

Factorisation

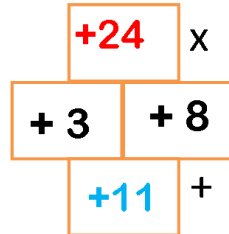
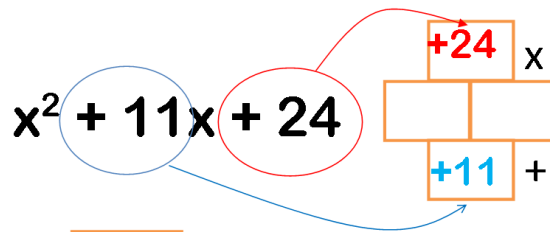
Ex 7A

- (i) $(x + y)^2 = x^2 + 2xy + y^2$
- (ii) $(x - y)^2 = x^2 - 2xy + y^2$
- (iii) $x^2 - y^2 = (x - y)(x + y)$
- (iv) $(x + a)(x + b) = x^2 + (a + b)x + ab$
- (v) $(x + y + z)^2 = x^2 + y^2 + z^2 + 2xy + 2yz + 2zx$
- (vi) $(x + y)^3 = x^3 + y^3 + 3xy(x + y)$
- (vii) $(x - y)^3 = x^3 - y^3 - 3xy(x - y)$
- (viii) $x^3 + y^3 + z^3 - 3xyz = (x + y + z)(x^2 + y^2 + z^2 - xy - yz - zx)$
 $x^3 + y^3 + z^3 = 3xyz$ if $x + y + z = 0$

Factoring Help!

Question	Strategy	Answer
$m^2 + 10m + 16$	Both signs are positive , so both signs in answer are positive.	$(m + 2)(m + 8)$
$n^2 - 8n - 48$	Two negatives , so in our answer, one will be positive (the smaller number) and one will be negative (the larger number)	$(n - 12)(n + 4)$
$y^2 - 15y + 56$	Second term negative , third term positive ; both signs in the answer will be negative	$(y - 8)(y - 7)$
$p^2 + p - 20$	Second term positive , third term negative ; one will be positive (the larger number) and one will be negative (the smaller number)	$(p + 5)(p - 4)$

Factorise $x^2 + 11x + 24$



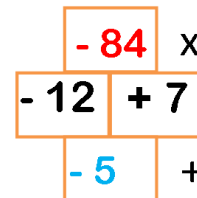
Find two numbers that multiply to get +24 and add to get +11

Final answer: $(x + 8)(x + 3)$

Factorise $x^2 - 5x - 84$

$$-12x + 7 = -84$$

$$-12 + 7 = -5$$



Final answer: $(x - 12)(x + 7)$

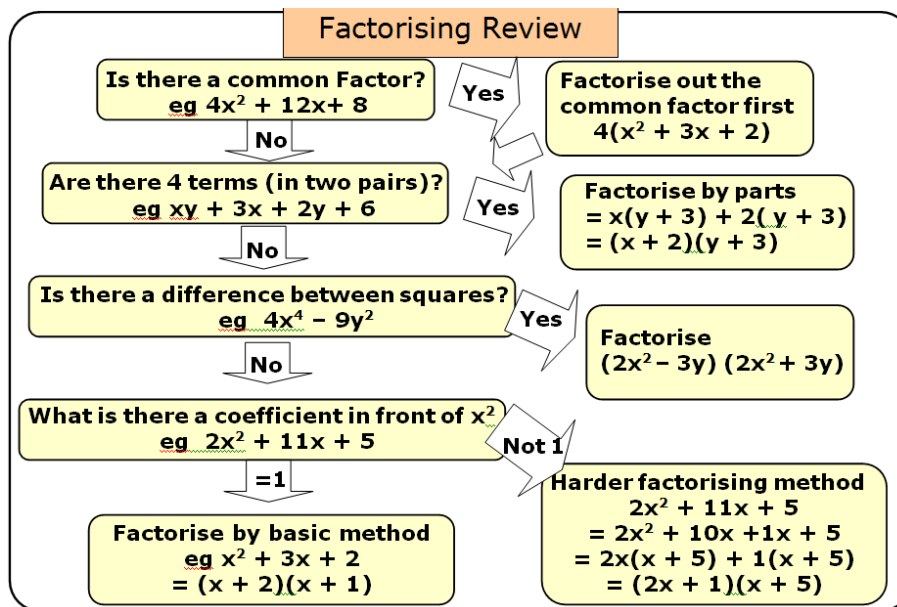
$$3x^2 + 7x + 2$$

$$2 \times 3 = 6 \quad \text{Factors } 1, 6 \quad 2, 3$$

$$= 3x^2 + 1x + 6x + 2$$

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

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



Q1

Answer :

- (i) $12x + 15 = 3(4x + 5)$
- (ii) $14m - 21 = 7(2m - 3)$
- (iii) $9n - 12n^2 = 3n(3 - 4n)$

Q2

Answer :

- (i) H.C.F. of $16a^2$ and $24ab$ is $8a$.

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

- (ii) H.C.F. of $15ab^2$ and $20a^2b$ is $5ab$

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

- (iii) H.C.F. of $12x^2y^3$ and $21x^3y^2$ is $3x^2y^2$.

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

Q3

Answer :

- (i) H.C.F. of $24x^3$ and $36x^2y$ is $6x^2$.

$$\therefore 24x^3 - 36x^2y = 6x^2(4x - 6y)$$

- (ii) H.C.F. of $10x^3$ and $15x^2$ is $5x^2$.

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

- (iii) H.C.F. of $36x^3y$ and $60x^2y^3z$ is $12x^2y$

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

Q4

Answer :

(i) H.C.F. of $9x^3$, $6x^2$ and $12x$ is $3x$.

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

(ii) H.C.F. of $8x^3$, $72xy$ and $12x$ is $4x$.

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

(iii) H.C.F. of $18a^3b^3$, $27a^2b^3$ and $36a^3b^2$ is $9a^2b^2$.

