

Section 5.1 Polynomials and Polynomial Functions.

Section 5.2 Multiplication of Polynomials

Page 279 has two excellent tables showing terms and what they mean.

Notice that terms can be positive or negative and to make up a polynomial, they are added.

The “degree” of a polynomial is strange. This is the highest sum total of the exponents of any variables in the polynomial.

The table on page 279 probably should have had one more line:

	$2x^3$	$8x^2$	$-17x$	-3		$6x^2$	$8x^2y^3$	$-17xy$	$-24xy^2z^4$	$2y$	3
Factors	$2,x^3$	$2^3,x^2$	$-17,x$	-3		$2,3,x^2$	$2^3,x^2,y^3$	$-17,x,y$	$-24,x,y^2,z^4$	$2,y$	3

We usually arrange polynomials in decreasing powers of the variable so we would write:

$2x^3 + x^2 - 7x + 12$ instead of $x^2 + 12 - 7x + 2x^3$.

When you see notation such as: $f(x) = -x^2 + 4x + 1$ and $f(2)$ it means given an equation, $y = x^2 + 4x + 1$, compute the value of y when $x = 2$.

The textbook uses words like “add”, “subtract”, etc. We replace them with “simplify”.

The textbook uses the phrase: “opposite of a polynomial”. This most clearly can be defined using an example:

The opposite of $-5x^2 + 4x - 3$ is $-(-5x^2 + 4x - 3)$ and the answer is $5x^2 - 4x + 3$.

A style issue that needs to be repeated is:

Do not put equal signs into problems that don’t have equal signs.

In other words, for sections 5.1 and 5.2: *no equal signs!*

The text uses “combine like terms”, “add”, “subtract”, “multiply”, “divide”. I use the instruction: **simplify** in place of *all* of them.

Clearing parentheses in general

See pages 290 – 295

On page 290, example 4. I changed it to a stack and multiplied it while keeping like terms in columns so adding would be easier:

$$\begin{array}{r} p^4 \quad -2p^3 \quad +3 \\ p \\ \hline \text{Thus:} \quad 2p^4 \quad -4p^3 \quad +6 \\ p^5 \quad -2p^4 \quad +3p \\ \hline p^5 \quad -4p^3 \quad +3p \quad +6 \end{array}$$

When given a monomial to multiply times a polynomial, it is simple to just multiple one item at a time, in order until the job is completed:

$3x(2x^2 - 3x + 5)$ where the $3x$ is multiplied time the $2x^2$ then the $3x$ times the $-3x$ and finally the $3x$ times the 5 giving us: $6x^3 - 9x^2 + 15x$.

A very common situation is clearing parentheses for two binomials: $(3x + 2)(5x - 3)$.

The method used to remove the parentheses is called FOIL

$$\left. \begin{array}{l} \text{First} \quad 3x \quad 5x = 15x^2 \\ \text{Outside} \quad 3x \quad -3 = 9x \\ \text{Inside} \quad 2 \quad 5x = 10x \\ \text{Last} \quad 2 \quad -3 = -6 \end{array} \right\} 15x^2 + x - 6$$

Normally the outside and inside products will be *like terms* and need to be combined.

You must be very fast and very accurate when practicing foil multiplication. The time used here will have a significant effect on how quickly and accurately you can unFOIL – called factoring and this will be the subject of an upcoming lecture.

Copy the original problem. Write the resulting trinomial (usually) directly under the two binomials. Be very sure that your work is clear and legible. Write down your beginning time, your ending time and figure out your elapsed time for each assignment. Write the elapsed time on your Homework.

