

Factorisation - Lesson 7

Factorising a Difference of Two Squares (All Types)

LI

- Factorise expressions of the form $Cx^2 - Dy^2$.

SC

- Numerical factors.
- Square roots.

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

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

Example 1

$$x^2 - 16$$

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

Example 2

$$64 - r^2$$

$$= (8 + r)(8 - r)$$

1. $x^2 - 16$	2. $y^2 - 49$	3. $z^2 - 81$
4. $p^2 - 64$	5. $q^2 - 36$	6. $r^2 - 4$
7. $a^2 - 100$	8. $b^2 - 144$	9. $c^2 - 121$
10. $m^2 - 400$	11. $n^2 - 900$	12. $u^2 - 2500$
13. $v^2 - 1600$	14. $x^2 - 3600$	15. $y^2 - 225$
16. $z^2 - 625$	17. $a^2 - \frac{1}{4}$	18. $b^2 - \frac{1}{9}$
19. $c^2 - \frac{1}{25}$	20. $m^2 - \frac{1}{16}$	21. $n^2 - \frac{1}{100}$
22. $u^2 - \frac{1}{36}$	23. $v^2 - \frac{1}{64}$	24. $r^2 - \frac{1}{81}$
25. $s^2 - \frac{1}{49}$	26. $9 - a^2$	27. $25 - b^2$
28. $16 - c^2$	29. $4 - d^2$	30. $64 - m^2$
31. $36 - n^2$	32. $81 - p^2$	33. $1 - q^2$
34. $100 - r^2$	35. $144 - s^2$	36. $121 - t^2$
37. $900 - x^2$	38. $400 - y^2$	39. $1600 - z^2$
40. $2500 - a^2$	41. $6400 - b^2$	42. $4900 - c^2$
43. $225 - d^2$	44. $\frac{1}{25} - u^2$	45. $\frac{1}{100} - v^2$
46. $\frac{1}{9} - m^2$	47. $\frac{1}{16} - n^2$	48. $\frac{1}{4} - x^2$
49. $\frac{1}{36} - y^2$	50. $\frac{1}{144} - z^2$	

Answers

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|---|--|--|
| 1. $x^2 - 16 (x + 4)(x - 4)$ | 2. $y^2 - 49 (y + 7)(y - 7)$ | 3. $z^2 - 81 (z + 9)(z - 9)$ |
| 4. $p^2 - 64 (p + 8)(p - 8)$ | 5. $q^2 - 36 (q + 6)(q - 6)$ | 6. $r^2 - 4 (r + 2)(r - 2)$ |
| 7. $a^2 - 100 (a + 10)(a - 10)$ | 8. $b^2 - 144 (b + 12)(b - 12)$ | 9. $c^2 - 121 (c + 11)(c - 11)$ |
| 10. $m^2 - 400 (m + 20)(m - 20)$ | 11. $n^2 - 900 (n + 30)(n - 30)$ | 12. $u^2 - 2500 (u + 50)(u - 50)$ |
| 13. $v^2 - 1600 (v + 40)(v - 40)$ | 14. $x^2 - 3600 (x + 60)(x - 60)$ | 15. $y^2 - 225 (y + 15)(y - 15)$ |
| 16. $z^2 - 625 (z + 25)(z - 25)$ | 17. $a^2 - \frac{1}{4} (a + 1/2)(a - 1/2)$ | 18. $b^2 - \frac{1}{9} (b + 1/3)(b - 1/3)$ |
| 19. $c^2 - \frac{1}{25} (c + 1/5)(c - 1/5)$ | 20. $m^2 - \frac{1}{16} (m + 1/4)(m - 1/4)$ | 21. $n^2 - \frac{1}{100} (n + 1/10)(n - 1/10)$ |
| 22. $u^2 - \frac{1}{36} (u + 1/6)(u - 1/6)$ | 23. $v^2 - \frac{1}{64} (v + 1/8)(v - 1/8)$ | 24. $r^2 - \frac{1}{81} (r + 1/9)(r - 1/9)$ |
| 25. $s^2 - \frac{1}{49} (s + 1/7)(s - 1/7)$ | 26. $9 - a^2 (3 + a)(3 - a)$ | 27. $25 - b^2 (5 + b)(5 - b)$ |
| 28. $16 - c^2 (4 + c)(4 - c)$ | 29. $4 - d^2 (2 + d)(2 - d)$ | 30. $64 - m^2 (8 + m)(8 - m)$ |
| 31. $36 - n^2 (6 + n)(6 - n)$ | 32. $81 - p^2 (9 + p)(9 - p)$ | 33. $1 - q^2 (1 + q)(1 - q)$ |
| 34. $100 - r^2 (10 + r)(10 - r)$ | 35. $144 - s^2 (12 + s)(12 - s)$ | 36. $121 - t^2 (11 + t)(11 - t)$ |
| 37. $900 - x^2 (30 + x)(30 - x)$ | 38. $400 - y^2 (20 + y)(20 - y)$ | 39. $1600 - z^2 (40 + z)(40 - z)$ |
| 40. $2500 - a^2 (50 + a)(50 - a)$ | 41. $6400 - b^2 (80 + b)(80 - b)$ | 42. $4900 - c^2 (70 + c)(70 - c)$ |
| 43. $225 - d^2 (15 + d)(15 - d)$ | 44. $\frac{1}{25} - u^2 (1/5 + u)(1/5 - u)$ | 45. $\frac{1}{100} - v^2 (1/10 + v)(1/10 - v)$ |
| 46. $\frac{1}{9} - m^2 (1/3 + m)(1/3 - m)$ | 47. $\frac{1}{16} - n^2 (1/4 + n)(1/4 - n)$ | 48. $\frac{1}{4} - x^2 (1/2 + x)(1/2 - x)$ |
| 49. $\frac{1}{36} - y^2 (1/6 + y)(1/6 - y)$ | 50. $\frac{1}{144} - z^2 (1/12 + z)(1/12 - z)$ | |

