Name: Key Date:
Algebra 1 Band:

Unit 8: Polynomials & Factoring Study Guide

LT#1: Classify, add, and subtract polynomials.

Write each polynomial in standard form. Then name each polynomial based on its degree and number of terms.

1. $4r + 3 - 9r^2 + 7r$

$-9r^2+11r+3$

quadratic trinomial

2. $3 + b^3 + b^2$

b^3+b^2+3

cubic trinomial

3. $3 + 8t^2$

$8t^2+3$

quadratic binomial

4. $n^3 + 4n^5 + n - n^3$

$4n^5+n$

5th degree binomial

5. $7x^2 + 8 + 6x - 7x^2$

$6x+8$

linear binomial

6. p^3q^3

p^3q^3

6th degree monomial

Simplify. Write each answer in standard form.

7. $(2v^3 - v + 8) + (-v^3 + v - 3)$

v^3+5

8. $(6s^4 + 7s^2 + 7) + (8s^4 - 11s^2 + 9s)$

$14s^4-4s^2+9s+7$

9. $(4h^3 + 3h + 1) - (-5h^3 + 6h - 2)$

$4h^3+3h+1+5h^3-6h+2$

$9h^3-3h+3$

10. $(8z^3 - 3z^2 - 7) - (z^3 - z^2 + 9)$

$8z^3-3z^2-7-z^3+z^2-9$

$7z^3-2z^2-16$

LT#2: Multiply a monomial by a polynomial.

Simplify each product. Write in standard form.

11. $5k(3 - 4k)$

$5k(3)+5k(-4k)$

$15k-20k^2$

$-20k^2+15k$

12. $4m(2m + 9m^2 - 6)$

$4m(2m)+4m(9m^2)+4m(-6)$

$8m^2+36m^3-24m$

$36m^3+8m^2-24m$

13. $6g^2(g - 8)$

$6g^2(g)+6g^2(-8)$

$6g^3-48g^2$

14. $3d(6d + d^2)$

$3d(6d)+3d(d^2)$

$18d^2+3d^3$

$3d^3+18d^2$

15. $-2n^2(5n - 9 + 4n^2)$

$-2n^2(5n)-2n^2(-9)-2n^2(4n^2)$

$-10n^3+18n^2-8n^4$

$-8n^4-10n^3+18n^2$

16. $q(11 + 8q - 2q^2)$

$q(11)+q(8q)+q(-2q^2)$

$11q+8q^2-2q^3$

$-2q^3+8q^2+11q$

LT#3: Factor a monomial from a polynomial.

Find the GCF of the terms of each polynomial. Then factor the polynomial.

17. $12p^4 + 16p^3 + 8p$

GCF = $4p$

$4p(3p^3 + 4p^2 + 2)$

18. $3b^4 - 9b^2 + 6b$

GCF = $3b$

$3b(b^3 - 3b + 2)$

19. $45c^5 - 63c^3 + 27c$

GCF = $9c$

$9c(5c^4 - 7c^2 + 3)$

20. $4g^2 + 8g$

GCF = $4g$

$4g(g + 2)$

21. $3t^4 - 6t^3 - 9t + 12$

GCF = 3

$3(t^4 - 2t^3 - 3t + 4)$

22. $30h^5 - 5h^4 - 15h^3$

GCF = $5h^3$

$5h^3(6h^2 - h - 3)$

23. The GCF of two numbers p and q is 5. Can you find the GCF of $6p$ and $6q$? Explain your answer.

GCF = 5

$6p = 2 \cdot 3 \cdot p$

$6q = 2 \cdot 3 \cdot q$

6

GCF = $5 \cdot 6 = 30$

LT#4: Multiply two binomials or a binomial by a trinomial.
LT#5: Find the square of a binomial and to find the product of a sum and difference.

Simplify each product. Write in standard form.

24. $(w + 1)(w + 12)$

$w^2 + 1w + 12w + 12$

$w^2 + 13w + 12$

25. $(2s - 3)(5s + 4)$

$10s^2 + 8s - 15s - 12$

$10s^2 - 7s - 12$

26. $(3r - 2)^2 = (3r - 2)(3r - 2)$

$9r^2 - 6r - 6r + 4$

$9r^2 - 12r + 4$

27. $(6g + 7)(g - 8)$

$6g^2 - 48g + 7g - 56$

$6g^2 - 41g - 56$

28. $(7q + 2)(3q + 8)$

$21q^2 + 56q + 6q + 16$

$21q^2 + 62q + 16$

29. $(4n^3 + 5)(3n + 5)$

$12n^4 + 20n^3 + 15n + 25$

30. $(t+9)(t-3)$

$t^2-3t+9t-27$

$t^2+6t-27$

31. $(6c+5)^2$ $(6c+5)(6c+5)$

$36c^2+30c+30c+25$

$36c^2+60c+25$

32. $(7h-3)(7h+3)$

$49h^2+21h-21h-9$

$49h^2-9$

33. $(y-6)(3y+7)$

$3y^2+7y-18y-42$

$3y^2-9y-42$

34. $(4a-7)(8a+3)$

$32a^2+12a-56a-21$

$32a^2-44a-21$

35. $(4b-3)(4b+3)$

$16b^2+12b-12b-9$

$16b^2-9$

36. A rectangle has dimensions $3x+5$ and $x+7$. Write an expression for the area of the rectangle as a product and as a polynomial in standard form.

$x+7$ | $3x+5$

Area $=(x+7)(3x+5)=3x^2+5x+21x+35$

$=3x^2+26x+35$

LT#6: Factor trinomials of the form x^2+bx+c.
LT#7: Factor trinomials of the form ax^2+bx+c.

