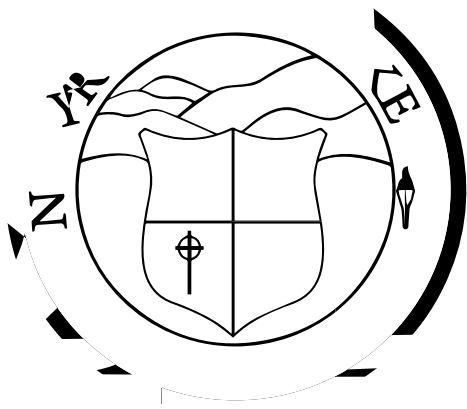


1 2 3 4 5 6 7 8 9 10 11 12



0 1 2 3 4 5 6 7 8 9 10 11 12

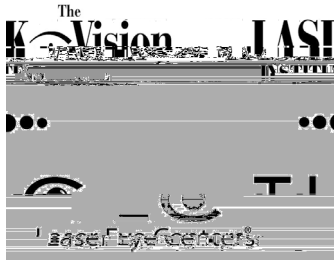
B

2025年1月1日

$\vec{a} = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}$
 Länge $|\vec{a}| = \sqrt{1^2 + 2^2 + 3^2} = \sqrt{14}$
 $\vec{b} = \begin{pmatrix} 2 \\ 1 \\ 1 \end{pmatrix}$
 Länge $|\vec{b}| = \sqrt{2^2 + 1^2 + 1^2} = \sqrt{6}$
 $\vec{c} = \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$
 Länge $|\vec{c}| = \sqrt{1^2 + 1^2 + 1^2} = \sqrt{3}$
 $\vec{a} \cdot \vec{b} = 1 \cdot 2 + 2 \cdot 1 + 3 \cdot 1 = 8$
 $\vec{a} \cdot \vec{c} = 1 \cdot 1 + 2 \cdot 1 + 3 \cdot 1 = 6$
 $\vec{b} \cdot \vec{c} = 2 \cdot 1 + 1 \cdot 1 + 1 \cdot 1 = 4$
 $\cos \alpha = \frac{\vec{a} \cdot \vec{b}}{|\vec{a}| |\vec{b}|} = \frac{8}{\sqrt{14} \sqrt{6}} = \frac{4}{\sqrt{21}}$
 $\cos \beta = \frac{\vec{a} \cdot \vec{c}}{|\vec{a}| |\vec{c}|} = \frac{6}{\sqrt{14} \sqrt{3}} = \frac{2}{\sqrt{7}}$
 $\cos \gamma = \frac{\vec{b} \cdot \vec{c}}{|\vec{b}| |\vec{c}|} = \frac{4}{\sqrt{6} \sqrt{3}} = \frac{2}{\sqrt{3}}$
 $\alpha = \arccos\left(\frac{4}{\sqrt{21}}\right)$
 $\beta = \arccos\left(\frac{2}{\sqrt{7}}\right)$
 $\gamma = \arccos\left(\frac{2}{\sqrt{3}}\right)$

$\vec{a} = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}$
 $\vec{b} = \begin{pmatrix} 2 \\ 1 \\ 1 \end{pmatrix}$
 $\vec{c} = \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$
 $\vec{a} \cdot \vec{b} = 8$
 $\vec{a} \cdot \vec{c} = 6$
 $\vec{b} \cdot \vec{c} = 4$
 $|\vec{a}| = \sqrt{14}$
 $|\vec{b}| = \sqrt{6}$
 $|\vec{c}| = \sqrt{3}$
 $\cos \alpha = \frac{8}{\sqrt{14} \sqrt{6}} = \frac{4}{\sqrt{21}}$
 $\cos \beta = \frac{6}{\sqrt{14} \sqrt{3}} = \frac{2}{\sqrt{7}}$
 $\cos \gamma = \frac{4}{\sqrt{6} \sqrt{3}} = \frac{2}{\sqrt{3}}$
 $\alpha = \arccos\left(\frac{4}{\sqrt{21}}\right)$
 $\beta = \arccos\left(\frac{2}{\sqrt{7}}\right)$
 $\gamma = \arccos\left(\frac{2}{\sqrt{3}}\right)$

1. 2. 3. 4. 5. 6. 7. 8. 9. 10.



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