

2.5 Reason Using Properties from Algebra

Postulates – statements that are true without proof.

One of Euclid's common notions states:

If equals are added to equals then the wholes are equal.

aka Addition Property of Equality

CHECK IT OUT:

$$x - 3 = 5 \quad \text{Given}$$

$$\begin{array}{r} +3 \quad +3 \\ x - 3 = 5 \\ \hline x = 8 \end{array}$$

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 $a \cdot c = b \cdot c$

DIVISION PROPERTY:

If $a = b$ and $c \neq 0$ $\frac{a}{c} = \frac{b}{c}$

SUBSTITUTION PROPERTY:

If $a = b$, then a can be substituted by b vice versa

Write reasons for each step.

Solve $2x + 5 = 20 - 3x$. Write a reason for each step.

Statement	"Justification" Reason
$2x + 5 = 20 - 3x$ $\begin{array}{r} +3x \quad +3x \\ 2x + 5 = 20 - 3x \\ \hline 5x + 5 = 20 \end{array}$ $\begin{array}{r} -5 \quad -5 \\ 5x + 5 = 20 \\ \hline 5x = 15 \end{array}$ $\begin{array}{r} \div 5 \quad \div 5 \\ 5x = 15 \\ \hline x = 3 \end{array}$	<p>Given</p> <p style="color: red;">Add. Prop. of =.</p> <p style="color: green;">Subt. Prop. of =.</p> <p style="color: blue;">Div. Prop. of =.</p>

Let a, b, and c be real numbers.

Distributive Property: if $a(b + c) = ab + ac$ then

Use the Distributive Property.

Solve $-4(11x + 2) = 80$. Write a reason for each step.

STATEMENT	REASON
$-4(11x + 2) = 80$	Given
$-44x - 8 = 80$ $+8 \quad +8$	Dist. Prop of =.
$-44x = 88$ $\frac{-44x}{-44} = \frac{88}{-44}$	Add. Prop of =.
$x = -2$	Div Prop of =.

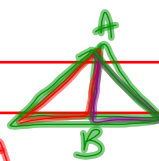
REFLEXIVE PROPERTY OF EQUALITY.

Real Numbers: For any real number a, $a = a$

Segment Length: For any segment AB, $AB = AB$

Angle Measure: For any angle A, $m\angle A = m\angle A$

$m\angle A = m\angle A$



SYMMETRIC PROPERTY OF EQUALITY.

Real Numbers: For any real numbers a and b, if $a = b$, then $b = a$

Segment Length: For any segments AB and CD, if $AB = CD$, then $CD = AB$

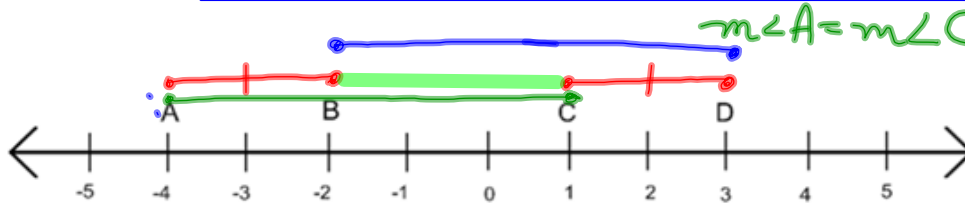
Angle Measure: For any angles A and B, if $m\angle A = m\angle B$, then $m\angle B = m\angle A$

TRANSITIVE PROPERTY OF EQUALITY.

Real Numbers: For any real numbers a, b and c, if $a = b$ and $b = c$, then $a = c$

Segment Length: For any segments AB, CD, and EF, if $AB = CD$ and $CD = EF$, then $AB = EF$

Angle Measure: For any angles A, B, and C, if $m\angle A = m\angle B$ and $m\angle B = m\angle C$, then $m\angle A = m\angle C$



If $AB = CD$, what can you conclude about AC and BD?

STATEMENT	REASON
$AB = CD$	Given
$AB + BC = CD + BC$	Add. Prop of =.
$AB + BC = AC$	Seg. Add. Prop.
$CD + BC = BD$	Seg. Add. Prop.
$AC = BD$	Subst. Prop. of =.