Factor each expression.

37. $g^2-5g-14$ $\quad x\cdot -14 \mid +-5$; $-7,2 \mid -5$

$(g-7)(g+2)$

38. $2n^2+3n-2$ $\quad x\cdot -4 \mid +3$; $4,-1 \mid 3$

$2n^2+4n-n-2$

$2n(n+2)-1(n+2)$

$(2n-1)(n+2)$

39. $6k^2-10kl+4l^2$ $\quad x\cdot 24 \mid +-10$; $-6,-4 \mid -10$

$6k^2-6kl-4kl+4l^2$

$6k(k-l)-4l(k-l)$

$(6k-4l)(k-l)$

40. $p^2+8p+12$ $\quad x\cdot 15 \mid +8$; $5,3 \mid 8$

$(p+5)(p+3)$

41. $r^2+6r-40$ $\quad x\cdot -40 \mid +6$; $10,-4 \mid 6$

$(r+10)(r-4)$

42. $6m^2+25mn+11n^2$ $\quad x\cdot 66 \mid +25$; $22,3 \mid 25$

$6m^2+22mn+3mn+11n^2$

$2m(3m+11n)+n(3m+11n)$

$(2m+n)(3m+11n)$

43. $t^2 - 13t - 30$ (×-30 | +-13; -15, 2 | -13)

$(t-15)(t+2)$

44. $2g^2 - 35g + 17$ (×34 | +-35; -34, -1 | -35)

$2g^2 - 34g - g + 17$

$2g(g-17) - 1(g-17)$

$(2g-1)(g-17)$

45. $3x^2 + 3x - 6$ (×-2 | +1; 2, -1 | 1)

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

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

46. $d^2 - 18d + 45$ (×45 | +-18; -15, -3 | -18)

$(d-15)(d-3)$

47. $w^2 - 15w - 54$ (×-54 | +-15; -18, 3 | -3)

$(w-18)(w+3)$

48. $21z^2 - 70z + 49$ (×21 | +-70; -7, -3 | -70)

$7(3z^2 - 10z + 7)$

$7(3z^2 - 7z - 3z + 7)$

$7[z(3z-7) - 1(3z-7)]$

$7(z-1)(3z-7)$

49. $x^2 + 21x + 38$ (×38 | +21; 19, 2 | 21)

$(x+19)(x+2)$

50. $10v^2 + 11v - 8$ (×-80 | +11; 16, -5 | 11)

$10v^2 + 16v - 5v - 8$

$2v(5v+8) - 1(5v+8)$

$(2v-1)(5v+8)$

51. $5g^2 + 15g + 10$ (×2 | +3; 2, 1 | 3)

$5(g^2 + 3g + 2)$

$5(g+2)(g+1)$

52. Can you factor the expression $2x^2 + 15x + 9$? Explain why or why not.

×18	+15
1, 18	19
2, 9	11
3, 6	9

no, because no factors of 18 sum to 15.

LT#8: Factor perfect-square trinomials and the differences of two squares.

Factor each expression.

53. $s^2 - 20s + 100$

$(s-10)^2$

54. $16q^2 + 56q + 49$

$(4q+7)^2$

55. $r^2 - 64$

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

56. $9z^2 - 16$

$(3z-4)(3z+4)$

57. $25m^2 + 80m + 64$

$(5m+8)^2$

58. $49n^2 - 4$

$(7n-2)(7n+2)$

59. $g^2 - 225$

$(g-15)(g+15)$

60. $9p^2 - 42p + 49$

$(3p+7)^2$

61. $36h^2 - 12h + 1$

$(6h-1)^2$

62. $w^2 + 24w + 144$

$(w+12)^2$

63. $32v^2 - 8$

$8(4v^2-1)$

$8(2v-1)(2v+1)$

64. $25x^2 - 36$

$(5x-6)(5x+6)$

65. Find an expression for the length of a side of a square with an area of $9n^2 + 54n + 81$.

$= (3n+9)^2$

length $= 3n+9$

66. Suppose you are using algebra tiles to factor a quadratic trinomial. What do you know about the factors of the trinomial when the tiles form a square?

The factors are the side lengths of the square.

example:

	x	$+5$
x	x^2	$5x$
$+5$	$5x$	25

$x^2+10x+25 = (x+5)(x+5) = (x+5)^2$

LT#9: Factor higher-degree polynomials by grouping.

Find the GCF of the first two terms and the GCF of the last two terms for each polynomial.

67. $6y^3 - 3y^2 + 2y - 1$

GCF: $3y^2$ GCF: 1

68. $8m^3 + 40m^2 + 6m + 15$

GCF: $8m^2$ GCF: 3

Factor completely.

69. $6d^4 + 4d^3 - 6d^2 - 4d$

$2d(3d^3 + 2d^2 - 3d - 2)$

$2d[d(3d^2 + 2) - 1(3d + 2)]$

$\boxed{2d(d-1)(3d^2+2)}$

70. $11b^3 - 6b^2 + 11b - 6$

$b^2(11b - 6) + 1(11b - 6)$

$\boxed{(b^2+1)(11b-6)}$

71. $45z^3 + 20z^2 + 9z + 4$

$5z^2(9z + 4) + 1(9z + 4)$

$\boxed{(5z^2+1)(9z+4)}$

72. $9a^3 - 12a^2 + 18a - 24$

$3(3a^3 - 4a^2 + 6a - 8)$

$3[a^2(3a - 4) + 2(3a - 4)]$

$\boxed{3(a^2+2)(3a-4)}$