

Cypress College Math Review: Absolute Value Inequalities

Absolute Value as Distance from the origin

Inequalities of the form $|X| < c$

$$\text{Ex 1) } |x| < 3$$

$$\text{Ex 2) } |x + 5| - 4 \leq 8$$

$$\text{Ex 3) } 4 > |x - 2|$$

$$\text{Ex 4) } 3|x - 2| + 1 \leq 7$$

Inequalities of the form $|X| > c$

Ex 5) $|x| > 6$

Ex 6) $|x - 3| + 6 > 8$

Ex 7) $2|3x + 1| - 4 \geq 6$

Ex 8) $|4 - 2x| \geq 12$

Negative numbers and zero

We have covered $|x| > c$ and $|x| < c$ where c is a positive number. Now, what if c is a negative number or zero?

Ex 9) $|x| < \text{negative}$

Ex 10) $|x| \leq \text{negative}$

Ex 11) $|x| \leq \text{zero}$

Ex 12) $|x| > \text{negative}$

Ex 13) $|x| \geq \text{negative}$

Ex 14) $|x| \geq \text{zero}$

Extra practice problems

1. $|x - 7| + 3 < 4$

2. $|6 - 3x| < 7$

3. $|2x - 4| + 6 \geq 10$

4. $|x - 1| + 5 > 2$

5. $|x + 5| < -4$

6. $|x - 2| + 3 \geq 7$

Answers to practice problems

1. $(6, 8)$

2. $\left(\frac{-1}{3}, \frac{13}{3}\right)$

3. $(-\infty, 0] \cup [4, \infty)$

4. All real numbers

5. No solution

6. $(-\infty, -2] \cup [6, \infty)$

Extra Practice – Try these on your own, then check with the answers below.

1. $6x^2 + 35x + 36$

2. $5x^2 - 21x + 4$

3. $20x^2 - 56x + 15$

4. $12x^2 - x - 6$

5. $12x^2 - 16x - 3$

Answers

1. $(2x + 9)(3x + 4)$

2. $(x - 4)(5x - 1)$

3. $(2x - 5)(10x - 3)$

4. $(3x + 2)(4x - 3)$

5. $(2x - 3)(6x + 1)$