جامعة المستقبل
AL MUSTAQBAL UNIVERSITY
كلية الصيدلة

Mathematics and Biostatistics

First Stage

LECTURE 2

Inequality and Absolute Value or Magnitude

BY

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Inequality and Absolute Value or Magnitude

Inequality involves comparing two quantities using symbols such as $>$, $<$, $\geq$, or $\leq$.

Absolute Value or **Magnitude** refers to the non-negative value of a number or expression, regardless of its sign. It is often denoted by two vertical bars, e.g., $|x|$, and represents the distance of a number from zero on the number line.

Properties of Absolute Value in Inequalities

1. $|x| \geq a$:
   - This means $x \leq -a$ or $x \geq a$, where $a \geq 0$.
2. $|x| \leq a$:
   - This means $-a \leq x \leq a$, where $a \geq 0$.

Example 1: Solving $|x| > 5$

The inequality $|x| > 5$ means the values of x are more than 5 units away from zero. This can be expressed as:

$$x < -5 \quad \text{or} \quad x > 5$$

Solution:

- The solution set is $x \in (-\infty, -5) \cup (5, \infty)$.

Example 2: Solving $|x+2| \leq 3$

The inequality $|x+2| \leq 3$ means the expression $x+2$ is within 3 units of zero. This can be rewritten as:

$$-3 \leq x+2 \leq 3$$

Solution:

- Subtract 2 from all sides:

$$-3-2 \leq x \leq 3-2$$

$$-5 \leq x \leq 1$$

- The solution set is $x \in [-5, 1]$.

Example 3: Geometric Interpretation of $|x| < 4$

The inequality $|x| < 4$ means x is less than 4 units away from zero. The solution is the interval:

$$x \in (-4, 4)$$

OTHER EXAMPLES

Example 1: Solving $|x| < 7$

The inequality $|x| < 7$ means x is less than 7 units away from 0. Rewrite it as:

$$-7 < x < 7$$

Solution:

- The solution set is $x \in (-7, 7)$.

Example 2: Solving $|x-3| \geq 4$

The inequality $|x-3| \geq 4$ means the distance between x and 3 is at least 4. Rewrite it as:

$$x-3 \leq -4 \quad \text{or} \quad x-3 \geq 4$$

Solution:

- For $x-3 \leq -4$:

$$x \leq -1$$

- For $x-3 \geq 4$:

$$x \geq 7$$

- The solution set is $x \in (-\infty, -1] \cup [7, \infty)$.

Example 3: Solving $|2x+1| \leq 5$

The inequality $|2x+1| \leq 5$ means the expression $2x+1$ lies between -5 and 5. Rewrite it as:

$$-5 \leq 2x+1 \leq 5$$

Solution:

1. Subtract 1 from all sides:

$$-5-1 \leq 2x \leq 5-1$$

$$-6 \leq 2x \leq 4$$

2. Divide all sides by 2:

$$-3 \leq x \leq 2$$

- The solution set is $x \in [-3, 2]$.

Example 4: Solving $|x+4| > 6$

The inequality $|x+4| > 6$ means the expression $x+4$ is more than 6 units away from 0. Rewrite it as:

$$x+4 < -6 \quad \text{or} \quad x+4 > 6$$

Solution:

- For $x+4 < -6$:

$$x < -10$$

- For $x+4 > 6$:

$$x > 2$$

- The solution set is $x \in (-\infty, -10) \cup (2, \infty)$.

Example 5: Solving $|3x-2|<8$

The inequality $|3x-2|<8$ means $3x-2$ lies within 8 units of 0. Rewrite it as:

$$-8<3x-2<8$$

Solution:

1. Add 2 to all sides:

$$-8+2<3x<8+2$$

$$-6<3x<10$$

2. Divide all sides by 3:

$$-2<x<\frac{10}{3}$$

- The solution set is $x\in(-2,\frac{10}{3})$.

Example 6: Solving $|x| \geq 9$

The inequality $|x| \geq 9$ means x is at least 9 units away from 0. Rewrite it as:

$$x \leq -9 \quad \text{or} \quad x \geq 9$$

Solution:

- The solution set is $x \in (-\infty, -9] \cup [9, \infty)$.

- Thanks for lessening ..

Any questions?