1. $(5X - 4)(7X - 3)$
2. $(4X - 2)(9X - 8)$
3. $(8X - 12)(9X + 5)$
4. $(9X + 10)(7X + 12)$
5. $(3X - 1)(5X - 10)$
6. $(7X - 7)(7X - 5)$
7. $(2X + 8)(8X - 7)$
8. $(7X - 5)(11X + 10)$
9. $(6X - 1)(6X - 4)$
10. $(2X - 8)(6X + 6)$
11. $(2X + 10)(7X - 3)$
12. $(7X + 8)(9X + 10)$
13. $(5X + 12)(3X - 3)$
14. $(11X + 6)(9X + 2)$
15. $(9X - 6)(8X - 7)$
16. $(4X - 8)(12X - 7)$
17. $(12X - 10)(8X + 5)$
18. $(5X - 3)(12X + 3)$
19. $(4X + 7)(10X + 6)$
20. $(4X - 2)(X + 3)$
21. $(8X - 12)(7X + 9)$
22. $(X + 10)(10X - 11)$
23. $(11X + 5)(2X - 10)$
24. $(7X - 11)(2X - 9)$
25. $(6X - 11)(5X + 8)$
26. $(X - 9)(12X + 7)$
27. $(4X - 6)(10X + 1)$
28. $(8X - 1)(8X - 4)$
29. $(6X + 7)(6X - 12)$
30. $(12X + 1)(4X - 8)$
31. $(2X + 7)(2X - 8)$
32. $(3X + 2)(7X + 7)$
33. $(10X - 6)(X + 3)$
34. $(6X - 10)(4X - 5)$
35. $(11X - 9)(X + 11)$
36. $(5X + 10)(7X + 5)$
37. $(4X - 2)(5X - 10)$
38. $(5X - 10)(7X - 5)$
39. $(11X - 9)(3X + 3)$
40. $(2X - 1)(2X - 10)$
41. $(8X - 11)(8X + 5)$
42. $(11X - 8)(2X + 11)$
43. $(2X + 12)(5X + 11)$
44. $(10X + 9)(11X + 5)$
45. $(7X - 8)(10X - 8)$
46. $(3X + 4)(8X + 8)$
47. $(X - 8)(7X - 5)$
48. $(10X + 9)(9X + 2)$
49. $(9X + 11)(12X + 12)$
50. $(10X - 1)(11X - 1)$
51. $(6X - 9)(3X - 4)$
52. $(2X + 4)(5X + 2)$
53. $(9X - 11)(11X - 4)$
54. $(6X - 10)(9X + 2)$
55. $(2X - 4)(3X - 7)$
56. $(4X - 6)(X + 4)$
57. $(8X + 11)(8X - 10)$
58. $(11X - 10)(12X - 9)$
59. $(6X - 12)(7X - 3)$
60. $(7X - 2)(2X - 9)$
61. $(6X + 4)(10X + 3)$
62. $(3X - 5)(6X - 1)$
63. $(6X + 6)(6X - 11)$
64. $(4X + 8)(X - 11)$
65. $(7X + 11)(6X + 10)$
66. $(11X + 1)(6X - 5)$
67. $(5X + 11)(2X - 3)$
68. $(11X + 2)(10X - 9)$
69. $(X - 5)(9X - 3)$
70. $(7X + 12)(4X - 5)$
71. $(9X + 7)(8X + 12)$
72. $(6X + 5)(3X - 9)$
73. $(6X - 8)(3X - 7)$
74. $(11X - 10)(6X + 2)$
75. $(5X - 3)(11X - 8)$
76. $(X + 10)(2X + 8)$
77. $(8X - 5)(7X - 2)$
78. $(11X - 8)(6X + 6)$
79. $(9X - 5)(3X + 8)$
80. $(5X + 11)(6X - 11)$
81. $(8X + 10)(2X - 9)$
82. $(9X - 8)(5X + 12)$
83. $(7X - 9)(7X + 9)$
84. $(10X - 7)(9X + 9)$
85. $(5X - 4)(7X + 12)$
86. $(10X + 9)(X + 1)$
87. $(6X + 7)(12X - 3)$
88. $(11X - 10)(8X + 9)$
89. $(X + 7)(2X + 7)$
90. $(11X - 5)(6X + 5)$
91. $(5X + 5)(8X - 11)$
92. $(3X - 8)(12X + 5)$
93. $(X + 1)(X + 4)$
94. $(6X + 7)(3X - 1)$
95. $(X + 5)(7X + 8)$
96. $(X + 7)(10X - 3)$
97. $(3X + 5)(9X - 2)$
98. $(8X - 7)(11X + 3)$
99. $(4X + 11)(2X + 10)$
100. $(8X + 5)(9X - 12)$
101. $(11X - 7)(5X + 2)$
102. $(12X + 2)(11X + 11)$
103. $(3X + 9)(X + 2)$
104. $(3X + 8)(7X + 1)$
105. $(9X - 3)(10X + 8)$
106. $(2X + 10)(2X - 2)$
107. $(5X + 1)(9X + 8)$
108. $(10X + 11)(8X + 9)$
109. $(10X - 1)(9X - 11)$
110. $(4X - 3)(11X - 12)$
111. $(11X + 7)(4X + 1)$
112. $(2X - 2)(7X - 2)$
113. $(5X - 4)(3X + 12)$
114. $(10X + 2)(X - 6)$
115. $(2X - 5)(X - 3)$
116. $(3X + 8)(8X - 6)$
117. $(2X + 11)(12X - 7)$
118. $(11X + 10)(12X + 9)$
119. $(6X + 2)(9X + 4)$
120. $(9X - 8)(8X - 3)$
121. $(7X - 9)(8X + 9)$
122. $(X + 4)(7X - 12)$
123. $(12X - 3)(12X + 1)$
124. $(10X + 2)(3X - 1)$
125. $(2X + 10)(7X - 12)$
126. $(2X - 11)(5X + 2)$
127. $(X - 4)(8X + 8)$
128. $(9X - 10)(12X - 8)$
129. $(11X - 11)(8X + 5)$
130. $(10X - 2)(12X - 1)$
131. $(9X + 12)(11X + 4)$
132. $(2X + 6)(6X - 5)$
133. $(10X + 9)(X - 3)$
134. $(11X + 8)(7X - 1)$
135. $(6X - 7)(12X - 7)$
136. $(3X + 6)(3X + 2)$
137. $(6X - 10)(9X + 12)$
138. $(9X - 4)(11X - 8)$
139. $(3X - 9)(4X + 9)$
140. $(9X - 11)(8X + 12)$
141. $(4X - 7)(9X - 9)$
142. $(X - 9)(3X - 8)$
143. $(11X - 2)(4X + 1)$
144. $(10X + 4)(4X - 10)$