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

Q5

Answer :

(i) H.C.F. of $14x^3$, $21x^4y$ and $28x^2y^2$ is $7x^2$.

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

(ii) H.C.F. of -5 , $-10t$ and $20t^2$ is 5 .

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

Q6

Answer :

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

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

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

Q7

Answer :

We have:

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

Q8

Answer :

We have:

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

Q9

Answer :

We have:

$$9a(3a - 5b) - 12a^2(3a - 5b) = (3a - 5b)(9a - 12a^2) = 3a(3a - 5b)(3 - 4a)$$

Q10

Answer :

We have:

$$\begin{aligned}(x + 5)^2 - 4(x + 5) &= (x + 5)\{(x + 5) - 4\} \\ &= (x + 5)(x + 5 - 4) \\ &= (x + 5)(x + 1)\end{aligned}$$

$$\therefore (x + 5)^2 - 4(x + 5) = (x + 5)(x + 1)$$

Q11

Answer :

$$\begin{aligned}3(a - 2b)^2 - 5(a - 2b) &= (a - 2b)\{3(a - 2b) - 5\} \\ &= (a - 2b)(3a - 6b - 5)\end{aligned}$$

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

Q12

Answer :

We have:

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

$$\therefore 2a + 6b - 3(a + 3b)^2 = (a + 3b)(2 - 3a - 9b)$$

Q13

Answer :

We have:

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

$$\therefore 16(2p - 3q)^2 - 4(2p - 3q) = (2p - 3q)(32p - 48q - 4)$$

Q14

Answer :

We have:

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

$$\therefore x(a - 3) + y(3 - a) = (a - 3)(x - y)$$

Q15

Answer :

We have:

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

$$\therefore 12(2x - 3y)^2 - 16(3y - 2x) = (2x - 3y)(24x - 36y + 16)$$

Q16

Answer :

We have:

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

Q17

Answer :

By grouping the terms:

$$\begin{aligned}ar + br + at + bt &= (ar + br) + (at + bt) \\ &= r(a + b) + t(a + b) \\ &= (a + b)(r + t)\end{aligned}$$

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

Q18

Answer :

By suitably arranging the terms:

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

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

Q19

Answer :

By suitably arranging the terms:

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

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

Q20

Answer :

By suitably arranging the terms:

$$\begin{aligned}x^2 - xz + xy - yz &= x^2 + xy - xz - yz \\ &= (x^2 + xy) - (xz + yz) \\ &= x(x + y) - z(x + y) \\ &= (x + y)(x - z)\end{aligned}$$

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

Q21

Answer :

By suitably arranging the terms:

$$\begin{aligned}6ab - b^2 + 12ac - 2bc &= 6ab + 12ac - b^2 - 2bc \\ &= (6ab + 12ac) - (b^2 + 2bc) \\ &= 6a(b + 2c) - b(b + 2c) \\ &= (b + 2c)(6a - b)\end{aligned}$$

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

Q22

Answer :

We have:

$$\begin{aligned}(x-2y)^2 + 4x - 8y &= (x-2y)^2 + 4(x-2y) \\&= (x-2y)(x-2y) + 4(x-2y) \\&= (x-2y)\{(x-2y) + 4\} \\&= (x-2y)(x-2y+4)\end{aligned}$$

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

Q23

Answer :

We have:

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

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

Q24

Answer :

We have:

$$\begin{aligned}(ax+by)^2 + (bx-ay)^2 &= (a^2x^2 + b^2y^2 + 2abxy) + (b^2x^2 + a^2y^2 - 2bxa y) \\&= a^2x^2 + a^2y^2 + b^2y^2 + b^2x^2 + 2abxy - 2bxa y \\&= a^2(x^2 + y^2) + b^2x^2 + b^2y^2 + 2abxy - 2abxy \\&= a^2(x^2 + y^2) + b^2(x^2 + y^2) \\&= (x^2 + y^2)(a^2 + b^2)\end{aligned}$$

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

Q25

Answer :

We have:

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

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

Q26

Answer :

We have:

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

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

Q27

Answer :

We have:

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

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

Q28

Answer :

We have:

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

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

Factorisation

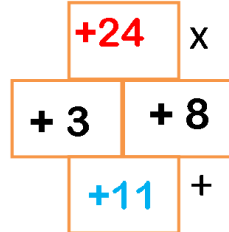
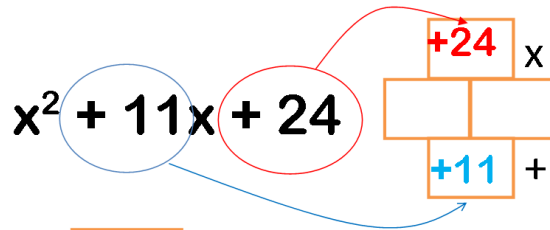
Ex 7B

- (i) $(x + y)^2 = x^2 + 2xy + y^2$
- (ii) $(x - y)^2 = x^2 - 2xy + y^2$
- (iii) $x^2 - y^2 = (x - y)(x + y)$
- (iv) $(x + a)(x + b) = x^2 + (a + b)x + ab$
- (v) $(x + y + z)^2 = x^2 + y^2 + z^2 + 2xy + 2yz + 2zx$
- (vi) $(x + y)^3 = x^3 + y^3 + 3xy(x + y)$
- (vii) $(x - y)^3 = x^3 - y^3 - 3xy(x - y)$
- (viii) $x^3 + y^3 + z^3 - 3xyz = (x + y + z)(x^2 + y^2 + z^2 - xy - yz - zx)$
 $x^3 + y^3 + z^3 = 3xyz$ if $x + y + z = 0$

Factoring Help!

