Section 1.1 – Practice Problems

Give four examples for b so that the following trinomials can be factored

1. $x^2 + bx + 6$ ← multiply to $\qquad$ 7, 5, -7, -5

add to $\quad$ 1,6 $\quad$ -1,-6
$\qquad$ 2,3 $\quad$ -2,-3

2. $x^2 + bx + 4$ $\qquad$ 5, -5, 4, -4

$\qquad$ 1,4 $\quad$ -2,-2
$\qquad$ 2,2 $\quad$ -1,-4

3. $x^2 + bx - 8$ $\quad$ -1,8 $\quad$ -2,4 $\qquad$ 7, -7, 2, -2

$\qquad$ 1,-8 $\quad$ 2,-4

4. $x^2 + bx - 6$ $\quad$ 1,-6 $\quad$ 2,-3 $\qquad$ -5, 5, -1, 1

$\qquad$ -1,6 $\quad$ +3,-2

Give positive and negative examples for c so that the following trinomials can be factored

5. $x^2 + 6x + c$ $\quad$ 1,5 $\quad$ +7,-1 $\Big\}$ product of $\qquad$ 5, 8, -7, -16

Add to 6 $\quad$ 4,2 $\quad$ 8,-2 $\quad$ these $\quad$ Answers will vary.

6. $x^2 - 4x + c$ $\quad$ -2,-2 $\quad$ -5,1 $\qquad$ 4, 3, -5, -12

$\qquad$ -3,-1 $\quad$ -6,2

7. $x^2 + x + c$ $\quad$ $\frac{1}{2}$ $\frac{1}{2}$ $\quad$ +2,-1 $\qquad$ $\frac{1}{4}$, $\frac{3}{16}$, -2, -6

add to 1 $\quad$ $\frac{1}{4}$ $\frac{3}{4}$ $\quad$ 3,-2

8. $x^2 - 5x + c$ $\qquad$ 6, 4, -6, -14

$\qquad$ -2,-3 $\quad$ -6,1

$\qquad$ -1,-4 $\quad$ -7,2

9. A student factored $x^3 - 5x^2 - 14x$ into $(x - 7)(x + 2)$. Explain the error that was made.

$\quad$ You have to first factor out an x. $\quad$ $x(x^2 - 5x - 14)$

$\qquad\qquad\qquad\qquad\qquad\qquad\qquad$ $\downarrow$

$\qquad\qquad\qquad\qquad\qquad\qquad$ $x(x-7)(x+2)$

Factor

add to

10. $a^2 + 9a + 8$ ← multiply to (1, 8)

