

Chapter 9 — Polynomials: Operations

Teacher Guide

Teacher Chapter-at-a-Glance

Materials

None required. Algebra tiles are optional for building the area model physically.

Pacing

Move quickly through addition and subtraction (mostly Chapter 1 review in a new context). Spend the most time on binomial multiplication and the square-of-a-binomial special case.

Talk Prompt

"Did you make all four products, and did you combine the right ones?"

If Ready-to-Learn Reveals a Gap

If students cannot combine like terms or apply the distributive property, reteach the relevant part of Chapter 1 or 2 before continuing.

Mastery Decision Guide

What a missed Tripwire item actually means, and what to do about it before moving on.

Missed Tripwire #1 → Adding Exponents While Adding Terms (Mistake 1). *The exponent on a term changes after an addition or subtraction step, rather than only the coefficient.* Review before the next chapter.

Missed Tripwire #2 → Omitting a Binomial Product (Mistake 4). *A binomial-times-binomial answer is missing an x -term altogether, a sign of only two products being made instead of four.* Review before the next chapter.

Ready-to-Learn Check

Quick check before starting. A wrong answer below points to a specific gap worth closing first, not just a miss to shrug off.

1. Simplify $7x - 2x$.

Correct answer: $5x$

Likely wrong answer: $5x^2$

Misconception: Treats combining like terms as if it were multiplication, adding the exponents instead of just the coefficients.

Next move: Review Chapter 1: combining like terms changes only the coefficient. The exponent never changes when adding or subtracting.

2. Expand $3(x - 4)$.

Correct answer: $3x - 12$

Likely wrong answer: $3x - 4$

Misconception: Multiplies the 3 by the first term only and forgets to distribute it to the second term.

Next move: Review the distributive property before multiplying polynomials: every term inside the brackets must be multiplied.

3. Write $x \times x \times x$ using an exponent.

Correct answer: x^3

Likely wrong answer: $3x$

Misconception: Confuses repeated multiplication with repeated addition, writing the count of factors as a coefficient instead of an exponent.

Next move: Review exponents as repeated multiplication before multiplying powers of x .

Common Mistakes

TEACHING NOTE

Mistake 4 (omitting a binomial product) and Mistake 5 (forgetting the middle term in a square) are two flavours of the same underlying gap: not all four products were made.

Students often run into the same kinds of trouble with this topic. Recognizing these patterns helps avoid them.

Mistake 1: Adding Exponents While Adding Terms

What students do: In $3x^2 + 2x^2$, a student writes $5x^4$.

Why this happens: The student remembers "add exponents" from multiplication and uses it in the wrong operation.

What to do instead: Add exponents only when multiplying powers with the same base. When adding like terms, only the coefficient changes: $3x^2 + 2x^2 = 5x^2$.

Diagnostic trigger: The exponent on a term changes after an addition or subtraction step, rather than only the coefficient.

Mistake 2: Changing Only One Sign When Subtracting

What students do: $(4x^2 - 3x) - (x^2 + 5x)$ is simplified to $3x^2 + 2x$.

Why this happens: The student subtracts the first term of the second polynomial but not the rest.

What to do instead: Subtracting a polynomial means adding the opposite of every one of its terms: $4x^2 - 3x - x^2 - 5x = 3x^2 - 8x$.

Diagnostic trigger: Only the first term of the subtracted polynomial has a flipped sign; later terms keep their original sign.

Mistake 3: Multiplying a Monomial by Only One Term

What students do: $2x(3x - 4)$ is simplified to $6x - 4$.

Why this happens: The student multiplies the first term inside the brackets but forgets the rest.

What to do instead: A factor outside brackets must multiply every term inside: $2x(3x - 4) = 6x^2 - 8x$.

Diagnostic trigger: A term inside the brackets appears in the answer with the outside factor never applied to it.

Mistake 4: Omitting a Binomial Product

What students do: $(x + 3)(x + 4)$ is simplified to $x^2 + 12$.

Why this happens: The student multiplies the first terms and the last terms but skips the two middle products.