Question	Strategy	Answer
$m^2 + 10m + 16$	Both signs are positive , so both signs in answer are positive.	$(m + 2)(m + 8)$
$n^2 - 8n - 48$	Two negatives , so in our answer, one will be positive (the smaller number) and one will be negative (the larger number)	$(n - 12)(n + 4)$
$y^2 - 15y + 56$	Second term negative , third term positive ; both signs in the answer will be negative	$(y - 8)(y - 7)$
$p^2 + p - 20$	Second term positive , third term negative ; one will be positive (the larger number) and one will be negative (the smaller number)	$(p + 5)(p - 4)$

Factorise $x^2 + 11x + 24$



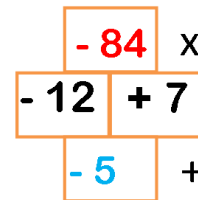
Find two numbers that multiply to get +24 and add to get +11

Final answer: $(x + 8)(x + 3)$

Factorise $x^2 - 5x - 84$

$$-12x + 7 = -84$$

$$-12 + 7 = -5$$



Final answer: $(x - 12)(x + 7)$

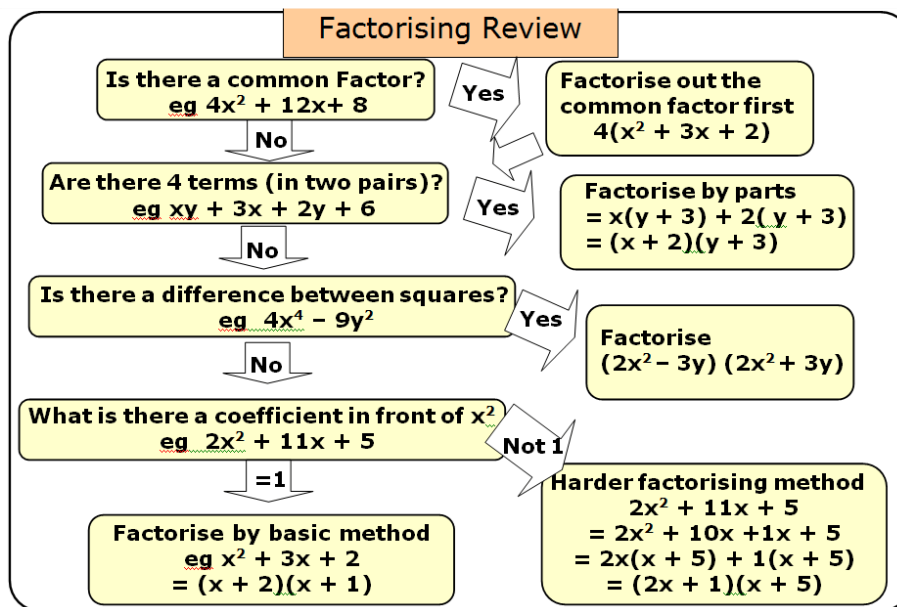
$$3x^2 + 7x + 2$$

$$2 \times 3 = 6 \quad \text{Factors } 1, 6 \quad 2, 3$$

$$= 3x^2 + 1x + 6x + 2$$

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

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



Q1

Answer :

We have:

$$\begin{aligned} x^2 - 36 &= (x)^2 - (6)^2 \\ &= (x + 6)(x - 6) \end{aligned}$$

$$\therefore x^2 - 36 = (x + 6)(x - 6)$$

Q2

Answer :

We have:

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

$$\therefore 4a^2 - 9 = (2a + 3)(2a - 3)$$

Q3

Answer :

We have:

$$\begin{aligned} 81 - 49x^2 &= (9)^2 - (7x)^2 \\ &= (9 + 7x)(9 - 7x) \end{aligned}$$

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

Q4

Answer :

We have:

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

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

Q5

Answer :

We have:

$$\begin{aligned}16a^2 - 225b^2 &= (4a)^2 - (15b)^2 \\ &= (4a + 15b)(4a - 15b)\end{aligned}$$

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

Q6

Answer :

We have:

$$\begin{aligned}9a^2b^2 - 25 &= (3ab)^2 - (5)^2 \\ &= (3ab + 5)(3ab - 5)\end{aligned}$$

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

Q7

Answer :

We have:

$$\begin{aligned}16a^2 - 144 &= (4a)^2 - (12)^2 \\ &= (4a + 12)(4a - 12) \\ &= 4(a + 3) 4(a - 3) = 16(a + 3)(a - 3)\end{aligned}$$

$$\therefore 16a^2 - 144 = 16(a + 3)(a - 3)$$

Q8

Answer :

We have:

$$\begin{aligned}63a^2 - 112b^2 &= 7(9a^2 - 16b^2) \\ &= 7\{(3a)^2 - (4b)^2\} \\ &= 7(3a + 4b)(3a - 4b)\end{aligned}$$

$$\therefore 63a^2 - 112b^2 = 7(3a + 4b)(3a - 4b)$$

Q9

Answer :

We have:

$$\begin{aligned}20a^2 - 45b^2 &= 5(4a^2 - 9b^2) \\&= 5\{(2a)^2 - (3b)^2\} \\&= 5(2a + 3b)(2a - 3b) \\ \therefore 20a^2 - 45b^2 &= 5(2a + 3b)(2a - 3b)\end{aligned}$$

Q10

Answer :

We have:

$$\begin{aligned}12x^2 - 27 &= 3(4x^2 - 9) \\&= 3\{(2x)^2 - (3)^2\} \\&= 3(2x + 3)(2x - 3) \\ \therefore 12x^2 - 27 &= 3(2x + 3)(2x - 3)\end{aligned}$$

Q11

Answer :

We have:

$$\begin{aligned}x^3 - 64x &= x(x^2 - 64) \\&= x\{(x)^2 - (8)^2\} \\&= x(x + 8)(x - 8) \\ \therefore x^3 - 64x &= x(x + 8)(x - 8)\end{aligned}$$

Q12

Answer :

We have:

$$\begin{aligned}16x^5 - 144x^3 &= 16x^3(x^2 - 9) \\&= 16x^3\{(x)^2 - (3)^2\} \\&= 16x^3(x + 3)(x - 3) \\ \therefore 16x^5 - 144x^3 &= 16x^3(x + 3)(x - 3)\end{aligned}$$

