

**CHAPTER 11 Algebraic Products**

Much of the work in this chapter can be done as oral classwork.

**Exercise 11a (p. 192)**

- |              |                  |                   |
|--------------|------------------|-------------------|
| 1. $2x + 2$  | 7. $5 - 5b$      | 13. $15xy + 5xz$  |
| 2. $3x - 3$  | 8. $6a - 2$      | 14. $16xy + 12yz$ |
| 3. $4x + 12$ | 9. $8 + 12b$     | 15. $6np - 10nq$  |
| 4. $5a + 20$ | 10. $5ab - 5ac$  | 16. $16rt - 8rs$  |
| 5. $3b + 21$ | 11. $4ab - 8ac$  | 17. $3ab - 15ac$  |
| 6. $3 - 3a$  | 12. $6a^2 + 3ab$ | 18. $12xy + 8xz$  |

**Exercise 11b (p. 193)**

The suggested order for multiplying the terms in the two brackets gives lines which some pupils see as forming a face. Two lines give the eyebrows, while the other two form the nose and chin.

Some teachers may prefer a different order, e.g.

$$(a + b)(c + d) = ac + ad + bc + bd$$

- |                             |                                |
|-----------------------------|--------------------------------|
| 1. $ac + ad + bc + bd$      | 11. $2ps - 3pt + 2qs - 3qt$    |
| 2. $ps + pt + qs + qt$      | 12. $ac - ad - 2bc + 2bd$      |
| 3. $2ac + 4ad + bc + 2bd$   | 13. $6uw - 30ur - 5vw + 25vr$  |
| 4. $5xz + 15x + 2yz + 6y$   | 14. $6ac - 9ad + 8bc - 12bd$   |
| 5. $xz - 4x + yz - 4y$      | 15. $9xz + 6x + 6yz + 4y$      |
| 6. $ac + ad - bc - bd$      | 16. $12pr - 9ps - 4qr + 3qs$   |
| 7. $xy + xz + y^2 + yz$     | 17. $9ac + 12ad - 12bc - 16bd$ |
| 8. $6ac + 2ad + 3bc + bd$   | 18. $21x - 14xz - 6y + 4yz$    |
| 9. $5xz + 10x + 4yz + 8y$   | 19. $10ac - 4a + 5bc - 2b$     |
| 10. $15x - 3xz - 10y + 2yz$ | 20. $15a - 10ad - 12b + 8bd$   |

**Exercise 11c (p. 193)**

With other than average pupils it is probably wise to write down the four terms obtained by multiplying the brackets, and then to collect like terms as a separate step.

- |                      |                      |
|----------------------|----------------------|
| 1. $x^2 + 7x + 12$   | 14. $x^2 - 13x + 30$ |
| 2. $x^2 + 6x + 8$    | 15. $b^2 - 10b + 25$ |
| 3. $x^2 + 7x + 6$    | 16. $x^2 - 7x + 12$  |
| 4. $x^2 + 7x + 10$   | 17. $x^2 - 12x + 32$ |
| 5. $x^2 + 11x + 24$  | 18. $b^2 - 6b + 8$   |
| 6. $a^2 + 9a + 20$   | 19. $a^2 - 8a + 16$  |
| 7. $b^2 + 9b + 14$   | 20. $p^2 - 15p + 56$ |
| 8. $c^2 + 10c + 24$  | 21. $x^2 + x - 6$    |
| 9. $p^2 + 15p + 36$  | 22. $x^2 + x - 20$   |
| 10. $q^2 + 17q + 70$ | 23. $x^2 - 3x - 28$  |
| 11. $x^2 - 5x + 6$   | 24. $a^2 - 7a - 30$  |
| 12. $x^2 - 12x + 35$ | 25. $p^2 - 25$       |
| 13. $a^2 - 10a + 16$ | 26. $x^2 + 5x - 14$  |

27.  $x^2 + x - 30$

28.  $x^2 + 9x - 10$

29.  $b^2 - 15b + 56$

30.  $z^2 - 13z + 12$

**EXERCISE 11d (p. 195)**

The value of setting out as given in the text will become apparent when factorising is considered in the next chapter.

