1. The binomials could be multiplied in a horizontal format or a vertical format. The patterns from Pascal's Triangle could also be used.

2. yes; When the sum and difference of two quantities are multiplied, the result is the difference of their squares.

3. $x^2 + x + 1$

4. $-13x^2 + 6x - 1$

5. $12x^5 + 5x^4 - 3x^3 + 6x - 4$

6. $8x^4 + 3x^3 - 3x^2 + 7x$

7. $7x^6 + 7x^5 + 8x^3 - 9x^2 + 11x - 5$

8. $20x^4 - 3x^3 - 6x - 2$

9. $-2x^3 - 14x^2 + 7x - 4$

10. $5x^4 - 12x^3 - 3x^2 + 4x + 10$

11. $5x^6 - 7x^5 + 6x^4 + 9x^3 + 7$

12. $-10x^5 + 8x^4 - 7x^3 - 20x^2 - x + 18$

13. $-x^5 + 7x^3 + 11x^2 + 10x - 4$

14. $9x^4 - 6x^3 - 9x^2 + x + 20$

15. $P = 47.7t^2 + 678.5t + 17{,}667.4$; The constant term represents the total number of people attending degree-granting institutions at time $t = 0$.

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

17. $35x^5 + 21x^4 + 7x^3$

18. $-44x^8 - 8x^7 - 36x^6 - 4x^5$

19. $-10x^3 + 23x^2 - 24x + 18$

20. $-2x^3 - 11x^2 - 23x - 24$

21. $x^4 - 5x^3 - 3x^2 + 22x + 20$

22. $-12x^4 - 10x^3 + 3x^2 + 3x + 2$

23. $3x^5 - 6x^4 - 6x^3 + 25x^2 - 23x + 7$

24. $4x^6 - 8x^5 + 10x^4 - 8x^3 - 38x^2 - 8x$

25. The negative was not distributed through the entire second set of parenthesis;

$$\begin{aligned}(x^2 - 3x + 4) - (x^3 + 7x - 2) &= x^2 - 3x + 4 - x^3 - 7x + 2 \\ &= -x^3 + x^2 - 10x + 6\end{aligned}$$

26. The exponent cannot be distributed through a binomial. The three binomials must be multiplied; $(2x - 7)^3 = 8x^3 - 84x^2 + 294x - 343$

27. $x^3 + 3x^2 - 10x - 24$

28. $x^3 - 9x^2 + 8x + 60$

29. $12x^3 - 29x^2 + 7x + 6$

30. $6x^3 + 11x^2 - 26x - 40$

31. $-24x^3 + 86x^2 - 57x - 20$

32. $30x^3 - 19x^2 - 14x + 8$

33. $(a + b)(a - b) = a^2 - ab + ab - b^2 = a^2 - b^2$;

Sample answer:
$$\begin{aligned} 24 \cdot 16 &= (20 + 4)(20 - 4) \\ &= 20^2 - 4^2 \\ &= 400 - 16 \\ &= 384 \end{aligned}$$

34. $31 \cdot 29$ can be found using:
$$\begin{aligned} (30 + 1)(30 - 1) &= 30^2 - 1^2 \\ &= 900 - 1 \\ &= 899 \end{aligned}$$

35. $x^2 - 81$

36. $m^2 + 12m + 36$

37. $9c^2 - 30c + 25$

38. $4y^2 - 25$

39. $49h^2 + 56h + 16$

40. $81g^2 - 72g + 16$

41. $8k^3 + 72k^2 + 216k + 216$

42. $64n^3 - 144n^2 - 108n - 27$

43. $8t^3 + 48t^2 + 96t + 64$

44. $36m^2 + 24m + 4$

45. $16q^4 - 96q^3 + 216q^2 - 216q + 81$

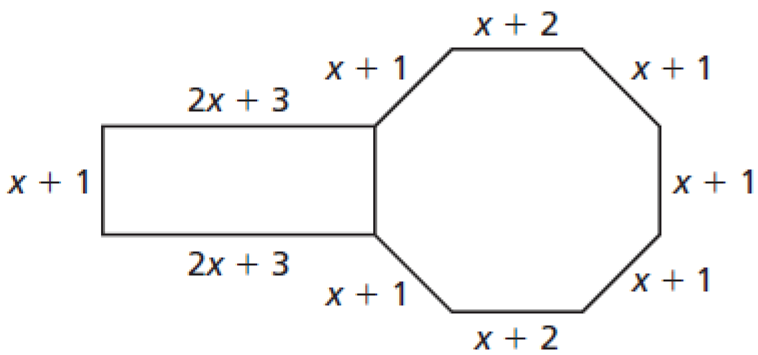
46. $g^5 + 10g^4 + 40g^3 + 80g^2 + 80g + 32$

