

Exercise Set 4.1: Greatest Common Factor and Factoring by Grouping

Find the GCF (Greatest Common Factor) of the following monomials.

- $18x^3y^2, 24x^2y^5, 12xy^4$
- $20x^3y^5, 32x^7y^3, 8x^4y^9$
- $a^7b^4, 7a^4b^5, 14a^7b^8$
- $12c^6d^{10}, 15c^4d, 21c^7d^4$
- $16a^3b^{12}c^{10}, 32a^5bc^6, 100a^7c^5$
- $30a^5b^2, 90a^7c^3, 45b^7c^3$
- $10x^6y^9z^8, 18x^3y^5z^7, 7x^5y^6z^4$
- $9x^7y^5z^3, 50x^4y^8, 20x^6y^5z^2$

Find the GCF of the terms of the polynomial and factor it out. If the first term that appears in the polynomial has a negative coefficient, then factor out the negative of the GCF.

- $5a + 10$
- $4x - 12$
- $-3b + 15$
- $-4y - 24$
- $9x - 24y$
- $-10a + 25c$
- $6x - 8xy$
- $8ab - 12bc$
- $6a^3b^2 + 2ab$
- $3ac - 6a^5c^7$
- $15r^2t - 20rt^2$
- $-30u^4v^3 + 2u^3w^6$
- $4x^3 + 2x^2 - 8x$
- $18x^5 - 36x^3 + 45x^2$
- $-5x^3y^2 + 3x^4y^5 - 7x^8y^3$
- $20a^3b^6 - 8ab^4 + 12a^5b^2$
- $35a^7b^4c^9 - 28a^2b^5c + 21a^3b^9c^6$
- $-36x^3y^7z^8 - 12x^2y^5z^4 - 48x^2y^6z^7$

27. $-10a^3b^2c^5 + 21a^4c^7 - 49b^3c^8$

28. $4x^7y^4z + 35y^6z^4 - 9x^2y^6z^3$

Factor the following expressions.

29. (a) $xy - 5y$

(b) $x(x-4) - 5(x-4)$

30. (a) $xy + 3y$

(b) $x(x+6) + 3(x+6)$

31. (a) $3b + ab$

(b) $3(c+5) + a(c+5)$

32. (a) $ap - cp$

(b) $a(b-2) - c(b-2)$

33. $3a(a+5) + 4b(a+5)$

34. $4x(x-7) - 3y(x-7)$

35. $2x(x+8) + (x+8)$

36. $3b(b-2) - (b-2)$

37. $(x-3)(x+5) + (x+2)(x+5)$

38. $(x-4)(x+1) + (x-4)(x-6)$

39. $(a-2)(4a-3) - (a+8)(a-2)$

40. $(3a-1)(2a-6) - (3a-1)(a+2)$

Factor by grouping.

41. $2b + 2c + ab + ac$

42. $3x - 3y + xz - yz$

43. $5y + 5z - xy - xz$

44. $4a - 4b - ca + cb$

45. $x^2 - 3x + xy - 3y$

46. $xy + 3x - 5y - 15$

47. $ac - ad - bc + bd$

48. $p^2 - pr + tp - tr$

49. $xy - 4x + y - 4$

50. $b + 2 + ab + 2a$

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51. $y^2 + xy - y - x$

52. $px + p^2 - x - p$

53. $12b + 8 + 3ab + 2a$

54. $18xy - 24x + 15y - 20$

55. $6t^2 - 2tx + 3t - x$

56. $15x^2 - 5xy - 6x + 2y$

57. $12ac - 3ad - 8bc + 2bd$

58. $24xy - 15xz + 8y - 5z$

Factor by grouping. (Hint: Use groups of three.)

59. $ad - ae - af + bd - be - bf$

60. $xy + xz - 4x - 3y - 3z + 12$

61. $3x^2 + 12xz - 15x - 2xy - 8yz + 10y$

62. $12ab - 8ac - 20ad + 3b^2 - 2bc - 5bd$

Each of the following expressions contains like terms. Do *not* combine the like terms; instead, simply factor by grouping. (This method will be helpful in the next section when factoring trinomials.)

63. $x^2 - 3x + 2x - 6$

64. $x^2 + 5x + 7x + 35$

65. $x^2 - 4x - 3x + 12$

66. $x^2 + 3x - 6x - 18$

67. $6x^2 + 10x + 9x + 15$

68. $21x^2 - 3x + 14x - 2$

69. $9x^2 + 21x - 6x - 14$

70. $25x^2 - 5x - 20x + 4$

71. $4x^2 + 14x + 14x + 49$

72. $9x^2 - 15x - 15x + 25$