1.  $x^2 + 9x + 20$

2.  $a^2 + 7a + 10$

3.  $x^2 - 9x + 20$

4.  $a^2 - 7a + 10$

5.  $x^2 + 14x + 48$

6.  $a^2 + 17a + 70$

7.  $x^2 - 14x + 48$

8.  $a^2 - 17a + 70$

9.  $a^2 - 3a - 10$

10.  $y^2 - 3y - 18$

11.  $z^2 - 6z - 40$

12.  $p^2 - 3p - 40$

13.  $a^2 - 3a - 70$

14.  $y^2 + 8y - 20$

15.  $z^2 - 11z - 12$

16.  $p^2 - 11p - 26$

17.  $x^2 - 6x + 5$

18.  $b^2 + 16b + 63$

19.  $a^2 - 16$

20.  $r^2 - 12r - 28$

21.  $p^2 + 14p + 24$

22.  $t^2 - 7t - 60$

23.  $c^2 + 3c - 40$

24.  $x^2 - 25$

**Exercise 11e (p. 196)**

1.  $2x^2 + 3x + 1$

2.  $5x^2 + 12x + 4$

3.  $5x^2 + 17x + 6$

4.  $3x^2 + 19x + 20$

5.  $3x^2 + 5x + 2$

6.  $3x^2 + 11x + 6$

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

8.  $7x^2 + 23x + 6$

9.  $6x^2 + 13x + 6$

10.  $12x^2 - 25x + 12$

11.  $10x^2 - 3x - 18$

12.  $21a^2 - 58a + 21$

13.  $10x^2 + 31x + 15$

14.  $21x^2 - 20x + 4$

15.  $12x^2 - 5x - 2$

16.  $6b^2 - 5b - 25$

17.  $4a^2 - 9$

18.  $9b^2 - 49$

19.  $49y^2 - 25$

20.  $20a^2 + a - 12$

21.  $16x^2 - 9$

22.  $25y^2 - 4$

23.  $9x^2 - 1$

24.  $16x^2 - 8x - 35$

25.  $6x^2 + 5x + 1$

26.  $-5x^2 + 8x + 4$

27.  $-6x^2 + 19x - 3$

28.  $-35a^2 + 29a - 6$

29.  $8 + 10x - 3x^2$

30.  $4x^2 + 7x - 15$

31.  $15x^2 + 26x + 8$

32.  $-14x^2 + 13x + 12$

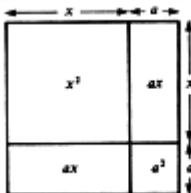
33.  $-20x^2 + 27x - 9$

34.  $12 - p - p^2$

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

36.  $4x^2 + 9x - 9$

Better pupils would be expected to remember and use the screened results. Some teachers may like to illustrate these results geometrically, for example:

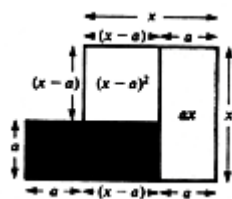


Area of whole =  $(x + a)^2$

Total area of separate parts =  $x^2 + ax + ax + a^2$

$= x^2 + 2ax + a^2$

Therefore  $(x + a)^2 = x^2 + 2ax + a^2$

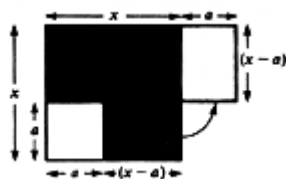


Area of whole = area of large square + area of small square  
 $= x^2 + a^2$

Area of whole also  $= (x - a)^2 + ax + ax$

Therefore  $(x - a)^2 + 2ax = x^2 + a^2$

i.e.  $(x - a)^2 = x^2 - 2ax + a^2$



Area shaded is  $x^2 - a^2$

The rectangle measuring  $(x + a)$  by  $(x - a)$  has an equal area which is  $(x + a)(x - a)$

