Powers and polynomial multiplication — Teacher answers

Year 8, upper volume • text pp. 51–62 • foundation lessons 26–31

Use the worked model and guided attempt selectively, then the eight core questions. Keep further practice and extensions optional. Ask for a reason and an original-equation or expansion check.

Worked example 1

Simplify completely, showing the relevant rule.

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

Reference answer

$2x^2+5x-12$.

$$2x^2+5x-12$$

1. Multiply every term in one bracket by every term in the other, then collect like terms.
2. $(2x-3)(x+4)=2x^2+8x-3x-12$.
3. Collect like terms to obtain $2x^2+5x-12$.
4. Check the signs, coefficients and exponents in every term.

- Show the rule and a complete intermediate line.
- Give an algebraically equivalent simplified expression.

Guided attempt 2

Simplify completely, showing the relevant rule.

$$(2x^2y)^3$$

1. 2^3=___; $(x^2)^3=x^{\square}$; y^3=___.
2. Multiply the three factors: ___.

Reference answer

$8x^6y^3$.

$$8x^6y^3$$

1. Raise every factor to the power, including the coefficient and its sign.
2. $(2x^2y)^3=2^3(x^2)^3y^3$.
3. Collect like terms to obtain $8x^6y^3$.
4. Check the signs, coefficients and exponents in every term.

- Show the rule and a complete intermediate line.
- Give an algebraically equivalent simplified expression.

Prerequisite 3

Simplify completely, showing the relevant rule.

$$x^3x^4$$

Reference answer

x^7.

$$x^7$$

1. For the same base, add exponents in a product and multiply exponents for a power of a power.
2. $x^3x^4=x^{3+4}$.
3. Collect like terms to obtain x^7.
4. Check the signs, coefficients and exponents in every term.

- Show the rule and a complete intermediate line.
- Give an algebraically equivalent simplified expression.

Prerequisite 4

Simplify completely, showing the relevant rule.

$$(x^3)^4$$

Reference answer

x^{12}.

$$x^{12}$$

1. For the same base, add exponents in a product and multiply exponents for a power of a power.
2. $(x^3)^4 = x^{3 \cdot 4}$.
3. Collect like terms to obtain x^{12}.
4. Check the signs, coefficients and exponents in every term.

- Show the rule and a complete intermediate line.
- Give an algebraically equivalent simplified expression.

Independent practice 5

Simplify completely, showing the relevant rule.

$$(3xy^2)^2$$

Reference answer

$9x^2y^4$.

$$9x^2y^4$$

1. Raise every factor to the power, including the coefficient and its sign.
2. $(3xy^2)^2 = 3^2x^2(y^2)^2$.
3. Collect like terms to obtain $9x^2y^4$.
4. Check the signs, coefficients and exponents in every term.

- Show the rule and a complete intermediate line.
- Give an algebraically equivalent simplified expression.

Independent practice 6

Simplify completely, showing the relevant rule.

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

Reference answer

$-6x^3y^4$.

$$-6x^3y^4$$

1. Raise every factor to the power, including the coefficient and its sign.
2. $(-2x^2y)(3xy^3) = (-2 \cdot 3)x^{2+1}y^{1+3}$.
3. Collect like terms to obtain $-6x^3y^4$.
4. Check the signs, coefficients and exponents in every term.

- Show the rule and a complete intermediate line.
- Give an algebraically equivalent simplified expression.

Independent practice 7

Simplify completely, showing the relevant rule.

$$3x(2x-5)$$

Reference answer

$6x^2-15x$.

$$6x^2-15x$$

1. Multiply every term in one bracket by every term in the other, then collect like terms.
2. $3x(2x-5)=3x\cdot 2x-3x\cdot 5$.
3. Collect like terms to obtain $6x^2-15x$.
4. Check the signs, coefficients and exponents in every term.

- Show the rule and a complete intermediate line.
- Give an algebraically equivalent simplified expression.

Independent practice 8

Simplify completely, showing the relevant rule.

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

Reference answer

$x^2-3x-10$.

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

1. Multiply every term in one bracket by every term in the other, then collect like terms.
2. $(x+2)(x-5)=x^2-5x+2x-10$.
3. Collect like terms to obtain $x^2-3x-10$.
4. Check the signs, coefficients and exponents in every term.

