

Name: Key

Algebraic Proofs  
Sec. 6.1A

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

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

| Statements  | Reasons                                    |
|---|--|
| 1. $3x + 6 = 7x - 2$<br><small>-3x      -3x</small> | 1. <u>Given</u>                            |
| 2. $6 = 4x - 2$<br><small>+2      +2</small>        | 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>   |

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> |

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>   |

4. Given:  $\begin{cases} a = 2 \\ -(-2a + 3b) = 6 \end{cases}$   
 Prove:  $b = -\frac{2}{3}$

| Statements                | Reasons                                 |
|---------------------------|---|
| 1. $-(-2a + 3b) = 6$      | 1. <u>Given</u>                         |
| 2. $-2a + 3b = -6$        | 2. <u>mult/div property of equality</u> |
| 3. $3b = 2a - 6$          | 3. <u>Addition property of equality</u> |
| 4. $b = \frac{2}{3}a - 2$ | 4. <u>Division property of equality</u> |
| 5. $a = 2$                | 5. <u>Given</u>                         |
| 6. $b = \frac{4}{3} - 2$  | 6. <u>Substitution</u>                  |
| 7. $b = -\frac{2}{3}$     | 7. <u>substitution</u>                  |

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>Substitutions</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>                     |

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 |

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

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

8. Given:  $3 - 2x + 12 = 4x - 7 - 2x$   
 Prove:  $\frac{11}{2} = x$

| Statements   | Reasons  |
|--|--|
| ① $3 - 2x + 12 = 4x - 7 - 2x$<br>② $15 - 2x = 4x - 7 - 2x$<br>③ $15 - 2x = 2x - 7$<br>④ $15 = 4x - 7$<br>⑤ $22 = 4x$<br>⑥ $\frac{11}{2} = x$ | ① Given<br>② Substitution<br>③ Substitution<br>④ Addition Property of Equality<br>⑤ Addition Property of Equality<br>⑥ Division Property of Equality |

9. Given:  $\begin{cases} a = -3 \\ 2b + a + 1 = 5 \end{cases}$

Prove:  $b = \frac{7}{2}$

| Statements                   | Reasons                            |
|------------------------------|------------------------------------|
| ① $2b + a + 1 = 5$           | ① Given                            |
| ② $2b + a = 4$               | ② Subtraction property of equality |
| ③ $2b = -a + 4$              | ③ Subtraction property of equality |
| ④ $b = -\frac{1}{2}a + 2$    | ④ Division property of equality    |
| ⑤ $a = -3$                   | ⑤ Given                            |
| ⑥ $b = -\frac{1}{2}(-3) + 2$ | ⑥ Substitution                     |
| ⑦ $b = \frac{3}{2} + 2$      | ⑦ Substitution                     |
| ⑧ $b = \frac{7}{2}$          | ⑧ Substitution                     |

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 |