The following are the answers to Foil-E. Check your answers *after doing the problems* to be certain you have ability to FOIL two binomials.

109. $90x^2 - 119x + 11$
110. $44x^2 - 81x + 36$
111. $44x^2 + 39x + 7$
112. $14x^2 - 18x + 4$
113. $15x^2 + 48x - 48$
114. $10x^2 - 58x - 12$
115. $2x^2 - 11x + 15$
116. $24x^2 + 46x - 48$
117. $24x^2 + 118x - 77$
118. $132x^2 + 219x + 90$
119. $54x^2 + 42x + 8$
120. $72x^2 - 91x + 24$
121. $56x^2 - 9x - 81$
122. $7x^2 + 16x - 48$
123. $144x^2 - 24x - 3$
124. $30x^2 - 4x - 2$
125. $14x^2 + 46x - 120$
126. $10x^2 - 51x - 22$
127. $8x^2 - 24x - 32$
128. $108x^2 - 192x + 80$
129. $88x^2 - 33x - 55$
130. $120x^2 - 34x + 2$
131. $99x^2 + 168x + 48$
132. $12x^2 + 26x - 30$
133. $10x^2 - 21x - 27$
134. $77x^2 + 45x - 8$
135. $72x^2 - 126x + 49$
136. $9x^2 + 24x + 12$
137. $54x^2 - 18x - 120$
138. $99x^2 - 116x + 32$
139. $12x^2 - 9x - 81$
140. $72x^2 + 20x - 132$
141. $36x^2 - 99x + 63$
142. $3x^2 - 35x + 72$
143. $44x^2 + 3x - 2$
144. $40x^2 - 84x - 40$

Copy the original problem. Write the resulting trinomial (usually) directly under the two binomials. Be very sure that your work is clear and legible. Write down your beginning time, your ending time and figure out your elapsed time for each assignment. Write the elapsed time on your Homework.

