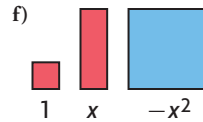
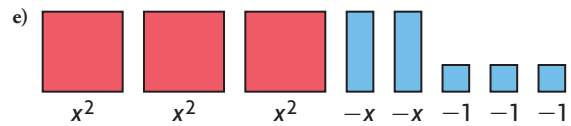
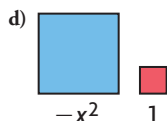
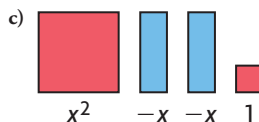
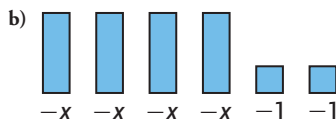
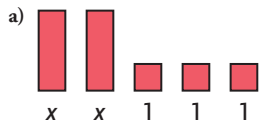


- b) t represents time, which can never be negative.
 c) 16.7 m
 d) 1.8 s
 e) 3.6 s
 f) $D = \{t \in \mathbf{R} \mid 0 \leq t \leq 3.6\}$, $R = \{b(t) \in \mathbf{R} \mid 0 \leq b(t) \leq 16.7\}$

Chapter 2

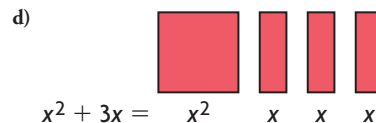
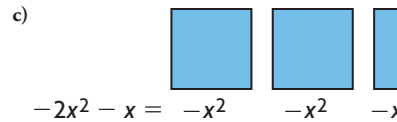
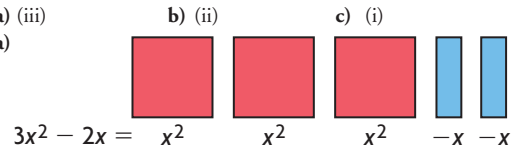
Getting Started, pp. 74–76

- a) (vii) c) (viii) e) (i) g) (ii)
 b) (iv) d) (vi) f) (iii) h) (v)
- a) $-6x + y$ c) $3x - 3y + 3$
- a) xy d) $-9a - 7b - 7ab$
- a) x^5 b) $10x^3$ c) x^2 d) $2x^2$
- a) $(x)(x) = x^2$ b) $(2x)(4x) = 8x^2$
- a) $9x - 24$ d) $-5d^3 - 11d^2 - 6d + 36$
 b) $-32x^2 + 8x - 4$ e) $6x^3 + 10x^2$
 c) $14x^2 - 10x + 8$ f) $-5x^4 + 15x^3 - 20x^2$
- a) $2(x - 5)$ c) $5(5x^2 + 4x - 20)$
 b) $6(x^2 + 4x + 5)$ d) $x^3(7x + 12 - 9x^2)$
- a) x^5 b) $-30x^7$ c) $15x^7$ d) $2x^3$
- a) (i) and (v) c) (iii)
 b) (ii), (iv), and (vi) d) (iii) and (iv)
- a) 8 c) 18 e) $3x + 2$
 b) 8 d) x f) $5x$
- a) $2 \times 3 \times 13$ b) 7×3^2 c) $5^2 \times 11^2$ d) 41



12. a) (iii)

13. a)



14. a) Agree: Area = length \times width, in which length and width are factors of the product Area.
 b) Disagree: factors are integers; Agree: factors are terms that multiply together to make the product.
 c) Disagree: -2 and $-x - 3$ are other factors of $2x + 6$.

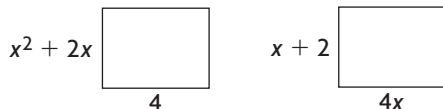
Lesson 2.1, pp. 85–87

- a) $A = (2x + 1)(x + 3) = 2x^2 + 7x + 3$
 b) $A = (2x + 3)(3x - 2) = 6x^2 + 5x - 6$
- a) $x^2 + 4x - 21$ c) $4x^2 - 20x + 25$
 b) $a^2 + 12a + 36$ d) $m^2 - 81$
- a) $3x^2 - 3x - 90$ c) $-3n^2 + 2n + 4$
 b) $a^2 - 2a + 7$ d) $-6x^2 + 24x + 1$
- a) $(x + 1)(2x + 2) = 2x^2 + 4x + 2$
 b) $(2x - 1)(x + 3) = 2x^2 + 5x - 3$
- a) $12x^2 + 7x - 10$ d) $4a^2 + 29a + 32$
 b) $45x^2 + 60x + 20$ e) $-20n^2 - 2n$
 c) $-14x^2 - 12x + 19$ f) $4x^2 + 75$
- a) 11 c) $-2x^2 - x + 6$
 b) -2 d) -22
 e) $-2x^2 - x + 6$ evaluated for $x = -4$ is -22 .