Example 3

$$16x^2 - 25y^2$$

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

Example 4

$$64 n^2 - 121 p^2$$
$$= (8 n + 11 p) (8 n - 11 p)$$

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|--------------------|-----------------------|--------------------------|
| 1) $4x^2 - y^2$ | 17) $9v^2 - 484m^2$ | 33) $H^2 - 1/4e^2$ |
| 2) $p^2 - 81D^2$ | 18) $900y^2 - 49K^2$ | 34) $1/9U^2 - w^2$ |
| 3) $9L^2 - b^2$ | 19) $16g^2 - 225R^2$ | 35) $4b^2 - 1/16D^2$ |
| 4) $r^2 - 144A^2$ | 20) $324F^2 - 25T^2$ | 36) $1/36e^2 - 25I^2$ |
| 5) $16T^2 - m^2$ | 21) $4X^2 - 289w^2$ | 37) $121C^2 - 1/25a^2$ |
| 6) $w^2 - 100K^2$ | 22) $361P^2 - 64s^2$ | 38) $1/100h^2 - 144X^2$ |
| 7) $121L^2 - e^2$ | 23) $25j^2 - 256E^2$ | 39) $289v^2 - 1/81M^2$ |
| 8) $r^2 - 169A^2$ | 24) $400a^2 - 9u^2$ | 40) $1/225S^2 - 16p^2$ |
| 9) $36F^2 - s^2$ | 25) $25c^2 - 196N^2$ | 41) $1/81i^2 - 1/100d^2$ |
| 10) $Q^2 - 64G^2$ | 26) $169R^2 - 81G^2$ | 42) $1/100z^2 - 100f^2$ |
| 11) $49h^2 - C^2$ | 27) $64K^2 - 289B^2$ | 43) $1/400j^2 - 1/9L^2$ |
| 12) $w^2 - 196x^2$ | 28) $121U^2 - 25A^2$ | 44) $1/16r^2 - 1/81B^2$ |
| 13) $400x^2 - j^2$ | 29) $49F^2 - 900h^2$ | 45) $9/121A^2 - 196k^2$ |
| 14) $S^2 - 441v^2$ | 30) $4w^2 - 529G^2$ | 46) $9/25Q^2 - 1/81n^2$ |
| 15) $324B^2 - a^2$ | 31) $1600J^2 - 9R^2$ | 47) $441I^2 - 36/25y^2$ |
| 16) $n^2 - 256H^2$ | 32) $81b^2 - 2500M^2$ | 48) $T^2 - 3600g^2$ |

