Writing Algebraic Proofs

• Algebraic proofs involve solving a multi-step linear equation, showing and justifying each step that you take

• **To write an algebraic proof:**

  • Go step by step

    • Write your steps in a column called "statements"

  • You must give a reason for every step

    • Write your reasons in a column called "reasons"

      • These reasons are your properties from algebra, definitions, postulates and previously proven theorems

  • You may not skip steps

  • When provided an if-then statement, your if (hypothesis) is the given, and the then (conclusion) is what you are going to prove

> Since Algebraic proofs are "training proofs" it is very important to emphasize structure and completeness!

Examples:

Given: 5x = 20

Prove: x = 4

Statements	Reasons
1.　5x = 20	1. Given
2.　5x/5 = 20/5	2. Division Property
3.　x = 4	3. Simplify

Given: 2x + 4 = 10

Prove: x = 3

Statements	Reasons
1.　2x + 4 = 10	1. Given
2.　2x + 4 – 4 = 10 – 4	2. Subtraction Property
3.　2x = 6	3. Simplify
4.　2x/2 = 6/2	4. Division Property
5. x = 3	5. Simplify

Given: $4(2x + 3) = 30$

Prove: $x = -2$

Statements	Reasons
1. $4(2x + 3) = 52$	1. Given
2. $8x + 12 = 52$	2. Distributive Property
3. $8x + 12 - 12 = 52 - 12$	3. Subtraction Property
4. $8x = 40$	4. Simplify
5. $8x/8 = 40/8$	5. Division Property
6. $x = 5$	6. Simplify

Given: $-2 + 9x + 5 = 5(x - 1)$

Prove: $x = -2$

Statements	Reasons
1. $-2 + 9x + 5 = 5(x - 1)$	1. Given
2. $-2 + 9x + 5 = 5x - 5$	2. Distributive Property
3. $9x + 3 = 5x - 5$	3. Combine like terms
4. $9x - 5x + 3 = 5x - 5x - 5$	4. Subtraction Property
5. $4x + 3 = -5$	5. Simplify
6. $4x + 3 - 3 = -5 - 3$	6. Subtraction Property
7. $4x = -8$	7. Simplify
8. $4x/4 = -8/4$	8. Division Property
9. $x = -2$	9. Simplify

Given : $\dfrac{-2(x+5)}{3} = -2$

Prove : $x = -2$

Statements	Reasons
1. $\dfrac{-2(x+5)}{3} = -2$	1. Given
2. $3 * \left(\dfrac{-2(x+5)}{3}\right) = (-2) * 3$	2. Multiplication Property
3. $-2(x+5) = -6$	3. Simplify
4. $-2x - 10 = -6$	4. Distributive Property
5. $-2x - 10 + 10 = -6 + 10$	5. Addition Property
6. $-2x = 4$	6. Simplify
7. $-2x/-2 = 4/-2$	7. Division Property
8. $x = -2$	8. Simplify

Given : $\dfrac{x}{3} + \dfrac{2x}{4} = 10$

Prove : $x = 12$

Statements	Reasons
1. $\dfrac{x}{3} + \dfrac{2x}{4} = 10$	1. Given
2. $12 * \left(\dfrac{x}{3} + \dfrac{2x}{4}\right) = 10 * 12$	2. Multiplication Property
3. $4x + 6x = 120$	3. Simplify
4. $10x = 120$	4. Combine Like Terms
5. $10x/10 = 120/10$	5. Division Property
6. $x = 12$	6. Simplify