

Level 2 algebra



Stage 1: manipulate expressions with several connected steps.

Name _____

Date _____

Structure first

Show expansions and factor choices. Simplify fully; state excluded values for algebraic fractions.

1. Simplify $4x^2 - 3x + 7 + 2x^2 + 5x - 9$.

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

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

4. Expand and simplify $(2x - 5)^2$.

5. Simplify $\frac{18a^5b^3}{6a^2b}$.

6. Factorise fully $6y^2 - 15y$.

7. Factorise $x^2 - 9x + 20$.

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

9. Factorise $9p^2 - 16$.

10. Simplify $\frac{x^2 - 9}{x + 3}$.

11. Simplify $\frac{2x^2 - 8x}{2x}$.

12. Simplify $\frac{x^2 - 5x + 6}{x^2 - 4}$.

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Stage 2: solve equations, systems, inequalities, and justify patterns.



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Preserve equality

Show inverse operations clearly. Check possible solutions when denominators or quadratics are involved.

13. Solve $7x - 5 = 3x + 19$.

14. Solve $4(2x - 3) = 5x + 9$.

15. Solve $\frac{3x - 2}{4} - \frac{x + 1}{2} = 5$.

16. Solve $5 - 2(3x + 1) = 4(x - 3)$.

17. Solve $\frac{5}{x - 1} = 2$.

18. Solve $x^2 - 7x + 12 = 0$.

19. Solve $2x^2 + 7x - 4 = 0$.

20. Solve $3(x - 2)(x + 1) = 18$.

21. Solve $2x + y = 11$ and $x - y = 1$.

22. Solve $3x - 2y = 4$ and $2x + 3y = 13$.

23. Solve $5 - 2x \leq 3x + 20$.

24. Show that the sum of three consecutive even integers is a multiple of 6.

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Stage 3: connect negative and fractional indices to formula rearrangement.

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Use index meaning

Give answers with positive indices. When rearranging, undo operations in a mathematically valid order.

25. Simplify $x^{-3} \times x^7$.

26. Simplify $\frac{a^{5/2}}{a^{-1/2}}$.

27. Simplify $(8m^6n^{-3})^{2/3}$.

28. Evaluate $81^{-3/4}$.

29. Solve $x^{3/2} = 64$, where $x \geq 0$.

30. Solve $x^{-1/2} = \frac{1}{5}$, where $x > 0$.

31. Simplify $\left(\frac{x^{-2}y^{1/2}}{x^{1/2}y^{-1}}\right)^2$.

32. Simplify $\frac{(4a^{-2}b^3)^{1/2}}{2a^{-1}b^{-1/2}}$.

33. Make t the subject: $v = u + at$.

34. Make r the subject: $A = \pi r^2$.

35. Make x the subject: $y = \frac{3x - 5}{2x + 1}$.

36. Make L the subject: $T = 2\pi\sqrt{\frac{L}{g}}$.

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Stage 4: combine methods in unfamiliar, multi-step algebra.



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Plan before moving symbols

Identify the outer operation first. Reject extraneous roots and include restrictions where appropriate.

37. Make a the subject: $k = \frac{3a - b}{2a + b}$.

38. Make b the subject: $P = ka^{-1/2}b^{3/2}$.

39. Solve $4(x - 2)(x + 3) = 24$.

40. Solve $\frac{x+1}{x-2} = \frac{4}{x}$, $x \neq 0, 2$.

41. Simplify $\frac{2x^2 + x - 3}{5x^2 - 3x - 2}$.

42. Solve $9^x = 27$.

43. Show $(2n)^2 + (2n+2)^2 + (2n+4)^2 + 2(3n^2 + 2)$ is a multiple of 6.

44. A rectangle has sides $3x - 2$ and $x + 5$. Its area is 90. Find $x > 0$.

45. Make a the subject: $s = ut + \frac{1}{2}at^2$.

46. Make x the subject: $\frac{1}{y} = \frac{1}{x} + \frac{1}{c}$.

47. Solve $\sqrt{x+5} = x - 1$.

48. Make x the subject: $Q = (ax^{-1/2} + b)^3$.