Factoring Polynomials

Emphasis on Factoring Quadratics – Mixture of a = 1 and a ≠ 1

Completely factor each of the following:

1. $v^2 + 10v + 9$

$(v+9)(v+1)$

9
+1 +9 = 10
3 3

2. $-5x^2 + 19x - 12$

$-1(5x^2 - 19x + 12)$
$-1(5x^2 - 4x - 15x + 12)$
$-1[(5x^2 - 4x) - (15x - 12)]$
$-1[x(5x-4) - 3(5x-4)]$
$-1(x-3)(5x-4)$

5(12) = 60
1 60
2 30
3 20
-4 -15
5 12
6 10

3. $x^2 - 12x + 27$

$(x-3)(x-9)$

27
1 27
-3 -9 = -12

4. $5x^2 + 24x - 36$

$5x^2 - 6x + 30x - 36$
$(5x^2 - 6x) + (30x - 36)$
$x(5x-6) + 6(5x-6)$
$(x+6)(5x-6)$

5(36) = 180
1 180
2 90
3 60
4 45
5 36
-6 +30
9 20
10 18
12 15

5. $v^2 + 4v - 32$

$(v+8)(v-4)$

32
1 32
2 16
-4 +8 = 4

6. $28b^2 - 156b - 72$

4 | 4 | 4

$7x^2 - 39x - 18$
$7x^2 + 3x - 42x - 18$
$(7x^2 + 3x) - (42x + 18)$
$x(7x+3) - 6(7x+3)$
$4(x-6)(7x+3)$

7(18) = 126
1 126
2 63
+3 -42
6 21
9 14

7. $x^2 - 13x + 30$

$(x-3)(x-10)$

30
1 30
2 15
-3 -10 = -13
5 6

8. $21r^2 - 177r + 210$

3 | 3 | 3

$7r^2 - 59r + 70$
$7r^2 - 10r - 49r + 70$
$(7r^2 - 10r) - (49r - 70)$
$r(7r-10) - 7(7r-10)$
$3(r-7)(7r-10)$

7(70) = 490
1 490
2 245
5 98
7 70
-10 -49
14 35

9. $x^2 + 19x + 90$

$(x+9)(x+10)$

90
1 90
2 45
3 30
5 18
6 15
+9 +10 = 19

10. $6b^2 + 51b + 105$

3 | 3 | 3

$2b^2 + 17b + 35$
$2b^2 + 7b + 10b + 35$
$(2b^2 + 7b) + (10b + 35)$
$b(2b+7) + 5(2b+7)$
$3(b+5)(2b+7)$

2(35) = 70
1 70
2 35
5 14
+7 +10

11. $10n^2 + 69n + 54$

$10(54) = 540$

1	540
2	270
3	180
4	135
5	108
6	90
+9	+60
10	54

$10n^2 + 9n + 60n + 54$

$(10n^2 + 9n) + (60n + 54)$

$n(10n + 9) + 6(10n + 9)$

$(n + 6)(10n + 9)$

12. $4x^2 + 48x + 108$

$4(x^2 + 12x + 27)$

27	
1	27
+3	+9

$= 12$

$4(x + 3)(x + 9)$

13. $9x^2 - 55x + 50$

$9(50) = 450$

1	450
2	225
3	150
5	90
6	75
9	50
−10	−45
15	30
18	25

$9x^2 - 10x - 45x + 50$

$(9x^2 - 10x) - (45x - 50)$

$x(9x - 10) - 5(9x - 10)$

$(x - 5)(9x - 10)$

14. $6b^2 + 90b + 324$

$6(b^2 + 15b + 54)$

54	
1	54
2	27
3	18
+6	+9

$= 15$

$6(b + 6)(b + 9)$

15. $-9b^2 - 79b + 18$

(-1) -1 -1

$9(18) = 162$

1	162
−2	+81
3	54
6	27
9	18

$9b^2 + 79b - 18$

$9b^2 - 2b + 81b - 18$

$(9b^2 - 2b) + (81b - 18)$

$b(9b - 2) + 9(9b - 2)$

$-1(b + 9)(9b - 2)$

16. $6n^2 - 30n - 144$

$6(n^2 - 5n - 24)$

24	
1	24
2	12
+3	−8
4	6

$= -5$

$6(n - 8)(n + 3)$

17. $18n^2 - 48n - 40$

2 2 2

$9(20) = 180$

1	180
2	90
3	60
4	45
5	36
+6	−30
9	20
10	18
12	15

$9n^2 - 24n - 20$

$9n^2 + 6n - 30n - 20$

$(9n^2 + 6n) - (30n + 20)$

$3n(3n + 2) - 10(3n + 2)$

$2(3n - 10)(3n + 2)$

18. $-6x^2 - 18x + 108$

$-6(x^2 + 3x - 18)$

18	
1	18
2	9
−3	+6

$= 3$

$-6(x + 6)(x - 3)$

19. $30a^2 + 33a - 105$

3 3 3

$10(35) = 350$

1	350
2	175
5	70
7	50
10	35
−14	+25

$10a^2 + 11a - 35$

$10a^2 - 14a + 25a - 35$

$(10a^2 - 14a) + (25a - 35)$

$2a(5a - 7) + 5(5a - 7)$

$3(2a + 5)(5a - 7)$

20. $2m^2 + 8m - 64$

$2(m^2 + 4m - 32)$

32	
1	32
2	16
−4	+8

$= 4$

$2(m + 8)(m - 4)$