Q13

Answer :

We have:

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

Q14

Answer :

We have:

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

Q15

Answer :

We have:

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

$$\therefore 63a^2b^2 - 7 = 7(3ab + 1)(3ab - 1)$$

Q16

Answer :

We have:

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

$$\therefore 1 - (b - c)^2 = (1 + b - c)(1 - b + c)$$

Q17

Answer :

We have:

$$\begin{aligned}(2a + 3b)^2 - 16c^2 &= (2a + 3b)^2 - (4c)^2 \\&= \{(2a + 3b) + 4c\}\{(2a + 3b) - 4c\} \\&= (2a + 3b + 4c)(2a + 3b - 4c)\end{aligned}$$

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

Q18

Answer :

We have:

$$\begin{aligned}(l + m)^2 - (l - m)^2 &= \{(l + m) + (l - m)\}\{(l + m) - (l - m)\} \\&= (l + m + l - m)(l + m - l + m) \\&= (2l)(2m)\end{aligned}$$

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

Q19

Answer :

We have:

$$\begin{aligned}(2x + 5y)^2 - 1 &= (2x + 5y)^2 - (1)^2 \\&= \{(2x + 5y) + 1\}\{(2x + 5y) - 1\} \\&= (2x + 5y + 1)(2x + 5y - 1)\end{aligned}$$

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

Q20

Answer :

We have:

$$\begin{aligned}36c^2 - (5a + b)^2 &= (6c)^2 - (5a + b)^2 \\&= \{(6c) + (5a + b)\}\{(6c) - (5a + b)\} \\&= (6c + 5a + b)(6c - 5a - b)\end{aligned}$$

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

Q21

Answer :

We have:

$$\begin{aligned}(3x-4y)^2 - 25z^2 &= (3x-4y)^2 - (5z)^2 \\ &= \{(3x-4y) + 5z\}\{(3x-4y) - 5z\} \\ &= (3x-4y+5z)(3x-4y-5z)\end{aligned}$$

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

Q22

Answer :

We have:

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

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

Q23

Answer :

We have:

$$\begin{aligned}25 - a^2 - b^2 - 2ab &= 25 - (a^2 + b^2 + 2ab) \\ &= 25 - (a+b)^2 \\ &= (5)^2 - (a+b)^2 \\ &= \{5 + (a+b)\}\{5 - (a+b)\} \\ &= (5+a+b)(5-a-b)\end{aligned}$$

$$\therefore 25 - a^2 - b^2 - 2ab = (5+a+b)(5-a-b)$$

Q24

Answer :

We have:

$$\begin{aligned}25a^2 - 4b^2 + 28bc - 49c^2 &= 25a^2 - (4b^2 - 28bc + 49c^2) \\ &= (5a)^2 - (2b-7c)^2 \\ &= \{5a + (2b-7c)\}\{5a - (2b-7c)\} \\ &= (5a+2b-7c)(5a-2b+7c)\end{aligned}$$

$$\therefore 25a^2 - 4b^2 + 28bc - 49c^2 = (5a+2b-7c)(5a-2b+7c)$$

Q25

Answer :

We have:

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

$$\therefore 9a^2 - b^2 + 4b - 4 = (3a+b-2)(3a-b+2)$$

Q26

Answer :

We have:

$$\begin{aligned}100 - (x-5)^2 &= (10)^2 - (x-5)^2 \\ &= \{10 + (x-5)\}\{10 - (x-5)\} \\ &= (10+x-5)(10-x+5) \\ &= (5+x)(15-x)\end{aligned}$$

$$\therefore 100 - (x-5)^2 = (5+x)(15-x)$$

Q27

Answer :

We have:

$$\begin{aligned}\left\{(405)^2 - (395)^2\right\} &= (405 + 395)(405 - 395) \\ &= (800 \times 10) \\ &= 8000\end{aligned}$$

$$\therefore \left\{(405)^2 - (395)^2\right\} = 8000$$

Q28

Answer :

We have:

$$\begin{aligned}\left\{(7.8)^2 - (2.2)^2\right\} &= (7.8 + 2.2)(7.8 - 2.2) \\ &= (10 \times 5.6) \\ &= 56\end{aligned}$$

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

Factorisation

Ex 7C

Q1

Answer :

We have:

$$\begin{aligned}x^2 + 8x + 16 &= x^2 + 2 \times x \times 4 + (4)^2 \\&= (x + 4)^2\end{aligned}$$

$$\therefore x^2 + 8x + 16 = (x + 4)^2$$

Q2

Answer :

We have:

$$\begin{aligned}x^2 + 14x + 49 &= x^2 + 2 \times x \times 7 + (7)^2 \\&= (x + 7)^2\end{aligned}$$

$$\therefore x^2 + 14x + 49 = (x + 7)^2$$

Q3

Answer :

We have:

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

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

Q4

Answer :

We have;

$$\begin{aligned}9 + 6z + z^2 &= z^2 + 6z + 9 \\&= z^2 + 2 \times z \times 3 + (3)^2 \\&= (z + 3)^2\end{aligned}$$

$$\therefore 9 + 6z + z^2 = (z + 3)^2$$

Q5

Answer :

We have:

$$\begin{aligned}x^2 + 6ax + 9a^2 &= x^2 + 2 \times x \times 3a + (3a)^2 \\&= (x + 3a)^2\end{aligned}$$

$$\therefore x^2 + 6ax + 9a^2 = (x + 3a)^2$$

Q6

Answer :

We have:

$$\begin{aligned}4y^2 + 20y + 25 &= (2y)^2 + 2 \times 2y \times 5 + (5)^2 \\&= (2y + 5)^2\end{aligned}$$

$$\therefore 4y^2 + 20y + 25 = (2y + 5)^2$$

Q7

Answer :

