

1.2 Expand, factorise and solve equations and inequalities

Name: _____ Class: _____ Date: _____

Total: 28 marks

KEY WORDS expression • equation • inequality

Objective

Expand, factorise and solve equations and inequalities. Original GAC004-aligned practice, not an official assessment. Show the method as well as the result. All applied scenarios are invented classroom problems.

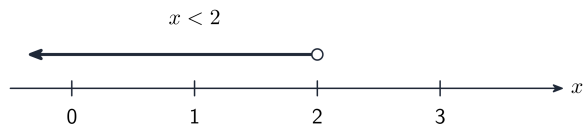
1 Key knowledge and worked examples

■ **Key knowledge:** an equation stays balanced when both sides undergo the same valid operation

An **expression** has no equals sign; an **equation** states that two expressions are equal. Expand by multiplying every term in a bracket. Factorising reverses expansion. Collect only like terms.

Apply the same operation to both sides of an equation. Dividing by an unknown expression can lose a solution if it might be zero. For an **inequality**, multiplying or dividing both sides by a negative number reverses the sign. A quadratic can have two, one or no real roots. In simultaneous equations, a solution must satisfy both equations.

■ **Worked example:** reverse the inequality sign when dividing by a negative



Known: solve $7 - 3x > 1$. Subtract 7 from both sides, then divide by negative 3. The last operation reverses the inequality.

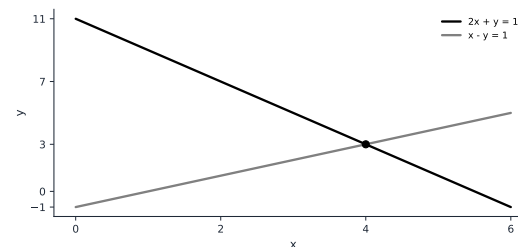
$$7 - 3x > 1 \implies -3x > -6$$

$$x < \frac{-6}{-3} = 2$$

The open circle excludes 2. Check $x = 1$: $7 - 3(1) = 4 > 1$; the boundary $x = 2$ gives equality and is excluded.

■ **Worked application:** Check a simultaneous solution in both equations

For $2x + y = 11$ and $x - y = 1$, add the equations to eliminate y : $3x = 12$, so $x = 4$. Substitute into $x - y = 1$ to obtain $y = 3$. Check both original equations: $2(4) + 3 = 11$ and $4 - 3 = 1$. A pair satisfying only one equation is not a simultaneous solution. Also, for $x^2 = 3x$, factor $x(x - 3) = 0$ to get $x = 0$ or 3; dividing immediately by x would lose zero. The method must preserve every allowed solution, not merely find one convenient result.



2 Practice

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

2.2 Solve $5x - 7 = 18$. [2]

2.3 Factorise $x^2 - x - 12$, then solve $x^2 - x - 12 = 0$. [3]

2.4 Solve $4 - 2x \leq 10$. State whether the boundary value is included. [3]

3 Exam-style questions

3.1 A club buys 3 adult tickets and 2 student tickets for 46 units. Another group buys 2 adult and 4 student tickets for 44 units. Both groups use the same prices. Find each ticket price and check both totals. [6]

3.2 A rectangle has width x metres and length $(x + 3)$ metres. Its area is 40 m^2 . (a) Form and solve an equation for x . (b) Choose the physical solution and find the perimeter. (c) A second rectangle has the same width x but length $(x + 5)$ metres. Find the increase in area. [8]

3.3 Solve $2x + y = 13$ and $x - y = 2$, showing elimination. Check your pair in both original equations. [4]