Level 2 algebra review: variation 2

Stage 1: manipulate, factorise, and simplify connected expressions.

Name _____ **Date** _____

Write the structure

Show key expansions or factors. Simplify fully and state restrictions for algebraic fractions.

1. Simplify $5x^2 - 4x + 3 - 2x^2 + 7x - 11$.

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

3. Expand and simplify $(x-6)(x+2) + 3x$.

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

5. Simplify $\dfrac{24a^7b^{-2}}{6a^3b^{-5}}$ using positive indices.

6. Factorise fully $14p^3q - 21p^2q^2$.

7. Factorise $x^2 - 13x + 36$.

8. Factorise $6x^2 - x - 2$.

9. Factorise $25y^2 - 49z^2$.

10. Simplify $\dfrac{x^2-16}{x^2+7x+12}$.

11. Simplify $\dfrac{3x^2-12x}{x^2-2x}$.

12. Simplify $\dfrac{2x^2-5x-3}{4x^2-9}$.

13. Simplify $\dfrac{x^2-4x-12}{x^2-x-6} \times \dfrac{x-3}{x+2}$.

14. Write $\dfrac{2}{x+1} - \dfrac{3}{x-2}$ as one fraction.

15. Simplify $\dfrac{x}{x-2} \div \dfrac{x^2}{x^2-4}$.

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Stage 2: solve equations, inequalities, systems, and algebraic arguments.

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Keep equations equivalent

Clear fractions carefully. Check restrictions, quadratic roots, and inequality direction.

16. Solve $9x - 8 = 4x + 27$.

17. Solve $5(2x - 3) - 4 = 3(x + 6)$.

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

19. Solve $7 - 3(2x - 5) = 4(x + 1)$.

20. Solve $\frac{8}{x + 2} = 3$.

21. Solve $x^2 - 11x + 24 = 0$.

22. Solve $3x^2 - 10x - 8 = 0$.

23. Solve $(x - 4)^2 = 3x + 4$.

24. Solve $\frac{x + 3}{x - 1} = 2$, $x \neq 1$.

25. Solve $3x + 2y = 16$ and $2x - y = 1$.

26. Solve $4x - 3y = -2$ and $5x + 2y = 19$.

27. Solve $7 - 3x > 2x - 18$.

28. Solve $-4(2x - 1) \leq 3x + 15$.

29. Show the sum of four consecutive odd integers is divisible by 8.

30. Two numbers differ by 7 and have product 60. Find both possible pairs.

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Stage 3: use fractional indices and rearrange increasingly nested formulae.

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Undo operations in order

Give positive indices. When making a subject, keep grouped expressions intact until isolated.

31. Simplify $a^{-5}a^{9}$.

32. Simplify $\dfrac{m^{7/3}}{m^{-2/3}}$.

33. Simplify $(27x^{9}y^{-6})^{1/3}$.

34. Evaluate $16^{-3/2}$.

35. Evaluate $32^{4/5}$.

36. Solve $x^{4/3}=16$, where $x\geq 0$.

37. Solve $x^{-2/3}=\dfrac{1}{9}$, where $x>0$.

38. Simplify $\left(\dfrac{a^{-1/2}b^{2}}{a^{3/2}b^{-1}}\right)^{2}$.

39. Simplify $\dfrac{(9p^{-4}q^{5})^{1/2}}{3p^{-1}q^{-1/2}}$.

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

41. Make h the subject: $V=\pi r^{2}h$.

42. Make x the subject: $y=\dfrac{5x+2}{3x-4}$.

43. Make r the subject: $S=4\pi r^{2}+2\pi rh$.

44. Make m the subject: $T=2\pi\sqrt{\dfrac{m}{k}}$.

45. Make x the subject: $P=a(bx-c)^{n}$.

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Stage 4: combine restrictions, powers, roots, and multi-step rearrangement.

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Plan, solve, verify

State restrictions. Check for extraneous roots and give exact forms unless a decimal is requested.

46. Make a the subject: $k = \dfrac{2a+3b}{5a-b}$.

47. Make b the subject: $P = ca^{-2/3}b^{5/2}$.

48. Make x the subject: $y = \sqrt{\dfrac{ax+b}{cx-d}}$.

49. Solve $\dfrac{x+2}{x-3} = \dfrac{5}{x}$, $x \neq 0, 3$.

50. Solve $\dfrac{3}{x-1} + \dfrac{2}{x+1} = 2$.

51. Simplify $\dfrac{3x^2-11x-4}{6x^2+x-2}$.

52. Solve $8^{x-1} = 4^{2x+1}$.

53. Solve $27^{2x} = 9^{x+1}$.

54. Solve $\sqrt{2x+7} = x-1$.

55. Solve $\sqrt{x+10}+2 = x$.

56. A rectangle has sides $2x+3$ and $x-1$ and area 90. Find $x > 1$.

57. Show $n(n+1)(n+2)$ is even for every integer n.

58. Make x the subject: $Q = \left(ax^{-1/3}+b\right)^4$.

59. Make x the subject: $R = \dfrac{a}{(bx+c)^{3/2}}$.

60. Solve $x^{1/2}+x^{-1/2} = \dfrac{5}{2}$, where $x > 0$.