1. $(X - 6)(X + 4)$
2. $(X - 8)(2X + 8)$
3. $(X + 7)(4X - 5)$
4. $(4X - 6)(2X + 2)$
5. $(X - 7)(X - 9)$
6. $(3X - 6)(3X + 2)$
7. $(2X + 6)(3X - 6)$
8. $(4X - 3)(X + 8)$
9. $(X + 2)(2X - 5)$
10. $(5X - 4)(5X - 1)$
11. $(X + 2)(X + 6)$
12. $(3X - 4)(3X - 9)$
13. $(4X + 2)(4X - 7)$
14. $(3X - 3)(5X + 7)$
15. $(5X + 8)(4X - 4)$
16. $(3X - 1)(3X - 8)$
17. $(4X - 3)(4X - 7)$
18. $(3X - 9)(X - 4)$
19. $(2X - 1)(3X + 5)$
20. $(X - 6)(4X + 4)$
21. $(2X - 6)(2X - 9)$
22. $(5X - 2)(5X - 2)$
23. $(2X - 5)(5X + 8)$
24. $(3X - 5)(3X + 4)$
25. $(3X + 6)(4X - 5)$
26. $(2X + 1)(4X - 3)$
27. $(3X + 6)(4X + 2)$
28. $(5X + 3)(5X - 3)$
29. $(X - 6)(3X - 1)$
30. $(2X - 6)(4X + 8)$
31. $(2X - 6)(4X + 8)$
32. $(3X - 3)(2X - 6)$
33. $(5X + 2)(4X + 2)$
34. $(X + 2)(2X - 6)$
35. $(X + 7)(2X - 2)$
36. $(2X - 9)(5X - 9)$
37. $(X - 1)(5X + 8)$
38. $(4X - 8)(4X - 9)$
39. $(2X + 8)(3X + 8)$
40. $(2X + 2)(3X + 7)$
41. $(X - 3)(5X + 2)$
42. $(5X - 9)(2X + 2)$
43. $(2X - 3)(5X + 1)$
44. $(2X + 9)(3X - 6)$
45. $(4X - 1)(5X - 2)$
46. $(4X - 2)(4X - 8)$
47. $(2X - 4)(4X + 8)$
48. $(4X + 7)(3X - 9)$
49. $(2X - 2)(X + 2)$
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51. $(2X + 8)(3X - 8)$
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55. $(X + 8)(4X - 2)$
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59. $(4X - 3)(2X + 7)$
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70. $(5X - 3)(5X + 3)$
71. $(X - 8)(4X + 4)$
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73. $(X - 4)(4X + 8)$
74. $(2X - 2)(5X - 9)$
75. $(4X - 9)(5X + 5)$
76. $(4X + 4)(3X - 8)$
77. $(5X + 7)(5X - 2)$
78. $(3X + 5)(5X - 6)$
79. $(5X - 4)(3X + 1)$
80. $(5X + 2)(3X + 9)$
81. $(4X - 5)(5X + 2)$
82. $(X - 2)(3X - 1)$
83. $(2X + 6)(5X - 2)$
84. $(5X - 5)(5X - 8)$
85. $(3X - 4)(X - 8)$
86. $(2X + 5)(X - 4)$
87. $(4X - 9)(2X + 4)$
88. $(4X - 3)(4X - 2)$
89. $(2X - 8)(2X - 6)$
90. $(X + 4)(2X + 4)$
91. $(X + 3)(2X - 4)$
92. $(5X - 2)(X - 8)$
93. $(5X - 4)(2X - 6)$
94. $(4X + 4)(4X + 4)$
95. $(X - 7)(2X + 1)$
96. $(2X - 2)(4X + 6)$
97. $(5X - 1)(4X + 7)$
98. $(4X - 2)(2X + 7)$
99. $(4X + 8)(2X - 6)$
100. $(2X + 6)(X - 8)$
101. $(4X + 5)(5X - 7)$
102. $(3X - 9)(5X + 4)$
103. $(X - 1)(4X + 4)$
104. $(2X + 7)(X - 9)$
105. $(4X + 1)(X - 4)$
106. $(X + 3)(2X - 3)$
107. $(3X + 7)(4X - 4)$
108. $(2X + 8)(4X + 4)$
109. $(X + 9)(3X - 4)$
110. $(2X + 1)(4X + 8)$
111. $(3X + 9)(5X + 8)$
112. $(2X - 1)(2X + 4)$
113. $(3X + 4)(2X + 3)$
114. $(5X - 7)(2X + 9)$
115. $(5X - 3)(4X + 6)$
116. $(5X - 1)(4X + 2)$
117. $(5X + 4)(4X - 3)$
118. $(4X - 9)(5X - 1)$
119. $(3X + 4)(4X - 5)$
120. $(4X - 6)(3X + 1)$
121. $(3X + 5)(4X + 7)$
122. $(X - 4)(X + 5)$
123. $(3X - 6)(3X - 9)$
124. $(2X - 1)(4X + 6)$
125. $(2X - 1)(X + 9)$
126. $(3X - 6)(X + 5)$
127. $(3X - 6)(4X + 5)$
128. $(5X + 4)(4X - 6)$
129. $(5X - 6)(3X - 3)$
130. $(5X - 7)(3X + 5)$
131. $(3X + 6)(4X - 3)$
132. $(5X - 8)(3X + 4)$
133. $(2X - 9)(4X + 9)$
134. $(5X - 3)(4X + 8)$
135. $(X - 3)(5X - 9)$
136. $(X - 2)(X + 2)$
137. $(5X - 8)(X - 9)$
138. $(X + 5)(4X + 5)$
139. $(2X + 5)(X - 7)$
140. $(X - 6)(4X - 2)$
141. $(X + 2)(4X + 2)$
142. $(2X + 6)(3X - 5)$
143. $(4X - 2)(X + 3)$
144. $(3X - 4)(2X + 5)$

Sections 5.3 – 5.7 deal with factoring.

