

2.1.4 Algebra Argument

Name: _____ Class: _____ Date: _____

KEY WORDS equivalent expression

<!-- Session 2 native-skill companion -->

Objective

Practise algebra argument within the labelled native lessons. Public original tasks; locally authored answer guidance.

1 Key knowledge and worked examples

■ Identities, equivalence and algebraic arguments · Foundation

An equation may hold only for some values, while an identity holds for every allowed input. Establish equivalent expressions by valid expansion or factorisation. A few matching inputs are checks rather than a general argument.

$$3(x + 2) - x = 2x + 6$$

Expand $3(x+2)-x=3x+6-x=2x+6$. This chain of valid steps shows the expressions agree for every x . However, $x^2=x$ holds only when $x=0$ or $x=1$; at $x=2$, $4 \neq 2$. Evaluating $(2n+1)^2$ at $n=3$ gives 49, but this one calculation does not establish an all-integers claim.

Start from an expression or the assumptions, not from the conclusion as though it were already true. An example can disprove an all-values claim, but one confirming example cannot prove it.

AQA A3/A6 Foundation distinguishes expression, equation and identity and argues equivalence using algebra. General parity and divisibility proofs belong to the Higher variant.

■ Identities, equivalence and algebraic arguments · Higher

An equation may be true only at certain values. An identity is true at every allowed value. Establish equivalence by valid expansion or factorisation; testing a few inputs is only a check. Higher proofs use a general integer or algebraic variable and a conclusion tied to its definition.

$$3(x + 2) - x = 2x + 6$$

Expanding $3(x+2)-x$ gives $3x+6-x=2x+6$, proving equivalence for every x . But $x^2=x$

holds only for $x=0$ or 1 . A counterexample $x=2$ rejects an all-values claim. For Higher, an odd integer is $2n+1$; its square is $4n^2+4n+1=2(2n^2+2n)+1$, so it is odd for every integer n .

Start from an expression or the assumptions, not from the conclusion as though it were already true. An example can disprove an all-values claim, but one confirming example cannot prove it.

AQA A6 Foundation distinguishes equation/identity and argues equivalence. Higher extends this to algebraic proofs. State integer restrictions when using parity or consecutive integers.

Valid expansion establishes equivalence

$$3(x + 2) - x$$

$$3x + 6 - x$$

$$2x + 6$$

Original native-lesson illustration; labels belong to its worked example.

2 Practice

2.1 (Foundation) Find the coefficient of x in $3(x+2)-x$.

2.2 (Foundation) Find x^2-x at $x=2$.

2.3 (Foundation) Find $(2n+1)^2$ at $n=3$.

3 Exam-style questions

3.1 Decide whether this claim is true. Justify with a concrete calculation or counterexample: Testing two expressions at one input proves that they are identical.

Solutions

2.1 Expand then collect: $3x - x = 2x$.

2.2 $4 - 2 = 2$, a nonzero counterexample.

2.3 $(6+1)^2 = 49$.

3.1 False. x and x^2 both equal 1 at $x=1$ but equal 2 and 4 at $x=2$. An identity requires equality at every allowed input, supported by algebra.

Local review guidance: show the chosen method; give the checked result; explain the condition or failed shortcut. This is authored classroom guidance.