What to do instead: Two binomials require four products before combining like terms: $(x + 3)(x + 4) = x^2 + 4x + 3x + 12 = x^2 + 7x + 12$.

***Diagnostic trigger:** A binomial-times-binomial answer is missing an x-term altogether, a sign of only two products being made instead of four.*

Mistake 5: Forgetting the Middle Term in a Square

What students do: $(x + 5)^2$ is simplified to $x^2 + 25$.

Why this happens: The student squares each term separately instead of multiplying the binomial by itself.

What to do instead: $(x + a)^2$ is not $x^2 + a^2$. Rewrite it as $(x + a)(x + a)$ first: $(x + 5)^2 = x^2 + 10x + 25$.

***Diagnostic trigger:** A squared binomial's answer has only two terms instead of three, with no middle term at all.*

Practice

Teacher solutions follow this practice set.

1. State the degree of $7x^5 - 2x^3 + x - 9$.
2. Identify the like-term groups in $4x^2 - 3x + 8 + 6x^2 + x - 5$.
3. Simplify $(5x^2 + 2x - 6) + (x^2 - 7x + 3)$.
4. Simplify $(3x^3 - x^2 + 4) + (2x^3 + 5x^2 - 9)$.
5. Simplify $(6x^2 + x - 8) - (2x^2 - 4x + 3)$.
6. Simplify $(2x^3 - 3x + 7) - (x^3 + 5x - 2)$.
7. Expand $3x^2(2x^3 - x + 5)$.
8. Expand $-4y(3y^2 - 2y - 1)$.
9. Expand $(x + 2)(x + 7)$.
10. Expand $(2x - 1)(x + 5)$.
11. Expand $(x - 6)^2$.
12. Expand $(x + 8)(x - 8)$.

Practice Solutions

Use these concise solutions to check the method as well as the final answer.

1. State the degree of $7x^5 - 2x^3 + x - 9$.

Solution: The highest exponent is 5, so the polynomial has degree 5.

2. Identify the like-term groups in $4x^2 - 3x + 8 + 6x^2 + x - 5$.

Solution: Match identical variable parts: $4x^2$ with $6x^2$; $-3x$ with x ; and 8 with -5 .

3. Simplify $(5x^2 + 2x - 6) + (x^2 - 7x + 3)$.

Solution: Add like terms: $(5 + 1)x^2 + (2 - 7)x + (-6 + 3) = 6x^2 - 5x - 3$.

4. Simplify $(3x^3 - x^2 + 4) + (2x^3 + 5x^2 - 9)$.

Solution: Add like terms: $(3 + 2)x^3 + (-1 + 5)x^2 + (4 - 9) = 5x^3 + 4x^2 - 5$.

5. Simplify $(6x^2 + x - 8) - (2x^2 - 4x + 3)$.

Solution: Distribute the subtraction, then combine: $6x^2 + x - 8 - 2x^2 + 4x - 3 = 4x^2 + 5x - 11$.

6. Simplify $(2x^3 - 3x + 7) - (x^3 + 5x - 2)$.

Solution: Distribute the subtraction, then combine: $2x^3 - 3x + 7 - x^3 - 5x + 2 = x^3 - 8x + 9$.

7. Expand $3x^2(2x^3 - x + 5)$.

Solution: Multiply each term: $3x^2(2x^3 - x + 5) = 6x^5 - 3x^3 + 15x^2$.

8. Expand $-4y(3y^2 - 2y - 1)$.

Solution: Multiply each term: $-4y(3y^2 - 2y - 1) = -12y^3 + 8y^2 + 4y$.

9. Expand $(x + 2)(x + 7)$.

Solution: Use four products: $(x + 2)(x + 7) = x^2 + 7x + 2x + 14 = x^2 + 9x + 14$.

10. Expand $(2x - 1)(x + 5)$.

Solution: Use four products: $(2x - 1)(x + 5) = 2x^2 + 10x - x - 5 = 2x^2 + 9x - 5$.

11. Expand $(x - 6)^2$.

Solution: $(x - 6)^2 = (x - 6)(x - 6) = x^2 - 12x + 36$.