The text tries to divide factoring into various categories but this approach does not seem to be very effective.

We need to be able to identify the factoring situation at hand and know what to do with it.

Common Factors – we look for the largest number that is a factor of all numbers. When we factor a common factor from an expression **with 4 terms**, we will have the factor on the outside and we will have **exactly 4 terms** inside the parentheses. The most common error in this regard is:

$$2 + 4x^2 - 6xy + 8y^3$$

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

What is wrong with this? Original had 4 terms. We have 3 terms inside the parentheses.

Properly done, you should get:

$$2 + 4x^2 - 6xy + 8y^3$$

$$2(1 + 2x^2 - 3xy + 4y^3)$$

Remember that you should check your factoring after you have done it. You should be able to multiply (clear the parentheses) and get what you started with.

unFOIL – Make lists of *all* factors for the leading coefficient and for the constant. Make your selection from those lists trying to get the middle terms to work.

$$\begin{array}{ccc}
 1 \cdot 12 & & 1 \cdot 15 \\
 2 \cdot 6 & 12x^2 - 8x - 15 & 3 \cdot 5 \\
 3 \cdot 4 & &
 \end{array}$$

Because the constant is negative, the signs will be different.

Had the constant been positive, the signs would have been the same as the sign of the middle term.

Sub cases in unFOIL include “difference of squares” and “perfect squares”. (Although one wonders what an “imperfect” square might be.) Both of these have important uses throughout algebra and we will see them before we finish the semester.

Sum/Difference of Cubes – This is another area where factoring is nearly automatic.

I use this formula for the Sum/Difference of Cubes: $(a^3 \pm b^3) = (a \pm b)(a^2 \mp ab + b^2)$ and

I translate it into English as:

A first number cubed plus or minus a second number cubed equals

“first agree second times first squared disagree product of the two always a plus second number squared.”

As was the case when we were working with clearing parentheses, practice is the only thing that makes this really easy. And, I should point out, that the practice must be done very quickly. You need to work fast, to force those combinations into your mind and to allow yourself to recognize the various situations.

Remember: *No equal signs!*

Copy the original problem. If there is a common factor in the trinomial, factor it out. Factor the resulting trinomial (usually) into the two binomials. Be very sure that your work is clear and legible.