It was shown in part (c) that the factors of $-2x^2 - x + 6$ are $(3 - 2x)$ and $(x + 2)$. Parts (a) and (b) showed that $(3 - 2x)$ and $(x + 2)$ evaluated for $x = 4$ are 11 and -2 , respectively, the

product of which is -22 . So, parts (a)–(b) show that if you evaluate two expressions for a specific number, x , and multiply the results of the evaluation together, it is equal to the product of those two expressions evaluated for that same number, x .

7. a) $2x^2 - 10x$ c) $18x^2 + 27x - 35$
 b) $a^2 - 2a - 63$ d) $11m^2 - 15m - 12$
 8. The highest exponent comes from $2x$ times $3x$, or $6x^2$.
 9. Answers may vary. E.g., 4 by $x^2 + 2x$ or $4x$ by $x + 2$



10. a) $(2x + 3)(2x - 4) = 4x^2 - 2x - 12$
 b) $\frac{1}{2}(2x - 1)(4x + 2) = 4x^2 - 1$
 11. a) πx^2 b) $\pi(x + 5)^2$ c) $10\pi x + 25\pi$
 12. a) Answers may vary. E.g., $(6x^2 - 8x) + (-15x^2 - 18x) = -9x^2 - 26x$
 b) Answers may vary. E.g., $(6x^2 - 8x) + (-15x^2 + 8x) = -9x^2$
 13. a) Answers may vary. E.g., $(2x + 3)(2x - 4) = 4x^2 - 2x - 12$
 b) Answers may vary. E.g., $(2x + 3)(2x - 3) = 4x^2 - 9$
 14. a) $6x^2 - xy - y^2$ c) $25m^2 - 49n^2$
 b) $9a^2 - 30ab + 25b^2$ d) $-4x^2 - 10xy + 6y^2$
 15. a) $(n + 1)^2 - n^2 = n^2 + 2n + 1 - n^2$
 b) 12
 c) 5, 12, 13
 d) 7, 24, 25; 9, 40, 41; 11, 60, 61

Lesson 2.2, pp. 92–94

1. a) $6x^2 + 4x; 2x$ b) $16x - 12x^2; 4x$
 2. a) 3 b) x
 3. a) $2(2x^2 - 3x + 1)$ c) $(a + 7)(5a + 2)$
 b) $5x(x - 4)$ d) $(3m - 2)(4m - 1)$
 4. a) $-6x^2; 6x$ b) $4x^2 + 16x; 4x$
 5. a) 6 b) $2x$ c) 2 d) -5
 6. a) $9x(3x - 1)$ d) $-2(a^2 + 2a - 3)$
 b) $-4m(2m - 5)$ e) $(x + 7)(3x - 2)$
 c) $5(2x^2 - x + 5)$ f) $(3x - 2)(2x + 1)$
 7. a) $2x - 1$ b) $m^2 - 2m + 2$
 8. $2\pi r(r + 10)$
 9. $2a(3a - 2) + 7(2 - 3a) = 2a(3a - 2) + 7(-1)(3a - 2)$
 $= 2a(3a - 2) - 7(3a - 2)$
 $= (3a - 2)(2a - 7)$
 10. a) Answers may vary. E.g., $6x^2 + 6x = 6x(x + 1)$; $12x^2 + 18x = 6x(2x + 3)$; $6x^2 - 30x = 6x(x - 5)$
 b) Answers may vary. E.g., $7x^2 + 7x + 7 = 7(x^2 + x + 1)$; $7x^2 + 14x + 7 = 7(x^2 + 2x + 1)$; $14x^2 + 7x + 7 = 7(2x^2 + x + 1)$
 11. Both common factors divide evenly into the quadratic, but the first term is usually positive after factoring.
 12. k must be a number that has a common factor with 6 and 12 but not with 6 and 4. So k can be any odd multiple of 3, such as ± 3 , ± 9 , ± 15 ,
 13. a) $n + 2$ c) $2n^2 + 4n + 4 = 2(n^2 + 2n + 2)$
 b) $n^2 + (n + 2)^2$
 14. If a polynomial has two terms and each term has a common factor, then this can be divided out of both terms. For example, $6x^2 + 8x = 2x(3x + 4)$.
 15. a) $5xy(x - 2y)$ c) $(x + y)(3x - y)$
 b) $5a^2b(2b^2 - 3b + 4)$ d) $(x - 2)(5y + 7)$