12. Expand $(x + 8)(x - 8)$.

Solution: Use the difference of squares: $(x + 8)(x - 8) = x^2 - 64$.

Tripwire Check

These questions test whether the thinking is solid — not just whether the procedure was memorized. Each wrong answer below points to a specific misconception, not just "try again."

1. A student writes $3x + 2x = 5x^2$. Is the student correct? Explain.

Correct answer: No. $3x + 2x = 5x$. Adding like terms combines coefficients; it does not change the exponent.

Likely wrong answer: $5x^2$

Misconception: The student is applying a multiplication exponent rule to addition.

Next move: Compare 3 groups of x plus 2 groups of x with $3x$ multiplied by $2x$.

2. A student expands $(x + 4)(x - 4)$ as $x^2 - 16x + 16$. Identify the error and give the correct expansion.

Correct answer: $x^2 - 16$. The middle products, $-4x$ and $4x$, cancel.

Likely wrong answer: $x^2 - 16x + 16$

Misconception: The student did not make or combine all four products correctly, and missed that the two middle terms cancel rather than combine into a larger term.

Next move: Write out all four products before combining anything.

Answer Key — Worksheets (Full Diagnostic)

Worksheet A: Guided Practice

1. Identify the terms in $5x^3 - 2x + 9$.

1. $5x^3$, $-2x$, 9 . Likely wrong answer: $5x^3$, $-2x$, 9 written as $5x^3$, $2x$, 9 (drops the sign on the middle term). Misconception: A term's sign is separated from the term itself when it is listed on its own.

2. State the degree and leading coefficient of $-4x^5 + 3x^2 - 7$.

2. Degree 5; leading coefficient -4 . Likely wrong answer: degree 5, leading coefficient 3 (names the coefficient of the wrong term). Misconception: The leading coefficient is read from a term other than the one with the highest exponent.

3. From $6x^2$, $-3x$, 4 , x^2 , $8x$, -9 , identify all like-term groups.

3. $6x^2$ and x^2 ; $-3x$ and $8x$; 4 and -9 . Likely wrong answer: groups $6x^2$ with $8x$ (matches on the letter alone, ignoring the exponent). Misconception: The exponent is not treated as part of what defines a matching variable part.

4. Simplify $(2x^2 + 5x - 3) + (4x^2 - x + 6)$.

4. $6x^2 + 4x + 3$ Likely wrong answer: $6x^4 + 4x + 3$ (adds the exponents of matching-power terms instead of keeping them the same). Misconception: Exponents are added when like terms are combined, instead of only the coefficients.

5. Simplify $(3y^3 - 2y + 8) + (5y^3 + y - 11)$.

5. $8y^3 - y - 3$ Likely wrong answer: $8y^3 + y + 3$ (mishandles the sign when combining the constants and the y -terms). Misconception: A negative term's sign is dropped when combined with a positive one.

6. Simplify $(7a^2 - 4a + 1) + (2a^2 + 6a - 9)$.

6. $9a^2 + 2a - 8$ Likely wrong answer: $9a^2 - 2a - 8$ (mishandles the sign combining $-4a$ and $6a$). Misconception: Unlike-signed coefficients are combined by adding magnitudes instead of their signed values.

7. Simplify $(5x^2 + 3x - 4) - (2x^2 - x + 7)$.

7. $3x^2 + 4x - 11$ Likely wrong answer: $3x^2 + 2x + 3$ (distributes the negative to only the first term of the second polynomial). Misconception: The negative sign is applied to only the first term of the polynomial being subtracted.

8. Simplify $(4m^3 - 2m + 6) - (m^3 + 5m - 3)$.

8. $3m^3 - 7m + 9$ Likely wrong answer: $3m^3 + 3m + 3$ (distributes the negative to only the first term of the second polynomial). Misconception: The negative sign is applied to only the first term of the polynomial being subtracted.

9. Expand $3x(2x^2 - x + 4)$.

9. $6x^3 - 3x^2 + 12x$ Likely wrong answer: $6x^3 - x^2 + 4x$ (multiplies only the first term by $3x$). Misconception: The monomial multiplier is applied to only one term inside the bracket.