- | | | |
|------------------------|------------------------|-------------------------|
| 1. $12X^2 - X - 20$ | 49. $6X^2 + 9X + 3$ | 97. $9X^2 + 12X - 12$ |
| 2. $5X^2 + 7X - 6$ | 50. $3X^2 + 6X + 3$ | 98. $2X^2 - 10X + 8$ |
| 3. $15X^2 + 13X + 2$ | 51. $18X^2 - 24X + 8$ | 99. $3X^2 + 2X - 1$ |
| 4. $3X^2 + 9X - 12$ | 52. $12X^2 + 6X - 18$ | 100. $10X^2 + 8X - 24$ |
| 5. $18X^2 - 12X - 6$ | 53. $8X^2 - 20X + 12$ | 101. $10X^2 - 19X + 6$ |
| 6. $6X^2 - 11X + 3$ | 54. $3X^2 + 10X + 3$ | 102. $X^2 - 2X - 3$ |
| 7. $8X^2 - 12X + 4$ | 55. $18X^2 + 3X - 3$ | 103. $6X^2 - 3X - 18$ |
| 8. $10X^2 + 17X + 3$ | 56. $3X^2 + 19X + 20$ | 104. $8X^2 - 6X - 5$ |
| 9. $2X^2 + 5X + 3$ | 57. $6X^2 + 15X + 9$ | 105. $18X^2 - 42X + 24$ |
| 10. $6X^2 - 14X + 8$ | 58. $4X^2 - 7X - 2$ | 106. $2X^2 + 4X - 6$ |
| 11. $18X^2 + 9X - 2$ | 59. $2X^2 + 4X - 16$ | 107. $12X^2 - 17X + 6$ |
| 12. $10X^2 + 3X - 18$ | 60. $10X^2 + X - 2$ | 108. $10X^2 + 21X + 9$ |
| 13. $X^2 + 3X - 4$ | 61. $X^2 - 2X - 15$ | 109. $X^2 + 6X + 5$ |
| 14. $9X^2 - 3X - 12$ | 62. $6X^2 + 11X - 10$ | 110. $9X^2 - 3X - 6$ |
| 15. $10X^2 - 13X + 4$ | 63. $X^2 + 4X + 3$ | 111. $4X^2 + 16X + 16$ |
| 16. $15X^2 + 3X - 12$ | 64. $12X^2 - 14X + 4$ | 112. $12X^2 + 10X - 12$ |
| 17. $8X^2 - 8X - 6$ | 65. $6X^2 - 7X - 5$ | 113. $3X^2 - 8X - 3$ |
| 18. $3X^2 + 6X - 9$ | 66. $3X^2 - 15X + 18$ | 114. $3X^2 - 4X - 4$ |
| 19. $X^2 + 3X - 18$ | 67. $9X^2 + 18X + 9$ | 115. $8X^2 + 10X + 3$ |
| 20. $6X^2 - 22X + 12$ | 68. $12X^2 + 22X + 10$ | 116. $2X^2 + 6X + 4$ |
| 21. $6X^2 + 11X + 4$ | 69. $3X^2 + 6X + 3$ | 117. $3X^2 - 4X - 15$ |
| 22. $9X^2 - 12X - 12$ | 70. $6X^2 + 29X + 20$ | 118. $5X^2 + 9X - 2$ |
| 23. $6X^2 - 18X + 12$ | 71. $2X^2 - 14X + 24$ | 119. $18X^2 - 6X - 12$ |
| 24. $6X^2 + 8X - 8$ | 72. $10X^2 - 5X - 5$ | 120. $5X^2 - 16X + 3$ |
| 25. $12X^2 + 19X + 4$ | 73. $9X^2 + 18X + 9$ | 121. $X^2 - 10X + 24$ |
| 26. $2X^2 - 6X + 4$ | 74. $4X^2 - 2X - 12$ | 122. $10X^2 - 14X + 4$ |
| 27. $8X^2 + 2X - 1$ | 75. $2X^2 - 6X - 8$ | 123. $18X^2 + 36X + 16$ |
| 28. $12X^2 - 28X + 16$ | 76. $3X^2 - 9X + 6$ | 124. $10X^2 - 3X - 4$ |
| 29. $6X^2 + 5X + 1$ | 77. $6X^2 + 4X - 16$ | 125. $6X^2 + 30X + 24$ |
| 30. $6X^2 - 6$ | 78. $X^2 + 7X + 6$ | 126. $5X^2 - 6X + 1$ |
| 31. $6X^2 - 21X + 9$ | 79. $15X^2 + 8X - 16$ | 127. $3X^2 - 5X - 2$ |
| 32. $3X^2 + 2X - 1$ | 80. $6X^2 + 8X + 2$ | 128. $18X^2 + 27X + 9$ |
| 33. $9X^2 + 30X + 24$ | 81. $5X^2 + 13X - 6$ | 129. $12X^2 - 2X - 2$ |
| 34. $2X^2 + 6X - 8$ | 82. $2X^2 - 4X - 6$ | 130. $10X^2 + 30X + 20$ |
| 35. $5X^2 + 16X + 3$ | 83. $2X^2 - 8X + 6$ | 131. $10X^2 + 8X - 24$ |
| 36. $5X^2 + 4X - 1$ | 84. $15X^2 - 2X - 24$ | 132. $6X^2 - 6$ |
| 37. $5X^2 + 14X - 24$ | 85. $18X^2 + 12X - 6$ | 133. $5X^2 + 9X - 18$ |
| 38. $3X^2 - 2X - 8$ | 86. $3X^2 + 9X + 6$ | 134. $12X^2 + 2X - 4$ |
| 39. $9X^2 + 6X - 3$ | 87. $6X^2 - 16X + 10$ | 135. $8X^2 + 4X - 12$ |
| 40. $X^2 + 2X - 8$ | 88. $X^2 - 5X + 4$ | 136. $2X^2 - 8$ |
| 41. $6X^2 - 13X - 15$ | 89. $10X^2 - 4X - 6$ | 137. $8X^2 + 14X + 5$ |
| 42. $18X^2 - 2$ | 90. $6X^2 - 13X + 6$ | 138. $10X^2 - 7X - 12$ |
| 43. $2X^2 - 8X - 10$ | 91. $5X^2 - 23X + 12$ | 139. $8X^2 + 2X - 15$ |
| 44. $10X^2 + 23X + 12$ | 92. $4X^2 + 6X + 2$ | 140. $9X^2 - 3X - 12$ |
| 45. $8X^2 - 2X - 10$ | 93. $3X^2 + 3X - 6$ | 141. $X^2 + 4X - 5$ |
| 46. $6X^2 - 25X + 4$ | 94. $3X^2 + 17X + 20$ | 142. $X^2 + 9X + 20$ |
| 47. $10X^2 - 3X - 1$ | 95. $4X^2 + 22X + 24$ | 143. $X^2 - 6X + 8$ |
| 48. $2X^2 - 9X - 18$ | 96. $4X^2 - 4$ | 144. $6X^2 - 14X + 4$ |