16. a) $(3a + b)(3x + 2)$ c) $(x + y)(x + y + 1)$
 b) $(2x - 1)(5x - 3y)$ d) $(1 + x)(1 + y)$

Lesson 2.3, pp. 99–100

1. a) $x^2 + x - 6 = (x + 3)(x - 2)$
 b) $x^2 - x - 12 = (x - 4)(x + 3)$
 2. a) $(x + 5)$ c) $(x + 8)$
 b) $(x + 4)$ d) $(x + 2)$
 3. a) $(x + 5)(x + 4)$ c) $(m + 3)(m - 2)$
 b) $(a - 5)(a - 6)$ d) $2(n + 5)(n - 7)$
 4. a) $x^2 + 4x + 3 = (x + 3)(x + 1)$
 b) $x^2 - 3x - 10 = (x - 5)(x + 2)$
 5. a) $(x + 6)$ b) $(x - 7)$ c) $(x + 5)$ d) $(x - 3)$
 6. a) $(x - 5)(x - 2)$ d) $(w + 3)(w - 6)$
 b) $(y - 5)(y + 11)$ e) $(x - 11)(x - 3)$
 c) $(x - 5)(x + 2)$ f) $(n - 10)(n + 9)$
 7. Answers may vary. E.g., $x^2 + 6x + 5$; $x^2 + 7x + 10$; $2x^2 + 16x + 30$
 8. $(2 - x) = -(x - 2)$ and $(5 - x) = -(x - 5)$. When multiplied, the two minus signs become a positive sign.
 9. a) $(a + 5)(a + 2)$ d) $(x - 4)(x + 15)$
 b) $-3(x + 3)(x + 6)$ e) $(x + 5)(x - 2)$
 c) $(z - 5)^2$ f) $(y + 6)(y + 7)$
 10. $f(n) = (n - 3)(n + 1)$ when factored. If $n = 4$, the first factor becomes 1. Therefore, prime. Other numbers larger than 4 always produce two factors and are not prime.
 11. We are looking for numbers that add to 0 and multiply to -16 to be able to factor.
 12. a) Answers may vary. E.g., $b = 3$ and $c = 2$.
 b) Answers may vary. E.g., $b = 5$ and $c = 6$.
 c) Answers may vary. E.g., $b = 5$ and $c = 9$.
 13. a) $k = 4$ or 5. These are the possible sums of the factors of 4. $2 + 2 = 4$ and $1 + 4 = 5$
 b) $k = 4, 3$, or 0. These are the possible products of the addends of 4. $2 \times 2 = 4$, $1 \times 3 = 3$, and $0 \times 4 = 0$
 c) $k = 4$ or 0. These are the possible numbers whose factors when added together give the same value. $2 \times 2 = 4$ and $2 + 2 = 4$. $0 \times 0 = 0$ and $0 + 0 = 0$
 14. a) $(x + 5y)(x - 2y)$
 b) $(a + 3b)(a + b)$
 c) $-5(m - n)(m - 2n)$
 d) $(x + y - 2)(x + y + 3)$
 15. $\left(1 + \frac{3}{x}\right)(x + 4)$ or $\left(1 + \frac{4}{x}\right)(x + 3)$

