# 6.3 Solve Multi-Step Inequalities

**Goal** • Solve multi-step inequalities.

***Your Notes***

**Example 1** *Solve a two-step inequality*

**Solve $4x + 6 \forall 54$. Graph your solution.**

**Solution**

$4x + 6 \forall 54$ — **Write original inequality.**

$4x \forall 48$ — **Subtract** 6 **from each side.**

$x \forall 12$ — **Divide each side by** 4 **.**

The solutions are all real numbers greater than or equal to 12 .


**Example 2** *Solve a multi-step inequality*

**Solve $-\frac{1}{3}(x + 21) < 2$.**

**Solution**

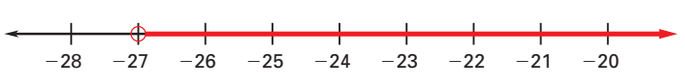
$-\frac{1}{3}(x + 21) < 2$ — **Write original inequality.**

$-\frac{1}{3}x - 7 < 2$ — **Distributive property**

$-\frac{1}{3}x < 9$ — **Add** 7 **to each side.**

$x > -27$ — **Multiply each side by** $-3$ **.** Reverse **the inequality symbol.**

The solutions are all real numbers greater than $-27$ .



***Your Notes***

**Checkpoint** **Solve the inequality. Graph your solution.**

**1.** $-5w - 2 \geq 23$

$w \leq -5$


**2.** $2(y - 2.2) > 0$

$y > 2.2$


**Example 3** ***Identify the number of solutions of an inequality***

**Solve the inequality, if possible.**

**a.** $8x + 3 > 2(4x + 1)$

**b.** $3(8b - 1) \leq 24b - 4$

**Solution**

**a.** $8x + 3 > 2(4x + 1)$ **Write original inequality.**

$8x + 3 >$ $8x + 2$ **Distributive property**

$3 > 2$ **Subtract** $8x$ **from each side.**

All real numbers are solutions because $3 > 2$ is true.

**b.** $3(8b - 1) \leq 24b - 4$ **Write original inequality.**

$24b - 3$ $\leq 24b - 4$ **Distributive property**

$-3 \leq -4$ **Subtract** $24b$ **from each side.**

There are no solutions because $-3 \leq -4$ is false.

***Your Notes***

✔ ***Checkpoint*** **Solve the inequality, if possible.**

| | |
|---|---|
| **3.** $18 + 4w \geq \frac{1}{2}(8w + 36)$ <br> All real numbers are solutions. | **4.** $-2(3z - 1) < 1 - 6z$ <br> No solution |

**Example 4** ***Solve a multi-step problem***

**Cell Phone** Your cell phone plan is \$35 a month for 1000 minutes. You are charged \$.25 per minute for any additional minutes. What are the possible numbers of additional minutes you can use if you want to spend no more than \$50 on your monthly cell phone bill?

**Solution**

The amount spent on the monthly plan plus additional minutes must be less than or equal to your monthly budget. Let $m$ be the number of additional minutes that you use.

| Price per minute (dollars/min) | • | Number of minutes (minutes) | + | Monthly fee (dollars) | ≤ | Monthly budget (dollars) |
|---|---|---|---|---|---|---|
| 0.25 | • | $m$ | + | 35 | ≤ | 50 |

$0.25 \cdot m + 35 \leq 50$ **Write inequality.**

$0.25m \leq 15$ **Subtract** 35 **from each side.**

$m \leq 60$ **Divide each side by** 0.25 **.**

You can use an additional 60 minutes or fewer per month to keep within your monthly cell phone budget.

***Homework***