These are the solutions to
Tri-L.

62. $(3X - 2)(2X + 5)$
63. $(X + 3)(X + 1)$
64. $2(2X - 1)(3X - 2)$
65. $(2X + 1)(3X - 5)$
66. $3(X - 3)(X - 2)$
67. $9(X + 1)(X + 1)$
68. $2(X + 1)(6X + 5)$
69. $3(X + 1)(X + 1)$
70. $(X + 4)(6X + 5)$
71. $2(X - 4)(X - 3)$
72. $5(2X + 1)(X - 1)$
73. $(3X + 3)(3X + 3)$
74. $2(X - 2)(2X + 3)$
75. $2(X - 4)(X + 1)$
76. $3(X - 2)(X - 1)$
77. $(2X + 4)(3X - 4)$
78. $(X + 1)(X + 6)$
79. $(3X + 4)(5X - 4)$
80. $2(3X + 1)(X + 1)$

These are the solutions to
Tri-D

41. $(2X + 5)(2X - 9)$
42. $(3X - 7)^2$
43. $4(5X + 4)(5X - 3)$
44. $12(X + 1)^2$
45. $6(2X - 1)(6X + 11)$
46. $9(X - 1)(X - 5)$
47. $(7X + 5)(3X + 4)$
48. $(5X - 11)(X - 10)$
49. $2(5X + 7)(2X - 3)$
50. $3(7X - 10)(3X - 4)$
51. $(4X + 1)(3X + 4)$
52. $(X - 7)(X - 5)$
53. $(12X + 7)(7X + 8)$
54. $(X - 9)(5X - 9)$
55. $(4X + 9)(3X - 8)$
56. $2(3X + 2)(4X - 11)$
57. $10(X + 1)(X - 6)$
58. $2(3X - 1)(3X + 4)$
59. $(4X - 9)(11X - 3)$
60. $(6X + 11)(7X + 8)$

Copy the original problem. If there is a common factor in the trinomial, factor it out. Factor the resulting trinomial (usually) into the two binomials. Be very sure that your work is clear and legible.