We have:

$$\begin{aligned}36a^2 + 36a + 9 &= (6a)^2 + 2 \times 6a \times 3 + (3)^2 \\&= (6a + 3)^2\end{aligned}$$

$$\therefore 36a^2 + 36a + 9 = (6a + 3)^2$$

Q8

Answer :

We have:

$$\begin{aligned}9m^2 + 24m + 16 &= (3m)^2 + 2 \times 3m \times 4 + (4)^2 \\&= (3m + 4)^2\end{aligned}$$

$$\therefore 9m^2 + 24m + 16 = (3m + 4)^2$$

Q9

Answer :

We have:

$$\begin{aligned}z^2 + z + \frac{1}{4} &= z^2 + 2 \times z \times \frac{1}{2} \times \left(\frac{1}{2}\right)^2 \\&= \left(z + \frac{1}{2}\right)^2\end{aligned}$$

$$\therefore z^2 + z + \frac{1}{4} = \left(z + \frac{1}{2}\right)^2$$

Q10

Answer :

We have:

$$\begin{aligned}49a^2 + 84ab + 36b^2 &= (7a)^2 + 2 \times 7a \times 6b + (6b)^2 \\&= (7a + 6b)^2\end{aligned}$$

$$\therefore 49a^2 + 84ab + 36b^2 = (7a + 6b)^2$$

Q11

Answer :

We have:

$$\begin{aligned}p^2 - 10p + 25 &= p^2 - 2 \times p \times 5 + (5)^2 \\&= (p - 5)^2\end{aligned}$$

$$\therefore p^2 - 10p + 25 = (p - 5)^2$$

Q12

Answer :

We have:

$$\begin{aligned}121a^2 - 88ab + 16b^2 &= (11a)^2 - 2 \times 11a \times 4b + (4b)^2 \\&= (11a - 4b)^2\end{aligned}$$

$$\therefore 121a^2 - 88ab + 16b^2 = (11a - 4b)^2$$

Q13

Answer :

We have:

$$\begin{aligned}1 - 6x + 9x^2 &= 9x^2 - 6x + 1 \\&= (3x)^2 - 2 \times 3x \times 1 + (1)^2 \\&= (3x - 1)^2\end{aligned}$$

$$\therefore 1 - 6x + 9x^2 = (3x - 1)^2$$

Q14

Answer :

We have:

$$\begin{aligned}9y^2 - 12y + 4 &= (3y)^2 - 2 \times 3y \times 2 + (2)^2 \\&= (3y - 2)^2\end{aligned}$$

$$\therefore 9y^2 - 12y + 4 = (3y - 2)^2$$

Q15

Answer :

We have:

$$\begin{aligned}16x^2 - 24x + 9 &= (4x)^2 - 2 \times 4x \times 3 + (3)^2 \\&= (4x - 3)^2\end{aligned}$$

$$\therefore 16x^2 - 24x + 9 = (4x - 3)^2$$

Q16

Answer :

We have:

$$\begin{aligned}m^2 - 4mn + 4n^2 &= m^2 - 2 \times m \times 2n + (2n)^2 \\&= (m - 2n)^2\end{aligned}$$

$$\therefore m^2 - 4mn + 4n^2 = (m - 2n)^2$$

Q17

Answer :

We have:

$$\begin{aligned}a^2b^2 - 6abc + 9c^2 &= (ab)^2 - 2 \times ab \times 3c + (3c)^2 \\&= (ab - 3c)^2\end{aligned}$$

Q18

Answer :

We have:

$$\begin{aligned}m^4 + 2m^2n^2 + n^4 &= (m^2)^2 + 2 \times m^2 \times n^2 + (n^2)^2 \\&= (m^2 + n^2)^2\end{aligned}$$

$$\therefore m^4 + 2m^2n^2 + n^4 = (m^2 + n^2)^2$$

Q19

Answer :

We have:

$$\begin{aligned}(l + m)^2 - 4lm &= (l^2 + m^2 + 2lm) - 4lm \\&= l^2 + m^2 + 2lm - 4lm \\&= l^2 + m^2 - 2lm \\&= (l)^2 + (m)^2 - 2 \times l \times m \\&= (l - m)^2\end{aligned}$$

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

Factorisation

Ex 7D

Q1

Answer :

The given expression is $x^2 + 5x + 6$.

Find two numbers that follow the conditions given below :

$$\text{Sum} = 5$$

$$\text{Product} = 6$$

Clearly, the numbers are 3 and 2.

$$\begin{aligned}x^2 + 5x + 6 &= x^2 + 3x + 2x + 6 \\&= x(x+3) + 2(x+3) \\&= (x+3)(x+2)\end{aligned}$$

Q2

Answer :

The given expression is $y^2 + 10y + 24$.

Find two numbers that follow the conditions given below :

$$\text{Sum} = 10$$

$$\text{Product} = 24$$

Clearly, the numbers are 6 and 4.

$$\begin{aligned}y^2 + 10y + 24 &= y^2 + 6y + 4y + 24 \\&= y(y+6) + 4(y+6) \\&= (y+6)(y+4)\end{aligned}$$

Q3

Answer :

The given expression is $z^2 + 12z + 27$.

Find two numbers that follow the conditions given below :

$$\text{Sum} = 12$$

$$\text{Product} = 27$$

Clearly, the numbers are 9 and 3.

$$\begin{aligned}z^2 + 12z + 27 &= z^2 + 9z + 3z + 27 \\&= z(z+9) + 3(z+9) \\&= (z+9)(z+3)\end{aligned}$$

Q4

Answer :

The given expression is $p^2 + 6p + 8$.

Find two numbers that follow the conditions given below :

$$\text{Sum} = 6$$

$$\text{Product} = 8$$

Clearly, the numbers are 4 and 2.

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

Q5

Answer :

The given expression is $x^2 + 15x + 56$.