Therefore  $x^2 - a^2 = (x + a)(x - a)$

### Exercise 11f (p. 198)

- |                       |                           |                           |
|-----------------------|---------------------------|---------------------------|
| 1. $x^2 + 2x + 1$     | 20. $36c^2 + 12c + 1$     | 39. $a^2 - 2ab + b^2$     |
| 2. $x^2 + 4x + 4$     | 21. $9a^2 + 6a + 1$       | 40. $u^2 - 2uv + v^2$     |
| 3. $a^2 + 6a + 9$     | 22. $4x^2 + 20x + 25$     | 41. $9x^2 - 6x + 1$       |
| 4. $b^2 + 8b + 16$    | 23. $9a^2 + 24a + 16$     | 42. $25z^2 - 10z + 1$     |
| 5. $t^2 + 20t + 100$  | 24. $16y^2 + 24y + 9$     | 43. $100a^2 - 180a + 81$  |
| 6. $x^2 + 24x + 144$  | 25. $x^2 + 4xy + 4y^2$    | 44. $16x^2 - 24x + 9$     |
| 7. $x^2 + 16x + 64$   | 26. $9x^2 + 6xy + y^2$    | 45. $4a^2 - 4a + 1$       |
| 8. $p^2 + 14p + 49$   | 27. $4x^2 + 20xy + 25y^2$ | 46. $16y^2 - 8y + 1$      |
| 9. $x^2 + 2xy + y^2$  | 28. $9a^2 + 12ab + 4b^2$  | 47. $49b^2 - 28b + 4$     |
| 10. $y^2 + 2yz + z^2$ | 29. $9a^2 + 6ab + b^2$    | 48. $25x^2 - 30x + 9$     |
| 11. $c^2 + 2cd + d^2$ | 30. $p^2 + 8pq + 16q^2$   | 49. $4y^2 - 4yx + x^2$    |
| 12. $m^2 + 2mn + n^2$ | 31. $49x^2 + 28xy + 4y^2$ | 50. $25x^2 - 10xy + y^2$  |
| 13. $p^2 + 2pq + q^2$ | 32. $9s^2 + 24st + 16t^2$ | 51. $9m^2 - 12mn + 4n^2$  |
| 14. $a^2 + 2ab + b^2$ | 33. $x^2 - 4x + 4$        | 52. $49x^2 - 42xy + 9y^2$ |
| 15. $e^2 + 2ef + f^2$ | 34. $x^2 - 12x + 36$      | 53. $a^2 - 6ab + 9b^2$    |
| 16. $u^2 + 2uv + v^2$ | 35. $a^2 - 20a + 100$     | 54. $m^2 - 16mn + 64n^2$  |
| 17. $4x^2 + 4x + 1$   | 36. $x^2 - 2xy + y^2$     | 55. $25a^2 - 20ab + 4b^2$ |
| 18. $16b^2 + 8b + 1$  | 37. $x^2 - 6x + 9$        | 56. $9p^2 - 30pq + 25q^2$ |
| 19. $25x^2 + 20x + 4$ | 38. $x^2 - 14x + 49$      |                           |

### Exercise 11g (p. 200)

- |               |                |               |
|---------------|----------------|---------------|
| 1. $x^2 - 16$ | 3. $c^2 - 9$   | 5. $x^2 - 25$ |
| 2. $b^2 - 36$ | 4. $x^2 - 144$ | 6. $a^2 - 49$ |

- |                  |                    |                      |
|------------------|--------------------|----------------------|
| 7. $q^2 - 100$   | 14. $4a^2 - 9$     | 21. $100a^2 - 81b^2$ |
| 8. $x^2 - 64$    | 15. $100m^2 - 1$   | 22. $25a^2 - 16b^2$  |
| 9. $4x^2 - 1$    | 16. $36a^2 - 25$   | 23. $1 - 9x^2$       |
| 10. $9x^2 - 1$   | 17. $9x^2 - 16y^2$ | 24. $9 - 25x^2$      |
| 11. $49a^2 - 4$  | 18. $4a^2 - 25b^2$ | 25. $25m^2 - 64n^2$  |
| 12. $25a^2 - 16$ | 19. $1 - 4a^2$     | 26. $36p^2 - 49q^2$  |
| 13. $25x^2 - 1$  | 20. $49y^2 - 9z^2$ |                      |

