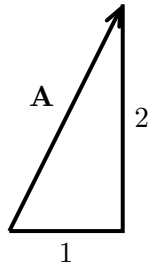


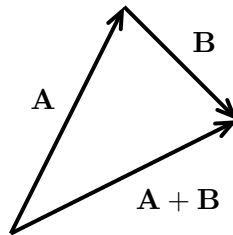
Vector lengths

1. Let $\mathbf{A} = \langle 1, 2 \rangle$, $\mathbf{B} = \langle 1, -1 \rangle$ and $\mathbf{C} = \mathbf{i} + 2\mathbf{j} + 3\mathbf{k}$. Find the lengths of \mathbf{A} , $\mathbf{A} + \mathbf{B}$ and \mathbf{C} .

Answer: Length is just an expression of the Pythagorean theorem. The picture below shows $|\mathbf{A}| = \sqrt{1^2 + 2^2} = \sqrt{5}$



Likewise $\mathbf{A} + \mathbf{B} = \langle 2, 1 \rangle \Rightarrow |\mathbf{A} + \mathbf{B}| = \sqrt{5}$. Perhaps, it's surprising that \mathbf{A} and $\mathbf{A} + \mathbf{B}$ can have the same length.



\mathbf{C} is a vector in space, but the length is computed the same way, except there are 3 terms under the radical sign.

$$|\mathbf{C}| = \sqrt{1^2 + 2^2 + 3^2} = \sqrt{14}.$$

$$\begin{aligned} \mathbf{C} &= \vec{i} + 2\vec{j} + 3\vec{k} \\ &= (\vec{i} + 2\vec{j}) + 3\vec{k} \\ |\mathbf{C}| &= \sqrt{(\sqrt{1^2 + 2^2})^2 + 3^2} \\ &= \sqrt{1^2 + 2^2 + 3^2} \end{aligned}$$

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