For all inequality problems,

- sketch the solution set on a number line,
- write the solution in interval notation,
- write the solution in set notation.

Questions

1. Reduce $|x - 6| = 16$.

2. Reduce $|2x - 5| = 13$.

3. Reduce $\left|\frac{1}{2} - \frac{3}{4}x\right| + 1 = 3$.

4. Reduce $\left|4 - \frac{5}{2}x\right| = 12$.

5. Reduce $|x + 6| = |2x - 3|$.

6. Reduce $|1.5x - 2| = |x - 0.5|$.

7. Reduce $\left|\frac{2}{5}x + 1\right| = |1 - x|$.

8. Reduce $|x| \leq 8$.

9. Reduce $|x| < 6$.

10. Reduce $|2x - 5| \leq 7$.

11. Reduce $\left|\frac{3}{5}(1 - 7x)\right| < 6$.

12. Reduce $|2 - 9x| > 20$.

Solutions

1. $|x-6|=16 \Rightarrow$

$$\begin{aligned} x-6=16 \quad &\text{or} \quad x-6=-16 \\ x=22 \quad &\text{or} \quad x=-10 \end{aligned}$$

2. $|2x-5|=13 \Rightarrow$

$$\begin{aligned} 2x-5=13 \quad &\text{or} \quad 2x-5=-13 \\ 2x=18 \quad &\text{or} \quad 2x=-8 \\ x=9 \quad &\text{or} \quad x=-4 \end{aligned}$$

3. $\left|\frac{1}{2}-\frac{3}{4}x\right|+1=3 \Rightarrow \left|\frac{1}{2}-\frac{3}{4}x\right|=2 \Rightarrow$

$$\begin{aligned} \frac{1}{2}-\frac{3}{4}x=2 \quad &\text{or} \quad \frac{1}{2}-\frac{3}{4}x=-2 \\ 2-3x=8 \quad &\text{or} \quad 2-3x=-8 \\ -3x=6 \quad &\text{or} \quad -3x=-10 \\ x=-2 \quad &\text{or} \quad x=\frac{10}{3} \end{aligned}$$

4. $\left|4-\frac{5}{2}x\right|=12 \Rightarrow$

$$\begin{aligned} 4-\frac{5}{2}x=12 \quad &\text{or} \quad 4-\frac{5}{2}x=-12 \\ -\frac{5}{2}x=8 \quad &\text{or} \quad -\frac{5}{2}x=-16 \\ x=-\frac{16}{5} \quad &\text{or} \quad x=\frac{32}{5} \end{aligned}$$

5. $|x+6|=|2x-3| \Rightarrow$

$$\begin{aligned} x+6=2x-3 \quad &\text{or} \quad x+6=-(2x-3) \\ -x=-9 \quad &\text{or} \quad x+6=-2x+3 \\ x=9 \quad &\text{or} \quad 3x=-3 \\ x=9 \quad &\text{or} \quad x=-1 \end{aligned}$$

6. $|1.5x-2|=|x-0.5| \Rightarrow$

$$\begin{aligned} 1.5x-2=x-0.5 \quad &\text{or} \quad 1.5x-2=-(x-0.5) \\ 0.5x=1.5 \quad &\text{or} \quad 1.5x-2=-x+0.5 \\ x=3 \quad &\text{or} \quad 2.5x=2.5 \\ x=3 \quad &\text{or} \quad x=1 \end{aligned}$$

7. $\left|\frac{2}{5}x+1\right|=|1-x| \Rightarrow$

$$\begin{aligned} \frac{2}{5}x+1=1-x \quad &\text{or} \quad \frac{2}{5}x+1=-(1-x) \\ \frac{2}{5}x=-x \quad &\text{or} \quad \frac{2}{5}x+1=-1+x \\ x=0 \quad &\text{or} \quad -\frac{3}{5}x=-2 \\ x=0 \quad &\text{or} \quad x=\frac{10}{3} \end{aligned}$$

8. Reduce $|x| \leq 8$.

Interval notation: $-8 \leq x \leq 8$

Set notation: $x \in [-8, 8]$

9. Reduce $|x| < 6$.

Interval notation: $-6 < x < 6$

Set notation: $x \in (-6, 6)$

10. Reduce $|2x - 5| \leq 7$.

$$-7 \leq 2x - 5 \leq 7$$
$$-2 \leq 2x \leq 12$$
$$-1 \leq x \leq 6$$

Interval notation: $-1 \leq x \leq 6$

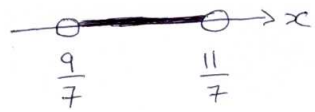
Set notation: $x \in [-1, 6]$

11. Reduce $\left|\frac{3}{5}(1 - 7x)\right| < 6$. In this problem we have to remember to change direction of inequality when multiplying by negative!

$$-10 < \frac{3}{5}(1 - 7x) < 10$$
$$-10 < 1 - 7x < 10$$
$$-11 < -7x < 9$$
$$\frac{11}{7} > x > \frac{9}{7}$$

Interval notation: $\frac{9}{7} < x < \frac{11}{7}$

Set notation: $x \in \left(\frac{9}{7}, \frac{11}{7}\right)$



12. Reduce $|2 - 9x| > 20$. In this problem we have to remember to change direction of inequality when multiplying by negative!

$$2 - 9x < -20 \quad \text{or} \quad 2 - 9x > 20$$
$$-9x < -22 \quad \text{or} \quad -9x > 18$$
$$x > \frac{22}{9} \quad \text{or} \quad x < -2$$

Interval notation: $x > \frac{22}{9}$ or $x < -2$

Set notation: $x \in (-\infty, -2) \cup \left(\frac{22}{9}, \infty\right)$