GRADE 8 MATHEMATICS

Algebraic Identities

Complete Printable Worksheet Pack — Corrected Edition

6 Practice Worksheets • 6 Answer Keys

Expansion • Factorisation • Number patterns • Mathematical reasoning

Name: _____ Date: _____

Worksheet 1 — Understanding Algebraic Identities

Show your working. Use identities where requested and explain your reasoning.

1. Complete: $(a + b)^2 = a^2 + 2ab + ___$.

2. Complete: $(a – b)^2 = a^2 – 2ab + ___$.

3. Complete: $(a + b)(a – b) = ___$.

4. Expand: $(x + 3)^2$.

5. Expand: $(x – 5)^2$.

6. Expand: $(y + 7)(y – 7)$.

7. Use an identity to find 52^2.

8. Use an identity to find 98^2.

9. Explain why $(a + b)^2$ is not equal to $a^2 + b^2$.

10. Challenge: Find the missing term: $(x + 4)^2 = x^2 + ___x + 16$.

Working space: _____

Answer Key 1 — Understanding Algebraic Identities

1. b^2

2. b^2

3. $a^2 - b^2$

4. $x^2 + 6x + 9$

5. $x^2 - 10x + 25$

6. $y^2 - 49$

7. $52^2 = (50 + 2)^2 = 2704$

8. $98^2 = (100 - 2)^2 = 9604$

9. The middle term 2ab is also required.

10. 8

Worksheet 2 — Expanding Perfect Squares

Show your working. Use identities where requested and explain your reasoning.

1. Expand: $(x + 6)^2$.

2. Expand: $(x – 7)^2$.

3. Expand: $(2x + 3)^2$.

4. Expand: $(3x – 4)^2$.

5. Expand: $(5a + 2)^2$.

6. Expand: $(4m – 5)^2$.

7. Expand: $(2p + 7)^2$.

8. Expand: $(3y – 8)^2$.

9. Find the missing term: $(2x + 5)^2 = 4x^2 + ___x + 25$.

10. Challenge: Expand and simplify $(x + 4)^2 – (x – 4)^2$.

Working space: _____

Answer Key 2 — Expanding Perfect Squares

1. $x^2 + 12x + 36$

2. $x^2 – 14x + 49$

3. $4x^2 + 12x + 9$

4. $9x^2 – 24x + 16$

5. $25a^2 + 20a + 4$

6. $16m^2 – 40m + 25$

7. $4p^2 + 28p + 49$

8. $9y^2 – 48y + 64$

9. 20x (corrected: the missing term includes x)

10. 16x

Worksheet 3 — Difference of Two Squares

Show your working. Use identities where requested and explain your reasoning.

1. Expand: $(x + 5)(x – 5)$.

2. Expand: $(a + 9)(a – 9)$.

3. Expand: $(2x + 3)(2x – 3)$.

4. Expand: $(5y + 4)(5y – 4)$.

5. Factorise: $x^2 – 25$.

6. Factorise: $a^2 – 81$.

7. Factorise: $4x^2 – 49$.

8. Factorise: $25m^2 – 16$.

9. Use an identity to calculate 103×97.

10. Challenge: Use an identity to calculate $49^2 – 31^2$.

Working space: _____

Answer Key 3 — Difference of Two Squares

1. $x^2 - 25$

2. $a^2 - 81$

3. $4x^2 - 9$

4. $25y^2 - 16$

5. $(x + 5)(x - 5)$

6. $(a + 9)(a - 9)$

7. $(2x + 7)(2x - 7)$

8. $(5m + 4)(5m - 4)$

9. $(100 + 3)(100 - 3) = 9991$

10. $(49 - 31)(49 + 31) = 1440$

Worksheet 4 — Factorising Using Identities

Show your working. Use identities where requested and explain your reasoning.

1. Factorise: $x^2 + 10x + 25$.

2. Factorise: $x^2 – 12x + 36$.

3. Factorise: $4x^2 + 12x + 9$.

4. Factorise: $9a^2 – 24a + 16$.

5. Factorise: $y^2 – 64$.

6. Factorise: $16m^2 – 81$.

7. Factorise: $25p^2 + 20p + 4$.

8. Factorise: $49q^2 – 14q + 1$.

9. Factorise: $36r^2 – 25$.

10. Challenge: Factorise $4x^2 – 20x + 25$.

Working space: _____

Answer Key 4 — Factorising Using Identities

1. $(x + 5)^2$

2. $(x – 6)^2$

3. $(2x + 3)^2$

4. $(3a – 4)^2$

5. $(y + 8)(y – 8)$

6. $(4m + 9)(4m – 9)$

7. $(5p + 2)^2$

8. $(7q – 1)^2$

9. $(6r + 5)(6r – 5)$

10. $(2x – 5)^2$

Worksheet 5 — Identities in Number & Real-Life Problems

Show your working. Use identities where requested and explain your reasoning.

1. Use an identity to calculate 49^2.

2. Use an identity to calculate 101^2.

3. Use an identity to calculate 75×85.

4. A square has side length $(x + 3)$ cm. Write an expression for its area.

5. A square has side length $(2x – 1)$ cm. Write an expression for its area.

6. A rectangle has sides $(x + 5)$ cm and $(x – 5)$ cm. Write its area in simplest form.

7. A square's side increases from x to x + 2. Write an expression for the increase in area.

8. Explain why 999^2 can be calculated efficiently using an identity.

9. Calculate 1002×998 using an identity.

10. Challenge: Calculate $51^2 – 49^2$ without calculating both squares separately.

Working space: _____

Answer Key 5 — Identities in Number & Real-Life Problems

1. 2401

2. 10201

3. $75 \times 85 = (80 - 5)(80 + 5) = 6375$

4. $(x + 3)^2 = x^2 + 6x + 9$

5. $(2x - 1)^2 = 4x^2 - 4x + 1$

6. $x^2 - 25$

7. $(x + 2)^2 - x^2 = 4x + 4$

8. $999 = 1000 - 1$, so $(1000 - 1)^2$ is quick to expand

9. $(1000 + 2)(1000 - 2) = 999996$

10. $(51 - 49)(51 + 49) = 200$

Worksheet 6 — Algebraic Identities Challenge

Show your working. Use identities where requested and explain your reasoning.

1. Simplify: $(x + 5)^2 – (x – 5)^2$.

2. Simplify: $(2x + 3)^2 – (2x – 3)^2$.

3. Simplify: $(3a + 4)(3a – 4)$.

4. Factorise: $9x^2 + 30x + 25$.

5. Factorise: $16y^2 – 40y + 25$.

6. If $x + 1 = 7$, find $x^2 + 2x + 1$ using an identity.

7. If $a – 2 = 9$, find $a^2 – 4a + 4$.

8. Find 1001^2 using an identity.

9. A student says $(x + 4)^2 = x^2 + 16$. Identify the error and give the correct expansion.

10. Challenge: Without direct multiplication, calculate 1005×995 and explain the identity used.

Working space: _____

Answer Key 6 — Algebraic Identities Challenge

1. 20x

2. 24x

3. $9a^2 – 16$

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

5. $(4y – 5)^2$

6. $(x + 1)^2 = 7^2 = 49$

7. $(a – 2)^2 = 9^2 = 81$

8. $(1000 + 1)^2 = 1{,}002{,}001$

9. The middle term 8x is missing; correct expansion is $x^2 + 8x + 16$

10. $(1000 + 5)(1000 – 5) = 999975$