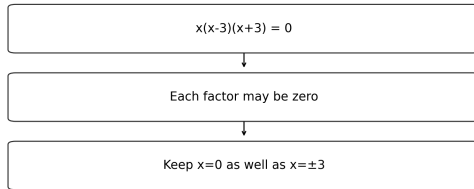


Linear, quadratic and polynomial relationships

Original skill preparation; versioned source scope

Method and conditions



- An identity holds for every permitted input. Start with $ax + b = cx + d$.
- Collect like terms; substitute ordered pairs; signed arithmetic.

Worked method 1

Read and reason

An identity holds for every permitted input. Start with $ax + b = cx + d$.

Collect terms: $(a - c)x = d - b$. Inspect $a - c$ before dividing. If $a = c$ and $b = d$, every real input works. If only $a = c$, no input works. Otherwise $x = (d - b)/(a - c)$ gives one solution.

Original context 1

Read and reason

Task context

Read and reason

Each task below states its own complete data. Values may differ from the worked example.

Attempt 1.1

Read and reason

Solve $x^3 - 9x = 0$ and $(x + 2)(x - 5) \geq 0$. Explain why dividing the cubic by x at the start loses a solution.

Reasoning 1.1

Read and reason

Factor $x(x-3)(x+3) = 0$, giving $-3, 0, 3$. Dividing by x improperly removes the allowed zero root. For the inequality, roots are $-2, 5$; the product is nonnegative outside the roots, including endpoints, so $x \leq -2$ or $x \geq 5$.

Attempt 2.1

Read and reason

Write $2x^2 - 12x + 23$ in vertex form and state its minimum. Find the coefficient of x in $(2x - 3)(x + 4)$.

Reasoning 2.1

Read and reason

Completing the square gives $2(x-3)^2 + 5$, with minimum 5 at $x = 3$. Expansion of the product is $2x^2 + 5x - 12$, so the coefficient is 5.

Attempt 3.1

Read and reason

A printer charges 25 yuan to set up a job and 0.40 yuan per page. Write the total charge for n pages and solve the 65-yuan budget inequality for whole pages. Compare this with the area expression for a rectangle with sides x and $x + 3$ metres.

Reasoning 3.1

Read and reason

$C = f + pn = 25 \text{ yuan} + (0.40 \text{ yuan/page})(n \text{ pages})$. Budget $25 + 0.40n \leq 65$ gives $0 \leq n \leq 100$, with integer n . The charge is affine linear in n .

Reasoning 3.2

Read and reason

The rectangle has $A = x(x + 3) = x^2 + 3x$ square metres for numerical lengths in metres and $x > 0$; multiplication of two variable lengths creates a quadratic, rather than a fixed fee plus a rate.

Transfer and limits

Read and reason

Collect like terms; substitute ordered pairs; signed arithmetic.

Check yourself

Read and reason

Close the worked reasoning. Explain why the method fits the final transfer task, reconstruct its conclusion, and state a condition that would change your answer. Then check the full reasoning in the reference.