

## Justifying Inequalities

<b>Properties of Inequalities</b> ( $a, b$ and $c$ are real numbers)	<b>Example</b>
<b>Addition Property of Inequality</b> Adding the same number to each side of an equation produces an equivalent inequality.	If $a > b$ then $a + c > b + c$
<b>Subtraction Property of Inequality</b> Subtracting the same number to each side of an equation produces an equivalent inequality.	If $a < b$ then $a - c < b - c$
<b>Multiplication Property of Inequality</b> Multiplying each side of the inequality by same <i>positive</i> number produces an equivalent inequality.  Multiplying each side of the inequality by the same <i>negative</i> number produces an equivalent inequality when the inequality sign is <i>reversed</i> .	If $a \geq b$ and $c > 0$ then $ac \geq bc$  If $a \geq b$ and $c < 0$ then $ac \leq bc$
<b>Division Property of Inequality</b> Dividing each side of the inequality by same <i>positive</i> number produces an equivalent inequality.  Dividing each side of the inequality by the same <i>negative</i> number produces an equivalent inequality when the inequality sign is <i>reversed</i> .	If $a \leq b$ and $c > 0$ then $\frac{a}{c} \leq \frac{b}{c}$ If $a \leq b$ and $c < 0$ then $\frac{a}{c} \geq \frac{b}{c}$

**Example 1:** Solve, justifying each step.

$\frac{n}{-2} \leq -6$ <hr style="border: 0.5px solid black;"/> $-2 \cdot \frac{n}{-2} \geq -6 \cdot -2$ $n \geq 12$	Justification  a) Multiplication Property of Inequality  b) Multiplicative Inverse, Substitution Property
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**Example 2:** Solve, justifying each step.

$-3 + 2b < 13$	Justification
$-3 + 3 + 2b < 13 + 3$	a) Addition Property of Inequality
$2b < 16$	b) Additive Inverse, Substitution Property
$\frac{2b}{2} < \frac{16}{2}$	c) Division Property of Inequality
$b < 8$	d) Multiplicative Inverse, Substitution Property

**Example 3:** Solve, justifying each step.

$5x - 7(x + 1) > 9$	Justification
$5x - 7x - 7 > 9$	a) Distributive Property
$-2x - 7 > 9$	b) Substitution Property
$-2x - 7 + 7 > 9 + 7$	c) Addition Property of Inequality
$-2x > 16$	d) Additive Inverse, Substitution
$\frac{-2x}{-2} < \frac{16}{-2}$	e) Division Property of Inequality
$x < -8$	f) Multiplicative Inverse, Substitution