Absolute Value Inequalities

Form 1: $\underset{\text{THEN}}{|P| < Q}$

$-Q < P < Q$

Form 2: $\underset{\text{THEN}}{|P| > Q}$

$P < -Q$ or $P > Q$

#8

$\underset{P}{|9x-2|} \leq \underset{Q}{10}$

$-Q \leq P \leq Q$

$-10 \leq 9x-2 \leq 10$

$-10+2 \leq 9x \leq 10+2$

$-8 \leq 9x \leq 12$

$-\frac{8}{9} \leq \frac{9}{9}x \leq \frac{12}{9}$

$-\frac{8}{9} \leq x \leq \frac{4}{3}$

$\left[-\frac{8}{9}, \frac{4}{3}\right]$

#9

$4\underbrace{|x-7|}_{P} \underbrace{-3 < 9}$

$4|x-7| < 9+3$

$4|x-7| < 12$

$\frac{4|x-7|}{4} < \frac{12}{4}$

$\underbrace{|x-7|}_{P} < \underbrace{3}_{Q}$

$-Q < P < Q$

$-3 < x-7 < 3$

$-3+7 < x < 3+7$

$4 < x < 10$

$(4, 10)$

#10

$\underbrace{|x+7|}_{P} \geq \underbrace{3}_{Q}$

$P \leq -Q$ or $P \geq Q$

$x+7 \leq -3$ or $x+7 \geq 3$

$x \leq -3-7$ $\quad$ $x \geq 3-7$

$x \leq -10$ or $x \geq -4$

$(-\infty, -10] \cup [-4, \infty)$

#11

$\underbrace{|-4x+3|}_{P} \underbrace{-10}_{} \geq 0$

$\underbrace{|-4x+3|}_{P} \geq \underbrace{10}_{Q}$

$P \leq -Q$ or $P \geq Q$

$-4x+3 \leq -10$ or $-4x+3 \geq 10$

$-4x \leq -10-3$ $\quad$ $-4x \geq 10-3$

$-4x \leq -13$ $\quad$ $-4x \geq 7$

$\frac{-4x}{-4} \geq \frac{-13}{-4}$ $\quad$ $\frac{-4}{-4}x \leq \frac{7}{-4}$

$x \geq \frac{13}{4}$ or $x \leq -\frac{7}{4}$

$x \leq -\frac{7}{4}$ or $x \geq \frac{13}{4}$

$\left(-\infty, -\frac{7}{4}\right] \cup \left[\frac{13}{4}, \infty\right)$