Find two numbers that follow the conditions given below :

$$\text{Sum} = 15$$

$$\text{Product} = 56$$

Clearly, the numbers are 8 and 7.

$$\begin{aligned} x^2 + 15x + 56 &= x^2 + 8x + 7x + 56 \\ &= x(x+8) + 7(x+8) \\ &= (x+8)(x+7) \end{aligned}$$

Q6

Answer :

The given expression is $y^2 + 19y + 60$.

Find two numbers that follow the conditions given below :

$$\text{Sum} = 19$$

$$\text{Product} = 60$$

Clearly, the numbers are 15 and 4.

$$\begin{aligned} y^2 + 19y + 60 &= y^2 + 15y + 4y + 60 \\ &= y(y+15) + 4(y+15) \\ &= (y+15)(y+4) \end{aligned}$$

Q7

Answer :

The given expression is $x^2 + 13x + 40$.

Find two numbers that follow the conditions given below :

$$\text{Sum} = 13$$

$$\text{Product} = 40$$

Clearly, the numbers are 8 and 5.

$$\begin{aligned} x^2 + 13x + 40 &= x^2 + 8x + 5x + 40 \\ &= x(x+8) + 5(x+8) \\ &= (x+8)(x+5) \end{aligned}$$

Q8

Answer :

The given expression is $q^2 - 10q + 21$.

Find two numbers that follow the conditions given below :

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

$$\text{Product} = 21$$

Clearly, the numbers are -7 and -3 .

$$\begin{aligned} q^2 - 10q + 21 &= q^2 - 7q - 3q + 21 \\ &= q(q-7) - 3(q-7) \\ &= (q-7)(q-3) \end{aligned}$$

Q9

Answer :

The given expression is $p^2 + 6p - 16$.

Find two numbers that follow the conditions given below :

$$\text{Sum} = 6$$

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

Clearly, the numbers are 8 and -2 .

$$\begin{aligned} p^2 + 6p - 16 &= p^2 + 8p - 2p - 16 \\ &= p(p + 8) - 2(p + 8) \\ &= (p + 8)(p - 2) \end{aligned}$$

Q10

Answer :

The given expression is $x^2 - 10x + 24$.

Find two numbers that follow the conditions given below :

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

$$\text{Product} = 24$$

Clearly, the numbers are -6 and -4 .

$$\begin{aligned} x^2 - 10x + 24 &= x^2 - 6x - 4x + 24 \\ &= x(x - 6) - 4(x - 6) \\ &= (x - 6)(x - 4) \end{aligned}$$

Q11

Answer :

The given expression is $x^2 - 23x + 42$.

Find two numbers that follow the conditions given below :

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

$$\text{Product} = 42$$

Clearly, the numbers are -21 and -2 .

$$\begin{aligned} x^2 - 23x + 42 &= x^2 - 21x - 2x + 42 \\ &= x(x - 21) - 2(x - 21) \\ &= (x - 21)(x - 2) \end{aligned}$$

Q12

Answer :

The given expression is $x^2 - 17x + 16$.

Find two numbers that follow the conditions given below :

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

$$\text{Product} = 16$$

Clearly, the numbers are -16 and -1 .

$$\begin{aligned} x^2 - 17x + 16 &= x^2 - 16x - x + 16 \\ &= x(x - 16) - 1(x - 16) \\ &= (x - 16)(x - 1) \end{aligned}$$

Q13

Answer :

The given expression is $y^2 - 21y + 90$.

Find two numbers that follow the conditions given below :

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

$$\text{Product} = 90$$

Clearly, the numbers are -15 and -6 .

$$\begin{aligned} y^2 - 21y + 90 &= y^2 - 15y - 6y + 90 \\ &= y(y - 15) - 6(y - 15) \\ &= (y - 15)(y - 6) \end{aligned}$$

Q14

Answer :

The given expression is $x^2 - 22x + 117$.

Find two numbers that follow the conditions given below :

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

$$\text{Product} = 117$$

Clearly, the numbers are -13 and -9 .

$$\begin{aligned}x^2 - 22x + 117 &= x^2 - 13x - 9x + 117 \\&= x(x - 13) - 9(x - 13) \\&= (x - 13)(x - 9)\end{aligned}$$

Q15

Answer :

The given expression is $x^2 - 9x + 20$.

Find two numbers that follow the conditions given below :

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

$$\text{Product} = 20$$

Clearly, the numbers are -5 and -4 .

$$\begin{aligned}x^2 - 9x + 20 &= x^2 - 5x - 4x + 20 \\&= x(x - 5) - 4(x - 5) \\&= (x - 5)(x - 4)\end{aligned}$$

Q16

Answer :

The given expression is $x^2 + x - 132$.

Find two numbers that follow the conditions given below :

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

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

Clearly, the numbers are 12 and -11 .

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

Q17

Answer :

The given expression is $x^2 + 5x - 104$.

Find two numbers that follow the conditions given below :

$$\text{Sum} = 5$$

$$\text{Product} = -104$$

Clearly, the numbers are 13 and -8 .

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

Q18

Answer :

The given expression is $y^2 + 7y - 144$.

Find two numbers that follow the conditions given below :

$$\text{Sum} = 7$$

$$\text{Product} = -144$$

Clearly, the numbers are 16 and -9 .

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

Q19

Answer :

The given expression is $z^2 + 19z - 150$.

Find two numbers that follow the conditions given below :

$$\text{Sum} = 19$$

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

Clearly, the numbers are 25 and -6 .

$$\begin{aligned} z^2 + 19z - 150 &= z^2 + 25z - 6z - 150 \\ &= z(z + 25) - 6(z + 25) \\ &= (z + 25)(z - 6) \end{aligned}$$

Q20

Answer :

The given expression is $y^2 + y - 72$.

Find two numbers that follow the conditions given below :

$$\text{Sum} = 1$$

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

Clearly, the numbers are 9 and -8 .

$$\begin{aligned} y^2 + y - 72 &= y^2 + 9y - 8y - 72 \\ &= y(y + 9) - 8(y + 9) \\ &= (y + 9)(y - 8) \end{aligned}$$

Q21

Answer :

The given expression is $a^2 + 6a - 91$.