- Show the rule and a complete intermediate line.
- Give an algebraically equivalent simplified expression.

Exit question 9

Simplify completely, showing the relevant rule.

$$x^2+x^2$$

Reference answer

$2x^2$.

$$2x^2$$

1. These are added like terms, not multiplied equal-base powers. Add the coefficients only.
2. $x^2+x^2=(1+1)x^2$.
3. Collect like terms to obtain $2x^2$.
4. Check the signs, coefficients and exponents in every term.

- Show the rule and a complete intermediate line.
- Give an algebraically equivalent simplified expression.

Exit question 10

Simplify completely, showing the relevant rule.

$$-2x(x-4)$$

Reference answer

-2x²+8x.

$$-2x^2+8x$$

1. Multiply every term in one bracket by every term in the other, then collect like terms.
2. $-2x(x-4) = -2x \cdot x + (-2x) \cdot (-4)$.
3. Collect like terms to obtain -2x²+8x.
4. Check the signs, coefficients and exponents in every term.

- Show the rule and a complete intermediate line.
- Give an algebraically equivalent simplified expression.

Further practice 11

Simplify completely, showing the relevant rule.

$$(a+b)^2(a+b)^3$$

Reference answer

(a+b)⁵.

$$(a+b)^5$$

1. For the same base, add exponents in a product and multiply exponents for a power of a power.
2. $(a+b)^2(a+b)^3 = (a+b)^{2+3}$.
3. Collect like terms to obtain (a+b)⁵.
4. Check the signs, coefficients and exponents in every term.

- Show the rule and a complete intermediate line.
- Give an algebraically equivalent simplified expression.

Further practice 12

Simplify completely, showing the relevant rule.

$$(y^2)^5$$

Reference answer

y¹⁰.

$$y^{10}$$

1. For the same base, add exponents in a product and multiply exponents for a power of a power.
2. $(y^2)^5 = y^{2 \cdot 5}$.
3. Collect like terms to obtain y¹⁰.
4. Check the signs, coefficients and exponents in every term.

- Show the rule and a complete intermediate line.
- Give an algebraically equivalent simplified expression.

Further practice 13

Simplify completely, showing the relevant rule.

$$(-3a^2b)^2$$

Reference answer

$9a^4b^2$.

$$9a^4b^2$$

1. Raise every factor to the power, including the coefficient and its sign.
2. $(-3a^2b)^2 = (-3)^2(a^2)^2b^2$.
3. Collect like terms to obtain $9a^4b^2$.
4. Check the signs, coefficients and exponents in every term.

- Show the rule and a complete intermediate line.
- Give an algebraically equivalent simplified expression.

Further practice 14

Simplify completely, showing the relevant rule.

$$(2x+1)(3x-2)$$

Reference answer

$6x^2$-x-2.

$$6x^2 - x - 2$$

1. Multiply every term in one bracket by every term in the other, then collect like terms.
2. $(2x+1)(3x-2) = 6x^2 - 4x + 3x - 2$.
3. Collect like terms to obtain $6x^2$-x-2.
4. Check the signs, coefficients and exponents in every term.

- Show the rule and a complete intermediate line.
- Give an algebraically equivalent simplified expression.

Extension 15

Simplify completely, showing the relevant rule.

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

Reference answer

$-24x^6$.

$$-24x^6$$

1. Raise every factor to the power, including the coefficient and its sign.
2. $(2x^2)(-3x)(4x^3) = (2 \cdot (-3) \cdot 4)x^{2+1+3}$.
3. Collect like terms to obtain $-24x^6$.
4. Check the signs, coefficients and exponents in every term.

- Show the rule and a complete intermediate line.
- Give an algebraically equivalent simplified expression.

Extension 16

A rectangle has positive side lengths x+3 and x+1 units, with x>0. Express its area as a simplified polynomial.

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

Reference answer

x^2+4x+3.

$$x^2+4x+3$$

1. Multiply every term in one bracket by every term in the other, then collect like terms.
2. $(x+3)(x+1)=x^2+x+3x+3$.
3. Collect like terms to obtain x^2+4x+3.
4. Check the signs, coefficients and exponents in every term.

- Show the rule and a complete intermediate line.
- Give an algebraically equivalent simplified expression.