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|----------------------|----------------------|-----------------------|
| 1. $10X^2-117X-36$ | 49. $20X^2-2X-42$ | 97. $54X^2+144X+90$ |
| 2. $15X^2+15X-30$ | 50. $63X^2-174X+120$ | 98. $44X^2-26X+2$ |
| 3. $X^2+13X+42$ | 51. $12X^2+19X+4$ | 99. $30X^2-93X+66$ |
| 4. $21X^2-11X-40$ | 52. $X^2-12X+35$ | 100. $11X^2-50X-25$ |
| 5. $36X^2+31X-56$ | 53. $84X^2+145X+56$ | 101. $8X^2+33X+4$ |
| 6. $77X^2+108X+36$ | 54. $5X^2-54X+81$ | 102. $120X^2+26X-77$ |
| 7. $X^2-17X+72$ | 55. $12X^2-5X-72$ | 103. $90X^2+46X+4$ |
| 8. $15X^2-2X-77$ | 56. $24X^2-50X-44$ | 104. $88X^2+49X-99$ |
| 9. $21X^2-11X-2$ | 57. $10X^2-50X-60$ | 105. $14X^2+47X-7$ |
| 10. $50X^2-40X-120$ | 58. $18X^2+18X-8$ | 106. $12X^2-94X+132$ |
| 11. $10X^2-4X-32$ | 59. $44X^2-111X+27$ | 107. $22X^2+144X+72$ |
| 12. $10X^2+19X+6$ | 60. $42X^2+125X+88$ | 108. $30X^2-129X+36$ |
| 13. $21X^2+20X-25$ | 61. $12X^2+101X+40$ | 109. $30X^2-88X-40$ |
| 14. $100X^2+130X+30$ | 62. $60X^2+129X+63$ | 110. $33X^2+89X+28$ |
| 15. $55X^2-150X+80$ | 63. $8X^2+62X+42$ | 111. $8X^2+23X-3$ |
| 16. $60X^2-126X+12$ | 64. $99X^2+26X-45$ | 112. $24X^2-70X+44$ |
| 17. $18X^2-66X-120$ | 65. $42X^2-89X+22$ | 113. $10X^2+X-3$ |
| 18. $27X^2-51X-28$ | 66. $6X^2-6$ | 114. $9X^2+6X-15$ |
| 19. $77X^2-34X-16$ | 67. $10X^2-99X-10$ | 115. $90X^2+101X-11$ |
| 20. $48X^2+36X-30$ | 68. $6X^2+17X+12$ | 116. $49X^2+147X+108$ |
| 21. $22X^2-X-5$ | 69. $6X^2+3X-30$ | 117. $8X^2+44X+48$ |
| 22. $60X^2+64X-7$ | 70. $132X^2+125X+28$ | 118. $108X^2+90X+18$ |
| 23. $6X^2+40X+24$ | 71. $30X^2-64X+18$ | 119. $50X^2+90X-20$ |
| 24. $9X^2-59X-28$ | 72. $24X^2-92X+40$ | 120. $64X^2+8X-90$ |
| 25. $35X^2+6X-77$ | 73. $10X^2+80X+70$ | 121. $50X^2-30X+4$ |
| 26. $60X^2-148X+80$ | 74. $42X^2+2X-20$ | 122. $56X^2+86X+20$ |
| 27. $48X^2+40X+7$ | 75. $88X^2+217X+132$ | 123. $18X^2+31X+11$ |
| 28. $72X^2-156X+84$ | 76. $6X^2+4X-2$ | 124. $66X^2+38X-4$ |
| 29. $8X^2-32$ | 77. $14X^2-45X-14$ | 125. $28X^2-37X-11$ |
| 30. $10X^2+28X-110$ | 78. $108X^2-165X+50$ | 126. $18X^2+60X+48$ |
| 31. $42X^2-61X+14$ | 79. $8X^2-39X-54$ | 127. $8X^2-102X+72$ |
| 32. $44X^2-101X+42$ | 80. $64X^2-64X-9$ | 128. $5X^2-6X+1$ |
| 33. $10X^2+15X-10$ | 81. $66X^2+14X-20$ | 129. $36X^2+105X-99$ |
| 34. $16X^2-32X-20$ | 82. $12X^2-94X+132$ | 130. $81X^2+9X-72$ |
| 35. $10X^2+52X+10$ | 83. $84X^2+48X-132$ | 131. $64X^2+40X-24$ |
| 36. $88X^2+15X-25$ | 84. $5X^2+56X+60$ | 132. $54X^2+15X-21$ |
| 37. $3X^2-29X-44$ | 85. $27X^2+45X+12$ | 133. $63X^2-139X+70$ |
| 38. $20X^2-48X-77$ | 86. $14X^2-91X+77$ | 134. $132X^2+89X+7$ |
| 39. $72X^2+24X-6$ | 87. $48X^2-20X-42$ | 135. $81X^2-117X+42$ |
| 40. $48X^2+168X+72$ | 88. $132X^2+171X+54$ | 136. $6X^2-28X+16$ |
| 41. $4X^2-8X-45$ | 89. $45X^2-49X-110$ | 137. $21X^2+21X-42$ |
| 42. $9X^2-42X+49$ | 90. $48X^2+156X+90$ | 138. $24X^2-112X+120$ |
| 43. $100X^2+20X-48$ | 91. $10X^2-104X-66$ | 139. $40X^2-106X+36$ |
| 44. $12X^2+24X+12$ | 92. $40X^2+14X-45$ | 140. $24X^2-96$ |
| 45. $72X^2+96X-66$ | 93. $96X^2-100X+24$ | 141. $24X^2+88X+14$ |
| 46. $9X^2-54X+45$ | 94. $25X^2-95X+90$ | 142. $18X^2+20X+2$ |
| 47. $21X^2+43X+20$ | 95. $84X^2-33X-72$ | 143. $110X^2-23X-70$ |
| 48. $5X^2-61X+110$ | 96. $24X^2+30X-36$ | 144. $44X^2-97X-66$ |