) = 2x(1 - 16x^2) \text{ (taking } 2x \text{ as common from whole)}$$
$$= 2x(1 - 4x)(1 + 4x) \because a^2 - b^2 = (a - b)(a + b)$$

3. Question

$$x^3 - 144x = ?$$

- A. $x(x - 12)^2$
- B. $x(x + 12)^2$
- C. $x(x - 12)(x + 12)$
- D. none of these

Answer

$$x^3 - 144x = x(x^2 - 144) \text{ (taking } x \text{ as common from whole)}$$
$$= x(x - 12)(x + 12) \because a^2 - b^2 = (a - b)(a + b)$$

4. Question

$$2 - 50x^2 = ?$$

- A. $2(1 - 5x)^2$
- B. $2(1 + 5x)^2$
- C. $(2 - 5x)(2 + 5x)$
- D. $2(1 - 5x)(1 + 5x)$

Answer

$$2 - 50x^2 = 2(1 - 25x^2) \text{ (taking } 2 \text{ as common from whole)}$$
$$= 2(1 - 5x)(1 + 5x) \because a^2 - b^2 = (a - b)(a + b)$$

5. Question

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

- A. $(a + b)(a + c)$
- B. $(a + b)(b + c)$
- C. $(b + c)(c + a)$
- D. $a(a + b + c)$

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

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

- A. $(pq + 1)(q - 1)$
- B. $p(q + 1)(q - 1)$

C. $q(p - 1)(q + 1)$

D. $(pq - 1)(q + 1)$

Answer

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

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

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

7. Question

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

A. $(a-b)(m-n)$

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

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

D. $(m-a)(n-b)$

Answer

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

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

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

8. Question

$$ab - a - b + 1 = ?$$

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

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

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

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

Answer

$$ab - a - b + 1$$

$$= a(b - 1) - 1(b - 1) \text{ (taking } a \text{ and } -1 \text{ as common)}$$

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

9. Question

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

A. $(x - z)(x + z)$

B. $(x - y)(x - z)$

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

D. $(x - z)(z - x)$

Answer

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

$$= x(x - z) + y(x - z) \text{ (taking } x \text{ and } y \text{ as common resp.)}$$

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

10. Question

$$12m^2 - 27 = ?$$

- A. $(2m - 3)(3m - 9)$
- B. $3(2m - 9)(3m - 1)$
- C. $3(2m - 9)(2m + 1)$
- D. none of these

Answer

$$\begin{aligned} 12m^2 - 27 &= 3(4m^2 - 9) \text{ (taking 3 as common from whole)} \\ &= 3(2m - 3)(2m + 3) \because a^2 - b^2 = (a - b)(a + b) \end{aligned}$$

11. Question

$$x^3 - x = ?$$

- A. $x(x^2 - x)$
- B. $x(x - x^2)$
- C. $x(1 + x)(1 - x)$
- D. $x(x + 1)(1 - x)$

Answer

$$\begin{aligned} x^3 - x &= x(x^2 - 1) \text{ (taking x as common from whole)} \\ &= x(x - 1)(x + 1) \because a^2 - b^2 = (a - b)(a + b) \end{aligned}$$

12. Question

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

- A. $(1 + a - b)(1 + a + b)$
- B. $(1 + a + b)(1 - a + b)$
- C. $(1 + a + b)(1 - a - b)$
- D. $(1 + a - b)(1 - a + b)$

Answer

$$\begin{aligned} 1 - 2ab - (a^2 + b^2) &= 1 - 2ab - a^2 - b^2 \\ &= 1 - (2ab + a^2 + b^2) \\ &= 1 - (a + b)^2 \\ &= (1 - a - b)(1 + a + b) \because a^2 - b^2 = (a - b)(a + b) \end{aligned}$$

13. Question

$$x^2 + 6x + 8 = ?$$

- A. $(x + 3)(x + 5)$
- B. $x + 3)(x + 4)$
- C. $(x + 2)(x + 4)$
- D. $(x + 1)(x + 8)$

Answer

$$x^2 + 6x + 8$$

Factorizing the equation and taking x and 2 as common,

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

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

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

14. Question

$$x^2 + 4x - 21 = ?$$

A. $(x - 7)(x + 3)$

B. $(x + 7)(x - 3)$

C. $(x - 7)(x - 3)$

D. $(x + 7)(x + 3)$

Answer

$$x^2 + 4x - 21$$

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

$$= x^2 + 7x - 3x - 21$$

$$= x(x + 7) - 3(x + 7)$$

$$= (x - 3)(x + 7).$$

15. Question

$$y^2 + 2y - 3 = ?$$

A. $(y - 1)(y + 3)$

B. $(y + 1)(y - 3)$

C. $(y - 1)(y - 3)$

D. $(y + 2)(y - 3)$

Answer

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

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

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

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

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

16. Question

$$40 + 3x - x^2 = ?$$

A. $(5 + x)(x - 8)$

B. $(5 - x)(8 + x)$

C. $(5 + x)(8 - x)$

D. $(5 - x)(8 - x)$

Answer

$$40 + 3x - x^2$$

Factorizing the equation and taking 8 and $-x$ as common,

$$\begin{aligned} &= 40 + 8x - 3x - x^2 \\ &= 8(5 + x) - x(5 + x) \\ &= (8 - x)(5 + x). \end{aligned}$$

17. Question

$$2x^2 + 5x + 3 = ?$$

- A. $(x + 3)(2x + 1)$
- B. $(x + 1)(2x + 3)$
- C. $(2x + 5)(x - 3)$
- D. none of these

Answer

$$2x^2 + 5x + 3$$

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

$$\begin{aligned} &= 2x^2 + 2x + 3x + 3 \\ &= 2x(x + 1) + 3(x + 1) \\ &= (2x + 3)(x + 1). \end{aligned}$$

18. Question

$$6a^2 - 13a + 6 = ?$$

- A. $(2a + 3)(3a - 2)$
- B. $(2a - 3)(3a + 2)$
- C. $(3a - 2)(2a - 3)$
- D. $(3a + 1)(2a - 3)$

Answer

$$6a^2 - 13a + 6$$

Factorizing the equation and taking $3a$ and -2 as common,

$$\begin{aligned} &= 6a^2 - 9a - 4a + 6 \\ &= 3a(2a - 3) - 2(2a - 3) \\ &= (3a - 2)(2a - 3). \end{aligned}$$

19. Question

$$4z^2 - 8z + 3 = ?$$

- A. $(2z - 1)(2z - 3)$
- B. $(2z + 1)(3 - 2z)$
- C. $(2z + 3)(3z + 1)$
- D. $(z - 1)(4z - 3)$

Answer

$$4z^2 - 8z + 3$$

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

$$3 + 23y - 8y^2 = ?$$

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

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

C. $(1 - 8y)(y - 3)$

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

Answer

$$3 + 23y - 8y^2$$

Factorizing the equation and taking 3 and $-y$ as common,

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

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

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

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