10. Expand $-2y(4y^2 + 3y - 5)$.

10. $-8y^3 - 6y^2 + 10y$ Likely wrong answer: $-8y^3 + 6y^2 - 10y$ (loses track of the negative sign on some terms). Misconception: The negative monomial's sign is not distributed consistently to every term.

11. Expand $(2x + 3)(x + 2)$.

11. $2x^2 + 7x + 6$ Likely wrong answer: $2x^2 + 6$ (multiplies only the first term of each bracket, missing the middle two products). Misconception: Only the first and last products are computed, skipping the two middle (outer/inner) products.

12. Expand $(x - 4)(x + 2)$.

12. $x^2 - 2x - 8$ Likely wrong answer: $x^2 - 8$ (misses the middle two products, or mishandles their sign). Misconception: Only the first and last products are computed, skipping the two middle (outer/inner) products.

13. Expand $(2x + 1)(x + 4)$.

13. $2x^2 + 9x + 4$ Likely wrong answer: $2x^2 + 4$ (misses the middle two products). Misconception: Only the first and last products are computed, skipping the two middle (outer/inner) products.

14. Expand $(x - 3)^2$.

14. $x^2 - 6x + 9$ Likely wrong answer: $x^2 + 9$ (squares each term separately instead of expanding the full product). Misconception: A binomial squared is expanded term-by-term instead of as a full product of two binomials.

15. A rectangle has length $x + 4$ and width $x + 3$. Write and simplify its area.

15. $x^2 + 7x + 12$ Likely wrong answer: $2x + 7$ (adds length and width instead of multiplying for area). Misconception: Area is computed by adding the dimensions instead of multiplying them.

Worksheet B: Independent Practice

1. Simplify $(8x^2 - 3x + 5) + (2x^2 + 7x - 9)$.

1. $10x^2 + 4x - 4$ Likely wrong answer: $10x^4 + 4x - 4$ (adds exponents of matching-power terms). Misconception: Exponents are added when like terms are combined, instead of only the coefficients.

2. Expand $5x^2(3x^3 - 2x + 4)$.

2. $15x^5 - 10x^3 + 20x^2$ Likely wrong answer: $15x^5 - 2x + 4$ (multiplies only the first term by $5x^2$). Misconception: The monomial multiplier is applied to only one term inside the bracket.

3. Expand $(x + 8)(x - 3)$.

3. $x^2 + 5x - 24$ Likely wrong answer: $x^2 - 24$ (misses the middle two products). Misconception: Only the first and last products are computed, skipping the two middle (outer/inner) products.

4. Simplify $(9y^2 + 4y - 7) - (3y^2 - 6y + 5)$.

4. $6y^2 + 10y - 12$ Likely wrong answer: $6y^2 - 2y - 2$ (distributes the negative to only the first term). Misconception: The negative sign is applied to only the first term of the polynomial being subtracted.

5. Expand $-3y^2(2y^3 + y - 6)$.

5. $-6y^5 - 3y^3 + 18y^2$ Likely wrong answer: $-6y^5 + 3y^3 - 18y^2$ (loses track of the negative sign on some terms). Misconception: The negative monomial's sign is not distributed consistently to every term.

6. Expand $(3x - 2)(x + 4)$.

6. $3x^2 + 10x - 8$ Likely wrong answer: $3x^2 + 2$ (misses the middle two products). Misconception: Only the first and last products are computed, skipping the two middle (outer/inner) products.

7. Simplify $(4a^3 - 5a^2 + 2a + 1) - (a^3 + 3a^2 - 7a - 4)$.

7. $3a^3 - 8a^2 + 9a + 5$ Likely wrong answer: $3a^3 - 2a^2 - 5a - 3$ (distributes the negative to only the first term). Misconception: The negative sign is applied to only some terms of the polynomial being subtracted.

