

Aljabar I

Persamaan – persamaan Umum dalam OSNK

variable

$$\underline{ax} + \underline{c} \rightarrow \text{konstanta} = \text{bilangan}$$

koeffisien = bilangan

3x + 2 → Ekspressi Aljabar

3x Variables
2 konstanta
koeffisien

* Persamaan

• Linier ✓

1 var
2 var

$$\left\{ \begin{array}{l} 3x = 5 \\ 2y = 5 \end{array} \right.$$

2 var
x & y

• Kuadrat ✓
 $\rightarrow 3x^2 = 72$

• Polinomial → Variable PK tertinggi = 2
 $\rightarrow x^{2021} + y^{2023}$

• Rasional → $\sqrt{x} + y = 5$

$$\frac{x}{y} = 5$$

Polinomial \rightarrow $x^{\frac{2024}{>2}} - y^{\frac{2023}{>2}}$

Poinom = banyak

* Mengelaskan Pers

$$3x = 5 \rightarrow 3 \cancel{x} = 5$$

Pindah mas

$\leftarrow \rightarrow \div$

$$x = 5 \div 3$$

$$x = \frac{5}{3}$$

Pindah mas

$+$	\rightarrow	$-$
$-$	\rightarrow	$+$
$*$	\rightarrow	\div
\div	\rightarrow	$*$

$$3x - 2 = 5$$

$$3x = 5 + 2$$

$$3x = 7 \rightarrow x = \frac{7}{3}$$

Sifat operasi hitung

•> Komutatif \rightarrow permutasi

$$5x = 5 \rightarrow 5 = 5x$$

•> Asosiatif \rightarrow pengelompokan

$$5x + 2 + 5 = 5x + (2 + 5)$$

$$5x + x + 5 = (5x + x) + 5$$

•) Distribusi f → Penyataan

$$a(b+c) = ab + ac$$

$$\frac{b}{a}x + \frac{c}{a}x = ba + ca$$

$$5x + 2x = x(5+2)$$

$$= x(7)$$

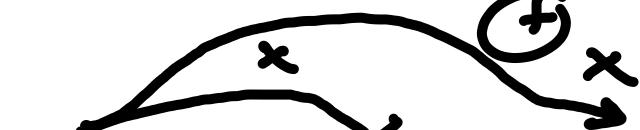
$$= 7x$$



$$3(2x + 5)$$

$$= 3 \cdot 2x + 3 \cdot 5$$

$$= 6x + 15$$



$$3x(2x + 5)$$

$$= 6x^2 + 15x$$

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

$$(x - 1)(x + 1)$$

$$\begin{aligned}
 &= (6x^2 + 3x) - 2x - 1 \\
 &= 6x^2 + 3x - 2x - 1 \\
 &= 6x^2 + x - 1 \\
 &= x^2 + x - x - 1 \\
 &= x^2 - 1
 \end{aligned}$$

* Eksponensial

$$\begin{aligned}
 3x \cdot x &= 3 \cdot x \cdot x \\
 &= 3 \cdot x^2 \\
 (3 \cdot x)^2 &= 3^2 \cdot x^2 \\
 &= 9x^2
 \end{aligned}$$

$$\begin{aligned}
 (x+1)^2 &= (x+1)(x+1) \\
 &= x^2 + 2x + 1
 \end{aligned}$$

* Menyelesaikan SPLDV

$$\begin{aligned} 3\underline{x} + 2\underline{y} &= 7 \\ \underline{y} - 2x &= 0 \end{aligned}$$

