

Solving Inequalities Using Addition and Subtraction

 Guide Notes

ADDITION PROPERTY OF INEQUALITIES

"If any number is added to each side of a true inequality, the resulting inequality is also true."

For all numbers a , b , and c , the following are true:

1. If $a > b$, then $a + c > b + c$.

$$\begin{array}{l} 11 > 8 \\ 11 + 2 > 8 + 2 \\ 13 > 10 \end{array}$$

2. If $a < b$, then $a + c < b + c$.

$$\begin{array}{l} 15 < 21 \\ 15 + 5 < 21 + 5 \\ 20 < 26 \end{array}$$

3. If $a \geq b$, then $a + c \geq b + c$.

$$\begin{array}{l} 9 \geq 8 \\ 9 + 4 \geq 8 + 4 \\ 13 \geq 12 \end{array}$$

4. If $a \leq b$, then $a + c \leq b + c$.

$$\begin{array}{l} 13 \leq 14 \\ 13 + 3 \leq 14 + 3 \\ 16 \leq 17 \end{array}$$

Sample Problem 1: Solve each inequality.

A. $x - 6 \geq 4$ $x - 6 + 6 \geq 4 + 6$ $x \geq 10$

B. $z - 45 < 13$ $z - 45 + 45 < 13 + 45$ $z < 58$

C. $-4 > z - 8$ $-4 + 8 > z - 8 + 8$ $4 > z$

D. $-5 + n \leq 9$ $-5 + 5 + n \leq 9 + 5$ $n \leq 14$

SUBTRACTION PROPERTY OF INEQUALITIES

"If any number is subtracted to each side of a true inequality, the resulting inequality is also true."

For all numbers a , b , and c , the following are true:

1. If $a > b$, then $a - c > b - c$.

$$\begin{array}{l} 12 > 7 \\ 15 + 5 > 7 + 5 \\ 20 > 12 \end{array}$$

2. If $a < b$, then $a - c < b - c$.

$$\begin{array}{l} 16 < 20 \\ 16 + 3 < 20 + 3 \\ 19 < 23 \end{array}$$

3. If $a \geq b$, then $a - c \geq b - c$.

$$\begin{array}{l} 8 \geq 7 \\ 8 + 2 \geq 7 + 2 \\ 10 \geq 9 \end{array}$$

4. If $a \leq b$, then $a - c \leq b - c$.

$$\begin{array}{l} 12 \leq 15 \\ 12 + 4 \leq 15 + 4 \\ 16 \leq 19 \end{array}$$

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 Guide Notes**Sample Problem 2:** Solve each inequality.

- A. $20 + x \geq 15$ $20 - 20 + x \geq 15 - 20$ $x \geq -5$
- B. $y + 5 < 22$ $y + 5 - 5 < 22 - 5$ $y < 17$
- C. $19 > z + 8$ $19 - 8 > z + 8 - 8$ $11 > z$
- D. $x + 16 \leq 27$ $x + 16 - 16 \leq 27 - 16$ $x \leq 11$

Sample Problem 3: Solve each inequality.

- A. $6 + x \geq 2x$ $6 + x - x \geq 2x - x$ $13 \geq x$
- B. $2y < 13 + y$ $2y - y < 13 + y - y$ $y < 28$
- C. $21 + 4z > 5z$ $21 + 4z - 4z > 5z - 4z$ $12 > z$
- D. $3x \leq 27 + 2x$ $3x - 2x \leq 27 + 2x - 2x$ $x \leq 11$

Sample Problem 4: Write and solve an inequality.

- A. Five times a number
- x
- plus seven is more than six times a number
- x
- .

$$5x + 7 > 6x \qquad 5x - 5x + 7 > 6x - 5x \qquad 7 > x$$

- B. Fifteen plus a number
- x
- is less than sixty.

$$15 + x < 60 \qquad 15 - 15 + x < 60 - 15 \qquad x < 45$$

- C. Eleven is more than or equal to a number
- x
- minus three.

$$11 \geq x - 3 \qquad 11 + 3 \geq x - 3 + 3 \qquad 14 \geq x$$

- D. A number
- x
- plus twenty one is less than or equal to thirty.

$$x + 21 \leq 30 \qquad x + 21 - 21 \leq 30 - 21 \qquad x \leq 9$$

Sample Problem 5: Write an inequality.

Ann ran a 5 kilometer race in 45 minutes. Write an inequality to describe the speeds of the runners who were faster than Ann.

$$speed_{Ann} = \frac{distance_{Ann}}{time_{Ann}} = \frac{5 \text{ km}}{45 \text{ min}} = speed_{Ann} = \frac{1}{9} \cdot \frac{\text{km}}{\text{min}}$$

$$speed_{faster \text{ than } Ann} > speed_{Ann}$$

$$s_f > \frac{1}{9} \cdot \frac{\text{km}}{\text{min}}$$