

Name: _____ Hour: _____

Algebraic Proofs ws **KEY**

1-3. Fill in the blanks to complete each proof.

1. **Given:** $8x - 5 = 2x + 1$
Prove: $x = 1$

Proof:

| Statements | Reasons |
|---|----------------------------------|
| a. $8x - 5 = 2x + 1$ | a. <u>Given</u> |
| b. $8x - 5 - 2x = 2x + 1 - 2x$ | b. <u>Subtraction P.</u> |
| c. <u>$6x - 5 = 1$</u> | c. Substitution Property |
| d. <u>$6x - 5 + 5 = 1 + 5$</u> | d. Addition Property |
| e. $6x = 6$ | e. <u>Substitution P. / dis.</u> |
| f. $\frac{6x}{6} = \frac{6}{6}$ | f. <u>Division P.</u> |
| g. <u>$x = 1$</u> | g. <u>Substitution P.</u> |

2. **Given:** $\frac{4x + 6}{2} = 9$
Prove: $x = 3$

Proof:

| Statements | Reasons |
|--|-----------------------------|
| a. $\frac{4x + 6}{2} = 9$ | a. <u>Given</u> |
| b. $-\left(\frac{4x + 6}{2}\right) = 2(9)$ | b. Mult. Prop. |
| c. $4x + 6 = 18$ | c. <u>subst. / Dist. P.</u> |
| d. $4x + 6 - 6 = 18 - 6$ | d. <u>subtraction P.</u> |
| e. $4x = 12$ | e. Substitution |
| f. $\frac{4x}{4} = \frac{12}{4}$ | f. Div. Prop. |
| g. <u>$x = 3$</u> | g. Substitution |

3. **Given:** $4x + 8 = x + 2$
Prove: $x = -2$

Proof:

| Statements | Reasons |
|---|-----------------------|
| a. $4x + 8 = x + 2$ | a. <u>Given</u> |
| b. $4x + 8 - x = x + 2 - x$ | b. <u>Subtraction</u> |
| c. $3x + 8 = 2$ | c. Substitution |
| d. <u>$3x + 8 - 8 = 2 - 8$</u> | d. Subtr. Prop. |
| e. <u>$3x = -6$</u> | e. Substitution |
| f. $\frac{3x}{3} = \frac{-6}{3}$ | f. <u>Division P.</u> |
| g. <u>$x = -2$</u> | g. Substitution |

4-7. Give the reason for each statement in the following two-column proof.

4. 1. Given: $3x + 6 = 7x - 2$
 Prove: $x = 2$

| Statements | Reasons |
|---|--|
| 1. $3x + 6 = 7x - 2$ $\quad -3x \quad -3x$ | 1. <u>Given</u> |
| 2. $6 = 4x - 2$ $\quad +2 \quad +2$ | 2. <u>Subtraction property of equality</u> |
| 3. $8 = 4x$ | 3. <u>Addition property of equality</u> |
| 4. $2 = x$ | 4. <u>Division property of equality</u> |
| 5. $x = 2$ | 5. <u>Symmetric property of equality</u> |

5. 2. Given: $2 - 6x + 4 = 3x - 14 + x$
 Prove: $x = 2$

| Statements | Reasons |
|-------------------------------|--|
| 1. $2 - 6x + 4 = 3x - 14 + x$ | 1. <u>Given</u> |
| 2. $6 - 6x = 3x - 14 + x$ | 2. <u>Substitution</u> |
| 3. $6 - 6x = 4x - 14$ | 3. <u>Substitution</u> |
| 4. $6 = 10x - 14$ | 4. <u>Addition property of equality</u> |
| 5. $20 = 10x$ | 5. <u>Addition property of equality</u> |
| 6. $2 = x$ | 6. <u>Division property of equality</u> |
| 7. $x = 2$ | 7. <u>Symmetric property of equality</u> |

6. 3. Given: $\frac{1}{4}x + 7y = 10 - y$
 Prove: $x = 40 - 32y$

| Statements | Reasons |
|--|---|
| 1. $\frac{1}{4}x + 7y = 10 - y$ | 1. <u>Given</u> |
| 2. $\frac{1}{4}x + 7y - 7y = 10 - y - 7y$ | 2. <u>Subtraction property of equality</u> |
| 3. $\frac{1}{4}x = 10 - 8y$ | 3. <u>Substitution</u> |
| 4. $4\left(\frac{1}{4}x\right) = 4(10 - 8y)$ | 4. <u>Multiplication property of equality</u> |
| 5. $x = 4(10 - 8y)$ | 5. <u>Substitution</u> |
| 6. $x = 40 - 32y$ | 6. <u>Distributive property of equality</u> |

7. 5. Given: $5(n - 3) = 4(2n - 7) - 14$
 Prove: $n = 9$

| Statements | Reasons |
|------------------------------------|--|
| 1. $5(n - 3) = 4(2n - 7) - 14$ | 1. <u>Given</u> |
| 2. $5n - 15 = 8n - 28 - 14$ | 2. <u>Distributive Property</u> |
| 3. $5n - 15 = 8n - 42$ | 3. <u>Substitution</u> |
| 4. $5n - 15 + 15 = 8n - 42 + 15$ | 4. <u>Addition property of equality</u> |
| 5. $5n = 8n - 27$ | 5. <u>Substitution</u> |
| 6. $5n - 8n = 8n - 27 - 8n$ | 6. <u>Subtraction property of equality</u> |
| 7. $-3n = -27$ | 7. <u>Substitution</u> |
| 8. $\frac{-3n}{3} = \frac{-27}{3}$ | 8. <u>Division property of equality</u> |
| 9. $n = 9$ | 9. <u>Substitution</u> |

8-10. Complete each proof

8. 6. Given: $4 - 7x = 2x - 23$
 Prove: $x = 3$

| Statements | Reasons |
|----------------------|----------------------------------|
| ① $4 - 7x = 2x - 23$ | ① Given |
| ② $4 = 9x - 23$ | ② Addition property of equality |
| ③ $27 = 9x$ | ③ Addition property of equality |
| ④ $3 = x$ | ④ Division property of equality |
| ⑤ $x = 3$ | ⑤ Symmetric property of equality |

9. 7. Given: $\frac{1}{2}x + 6y = 8 - 3y$
 Prove: $x = 16 - 18y$

| Statements | Reasons |
|---------------------------------|---------------------------------------|
| ① $\frac{1}{2}x + 6y = 8 - 3y$ | ① Given |
| ② $\frac{1}{2}x = 8 - 9y$ | ② Subtraction property of equality |
| ③ $2(\frac{1}{2}x) = 2(8 - 9y)$ | ③ Multiplication property of equality |
| ④ $x = 2(8 - 9y)$ | ④ Substitution |
| ⑤ $x = 16 - 18y$ | ⑤ Distributive property |

10. 10. Given: $-(n - 5) = 2(3n - 8) - 7$
 Prove: $n = 4$

| Statements | Reasons |
|------------------------------|----------------------------------|
| ① $-(n - 5) = 2(3n - 8) - 7$ | ① Given |
| ② $-n + 5 = 6n - 16 - 7$ | ② Distributive Property |
| ③ $-n + 5 = 6n - 23$ | ③ Substitution |
| ④ $5 = 7n - 23$ | ④ Addition property of equality |
| ⑤ $28 = 7n$ | ⑤ Addition property of equality |
| ⑥ $4 = n$ | ⑥ Division property of equality |
| ⑦ $n = 4$ | ⑦ Symmetric property of equality |