(1) cara substitusi

salah satu \rightarrow SPLTV $\rightarrow x = \dots / y = \dots$

salah dua \rightarrow SPLTV $\rightarrow x = \dots, y = \dots / y = \dots$

salah tiga \rightarrow SPLTV
x y

$$\begin{aligned} 3x + 2y &= 7 \\ y - 2x &= 0 \end{aligned}$$

$$\underline{y = 2x} \rightarrow 3x + 2y = 7$$

$$3x + 2(2x) = 7$$

$$3x + 4x = 7$$

$$7x = 7 \rightarrow \boxed{x = 1} \rightarrow y = 2x$$

$$\begin{aligned}y &= 2(1) \\&= 2\end{aligned}$$

(2) cara Eliminasi:

$$\begin{array}{l} \boxed{1x} + y = 9 \\ \boxed{2x} + 3y = 11 \end{array}$$

↓

supaya $x + y = 9 \rightarrow 2x$ | $\times 2$
 $2x + 3y = 11 \rightarrow 2x$ | $\times 1$

↓

$$\begin{array}{l} \boxed{2x + 2y = 8} \\ \boxed{2x + 3y = 11} \end{array}$$

kalau tanda beda
(+)
kalau tanda sama
(-)

↓ -

$$0 + y = +3$$

$$y = 3$$

$$y = 3 \rightarrow x + y = 4$$

$$\begin{aligned} x + 3 &= 1 \\ x &= 4 - 3 \\ &= 1 \end{aligned}$$

* Perbandingan Persamaan

$$\frac{a}{b} = \frac{c}{d} \rightarrow a \cdot d = b \cdot c$$

$$\frac{ad}{c} = b$$

$$a = \frac{bc}{d}$$

$$\frac{3x}{2} = \frac{2}{5} \rightarrow x = \dots ?$$

$15x = 4$

$x = \frac{4}{15}$

* cancellation

$$\frac{\cancel{ax}}{\cancel{bx}} \left\{ \frac{x}{x} \right\} = 1 \rightarrow \frac{a}{b}$$

$$\frac{2x + 2 \cdot 1}{-(x+1)} = \frac{2 \cdot (x+1)}{- \cdot (x+1)} = -2$$

$$a(b+c) = ab + ac$$

$2 \cdot x + 2 \cdot 1 \rightarrow 2(x+1)$

$$\cancel{6x} = \cancel{6x}$$

$\cancel{x} = x$

$$\frac{\cancel{6x}}{3} = \frac{3y}{3}$$

$$2x = y$$

$$6x^2 = x$$

$$6x \cdot \cancel{x} = \cancel{x}$$



$$6x = 1$$

$$x = 1/6$$

$$\begin{array}{r} \cancel{x+1} \\ - \\ \hline \end{array} = \frac{1}{-1} = -1$$

(Sarah)

$$\begin{array}{r} \cancel{6x+2} \\ - \\ \hline 3x+2 \end{array} = \frac{2y}{y}$$

(Sarah)

* Kthusus

$$* (a+b)(a-b) = a^2 - b^2$$

$$\begin{aligned}2024^2 - 1000^2 &= (2024 + 1000)(2024 - 1000) \\&= (3024)(1024)\end{aligned}$$

$$(x+1)(x-1) = x^2 - 1^2$$

$$* (a+b)^2 = a^2 + b^2 + 2ab$$

$$\begin{aligned}(x+1)^2 &= (x+1)(x+1) \text{ career} \\&= x^2 + 1^2 + 2 \cdot x \cdot 1 \\&= x^2 + 1 + 2x\end{aligned}$$

$$\star (a - b)^2 = a^2 + b^2 - 2ab$$

Persamaan

- ① Tanda Sama dengan " $=$ "
- ② Bisa dinyatakan dalam bentuk lain

Ex:

$$17 \textcolor{blue}{=} 2 \cdot \textcolor{red}{8} + 1 \rightarrow \underline{\text{Persamaan}}$$

$$17 \textcolor{blue}{=} 2 \times \textcolor{red}{x} + 1$$

$$17 \textcolor{blue}{=} 2x + 1$$

$$17 - 1 \textcolor{blue}{=} 2x$$

$$\begin{aligned} 16 &\textcolor{blue}{=} 2x \\ 2x &\textcolor{blue}{=} 16 \\ x &\textcolor{blue}{=} 8 \\ &= \frac{16}{2} \\ &= 8 \end{aligned}$$

$$\begin{aligned}
 2x - 1 &= 3 \\
 2x &= 3 + 1 \\
 2x &= 4 \\
 x &= \underline{\underline{2}}
 \end{aligned}$$

