

# Lembar Kerja Peserta Didik (LKPD)

## Topik: Operasi Vektor di R<sup>2</sup>

Nama : .....

Kelas : .....

No Absen : .....

### Operasi Vektor di R<sup>2</sup>

- Penjumlahan vektor
  - a. Jika tidak diketahui sudut antara dua vektor, maka operasi penjumlahan vektor seperti operasi penjumlahan matriks.
  - b. Jika diketahui sudut antara dua vektor:
$$\vec{a} + \vec{b} = \sqrt{|\vec{a}|^2 + |\vec{b}|^2 + 2|\vec{a}||\vec{b}| \cos \alpha}$$
- Pengurangan vektor
  - a. Jika tidak diketahui sudut antara dua vektor, maka operasi pengurangan vektor seperti operasi pengurangan matriks.
  - b. Jika diketahui sudut antara dua vektor:
$$\vec{a} - \vec{b} = \sqrt{|\vec{a}|^2 + |\vec{b}|^2 - 2|\vec{a}||\vec{b}| \cos(180^\circ - \alpha)}$$
- Perkalian vektor
  - a. Jika tidak diketahui sudut antara dua vektor:  $\vec{a} \cdot \vec{b} = a_1 b_1 + a_2 b_2$
  - b. Jika diketahui sudut antara dua vektor:  $\vec{a} \cdot \vec{b} = |\vec{a}||\vec{b}| \cos \alpha$
- Sudut antara dua vektor:  $\cos \alpha = \frac{\vec{a} \cdot \vec{b}}{|\vec{a}||\vec{b}|}$

**Latihan:** Selesaikan soal berikut

Diketahui  $\vec{a} = \begin{pmatrix} 6 \\ 4 \end{pmatrix}$ ,  $\vec{b} = \begin{pmatrix} -8 \\ 2 \end{pmatrix}$ ,  $\vec{c} = \begin{pmatrix} 10 \\ -9 \end{pmatrix}$  dan  $\vec{d} = \begin{pmatrix} -16 \\ -3 \end{pmatrix}$ .

1. Tentukan  $5\vec{a} + 2\vec{b} - 3\vec{c} - \vec{d}$
2. Tentukan penjumlahan vektor  $\vec{a}$  dan  $\vec{b}$  jika besar sudut antara kedua vektor tersebut adalah  $60^\circ$ .
3. Tentukan pengurangan vektor  $\vec{c}$  dan  $\vec{d}$  jika besar sudut antara kedua vektor tersebut adalah  $60^\circ$ .
4. Tentukan perkalian vektor  $\vec{a}$  dan  $\vec{c}$
5. Tentukan perkalian antara vektor  $\vec{b}$  dan  $\vec{c}$  jika besar sudut antara kedua vektor tersebut adalah  $60^\circ$ .
6. Tentukan besar sudut yang terbentuk antara vektor  $\vec{a}$  dan  $\vec{c}$

**Jawab:**

| No | Penyelesaian                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | <p>Diketahui <math>\vec{a} = \begin{pmatrix} 6 \\ 4 \end{pmatrix}</math>, <math>\vec{b} = \begin{pmatrix} -8 \\ 2 \end{pmatrix}</math>, <math>\vec{c} = \begin{pmatrix} 10 \\ -9 \end{pmatrix}</math> dan <math>\vec{d} = \begin{pmatrix} -16 \\ -3 \end{pmatrix}</math>.</p> $5\vec{a} + 2\vec{b} - 3\vec{c} - \vec{d} = 5(\dots\dots) + 2(\dots\dots) - 3(\dots\dots) - (\dots\dots)$ $= (\dots\dots) + (\dots\dots) - (\dots\dots) - (\dots\dots)$ $= (\dots\dots)$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 2  | <p>Diketahui <math>\vec{a} = \begin{pmatrix} 6 \\ 4 \end{pmatrix}</math>, <math>\vec{b} = \begin{pmatrix} -8 \\ 2 \end{pmatrix}</math> dan <math>\alpha = 60^\circ \rightarrow a_1 = \dots\dots, a_2 = \dots\dots, b_1 = \dots\dots, b_2 = \dots\dots</math></p> $ \vec{a}  = \sqrt{a_1^2 + a_2^2} = \sqrt{\dots\dots^2 + \dots\dots^2} = \sqrt{\dots\dots + \dots\dots} = \sqrt{\dots\dots}$ $ \vec{b}  = \sqrt{b_1^2 + b_2^2} = \sqrt{\dots\dots^2 + \dots\dots^2} = \sqrt{\dots\dots + \dots\dots} = \sqrt{\dots\dots}$ $\vec{a} + \vec{b} = \sqrt{ \vec{a} ^2 +  \vec{b} ^2 - 2 \vec{a}  \vec{b} \cos\alpha}$ $= \sqrt{(\sqrt{\dots\dots})^2 + (\sqrt{\dots\dots})^2 + 2(\sqrt{\dots\dots})(\sqrt{\dots\dots})\cos\dots\dots^\circ}$ $= \sqrt{\dots\dots + \dots\dots + 2(\sqrt{\dots\dots})x(\dots\dots)}$ $= \sqrt{\dots\dots + \sqrt{\dots\dots}}$ $= \sqrt{\dots\dots + \sqrt{\dots\dots x \dots\dots}}$ $= \sqrt{\dots\dots + \dots\dots \sqrt{\dots\dots}}$ <p>Jadi, <math>\vec{a} + \vec{b} = \sqrt{\dots\dots + \dots\dots \sqrt{\dots\dots}}</math></p> |
| 3  | <p>Diketahui <math>\vec{c} = \begin{pmatrix} 10 \\ -9 \end{pmatrix}</math>, <math>\vec{d} = \begin{pmatrix} -16 \\ -3 \end{pmatrix}</math> dan <math>\alpha = 60^\circ \rightarrow c_1 = \dots\dots, c_2 = \dots\dots, d_1 = \dots\dots, d_2 = \dots\dots</math></p> $ \vec{c}  = \sqrt{c_1^2 + c_2^2} = \sqrt{\dots\dots^2 + \dots\dots^2} = \sqrt{\dots\dots + \dots\dots} = \sqrt{\dots\dots}$ $ \vec{d}  = \sqrt{d_1^2 + d_2^2} = \sqrt{\dots\dots^2 + \dots\dots^2} = \sqrt{\dots\dots + \dots\dots} = \sqrt{\dots\dots}$ $\vec{c} + \vec{d} = \sqrt{ \vec{c} ^2 +  \vec{d} ^2 - 2 \vec{c}  \vec{d} \cos(180 - \alpha)}$ $= \sqrt{(\sqrt{\dots\dots})^2 + (\sqrt{\dots\dots})^2 - 2(\sqrt{\dots\dots})(\sqrt{\dots\dots})\cos(180 - \dots\dots)}$                                                                                                                                                                                                                                                                                                               |

