

Section 2.1 – Reasoning Using Properties from Algebra**Algebraic Properties of Equality**

Let a , b , and c be real numbers.

Addition Property

If $a = b$, then $a + c = b + c$

Subtraction Property

If $a = b$, then $a - c = b - c$

Multiplication Property

If $a = b$, then $ac = bc$

Division Property

If $a = b$ and $c \neq 0$, then $a \div c = b \div c$

Substitution Property

If $a = b$, then a can be substituted for b in any equation or expression

Distributive Property

$a(b + c) = ab + ac$

Reflexive Property (Reflection)

For any real number a , $a = a$

Transitive Property (Train)

If $a = b$ and $b = c$, then $a = c$.

Ex 1:

State the Property of Equality that applies to the statement.

a) If $y + 5 = 7$, then $y = 2$.

b) If $2AB = 25$, then $AB = 12.5$.

c) If $\frac{y}{3} = 4$, then $y = 12$.

d) $3(AB + BC) = 3AB + 3BC$

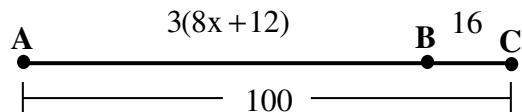
e) $m\angle A = m\angle A$

f) If $a = 1$ and $b = 5 + a$, then $b = 5 + 1$.

g) If $m\angle A = m\angle B$ and $m\angle B = m\angle C$, then $m\angle A = m\angle C$.

Ex 1:

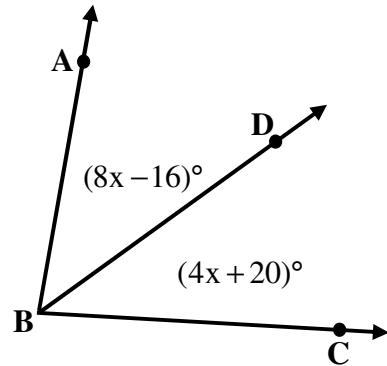
Find x giving a reason for each step.



| Statement | Reason |
|---|--------|
| 1. $AB = 3(8x + 12)$, $BC = 16$, $AC = 100$ | 1. |
| 2. $AB + BC = AC$ | 2. |
| 3. $3(8x + 12) + 16 = 100$ | 3. |
| 4. $24x + 36 + 16 = 100$ | 4. |
| 5. $24x + 52 = 100$ | 5. |
| 6. $24x = 48$ | 6. |
| 7. $x = 2$ | 7. |

Ex 2:

Given \overrightarrow{BD} bisects $\angle ABC$. Find x giving a reason for each step.



| Statement | Reason |
|--|--------|
| 1. \overrightarrow{BD} bisects $\angle ABC$ | 1. |
| 2. $m\angle ABD = 8x - 16$, $m\angle DBC = 4x + 20$ | 2. |
| 3. $m\angle ABD = m\angle DBC$ | 3. |
| 4. $8x - 16 = 4x + 20$ | 4. |
| 5. $8x = 4x + 36$ | 5. |
| 6. $4x = 36$ | 6. |
| 7. $x = 9$ | 7. |

Ex 3:

Given $\overline{AB} \cong \overline{BC}$, $\overline{BC} \cong \overline{CD}$. Find x giving a reason for each step.



| Statement | Reason |
|--|--------|
| 1. $\overline{AB} \cong \overline{BC}$, $\overline{BC} \cong \overline{CD}$ | 1. |
| 2. $\overline{AB} \cong \overline{CD}$ | 2. |
| 3. $AB = CD$ | 3. |
| 4. $AB = 2x + 1$, $CD = 4x - 11$ | 4. |
| 5. $2x + 1 = 4x - 11$ | 5. |
| 6. $2x = 4x - 12$ | 6. |
| 7. $-2x = -12$ | 7. |
| 8. $x = 6$ | 8. |