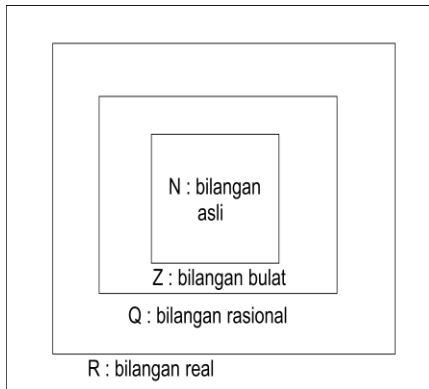


## Sistem Bilangan



$$\mathbb{N} = \{1, 2, 3, 4, 5, \dots\}$$

$$\mathbb{Z} = \{\dots, -3, -2, -1, 0, 1, 2, 3, \dots\}$$

$$\mathbb{Q} = \left\{ \frac{a}{b} \mid a, b \in \mathbb{Z}, b \neq 0 \right\}$$

Apakah  $3,25$      $1,33\bar{3}$      $6,25\bar{25}$      $7,124\bar{24}$

Merupakan bilangan rasional?

Bagaimana dengan  $\sqrt{2}$      $\sqrt{3}$      $3,1154672 \dots$      $\pi$

$$\mathbb{R} = \mathbb{Q} \cup \text{Irasional}$$

## Contoh 1

Misalkan  $x = 6,25\bar{25}$  maka  $100x = 625,25\bar{25}$  sehingga

$$\begin{array}{r} 100x = 625,25\bar{25} \\ x = 6,25\bar{25} \\ \hline 99x = 619 \\ x = \frac{619}{99} \end{array}$$

Jadi  $x$  adalah bilangan rasional.

## Contoh 2

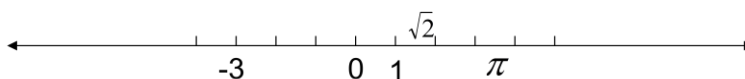
Misalkan  $x = 7,124\bar{24}$  maka  $1000x = 7124,24\bar{24}$  sehingga

$$\begin{array}{r} 1000x = 7124,24\bar{24} \\ 10x = 71,24\bar{24} \\ \hline 990x = 7053 \\ x = \frac{7053}{990} \end{array}$$

Jadi  $x$  adalah bilangan rasional.

## Garis Bilangan Real

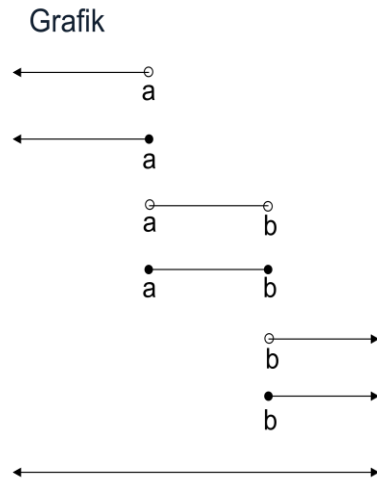
Setiap bilangan real mempunyai posisi pada suatu garis yang disebut dengan **garis bilangan (real)**.



## Selang/Interval

Himpunan bagian dari garis bilangan

Himpunan	selang
$\{x x < a\}$	$(-\infty, a)$
$\{x x \leq a\}$	$(-\infty, a]$
$\{x a < x < b\}$	$(a, b)$
$\{x a \leq x \leq b\}$	$[a, b]$
$\{x x > b\}$	$(b, \infty)$
$\{x x \geq b\}$	$[b, \infty)$
$\{x x \in \mathbb{R}\}$	$(-\infty, \infty)$



## Menyelesaikan Pertidaksamaan

### Contoh 1

$$13 \geq 2x - 3 \geq 5$$

$$13 + 3 \geq 2x \geq 5 + 3$$

$$16 \geq 2x \geq 8$$

$$8 \geq x \geq 4$$

$$4 \leq x \leq 8$$

$$\text{Hp} = [4, 8]$$



### Contoh 2

$$-2 < 6 - 4x \leq 8$$

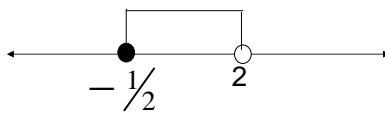
$$-8 < -4x \leq 2$$

$$8 > 4x \geq -2$$

$$-2 \leq 4x < 8$$

$$-\frac{1}{2} \leq x < 2$$

$$\text{Hp} = \left[-\frac{1}{2}, 2\right)$$

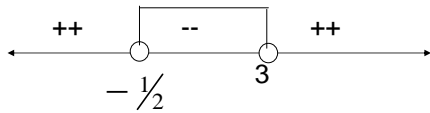


Contoh 3

$$2x^2 - 5x - 3 < 0$$

$$(2x+1)(x-3) < 0$$

Titik Pemecah (TP) :  $x = -\frac{1}{2}$  dan  $x = 3$



$$Hp = \left(-\frac{1}{2}, 3\right)$$

Contoh 4

$$2x - 4 \leq 6 - 7x \leq 3x + 6$$

$$2x - 4 \leq 6 - 7x \quad \text{dan} \quad 6 - 7x \leq 3x + 6$$

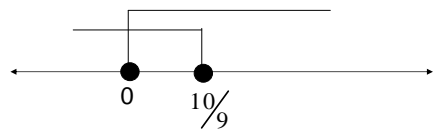
$$2x + 7x \leq 6 + 4 \quad \text{dan} \quad -7x - 3x \leq -6 + 6$$