$$= \sqrt{\dots\dots + \dots\dots - 2(\sqrt{\dots\dots}) \cos \dots\dots}$$

$$= \sqrt{\dots\dots + \dots\dots - 2(\sqrt{\dots\dots})x(-)}$$

$$= \sqrt{\dots\dots + \sqrt{\dots\dots}}$$

Jadi,  $\vec{c} - \vec{d} = \sqrt{\dots\dots + \sqrt{\dots\dots}}$

- 4 Diketahui  $\vec{a} = \begin{pmatrix} 6 \\ 4 \end{pmatrix}$  dan  $\vec{c} = \begin{pmatrix} 10 \\ -9 \end{pmatrix} \rightarrow a_1 = \dots\dots, a_2 = \dots\dots, c_1 = \dots\dots, c_2 = \dots\dots$
- $\vec{a} \cdot \vec{c} = a_1 c_1 + a_2 c_2 = (\dots\dots)(\dots\dots) + (\dots\dots)(\dots\dots) = \dots\dots + \dots\dots = \dots\dots$
- Jadi,  $\vec{a} \cdot \vec{c} = \dots\dots$

- 5 Diketahui  $\vec{b} = \begin{pmatrix} -8 \\ 2 \end{pmatrix}, \vec{c} = \begin{pmatrix} 10 \\ -9 \end{pmatrix}$  dan  $\alpha = 60^\circ \rightarrow b_1 = \dots\dots, b_2 = \dots\dots, c_1 = \dots\dots, c_2 = \dots\dots$
- $|\vec{b}| = \sqrt{b_1^2 + b_2^2} = \sqrt{\dots\dots^2 + \dots\dots^2} = \sqrt{\dots\dots + \dots\dots} = \sqrt{\dots\dots}$
- $|\vec{c}| = \sqrt{c_1^2 + c_2^2} = \sqrt{\dots\dots^2 + \dots\dots^2} = \sqrt{\dots\dots + \dots\dots} = \sqrt{\dots\dots}$
- $\vec{a} \cdot \vec{b} = |\vec{a}| |\vec{b}| \cos \alpha = (\sqrt{\dots\dots})(\sqrt{\dots\dots}) \cos \dots\dots$
- $$= (\sqrt{\dots\dots}) \left( \frac{\dots\dots}{\dots\dots} \right)$$
- $$= (\sqrt{\dots\dots} \times \dots\dots) \left( \frac{\dots\dots}{\dots\dots} \right)$$
- $$= \dots\dots \sqrt{\dots\dots} \left( \frac{\dots\dots}{\dots\dots} \right)$$
- $$= \sqrt{\dots\dots}$$
- Jadi,  $\vec{a} \cdot \vec{b} = \sqrt{\dots\dots}$

- 6 Diketahui  $\vec{a} = \begin{pmatrix} 6 \\ 4 \end{pmatrix}$  dan  $\vec{c} = \begin{pmatrix} 10 \\ -9 \end{pmatrix} \rightarrow a_1 = \dots\dots, a_2 = \dots\dots, c_1 = \dots\dots, c_2 = \dots\dots$
- $|\vec{a}| = \sqrt{a_1^2 + a_2^2} = \sqrt{\dots\dots^2 + \dots\dots^2} = \sqrt{\dots\dots + \dots\dots} = \sqrt{\dots\dots}$
- $|\vec{c}| = \sqrt{c_1^2 + c_2^2} = \sqrt{\dots\dots^2 + \dots\dots^2} = \sqrt{\dots\dots + \dots\dots} = \sqrt{\dots\dots}$

$$\vec{a} \cdot \vec{c} = a_1 c_1 + a_2 c_2 = (\dots)(\dots) + (\dots)(\dots) = \dots + \dots = \dots$$

$$\cos \alpha = \frac{\vec{a} \cdot \vec{c}}{|\vec{a}| |\vec{c}|} = \frac{\dots}{(\sqrt{\dots})(\sqrt{\dots})} = \frac{\dots}{\sqrt{\dots}} = \dots$$

$$\alpha = \arccos \dots = \dots^\circ$$

Jadi, besar sudut antara vektor  $\vec{a}$  dan  $\vec{c}$  adalah  $\dots^\circ$