

Factorisation

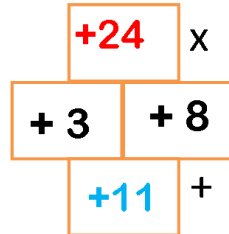
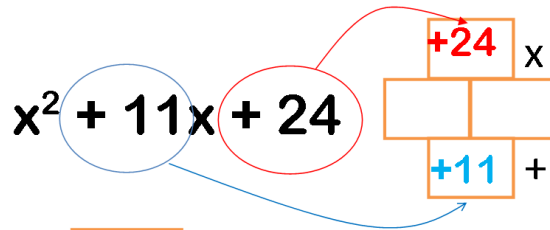
Ex 7B

- (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 $x^2 + 11x + 24$



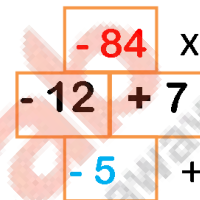
Find two numbers that multiply to get +24 and add to get +11

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

Factorise $x^2 - 5x - 84$

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

$$-12 + 7 = -5$$



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

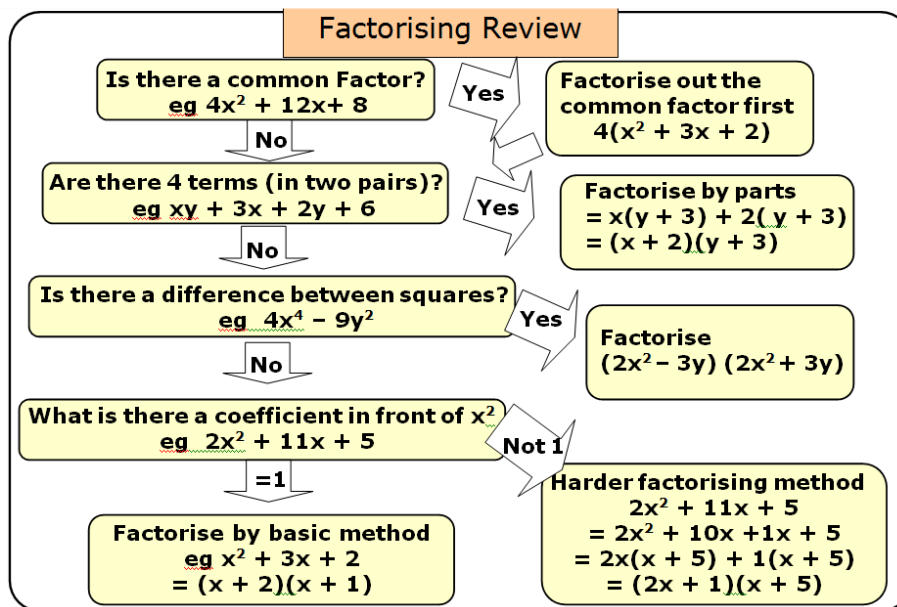
$$3x^2 + 7x + 2$$

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

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

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

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



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:

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

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

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