$a^2 - 2^2$ (bukan persamaan)

Karena tidak ada " $=$ "

$$a^2 - 2^2 = 0 \quad \text{garis}$$

$$a^2 - 2^2 \rightarrow a^2 = 2^2$$

Karena tidak ada soal

$$a^2 - b^2 = (a+b)(a-b)$$

$$(a+b)^2 = a^2 + b^2 + 2ab$$

$$(a-b)^2 = a^2 + b^2 - 2ab$$

1. Jika $4x^4 - 16x^2 + 16 = 25$ tentukan nilai x yang memenuhi!

$$4x^4 - 16x^2 + 16 = 25$$

$$4x^4 - 16x^2 = 25 - 16$$

$$4x^4 - 16x^2$$

linear
kuadrat
Polinomial

$$4x^4 - 16x^2 + 16$$

$$(2x^2)^2 - 2 \cdot 2 \cdot 4x^2 + 4^2$$

$$(a - b)^2 = a^2 + b^2 - 2ab$$

$$\frac{(2x^2)^2 + 4^2}{a = 4, b = 2x^2} - 2 \cdot 2 \cdot 4x^2$$

~~$$3^2 \cdot 3^5 = 3^7$$~~
~~$$2^2 \cdot 3^5 = (2 \cdot 3)^{2+5}$$~~

$a^x \cdot a^y = a^{x+y}$ (benar)

~~$$a^x \cdot b^y = ab^{x+y}$$
 (salah)~~

$$(a^b)^c = a^{b \cdot c}$$

~~$$(2x^2)^2 = 2^2 \cdot x^{2 \cdot 2}$$
 (salah)~~

$$2^2 \cdot x^{2 \cdot 2} = 4x^4$$
 (benar)

2. Diberikan persamaan

$$(p+5)^2 - (p+3)^2 = 27$$

Tentukan nilai p yang memenuhi!

$$a^2 - b^2 = \\ (p+5)^2 - (p+3)^2 = 27$$

$$a = p+5, b = p+3$$

$$(p+5 + p+3) ((p+5) - (p+3)) = 27$$

$$(2p+8) (p+5 - p-3) = 27$$

$$- (p+3) = -p-3$$

$$(2p+8) (5-3) = 27$$

$$(a-b)^2 = (4-2x)^2 \\ (4-2x)^2 = 25 \\ (4-2x)x = 5x \\ 4-2x = 5$$

$$4-5 = 2x$$

$$2x = -1$$

$$x = -1/2$$

$$\{(2p+8)(2) = 27$$

$$4p+16 = 27$$

$$= 27 - 16$$

$$4p = 11 \rightarrow p = 11/4$$

3. Diberikan bilangan bulat positif x yang tidak lebih besar dari 10 dan y merupakan faktor prima terkecil dari x . Berapakah nilai $x^2 + y^2$ paling besar?

$$X = \{1, 2, 3, 4, \dots, 10\}$$

$$y = 2$$

$$\downarrow x^2 + y^2 \text{ Paling Besar} \rightarrow 10^2 + 2^2 = 109$$

Punya Faktor prima 2

Jika

$$a = \frac{\frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \dots + \frac{1}{2024}}{1 + \frac{2}{3} + \frac{1}{2} + \dots + \frac{1}{1012}}$$

$$\alpha = \frac{\frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \dots + \frac{1}{2024}}{1 + \frac{2}{3} + \frac{1}{2} + \dots + \frac{1}{1012}}$$

$$a = \frac{\frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \dots + \frac{1}{2024}}{1 + \frac{2}{3} + \frac{1}{2} + \dots + \frac{1}{1012}}$$

$$2 \cdot \frac{\frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \dots + \frac{1}{2024}}{2024}$$

$$a = \frac{\left(\frac{1}{2} + \frac{1}{3} + \dots + \frac{1}{2024} \right)}{2 \left(\frac{1}{2} + \frac{1}{3} + \dots + \frac{1}{2024} \right)}$$

$$a = \frac{1}{2} \rightarrow 3a = 3 \cdot \frac{1}{2} \\ = \frac{3}{2} \quad \checkmark$$

