

Factoring Problems — Grouping

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Completely factor each of the following. Write complete and correct steps for all problems. Do not use a calculator. Work the odd problems, if you have any trouble whatsoever also do the even problems. The last 12 problems are review problems.

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| (1) $ax + 2x + a + 2$ | (2) $by + 3y + 2b + 6$ | (3) $xy + 3y + 7x + 21$ |
| (4) $st + 5t + 2s + 10$ | (5) $xy + 3y + ax + 3a$ | (6) $xy + 3y + 2bx + 6b$ |
| (7) $xy + 3y + 2x + 6$ | (8) $st + 5t + 2s + 10$ | (9) $2xy + y + 8x + 4$ |
| (10) $3yz + 2z + 15y + 10$ | (11) $2xy - 2y - 2x + 2$ | (12) $3ab - 9b + 6a - 18$ |
| (13) $6ab + 3b + 2a + 1$ | (14) $12st + 4t + 3s + 1$ | (15) $ab - 2b + 3a - 6$ |
| (16) $xy - 4y + 2x - 8$ | (17) $ax - 2x - 3a + 6$ | (18) $by - 2y - 5b + 10$ |
| (19) $8as + 28s - 6a - 21$ | (20) $10az - 15z + 8a - 12$ | (21) $2ax + 6x + 4a + 12$ |
| (22) $3by + 12y + 9b + 36$ | (23) $4ab + 20b + 4a + 20$ | (24) $5ab + 15b + 5a + 15$ |
| (25) $-ax - 2x - a - 2$ | (26) $-cy - 4y - 3c - 12$ | (27) $-2ab - 4b - 12a - 24$ |
| (28) $-3bc - 9c - 6b - 18$ | (29) $-yz - 4z - 9y - 36$ | (30) $-xy - 8y - 3x - 24$ |
| (31) $-5ab - 5b - 10a - 10$ | (32) $-7cd - 14d - 35c - 70$ | (33) $x^2 + 2x + 1 - a^2$ |
| (34) $y^2 + 4y + 4 - b^2$ | (35) $a^2 - 10a + 25 - x^2$ | (36) $b^2 - 6b + 9 - y^2$ |
| (37) $-x^2 - 8x + a^2 - 16$ | (38) $-y^2 - 6y + b^2 - 9$ | (39) $xy + ay + bx + ab$ |
| (40) $st + ct + 2ds + 2cd$ | (41) $-2dy + 3cy - 8dx + 12cx$ | (42) $-3by - 2ay + 6bx + 4ax$ |

_____ The following are review problems. Work all of them. _____

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|--------------------------------|------------------------------|-------------------------------|
| (43) $ab + 3b + 9a + 27$ | (44) $cd + d - 4c - 4$ | (45) $bc - 2c - 3b + 6$ |
| (46) $15xy - 10ay + 9bx - 6ab$ | (47) $3xy - 3y + 18x - 18$ | (48) $-2ab - 4b + 10a + 20$ |
| (49) $2bd - 4ad - bc + 2ac$ | (50) $y^2 + 2ay + a^2 - 4$ | (51) $4axy + 8ay - 6ax - 12a$ |
| (52) $-4x^2 - 4x + a^2 - 1$ | (53) $-2bd + ad - 6bc + 3ac$ | (54) $x^2 + cx + 2x + 2c$ |

Answers: (1) $(a + 2)(x + 1)$ (2) $(b + 3)(y + 2)$ (3) $(x + 3)(y + 7)$ (4) $(s + 5)(t + 2)$
 (5) $(x + 3)(y + a)$ (6) $(y + 2b)(x + 3)$ (7) $(x + 3)(y + 2)$ (8) $(s + 5)(t + 2)$
 (9) $(2x + 1)(y + 4)$ (10) $(3y + 2)(z + 5)$ (11) $2(x - 1)(y - 1)$ (12) $3(a - 3)(b + 2)$
 (13) $(2a + 1)(3b + 1)$ (14) $(3s + 1)(4t + 1)$ (15) $(a - 2)(b + 3)$ (16) $(x - 4)(y + 2)$
 (17) $(x - 3)(a - 2)$ (18) $(y - 5)(b - 2)$ (19) $(4s - 3)(2a + 7)$ (20) $(2a - 3)(5z + 4)$
 (21) $2(x + 2)(a + 3)$ (22) $3(y + 3)(b + 4)$ (23) $4(a + 5)(b + 1)$ (24) $5(a + 3)(b + 1)$
 (25) $-(x + 1)(a + 2)$ (26) $-(y + 3)(c + 4)$ (27) $-2(a + 2)(b + 6)$ (28) $-3(b + 3)(c + 2)$
 (29) $-(y + 4)(z + 9)$ (30) $-(x + 8)(y + 3)$ (31) $-5(a + 1)(b + 2)$ (32) $-7(c + 2)(d + 5)$
 (33) $(x + 1 - a)(x + 1 + a)$ (34) $(y + 2 - b)(y + 2 + b)$ (35) $(a - 5 - x)(a - 5 + x)$
 (36) $(b - 3 - y)(b - 3 + y)$ (37) $(a - x - 4)(a + x + 4)$ (38) $(b - y - 3)(b + y + 3)$
 (39) $(a + x)(b + y)$ (40) $(c + s)(2d + t)$ (41) $(3c - 2d)(4x + y)$ (42) $(2a + 3b)(2x - y)$
 (43) R (44) $(a + 3)(b + 9)$ (45) $(c + 1)(d - 4)$ (46) $(b - 2)(c - 3)$ (47) $(3x - 2a)(5y + 3b)$
 (48) $3(x - 1)(y + 6)$ (49) $-2(a + 2)(b - 5)$ (50) $(2a - b)(c - 2d)$ (51) $(y + a - 2)(y + a + 2)$
 (52) $2a(x + 2)(2y - 3)$ (53) $(a - 2x - 1)(a + 2x + 1)$ (54) $(a - 2b)(3c + d)$ (55) $(x + 2)(x + c)$