**Exercise 11h (p. 201)**

- |                     |                           |                            |
|---------------------|---------------------------|----------------------------|
| 1. $2x^2 + 9x + 12$ | 8. $x^2 - 2x - 23$        | 15. $a^2 - 2abc + b^2c^2$  |
| 2. $2x^2 + 9x + 2$  | 9. $16x^2 + 6x - 10$      | 16. $a^2b^2 - 4ab + 4$     |
| 3. $x^2 + 15x + 32$ | 10. $12x^2 + 8x - 20$     | 17. $36 - 12pq + p^2q^2$   |
| 4. $a^2 - 9a + 36$  | 11. $x^2y^2 - 6xy + 9$    | 18. $m^2n^2 + 6mn + 9$     |
| 5. $2a^2 - 10a - 3$ | 12. $25 - 10yz + y^2z^2$  | 19. $u^2v^2 - 4uvw + 4w^2$ |
| 6. $x^2 + 13x + 25$ | 13. $x^2y^2 + 8xy + 16$   |                            |
| 7. $x^2 - 2x - 21$  | 14. $9p^2q^2 + 48pq + 64$ |                            |

**Summary:** This could prove very useful for periodic revision using home grown examples or the mixed exercises that follow.

**Exercise 11i (p. 203)**

- |                         |                       |                           |
|-------------------------|-----------------------|---------------------------|
| 1. $5x + 10$            | 5. $x^2 + 16x + 60$   | 9. $25x^2 + 20x + 4$      |
| 2. $24pq - 16pr$        | 6. $x^2 - 20x + 96$   | 10. $4a^2 - 28ab + 49b^2$ |
| 3. $6a^2 - 13ab - 5b^2$ | 7. $16y^2 - 16y - 21$ |                           |
| 4. $12x^2 - 17x - 5$    | 8. $16y^2 - 81$       |                           |

**Exercise 11j (p. 204)**

- |                       |                          |                              |
|-----------------------|--------------------------|------------------------------|
| 1. $8 - 20x$          | 5. $-20x^2 - 48x + 5$    | 9. $25a^2 - 70a + 49$        |
| 2. $16a - 24a^2$      | 6. $y^2 + 4yz + 4z^2$    | 10. $36z^2 - 156zy + 169y^2$ |
| 3. $12a^2 - 35a - 33$ | 7. $36y^2 + 24yz - 5z^2$ |                              |
| 4. $x^2 + 2x - 99$    | 8. $16a^2 + 8a + 1$      |                              |

**Exercise 11k (p.204)**

- |                               |                     |                      |
|-------------------------------|---------------------|----------------------|
| 1. $6 - 3a$                   | 5. $a^2 + 16a + 63$ | 9. $9x^2 - 42x + 49$ |
| 2. $8ab + 4ac$                | 6. $a^2 - a - 20$   | 10. $25x^2 - 4y^2$   |
| 3. $10ac + 25ad + 4bc + 10bd$ | 7. $6x^2 + 11x + 3$ |                      |
| 4. $x^2 - 19x + 84$           | 8. $25x^2 - 4$      |                      |

**Exercise 11l (p. 204)**

- |                  |                        |                          |
|------------------|------------------------|--------------------------|
| 1. $15 - 5x$     | 4. $ac + ad - bc - bd$ | 8. $x^2 - 8xy + 16y^2$   |
| 2. $36x^2 - 24x$ | 5. $x^2 + 3x - 28$     | 9. $4x^2 + 28xz + 49z^2$ |
| 3. $6xy - 24xz$  | 6. $x^2 - 11x + 18$    | 10. $1 - 25a^2$          |
|                  | 7. $12x^2 + 11x + 2$   |                          |