Mid-Chapter Review, p. 103

1. a) $2x^2 - 18x + 15$ c) $-5x^2 - 15x$
 b) $18n^2 + 8$ d) $-18a^2 + 2b^2$
 2. $(2x + 1)$ and $(3x - 2)$; $6x^2 - x - 2$
 3. $6x^2 + 5x - 4$
 4. $5x$
 5. a) $-4x(2x - 1)$ c) $5(m^2 - 2m - 1)$
 b) $3(x^2 - 2x + 3)$ d) $(2x - 1)(3x + 5)$
 6. $-8x^2 + 4x$; $4x$
 7. a) $6x^2 + 24x + 24$ c) 6 is the common factor and $6 = 2 \times 3$.
 b) yes
 8. $x^2 + 3x - 10$; $(x - 2)(x + 5)$
 9. a) $(x - 3)(x + 5)$ c) $(x - 7)(x - 5)$
 b) $(n - 2)(n - 6)$ d) $2(a - 4)(a + 3)$

10. 4 does not divide evenly into 6.
 11. Yes, because the positive factors of c that add to b can both be made negative so that they add to $-b$.

Lesson 2.4, pp. 109–110

- $8x^2 + 14x + 3; (2x + 3)(4x + 1)$
 - $3x^2 + x - 2; (3x - 2)(x + 1)$
- $(2a - 1)$
 - $(5x - 2)$
 - $(x + 2)$
 - $4(n - 3)$
- $3x^2 + 16x + 5; (x + 5)(3x + 1)$
- $(x - 4)(2x + 1)$
 - $3(x + 1)(x + 5)$
 - $(x + 3)(5x + 2)$
 - $(x - 7)(2x - 1)$
- $(2x + 1)(4x + 3)$
 - $3(m - 1)(2m + 1)$
 - $(a - 4)(2a - 3)$
 - $(3x - 2)(5x + 2)$
 - $2(n + 5)(3n - 2)$
 - $2(4x + 3)(2x - 1)$
- Answers may vary. E.g., $4x^2 - 8x - 5$; $4x^2 - 4x - 15$; $4x^2 - 25$
- $k = 4, 3$
 - $k = 18, 6, -6, -18, -39$
 - $k = 3, 6$
- Yes. We want the product to be c and the sum to be b .
- $(2x - 3)(3x + 4)$
 - $(k + 5)(8k + 3)$
 - $5(2r - 7)(3r + 2)$
 - $(4y - 5)(6y + 5)$
 - $(3n(n - 4)(4n - 9))$
 - $3(k - 4)(k + 2)$
 - $(4y - 5)(6y + 5)$
- $(x + 3)(x + 2)$
 - $(x - 6)(x + 6)$
 - $(5a + 2)(a - 3)$
 - $(a - 4)(a + 3)$
 - $4(x + 6)(x - 2)$
 - $(2x - 3)(3x + 1)$
- Yes. $n = 16, 24, 41, 49, \dots$. The factors are $2(n + 1)(3n + 2)$.
 If either factor is a multiple of 25, the expression is a multiple of 50.
- Once you have found the greatest common factor you can ask yourself what must you multiply the common factor by to get each term of the original polynomial. This helps you find the other factor.
 For $-4x^2 + 38x - 48$, the greatest common factor is -2 .
 So the factors are $-2(2x^2 - 19x + 24)$. Now try to find two binomials that multiply to give the trinomial in the brackets,
 $-4x^2 + 38x - 48 = -2(2x - 3)(x - 8)$
- $(2x + 3y)(3x + y)$
 - $(a - 2b)(5a + 3b)$
 - $(2x - 3y)(4x - y)$
 - $4(a + 5)(3a - 2)$
- No. If a and c are odd, their product is odd. So we look for a pair of odd numbers that multiply to ac and add to b . But two odd numbers add to an even number, so b is not odd.

Lesson 2.5, pp. 115–116

- $4x^2 - 1; (2x + 1)(2x - 1)$
 - $9x^2 + 6x + 1; (3x + 1)(3x + 1)$
- $(x - 5)$
 - $(n + 4)$
 - $(x + 6)(x - 6)$
 - $(x + 5)^2$
 - $(7a + 3)^2$
 - $(x + 11)(x - 11)$
 - $(5a + 6)$
 - 7
 - $(x + 8)(x - 8)$
 - $(x - 12)^2$
 - $-2(2x - 3)^2$
 - $20(a + 3)(a - 3)$
 - $(2m - 3)$
 - $(3x + 1)$
 - $(x + 10)(x - 10)$
 - $(x + 2)^2$
 - $4(2 - 3x)(2 + 3x)$
 - $(x + 3)^2$
- 400
 - 580
- 5 is not a perfect square.
 - $b(-b)$ is not $+9$ and 5 is not a perfect square.
- $(x - 3)(x - 2)(x + 2)(x + 3)$
- 7, 5; $-7, -5$; $-7, 5$; $7, -5$; $5, 1$; $-5, -1$; $5, -1$; $-5, 1$
- $x^2 - (x - 2)^2 = 4(x - 1)$; average of x and $x - 2$ is $x - 1$