8. Expand $4a(2a^2 - 5a + 3)$.

8. $8a^3 - 20a^2 + 12a$ Likely wrong answer: $8a^3 - 20a + 12a$ (loses one term when distributing 4a). Misconception: The monomial multiplier misses one of the three terms inside the bracket.

9. Expand $(2x + 5)(x - 2)$.

9. $2x^2 + x - 10$ Likely wrong answer: $2x^2 - 10$ (misses the middle two products).

Misconception: Only the first and last products are computed, skipping the two middle (outer/inner) products.

10. Simplify $(5x^3 - 2x^2 + 4x - 6) + (3x^3 + 7x^2 - x + 8)$.

10. $8x^3 + 5x^2 + 3x + 2$ Likely wrong answer: $8x^4 + 5x^2 + 3x + 2$ (adds exponents of matching-power terms). Misconception: Exponents are added when like terms are combined, instead of only the coefficients.

11. Expand $-2m^3(m^2 - 4m + 7)$.

11. $-2m^5 + 8m^4 - 14m^3$ Likely wrong answer: $-2m^5 + 8m^4 + 14m^3$ (loses the sign on the last term). Misconception: The negative monomial's sign is not distributed consistently to every term.

12. Expand $(3x - 4)(x + 5)$.

12. $3x^2 + 11x - 20$ Likely wrong answer: $3x^2 + 7x - 20$ (mishandles the sign combining $-4x$ and $15x$). Misconception: Unlike-signed coefficients are combined by adding magnitudes instead of their signed values.

13. Simplify $(6m^2 - 3m + 8) + (2m^2 + 5m - 11) - (m^2 - 4m + 2)$.

13. $7m^2 + 6m - 5$ Likely wrong answer: distributes the final negative to only the first term of the third polynomial. Misconception: The negative sign is applied to only the first term of the polynomial being subtracted.

14. Expand $(2y - 3)(y - 4)$.

14. $2y^2 - 11y + 12$ Likely wrong answer: $2y^2 - 12$ (misses the middle two products).

Misconception: Only the first and last products are computed, skipping the two middle (outer/inner) products.

15. Simplify $3(2x^2 - x + 4) - (x^2 + 5x - 7)$.

15. $5x^2 - 8x + 19$ Likely wrong answer: $5x^2 - 4x + 5$ (distributes the leading 3 correctly but mishandles the subtraction after). Misconception: The subtraction of the second polynomial is only partly distributed after the first multiplication.

16. Expand $(4a + 1)(2a - 3)$.

16. $8a^2 - 10a - 3$ Likely wrong answer: $8a^2-3$ (misses the middle two products).

Misconception: Only the first and last products are computed, skipping the two middle (outer/inner) products.

17. Expand $(x + 7)^2$.

17. $x^2 + 14x + 49$ Likely wrong answer: x^2+49 (squares each term separately instead of expanding the full product). Misconception: A binomial squared is expanded term-by-term instead of as a full product of two binomials.

18. Expand $(2x - 5)(2x + 5)$.

18. $4x^2 - 25$ Likely wrong answer: $4x^2-20x-25$ (keeps the middle terms instead of recognizing they cancel). Misconception: A difference-of-squares product is expanded as an ordinary binomial product without noticing the middle terms cancel.

19. Simplify $2(x^2 + 3x - 4) - (x^2 - x + 5)$.

19. $x^2 + 7x - 13$ Likely wrong answer: $2x^2+7x-13$ (adds exponents when distributing the 2). Misconception: Exponents are added when a coefficient is distributed, instead of keeping the exponent the same.

20. A garden has length $2x + 3$ metres and width $x + 4$ metres. Write and simplify its area.

20. $2x^2 + 11x + 12 \text{ m}^2$. Likely wrong answer: $2x+7 \text{ m}$ (adds length and width instead of multiplying for area). Misconception: Area is computed by adding the dimensions instead of multiplying them.

Worksheet C: Mixed Application

1. A student subtracts $(2x^2 - 3x + 4)$ from $(5x^2 + x - 6)$ and writes $3x^2 - 2x - 10$. Identify the error and write the correct result.