47. $y^5z^5 + 5y^4z^4 + 10y^3z^3 + 10y^2z^2 + 5yz + 1$

48. $n^4p^4 - 4n^3p^3 + 6n^2p^2 - 4np + 1$

49. $9a^8 + 66a^6b^2 + 97a^4b^4 - 88a^2b^6 + 16b^8$; *Sample answer:* Pascal's Triangle; Use Pascal's Triangle to expand the two binomials. Multiply the results vertically to find your final product.

50. *Sample answer:*



$12x + 16$

51. $2x^3 + 10x^2 + 14x + 6$

52. $\pi(3x^3 - 16x^2 + 28x - 16)$

53. **a.** $5000(1 + r)^3 + 1000(1 + r)^2 + 4000(1 + r)$

b. $7000r^3 + 25{,}000r^2 + 34{,}000r + 16{,}000$; 7000 is the total amount of money that gained interest for three years, 25,000 is the total amount of money that gained interest for two years, 34,000 is the total amount of money that gained interest for one year, and 16,000 is the total amount of money invested.

c. about $17,763.38

54. $(2x + 10)^3 - \left[\frac{4}{3}\pi(x + 2)^3\right]$, or about $3.8x^3 + 94.9x^2 + 549.7x + 966.5$

55. no; The sum of $(x + 3)$ and $(x - 3)$ is $2x$, a monomial. The product of $(x + 3)$ and $(x - 3)$ is $x^2 - 9$, a binomial.

56. **a.** 12 in. by 6 in.

b. $V = x(12 - 2x)(6 - 2x)$; 3

57. equivalent; They produce the same graph.

58. not equivalent; They do not produce the same graph.

59. not equivalent; Although they appear to produce the same graph, the table of values shows they are off by a constant of 1.

60. equivalent; They produce the same graph.

61.

										1										
									1		1									
								1		2		1								
							1		3		3		1							
						1		4		6		4		1						
					1		5		10		10		5		1					
				1		6		15		20		15		6		1				
			1		7		21		35		35		21		7		1			
		1		8		28		56		70		56		28		8		1		
	1		9		36		84		126		126		84		36		9		1	
1		10		45		120		210		252		210		120		45		10		1

$$(x+3)^7 = x^7 + 21x^6 + 189x^5 + 945x^4 + 2835x^3 + 5103x^2 + 5103x + 2187;$$

$$(x-5)^9 = x^9 - 45x^8 + 900x^7 - 10{,}500x^6 + 78{,}750x^5 - 393{,}750x^4 + 1{,}312{,}500x^3 - 2{,}812{,}500x^2 + 3{,}515{,}625x - 1{,}953{,}125$$

62. When in standard form the function is

$x^4 + (ax^3 + bx^3 + cx^3 + dx^3) + (abx^2 + bcx^2 + bdx^2 + cdx^2) + (acx + adx + abcx + abdx + acdx + bcdx) + abcd$ which can also be written as

$x^4 + (a + b + c + d)x^3 + (ab + ad + ac + bc + bd + cd)x^2 + (abc + abd + acd + bcd)x + abcd.$

63. **a.** 5

b. 5

c. 9

d. $g(x) + h(x)$ has degree m. $g(x) - h(x)$ has degree m. $g(x) \bullet h(x)$ has degree $(m + n)$.

64. **a.** 3, 5, 7; The difference increases by 2 for each consecutive pair of square numbers.

b. The first difference is 3, given by $2(1) + 1 = 3$. The second difference is 5, given by $2(2) + 1 = 5$. The third difference is 7, given by $2(3) + 1$.

c. $(n + 1)^2 - n^2 = n^2 + 2n + 1 - n^2 = 2n + 1$

65. **a.** $(x^2 - y^2)^2 + (2xy)^2 = (x^2 + y^2)^2$

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

$x^4 + 2x^2y^2 + y^4 = x^4 + 2x^2y^2 + y^4$

b. The Pythagorean triple is 11, 60, and 61.

c. $121 + 3600 = 3721$

$3721 = 3721$

66. $8 + 7i$

67. $5 + 11i$

68. 21

69. $9 - 2i$