- A perfect-square trinomial has two of the three terms perfect squares and the non-square term is 2 times the product of the square roots of the two square terms. A difference of squares polynomial has two perfect square terms separated by a minus sign.
- $(10x + 3y)(10x - 3y)$
 - $(2x + y)^2$
 - $(2x - y + 3)(2x - y - 3)$
 - $10(3x - 2y)^2$
- $(2x - 5y - 2z)(2x - 5y + 2z)$
 - $-(x - 16)(x + 2)$

Chapter Review, pp. 120–121

- $7x^2 + 11x - 9$
 - $-144a^2 + 225$
 - $-54x^2 + 63x - 10$
 - $-20n^2 + 100n - 125$
- $(4x - 1)(x + 4); 4x^2 + 15x - 4$
- $(x - 2)$
 - 3
 - $(b^2 - 2)$
 - $4x + 5$
- $5x(2x - 1)$
 - $12(n^2 - 2n + 4)$
 - $2 \text{ by } 3x^2 - 4$
 - No. $3x^2 - 4$ does not factor.
- Answers may vary. E.g., $7x^2 - 7x$; $14x^2 - 21x$; $7x^3 + 21x^2 - 35x$
 - $7x(x - 1); 7x(2x - 3); 7x(x^2 + 3x - 5)$
- $6x - 2x^2 = 2x(3 - x)$
 - $x^2 + 2x - 15 = (x - 3)(x + 5)$
- $(x + 7)$
 - $(a - 4)$
 - $(x + 5)(x + 2)$
 - $(x - 3)(x - 9)$
 - $(b + 4)$
 - $(x - 5)$
 - $(x + 7)(x - 6)$
 - $(x - 10)(x + 9)$
- Answers may vary. E.g.,
 $x^2 + 5x + 6 = (x + 2)(x + 3)$; $x^2 + 3x + 2 = (x + 1)(x + 2)$
- $3x - 2x$
 - $24x - 15x$
 - $(2x + 5)$
 - $(a + 4)$
 - $(2x - 5)(3x - 2)$
 - $(2a - 3)(5a + 2)$
 - $9x^2 + 12x + 4; (3x + 2)(3x + 2)$
 - $9x^2 - 4; (3x - 2)(3x + 2)$
 - $(x - 5)$
 - $(3a + 1)$
 - $(2x + 3)(2x - 3)$
 - $(4a - 3)^2$
 - $6x - 56x$
 - $6x - 15x$
 - $(2b + 3)$
 - $(3x + 4)$
 - $(4x - 3)(5x + 6)$
 - $(n + 1)(6n + 7)$
 - $(2b - 5)$
 - $(3x - 8)$
 - $(x - 2)(x + 2)(x^2 + 4)(x^4 + 16)$
 - $(x + 1)^2$
- $x^2 + 0x + 1$ cannot be factored as no numbers that multiply to $+1$ add to 0.
- $(x + 5)(x - 3)$
 - $5(m + 4)(m - 1)$
 - $2(x + 3)(x - 3)$
 - $5c^2(3c + 5)$
 - $3(6x - 1)(x + 1)$
 - $4(3x + 2)(3x + 2)$
- Factoring can be the opposite of expanding, for example:
 $(x + 1)(x + 2) = x^2 + 3x + 2$
 [factored] \leftrightarrow [expanded]

Chapter Self-Test, p. 122

- $-7x^2 + 2x$
 - $-200n^2 - 80n - 128$
 - $22x^2 - 105x + 119$
 - $-78a^2 + 21a + 48$
- $(3x - 3)(2x + 5); 6x^2 + 9x - 15$
- $6x^2 - 7x - 3$
 - $4x - 6 \text{ by } 3x + 3$
 - $12x^2 - 6x - 18$