1. $3x^2 + 4x - 10$; subtracting $-3x$ makes $+3x$. Likely wrong answer: (already given) $3x^2-2x-10$. Misconception: The negative sign is applied to only the first term of the polynomial being subtracted.

2. A patio has length $x + 9$ metres and width $x - 4$ metres. Write and simplify an expression for its area.

2. $x^2 + 5x - 36 \text{ m}^2$. Likely wrong answer: $2x+5 \text{ m}^2$ (adds length and width instead of multiplying for area). Misconception: Area is computed by adding the dimensions instead of multiplying them.

3. A student simplifies $4x^2 + 3x + 2x^2 - 5x$ as $6x^4 - 2x$. Identify the error and write the correct simplification.

3. $6x^2 - 2x$; exponents are not added when terms are added. Likely wrong answer: (already given) $6x^4 - 2x$. Misconception: Exponents are added when like terms are combined, instead of only the coefficients.

4. A rectangular sign has length $3x - 2 \text{ cm}$ and width $x + 5 \text{ cm}$. Write and simplify an expression for its area.

4. $3x^2 + 13x - 10 \text{ cm}^2$. Likely wrong answer: $4x+3 \text{ cm}^2$ (adds length and width instead of multiplying for area). Misconception: Area is computed by adding the dimensions instead of multiplying them.

5. Revenue is $R = 8x^2 + 15x$ and cost is $C = 3x^2 + 4x + 20$. Write and simplify $P = R - C$.

5. $P = 5x^2 + 11x - 20$ Likely wrong answer: $P = 11x^2 + 19x + 20$ (adds cost instead of subtracting it from revenue). Misconception: Profit is computed by adding revenue and cost instead of subtracting.

6. A student expands $(2x - 3)(x + 4)$ as $2x^2 + 5x - 12$. Is the student correct? Verify using four products.

6. Yes: $2x^2 + 8x - 3x - 12 = 2x^2 + 5x - 12$. Likely wrong answer: agrees without actually computing all four products. Misconception: A proposed expansion is accepted without independently verifying it with all four products.

7. Income is $I = 6n^2 + 9n - 5$ and expenses are $E = 2n^2 - 3n + 12$. Write and simplify $I + E$.

7. $8n^2 + 6n + 7$ Likely wrong answer: $4n^2 + 12n - 17$ (subtracts expenses instead of adding, or mishandles a sign). Misconception: The two polynomials are combined with the wrong operation or a sign is dropped.

8. Is $(x + 4)^2$ equal to $x^2 + 16$? Expand and explain.

8. No: $(x + 4)^2 = x^2 + 8x + 16$. Likely wrong answer: says yes, x^2+16 is correct.

Misconception: A binomial squared is assumed to distribute the exponent to each term individually.

9. Compare $3x + 2x$ and $3x(2x)$. Simplify each and explain why the results differ.

9. $5x$; $6x^2$. Addition combines terms; multiplication combines factors. Likely wrong answer: both simplify to the same result. Misconception: Addition and multiplication of the same two terms are assumed to give the same kind of result.

10. Create two binomials whose product is $x^2 - x - 20$. Verify by expanding.

10. $(x - 5)(x + 4)$, or the reverse order. Likely wrong answer: guesses factors that multiply to -20 but don't add to -1. Misconception: Only the constant product is checked; the requirement that the outer coefficients also sum correctly is skipped.

11. A rectangle has area $x^2 - 2x - 24$. Write one possible pair of binomial dimensions and verify.

11. $(x - 6)(x + 4)$, or the reverse order. Likely wrong answer: guesses factors that multiply to -24 but don't add to -2. Misconception: Only the constant product is checked; the requirement that the factors also sum correctly is skipped.

12. Simplify $(7x^2 - 2x + 9) + (3x^2 + 5x - 4) - (x^2 - x + 6)$.

12. $9x^2 + 4x - 1$ Likely wrong answer: $9x^2+6x-1$ (distributes the final negative to only the first term). Misconception: The negative sign is applied to only the first term of the polynomial being subtracted.