Find two numbers that follow the conditions given below :

$$\text{Sum} = 6$$

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

Clearly, the numbers are 13 and -7 .

$$\begin{aligned} a^2 + 6a - 91 &= a^2 + 13a - 7a - 91 \\ &= a(a + 13) - 7(a + 13) \\ &= (a + 13)(a - 7) \end{aligned}$$

Q22

Answer :

The given expression is $p^2 - 4p - 77$.

Find two numbers that follow the conditions given below :

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

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

Clearly, the numbers are -11 and 7 .

$$\begin{aligned} p^2 - 4p - 77 &= p^2 - 11p + 7p - 77 \\ &= p(p - 11) + 7(p - 11) \\ &= (p - 11)(p + 7) \end{aligned}$$

Q23

Answer :

The given expression is $x^2 - 7x - 30$.

Find two numbers that follow the conditions given below :

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

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

Clearly, the numbers are -10 and 3 .

$$\begin{aligned} x^2 - 7x - 30 &= x^2 - 10x + 3x - 30 \\ &= x(x - 10) + 3(x - 10) \\ &= (x - 10)(x + 3) \end{aligned}$$

Q24

Answer :

The given expression is $x^2 - 11x - 42$.

Find two numbers that follow the conditions given below :

$$\text{Sum} = -11$$

$$\text{Product} = -42$$

Clearly, the numbers are -14 and 3 .

$$\begin{aligned}x^2 - 11x - 42 &= x^2 - 14x + 3x - 42 \\&= x(x - 14) + 3(x - 14) \\&= (x - 14)(x + 3)\end{aligned}$$

Q25

Answer :

The given expression is $x^2 - 5x - 24$.

Find two numbers that follow the conditions given below :

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

$$\text{Product} = -24$$

Clearly, the numbers are -8 and 3 .

$$\begin{aligned}x^2 - 5x - 24 &= x^2 - 8x + 3x - 24 \\&= x(x - 8) + 3(x - 8) \\&= (x - 8)(x + 3)\end{aligned}$$

Q26

Answer :

The given expression is $y^2 - 6y - 135$.

Find two numbers that follow the conditions given below :

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

$$\text{Product} = -135$$

Clearly, the numbers are -15 and 9 .

$$\begin{aligned}y^2 - 6y - 135 &= y^2 - 15y + 9y - 135 \\&= y(y - 15) + 9(y - 15) \\&= (y - 15)(y + 9)\end{aligned}$$

Q27

Answer :

The given expression is $z^2 - 12z - 45$.

Find two numbers that follow the conditions given below :

$$\text{Sum} = -12$$

$$\text{Product} = -45$$

Clearly, the numbers are -15 and 3 .

$$\begin{aligned}z^2 - 12z - 45 &= z^2 - 15z + 3z - 45 \\&= z(z - 15) + 3(z - 15) \\&= (z - 15)(z + 3)\end{aligned}$$

Q28

Answer :

The given expression is $x^2 - 4x - 12$.

Find two numbers that follow the conditions given below :

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

$$\text{Product} = -12$$

Clearly, the numbers are -6 and 2 .

$$\begin{aligned}x^2 - 4x - 12 &= x^2 - 6x + 2x - 12 \\&= x(x - 6) + 2(x - 6) \\&= (x - 6)(x + 2)\end{aligned}$$

Q29

Answer :

The given expression is $3x^2 + 10x + 8$.

Find two numbers that follow the conditions given below :

$$\text{Sum} = 10$$

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

Clearly, the numbers are 6 and 4.

$$\begin{aligned} 3x^2 + 10x + 8 &= 3x^2 + 10x + 8 \\ &= 3x^2 + 6x + 4x + 8 \\ &= 3x(x + 2) + 4(x + 2) \\ &= (x + 2)(3x + 4) \end{aligned}$$

Q30

Answer :

The given expression is $3y^2 + 14y + 8$

Find two numbers that follow the conditions given below :

$$\text{Sum} = 14$$

$$\text{Product} = 24$$

Clearly, the numbers are 12 and 2.

$$\begin{aligned} 3y^2 + 14y + 8 &= 3y^2 + 12y + 2y + 8 \\ &= 3y(y + 4) + 2(y + 4) \\ &= (3y + 2)(y + 4) \end{aligned}$$

Q31

Answer :

The given expression is $3z^2 - 10z + 8$.

Find two numbers that follow the conditions given below :

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

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

Clearly, the numbers are -6 and -4 .

$$\begin{aligned} 3z^2 - 10z + 8 &= 3z^2 - 6z - 4z + 8 \\ &= 3z(z - 2) - 4(z - 2) \\ &= (3z - 4)(z - 2) \end{aligned}$$

Q32

Answer :

The given expression is $2x^2 + x - 45$.

Find two numbers that follow the conditions given below :

$$\text{Sum} = 1$$

$$\text{Product} = -45 \times 2 = -90$$

Clearly, the numbers are 10 and -9 .

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

Q33

Answer :

The given expression is $6p^2 + 11p - 10$.

Find two numbers that follow the conditions given below :

$$\text{Sum} = 11$$

$$\text{Product} = 6 \times -10 = -60$$

Clearly, the numbers are 15 and -4 .

$$\begin{aligned} 6p^2 + 11p - 10 &= 6p^2 + 15p - 4p - 10 \\ &= 3p(2p + 5) - 2(2p + 5) \\ &= (2p + 5)(3p - 2) \end{aligned}$$

Q34

Answer :

The given expression is $2x^2 - 17x - 30$.

Find two numbers that follow the conditions given below :

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

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

Clearly, the numbers are -20 and 3 .

$$\begin{aligned} 2x^2 - 17x - 30 &= 2x^2 - 20x + 3x - 30 \\ &= 2x(x - 10) + 3(x - 10) \\ &= (2x + 3)(x - 10) \end{aligned}$$

Q35

Answer :

The given expression is $7y^2 - 19y - 6$.