$$9x \leq 10 \quad \text{dan} \quad -10x \leq 0$$

$$x \leq \frac{10}{9} \quad \text{dan} \quad 10x \geq 0$$

$$x \leq \frac{10}{9} \quad \text{dan} \quad x \geq 0$$

$$Hp = \left(-\infty, \frac{10}{9}\right] \cap [0, \infty)$$



Dari gambar tersebut dapat disimpulkan :

$$Hp = \left[0, \frac{10}{9}\right]$$

Contoh 5

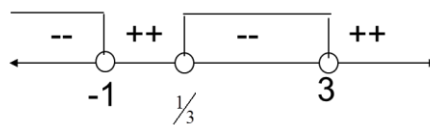
$$\frac{1}{x+1} < \frac{2}{3x-1}$$

$$\frac{1}{x+1} - \frac{2}{3x-1} < 0$$

$$\frac{(3x-1) - (2x+2)}{(x+1)(3x-1)} < 0$$

$$\frac{x-3}{(x+1)(3x-1)} < 0$$

TP : -1,  $\frac{1}{3}$ , 3



$$Hp = (-\infty, -1) \cup \left(\frac{1}{3}, 3\right)$$

Contoh 6

$$\frac{x+1}{2-x} \leq \frac{x}{3+x}$$

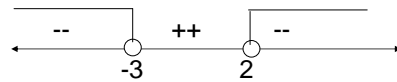
$$\frac{x+1}{2-x} - \frac{x}{3+x} \leq 0$$

$$\frac{(x+1)(3+x) - x(2-x)}{(2-x)(3+x)} \leq 0$$

$$\frac{2x^2 + 2x + 3}{(2-x)(x+3)} \leq 0$$

Untuk pembilang  $2x^2 + 2x + 3$  mempunyai nilai Diskriminan (D) < 0, sehingga nilainya selalu positif, Jadi TP : 2, -3

Pembilang tidak menghasilkan titik pemecah.



$$Hp = (\infty, -3) \cup (2, \infty)$$

Pertidaksamaan Nilai Mutlak

Nilai mutlak x (|x|) didefinisikan sebagai jarak x dari titik pusat pada garis bilangan, sehingga jarak selalu bernilai positif.

Definisi nilai mutlak

$$|x| = \begin{cases} x, & x \geq 0 \\ -x, & x < 0 \end{cases}$$

Sifat-sifat Nilai Mutlak

1.  $|x| = \sqrt{x^2}$
2.  $|x| \leq a$ , dengan  $a > 0$  jika dan hanya jika  $-a \leq x \leq a$
3.  $|x| \geq a$ , dengan  $a > 0$  jika dan hanya jika  $x \geq a$  atau  $x \leq -a$
4.  $|x| \leq |y|$  jika dan hanya jika  $x^2 \leq y^2$
5.  $\left| \frac{x}{y} \right| = \frac{|x|}{|y|}$
6.  $|x + y| \leq |x| + |y|$
7.  $|x - y| \geq ||x| - |y||$

Contoh 1

$$|2x - 5| < 3$$

Kita bisa menggunakan sifat ke-2.

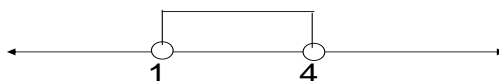
$$\Leftrightarrow -3 < 2x - 5 < 3$$

$$\Leftrightarrow 5 - 3 < 2x < 3 + 5$$

$$\Leftrightarrow 2 < 2x < 8$$

$$\Leftrightarrow 1 < x < 4$$

$$Hp = (1, 4)$$



Contoh 2

$$|2x+3| \geq |4x+5|$$

Kita bisa menggunakan sifat 4

$$\Leftrightarrow (2x+3)^2 \geq (4x+5)^2$$

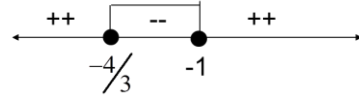
$$\Leftrightarrow 4x^2 + 12x + 9 \geq 16x^2 + 40x + 25$$

$$\Leftrightarrow -12x^2 - 28x - 16 \geq 0$$

$$\Leftrightarrow 3x^2 + 7x + 4 \leq 0$$

$$\text{TP: } -\frac{4}{3}, -1$$

Jika digambar pada garis bilangan :



$$\text{Hp} = (-4/3, -1)$$

Contoh 3

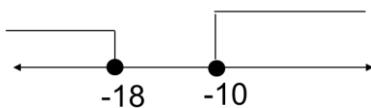
$$\left| \frac{x}{2} + 7 \right| \geq 2$$

$$\Leftrightarrow \frac{x}{2} + 7 \geq 2 \quad \text{atau} \quad \frac{x}{2} + 7 \leq -2$$

$$\Leftrightarrow \frac{x}{2} \geq -5 \quad \text{atau} \quad \frac{x}{2} \leq -9$$

$$\Leftrightarrow x \geq -10 \quad \text{atau} \quad x \leq -18$$

$$\text{Hp} = [-10, \infty) \cup (-\infty, -18]$$



Latihan 1

Carilah himpunan penyelesaian dari:

1.  $-8 \leq 5x - 3 < 12$
2.  $14 > 2 - 3x \geq 3$
3.  $3x^2 - 14x - 5 \geq 0$
4.  $x + 5 \leq 5x - 3 < 2x + 12$
5.  $\frac{2}{x+2} \geq \frac{1}{2x-1}$
6.  $\left| \frac{x+2}{5} \right| < 3$
7.  $|3x + 5| \geq 2$
8.  $|2x - 3| \leq |2x + 12|$