Jika $(p^2 - 1)x + 2y - 3 = 2x + ky - 3$ maka nilai minimum dari $p - k$ adalah

...

$$\underline{(p^2 - 1)x + 2y - 3} \quad \underline{= 2x + ky - 3}$$

① Sejajarkan mas kiri dan kanan

② Sejajarkan tanda (+, -) ~~$2x - 3 = 3x - 5$~~

③ Sejajarkan variabelnya

$$(p^2 - 1)x + 2y - 3 = 2x + ky - 3$$

$$ky = 2x$$

$$k = 2$$

$$p - k = -\sqrt{3} - 2 = -(\sqrt{3} + 2)$$

$$p^2 - 1 = 2$$

$$p^2$$

$$p^2$$

$$= 2 + 1$$

$$= 3$$

$$p = \sqrt{3}$$

$$\text{atau } p = -\sqrt{3}$$

OSK Math SMP 2023

Perhatikan persamaan berikut ini!

$$A = \frac{(p^2 + q^2 + r^2)^2}{p^2q^2 + q^2r^2 + r^2p^2}$$

$$B = \frac{(q^2 - pr)}{(p^2 + q^2 + r^2)}$$

Jika $p + q + r = 0$ tentukan $A^2 - 4B$

$$x^2 = \square \quad \left. \begin{array}{l} x = \sqrt{\square} \\ x = -\sqrt{\square} \end{array} \right\}$$

$$(-\sqrt{3})^2 = 3$$

$$-\sqrt{3} \cdot -\sqrt{3} = +3$$

$$(\sqrt{3})^2 = 3$$

$$\sqrt{9} = \cancel{-3} \text{ atau } \cancel{3}$$

Jika a, b, c, d bilangan-bilangan asli sehingga

$$a^5 = b^4, c^3 = d^2, \text{ dan } c - a = 19$$

maka nilai dari $d - b$ adalah

Misalkan bilangan pecahan $\frac{27}{5}$ dapat dinyatakan sebagai

$$\frac{27}{5} = A + \frac{1}{B + \frac{1}{C+1}}$$

dengan A, B, C adalah bilangan bulat. Nilai $A \times B \times C$ adalah....

- A. 9
B. 10
C. 15
D. 20

~~100~~

$$A + \frac{1}{x} = \frac{Ax + 1}{x} = \frac{27}{5} \rightarrow Ax + 1 = 27$$

$$5 + \frac{1}{2} = \frac{3 \cdot 2}{2} + \frac{1}{2} = \frac{7}{2}$$

$$Ax = 26$$
$$5 \cdot \frac{26}{5} = 26$$

$$\frac{27}{5} = 5 + \frac{1}{\frac{26}{5}} = 5 + \frac{1}{5 + \frac{1}{y}} \quad)$$

$$\frac{27}{5} = 5 + \frac{1}{\frac{26}{5}} \quad \frac{27}{5} = A + \frac{1}{B + \frac{1}{C+1}}$$

$$= \frac{5^A}{5^B} + \frac{1}{5^{C+1}} \rightarrow A + \frac{1}{B + \frac{1}{C+1}}$$

$$C+1 = 5 \rightarrow C = 4$$

$$\begin{aligned} A * B * C &= 5 \cdot 5 \cdot 4 \\ &= 100 \\ &= \underline{\underline{100}} \end{aligned}$$

Jika a, b, c, d adalah bilangan bulat positif berbeda sehingga $abcd = 2020$

maka nilai terkecil yang mungkin dari $\frac{a+b}{c+d}$ adalah ...

OSK Math SMP 2020

Bilangan $\frac{b}{a}$ terbesar dengan a, b positif sedemikian sehingga $\frac{5}{a} + 20b$ merupakan bilangan kuadrat sempurna yang kurang dari 2020 adalah ...