Find two numbers that follow the conditions given below :

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

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

Clearly, the numbers are -21 and 2 .

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

Q36

Answer :

The given expression is $28 - 31x - 5x^2$.

Find two numbers that follow the conditions given below :

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

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

Clearly, the numbers are -35 and 4 .

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

Q37

Answer :

The given expression is $3 + 23z - 8z^2$.

Find two numbers that follow the conditions given below :

$$\text{Sum} = 23$$

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

Clearly, the numbers are 24 and -1 .

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

Q38

Answer :

The given expression is $6x^2 - 5x - 6$.

Find two numbers that follow the conditions given below :

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

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

Clearly, the numbers are -9 and 4 .

$$\begin{aligned} 6x^2 - 5x - 6 &= 6x^2 - 9x + 4x - 6 \\ &= 3x(2x - 3) + 2(2x - 3) \\ &= (2x - 3)(3x + 2) \end{aligned}$$

Q39

Answer :

The given expression is $3m^2 + 24m + 36$.

Find two numbers that follow the conditions given below :

$$\text{Sum} = 24$$

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

Clearly, the numbers are 18 and 6.

$$\begin{aligned} 3m^2 + 24m + 36 &= 3m^2 + 18m + 6m + 36 \\ &= 3m(m+6) + 6(m+6) \\ &= (3m+6)(m+6) = 3(m+2)(m+6) \end{aligned}$$

Q40

Answer :

The given expression is $4n^2 - 8n + 3$.

Find two numbers that follow the conditions given below :

$$\text{Sum} = -8$$

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

Clearly, the numbers are -6 and -2 .

$$\begin{aligned} 4n^2 - 8n + 3 &= 4n^2 - 2n - 6n + 3 \\ &= 2n(2n-1) - 3(2n-1) \\ &= (2n-1)(2n-3) \end{aligned}$$

Q41

Answer :

The given expression is $6x^2 - 17x - 3$.

Find two numbers that follow the conditions given below :

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

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

Clearly, the numbers are -18 and 1 .

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

Q42

Answer :

The given expression is $7x^2 - 19x - 6$.

Find two numbers that follow the conditions given below :

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

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

Clearly, the numbers are -21 and 2 .

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

Factorisation Ex 7E

Q1

Answer :

$$(d) 7(a - 3b)(a + 3b)$$

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

Q2 $7(a - 3b)(a + 3b)$

Answer :

$$(d) 2x(1 - 4x)(1 + 4x)$$

$$\begin{aligned}(2x - 32x^3) \\ &= 2x(1 - 16x^2) \\ &= 2x(1 - 4x)(1 + 4x)\end{aligned}$$

Q3

Answer :

$$(c) x(x - 12)(x + 12)$$

$$\begin{aligned}x^3 - 144x \\ &= x(x^2 - 144) \\ &= x(x - 12)(x + 12)\end{aligned}$$

Q4

Answer :

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

$$\begin{aligned}2 - 50x^2 \\ &= 2(1 - 25x^2) \\ &= 2(1 - 5x)(1 + 5x)\end{aligned}$$

Q5

Answer :

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

$$\begin{aligned} a^2 + bc + ab + ac \\ &= a^2 + ab + bc + ac \\ &= a(a + b) + c(a + b) \\ &= (a + c)(a + b) \end{aligned}$$

Q6

Answer :

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

$$\begin{aligned} pq^2 + q(p - 1) - 1 \\ &= pq^2 + qp - q - 1 \\ &= pq(q + 1) - 1(q + 1) \\ &= (pq - 1)(q + 1) \end{aligned}$$

Q7

Answer :

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

$$\begin{aligned} ab - mn + an - bm \\ &= ab + an - mn - bm \\ &= a(b + n) - m(n + b) \\ &= (a - m)(b + n) \end{aligned}$$

Q8

Answer :

$$(a) (a - 1)(b - 1)$$

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

Q9

Answer :

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

$$\begin{aligned} x^2 - xz + xy - yz \\ &= x(x - z) + y(x - z) \\ &= (x + y)(x - z) \end{aligned}$$

Q10

Answer :

$$(c) 3(2m - 3)(2m + 3)$$

$$\begin{aligned} 12m^2 - 27 \\ &= 3(4m^2 - 9) \\ &= 3(2m - 3)(2m + 3) \end{aligned}$$

Q11

Answer :

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

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

Q12

Answer :

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

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

Q13

Answer :

$$(c) (x + 2)(x + 4)$$

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

Q14

Answer :

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

$$\begin{aligned} & x^2 + 4x - 21 \\ &= x^2 + 7x - 3x - 21 \\ &= x(x + 7) - 3(x + 7) \\ &= (x - 3)(x + 7) \end{aligned}$$

Q15

Answer :

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

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

Q16

Answer :

$$(c) (5 + x)(8 - x)$$

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

Q17

Answer :

$$(b) (x + 1)(2x + 3)$$

$$\begin{aligned} & 2x^2 + 5x + 3 \\ &= 2x^2 + 2x + 3x + 3 \\ &= 2x(x + 1) + 3(x + 1) \\ &= (2x + 3)(x + 1) \end{aligned}$$

Q18

Answer :

$$(c) (3a - 2)(2a - 3)$$

$$\begin{aligned} & 6a^2 - 13a + 6 \\ &= 6a^2 - 9a - 4a + 6 \\ &= 3a(2a - 3) - 2(2a - 3) \\ &= (3a - 2)(2a - 3) \end{aligned}$$

Q19

Answer :

$$\begin{aligned} & (a) (2z - 1)(2z - 3) \\ & 4z^2 - 8z + 3 \\ &= 4z^2 - 6z - 2z + 3 \\ &= 2z(2z - 3) - 1(2z - 3) \\ &= (2z - 1)(2z - 3) \end{aligned}$$

Q20

Answer :

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

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