

Section 2.4  
**Integration: Algebra**  
**Using Proof in algebra**

**Objective** To use properties of equality in algebraic and geometric proofs.

Properties of Equality for Real Numbers	
Reflexive Property	For every number $a$ , $a = a$ .
Symmetric Property	For all numbers $a$ and $b$ , if $a = b$ , then $b = a$
Transitive Property	For all numbers $a$ , $b$ , and $c$ , if $a = b$ and $b = c$ then $a = c$ .
Addition and Subtraction Properties	For all numbers $a$ , $b$ , and $c$ , if $a = b$ , then $a + c = b + c$ and $a - c = b - c$ .
Multiplication and Division Properties	For all numbers $a$ , $b$ , and $c$ , if $a = b$ , then $a \cdot c = b \cdot c$ , and if $c \neq 0$ , $\frac{a}{c} = \frac{b}{c}$ .
Substitution Property	For all numbers $a$ and $b$ , if $a = b$ , then $a$ may be replaced by $b$ in any equation or expression
Distributive Property	For all numbers $a$ , $b$ , and $c$ , $a(b + c) = ab + ac$

**Name the property of equality that justifies each statement.**

- a. If  $3x = 120$ , then  $x = 40$ .
- b. If  $12 = AB$  then  $AB = 12$ .
- c. If  $AB = BC$ , and  $BC = CD$ , then  $AB = CD$ .
- d. If  $y = 75$  and  $y = m\angle A$ , then  $m\angle A = 75$

Justify each step in solving  $\frac{x}{3} + 4 = 1$ .

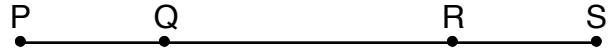
Statements	Reasons
1. $\frac{x}{3} + 4 = 1$	1.
2. $\frac{x}{3} = -3$	2.
3. $x = -9$	3.

Justify each step in solving  $-2x + \frac{3}{2} = 8$

Statements	Reasons
1. $-2x + \frac{3}{2} = 8$	1.
2. $2\left(-2x + \frac{3}{2}\right) = 2(8)$	2.
3. $-4x + 3 = 16$	3.
4. $-4x = 13$	4.
5. $x = -\frac{13}{4}$	5.

Given:  $PR = QS$

Prove:  $PQ = RS$

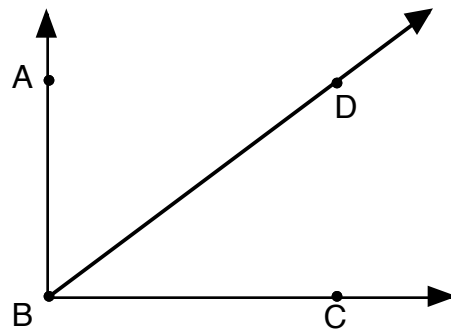


Proof:

Statements	Reasons
1. $PR = QS$	1.
2. $PQ + QR = PR$ $QR + RS = QS$	2.
3. $PQ + QR = QR + RS$	3.
4. $PQ = RS$	4.

Given:  $\angle ABD$  and  $\angle DBC$   
are complementary

Prove:  $\angle ABC$  is a right angle



Proof:

Statements	Reasons
1. $\angle ABD$ and $\angle DBC$ are complementary	1.
2. $m\angle ABD + m\angle DBC = 90$	2.
3. $m\angle ABD + m\angle DBC = m\angle ABC$	3.
4. $m\angle ABC = 90$	4.
5. $\angle ABC$ is a right angle	5.