Answers

- 1) $(2x - y)(2x + y)$ 17) $(3v - 22m)(3v + 22m)$ 33) $(H - \frac{1}{2}e)(H + \frac{1}{2}e)$
 2) $(p - 9D)(p + 9D)$ 18) $(30y - 7K)(30y + 7K)$ 34) $(\frac{1}{3}U - w)(\frac{1}{3}U + w)$
 3) $(3L - b)(3L + b)$ 19) $(4g - 15R)(4g + 15R)$ 35) $(2b - \frac{1}{4}D)(2b + \frac{1}{4}D)$
 4) $(r - 12A)(r + 12A)$ 20) $(18F - 5T)(18F + 5T)$ 36) $(\frac{1}{6}e - 5I)(\frac{1}{6}e + 5I)$
 5) $(4T - m)(4T + m)$ 21) $(2X - 17w)(2X + 17w)$ 37) $(11C - \frac{1}{5}a)(11C + \frac{1}{5}a)$
 6) $(w - 10K)(w + 10K)$ 22) $(19P - 8s)(19P + 8s)$ 38) $(\frac{1}{10}h - 12X)(\frac{1}{10}h + 12X)$
 7) $(11L - e)(11L + e)$ 23) $(5j - 16E)(5j + 16E)$ 39) $(17v - \frac{1}{9}M)(17v + \frac{1}{9}M)$
 8) $(r - 13A)(r + 13A)$ 24) $(20a - 3u)(20a + 3u)$ 40) $(\frac{1}{15}S - 4p)(\frac{1}{15}S + 4p)$
 9) $(6F - s)(6F + s)$ 25) $(5c - 14N)(5c + 14N)$ 41) $(\frac{1}{9}i - \frac{1}{10}d)(\frac{1}{9}i + \frac{1}{10}d)$
 10) $(Q - 8G)(Q + 8G)$ 26) $(13R - 9G)(13R + 9G)$ 42) $(\frac{1}{10}z - 10f)(\frac{1}{10}z + 10f)$
 11) $(7h - C)(7h + C)$ 27) $(8K - 17B)(8K + 17B)$ 43) $(\frac{1}{20}j - \frac{1}{3}L)(\frac{1}{20}j + \frac{1}{3}L)$
 12) $(w - 14x)(w + 14x)$ 28) $(11U - 5A)(11U + 5A)$ 44) $(\frac{1}{4}r - \frac{1}{9}B)(\frac{1}{4}r + \frac{1}{9}B)$
 13) $(20x - j)(20x + j)$ 29) $(7F - 30h)(7F + 30h)$ 45) $(\frac{3}{11}A - 14k)(\frac{3}{11}A + 14k)$
 14) $(S - 21v)(S + 21v)$ 30) $(2w - 23G)(2w + 23G)$ 46) $(\frac{3}{5}Q - \frac{1}{9}n)(\frac{3}{5}Q + \frac{1}{9}n)$
 15) $(18B - a)(18B + a)$ 31) $(40J - 3)(40J + 3R)$ 47) $(21I - \frac{6}{5}y)(21I + \frac{6}{5}y)$
 16) $(n - 16H)(n + 16H)$ 32) $(9b - 50M)(9b + 50M)$ 48) $(T - 190g)(T + 190g)$

Example 5

$$8x^2 - 18$$

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

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

Example 6

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

1) $3x^2 - 3y^2$	7) $12y^2 - 108D^2$	13) $\frac{2}{25}T^2 - \frac{2}{81}L^2$
2) $2x^2 - 50M^2$	8) $6S^2 - 54x^2$	14) $\frac{3}{400}f^2 - \frac{12}{81}P^2$
3) $4B^2 - 36n^2$	9) $18z^2 - 32R^2$	15) $\frac{45}{64}d^2 - \frac{5}{121}X^2$
4) $5E^2 - 45c^2$	10) $27A^2 - 243w^2$	16) $\frac{7}{484}V^2 - \frac{63}{289}b^2$
5) $12p^2 - 75v^2$	11) $50u^2 - 162C^2$	17) $\frac{17}{441}N^2 - \frac{68}{169}e^2$
6) $99g^2 - 44F^2$	12) $32Q^2 - 200a^2$	18) $\frac{21}{625}A^2 - \frac{189}{256}F^2$

Answers

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|---------------------------|--|
| 1) $3(x + y)(x - y)$ | 10) $3(3A + 9w)(3A - 9w)$ |
| 2) $2(x + 5M)(X - 5M)$ | 11) $2(5u + 9C)(5u - 9C)$ |
| 3) $4(B + 3n)(B - 3n)$ | 12) $8(2Q + 5a)(2Q - 5a)$ |
| 4) $5(E + 3c)(E - 3c)$ | 13) $2(\frac{1}{5}T + \frac{1}{9}L)(\frac{1}{5}T - \frac{1}{9}L)$ |
| 5) $3(2p + 5v)(2p - 5v)$ | 14) $3(\frac{1}{20}f + \frac{2}{9}p)(\frac{1}{20}f - \frac{2}{9}p)$ |
| 6) $11(3g + 2F)(3g - 2F)$ | 15) $5(\frac{3}{8}d + \frac{1}{11}X)(\frac{3}{8}d - \frac{1}{11}X)$ |
| 7) $12(y + 3D)(y - 3D)$ | 16) $7(\frac{1}{22}V + \frac{3}{17}b)(\frac{1}{22}V - \frac{3}{17}b)$ |
| 8) $6(S + 3x)(S - 3x)$ | 17) $17(\frac{1}{21}N + \frac{2}{13}e)(\frac{1}{21}N - \frac{2}{13}e)$ |
| 9) $2(3z + 4R)(3z - 4R)$ | 18) $21(\frac{1}{25}A + \frac{3}{16}F)(\frac{1}{25}A - \frac{3}{16}F)$ |