$(a+1)(a+8)$

11. $b^2 + 16b + 15$

$(b+15)(b+1)$

12. $c^2 + 10c + 24$

$(c+4)(c+6)$

13. $d^2 + 7d + 10$

$(d+2)(d+5)$

14. $x^2 - 18x + 72$

$(x-12)(x-6)$

15. $y^2 - 20y + 91$

$(y-7)(y-13)$

16. $z^2 - 13z + 36$

$(z-9)(z-4)$

17. $u^2 - 4u + 4$

$(u-2)(u-2)$

18. $l^2 + 7l - 30$

$(l+10)(l-3)$

19. $m^2 + 4m - 12$

$(m+6)(m-2)$

Factor Completely

20. $3x^2 + 15x + 12$

common factor

$3(x^2 + 5x + 4)$

$3(x+1)(x+4)$

21. $4y^2 + 20y + 24$

$4(y^2 + 5y + 6) \rightarrow 4(y+2)(y+3)$

22. $-5x^2 + 25x - 20$

$-5(x^2 - 5x + 4) \rightarrow -5(x-4)(x-1)$

Always factor negative

23. $-2y^2 + 58y - 200$

$-2(y^2 - 29y + 100) \rightarrow -2(y-25)(y-4)$

24. $-x^2 - 6x + 27$

$-(x^2 + 6x - 27) \rightarrow -(x+9)(x-3)$

25. $-x^2 + 7x + 44$

$-(x^2 - 7x - 44) \rightarrow -(x-11)(x+4)$

26. $x^3 + 8x^2 - 20x$

$x(x^2 + 8x - 20) \rightarrow x(x+10)(x-2)$

27. $-2x^4 - 4x^3 + 30x^2$

$-2x^2(x^2 + 2x - 15) \rightarrow -2x^2(x+5)(x-3)$

28. $-x^3y - x^2y^2 + 6xy^3$

$-xy(x^2 + xy - 6y^2)$

$-xy(x+3y)(x-2y)$

29. $2x^4 - 16x^3y + 32x^2y^2$

$2x^2(x^2 - 8xy + 16y^2) \rightarrow 2x^2(x-4y)(x-4y)$

30. $-x^3y^2 - 3x^2y^3 + 4xy^4$

$-xy^2(x^2 + 3xy - 4y^2)$

$-xy^2(x+4y)(x-y)$

31. $x^6 - 11x^5y + 28x^4y^2$

$x^4(x^2 - 11xy + 28y^2)$

$x^4(x-7y)(x-4y)$

23

Factor Completely

32. $(2a + 5)y^2 + 9(2a + 5)y - 10(2a + 5)$

$(2a+5)(y^2+9y - 10)$

$(2a+5)(y+10)(y-1)$

33. $x^3(a + b) - 6x^2(a + b) + 8x(a + b)$

$(a+b)(x^3-6x^2+8x) \to (a+b)(x)(x^2-6x+8)$

$(a+b)(x)(x - 4)(x - 2)$

34. $(2a + b)x^2 - 12(2a + b)x + 27(2a + b)$

$(2a+b)(x^2-12x+27)$

$(2a+b)(x - 9)(x-3)$

35. $(3a - b)y^2 - 13(3a - b)y + 40(3a - b)$

$(3a-b)(y^2-13y+40)$

$(3a-b)(y - 8)(y - 5)$

36. $x^4 + x^2 + 1$

$x^4 + 2x^2 - x^2 + 1$

$x^4+2x^2+1 - x^2$ difference of squares

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

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

37. $(2x + 3)^2 + (2xz + 3z) - 20z^2$ Let $2x+3=y$

$(2x+3)^2 + z(2x+3) - 20z^2$

$y^2 + yz - 20z^2$

$(y + 5z)(y - 4z)$ sub in for y

$(2x+3+5z)(2x+3-4z)$

38. $(x - 2y)^2 - 8a(x - 2y) + 15a^2$ Let $x-2y=z$

$z^2 - 8az + 15a^2$

$(z - 3a)(z - 5a) \to (x-2y-3a)(x-2y-5a)$ sub in for z

39. $(5x - y)^2 + (10xz - 2yz) - 24z^2$ $(5x-y)=a$

$(5x-y)^2 + 2z(5x-y) - 24z^2$

$a^2 + 2za - 24z^2$

$(a+6z)(a-4z)$ $(5x-y+6z)(5x-y-4z)$

40. The volume of a rectangular solid is $(x^3 + 7x^2 + 12x)\,cm^3$. Determine its dimensions in terms of x.
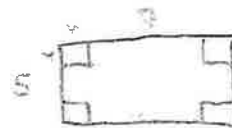
x^3+7x^2+12x

$\downarrow$

$x(x^2+7x+12)$

$\downarrow$

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

$\uparrow$ $\uparrow$ $\uparrow$
l w h

41. A sheet of cardboard measuring 5in by 7in has squares x inches wide cut from each corner. Then the sides are folded up to form an open top box. Express the volume of the box in factored form.

height is x
length is $7-2x$
width is $5-2x$

$V = x(7-2x)(5-2x)$

$x(35-14x-10x+4x^2)$

$x(35-24x+4x^2)$

$4x^3 - 24x^2+35x$ ← if curious

Factor each binomial completely

42. $x^2 - 1$ Difference of Squares

$(x+1)(x-1)$

43. $4x^2 - 1$

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

44. $y^2 - 25$

$(y+5)(y-5)$

45. $25y^2 - 9$

$(5y+3)(5y-3)$

46. $4 - 9z^2$

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

47. $16 - 25y^2$

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

48. $16x^2 - 9y^2$

$(4x-3y)(4x+3y)$

49. $25x^4 - 81y^6$

$(5x^2-9y^3)(5x^2+9y^3)$

50. $16x^2y^8 - 4 \rightarrow 4(4x^2y^8 - 1)$

$4(2xy^4-1)(2xy^4+1)$

51. $20x^2 - 5y^2 \rightarrow 5(4x^2 - y^2)$

$5(2x-y)(2x+y)$

52. $(x+1)^2 - y^2$

$(x+1-y)(x+1+y)$

53. $4 - (x+2)^2$

$(2+(x+2))(2-(x+2))$

$(2+x+2)(2-x-2)$

$\boxed{(x+4)(-x)}$

Factor each perfect square trinomial completely

54. $x^2 + 10x + 25$

$(x+5)^2$

55. $x^2 + 8x + 16$

$(x+4)^2$

56. $y^2 - 12y + 36$

$(x-6)^2$

57. $y^4 - 6y^2 + 9$

$(y^2-3)^2$

58. $2z^2 - 28z + 98$

$2(z^2-14z+49)$

$2(z-7)^2$

59. $-9x^2 - 24xy - 16y^2$

$-(9x^2+24xy+16y^2)$

$-(3x+4y)^2$

25