13. Non-routine diagnostic: a student expands $(2x + 1)(x - 3)$ as $2x^2 - 6x + 1$. Identify the missing product, correct the expansion, and explain why four products are required.

13. Missing x term. Correct: $2x^2 - 5x - 3$. Likely wrong answer: (already given) $2x^2-6x+1$. Misconception: One of the four required products (the outer or inner term) is skipped entirely.

14. Expand $(3x + 2)(x - 4)$.

14. $3x^2 - 10x - 8$ Likely wrong answer: $3x^2 - 8$ (misses the middle two products).

Misconception: Only the first and last products are computed, skipping the two middle (outer/inner) products.

15. Non-routine diagnostic: compare $3x(x + 2)$ and $3x + 2$. Explain why one is a product and the other is a sum. Expand or simplify each expression as appropriate.

15. $3x(x + 2) = 3x^2 + 6x$; $3x + 2$ is already simplified. Likely wrong answer: treats $3x+2$ as needing further expansion, multiplying terms that shouldn't be multiplied.

Misconception: A sum is mistaken for a product and terms are combined as if a multiplication were intended.

Answer Key — Exit Ticket

1. $5x^2 + 3x - 4$

2. $x^2 - 3x - 10$

3. $x^2 + 8x - 10$

Worksheet 1: Guided Practice

1. $5x^3, -2x, 9$.

2. Degree 5; leading coefficient -4 .

3. $6x^2$ and x^2 ; $-3x$ and $8x$; 4 and -9 .

4. $6x^2 + 4x + 3$

5. $8y^3 - y - 3$

6. $9a^2 + 2a - 8$

7. $3x^2 + 4x - 11$

8. $3m^3 - 7m + 9$

9. $6x^3 - 3x^2 + 12x$

10. $-8y^3 - 6y^2 + 10y$

11. $2x^2 + 7x + 6$

12. $x^2 - 2x - 8$

13. $2x^2 + 9x + 4$

14. $x^2 - 6x + 9$

15. $x^2 + 7x + 12$

Worksheet 2: Independent Practice

1. $10x^2 + 4x - 4$

2. $15x^5 - 10x^3 + 20x^2$
3. $x^2 + 5x - 24$
4. $6y^2 + 10y - 12$
5. $-6y^5 - 3y^3 + 18y^2$
6. $3x^2 + 10x - 8$
7. $3a^3 - 8a^2 + 9a + 5$
8. $8a^3 - 20a^2 + 12a$
9. $2x^2 + x - 10$
10. $8x^3 + 5x^2 + 3x + 2$
11. $-2m^5 + 8m^4 - 14m^3$
12. $3x^2 + 11x - 20$
13. $7m^2 + 6m - 5$
14. $2y^2 - 11y + 12$
15. $5x^2 - 8x + 19$
16. $8a^2 - 10a - 3$
17. $x^2 + 14x + 49$
18. $4x^2 - 25$
19. $x^2 + 7x - 13$
20. $2x^2 + 11x + 12 \text{ m}^2$.

Worksheet 3: Mixed Practice & Application

1. $3x^2 + 4x - 10$; subtracting $-3x$ makes $+3x$.
2. $x^2 + 5x - 36 \text{ m}^2$.
3. $6x^2 - 2x$; exponents are not added when terms are added.
4. $3x^2 + 13x - 10 \text{ cm}^2$.
5. $P = 5x^2 + 11x - 20$
6. Yes: $2x^2 + 8x - 3x - 12 = 2x^2 + 5x - 12$.
7. $8n^2 + 6n + 7$
8. No: $(x + 4)^2 = x^2 + 8x + 16$.
9. $5x$; $6x^2$. Addition combines terms; multiplication combines factors.
10. $(x - 5)(x + 4)$, or the reverse order.
11. $(x - 6)(x + 4)$, or the reverse order.

12. $9x^2 + 4x - 1$

13. Missing x term. Correct: $2x^2 - 5x - 3$.

14. $3x^2 - 10x - 8$

15. $3x(x + 2) = 3x^2 + 6x$; $3x + 2$ is already simplified.