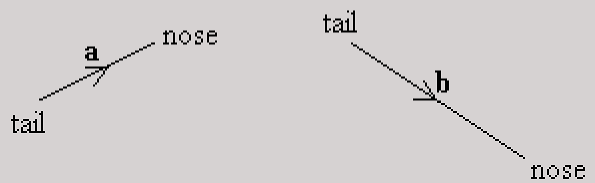
"Nose-to-Tail" Method

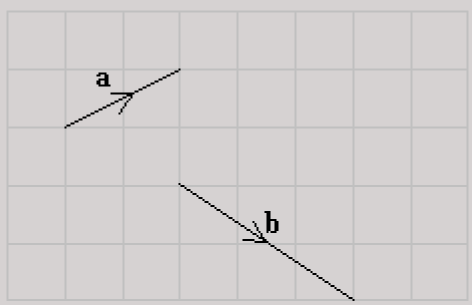
Vectors can be added using the 'nose-to-tail' method or "head-to-tail" method.

Two vectors **a** and **b** represented by the line segments can be added by joining the 'tail' of vector **b** to the 'nose' of vector **a**. Alternatively, the 'tail' of vector **a** can be joined to the 'nose' of vector **b**.



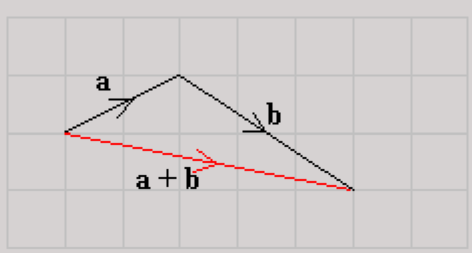
Example:

Find the sum of the two given vectors **a** and **b**.



Solution:

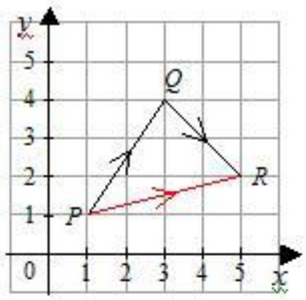
Draw the vector **a**. Draw the 'tail' of vector **b** joined to the 'nose' of vector **a.** The vector **a** + **b** is from the 'tail' of **a** to the 'nose' of **b**.



Example:

Given that $\overrightarrow{PQ} = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$ and $\overrightarrow{QR} = \begin{pmatrix} 2 \\ -2 \end{pmatrix}$, find the sum of the vectors.

Solution:



The sum of vectors $\overrightarrow{PQ}$ and $\overrightarrow{QR}$ is the same as the vector $\overrightarrow{PR}$ i.e. $\overrightarrow{PQ} + \overrightarrow{QR} = \overrightarrow{PR}$.
In column vector form, we add the corresponding components of the vectors $\overrightarrow{PQ} + \overrightarrow{QR} = \begin{pmatrix} 2 \\ 3 \end{pmatrix} + \begin{pmatrix} 2 \\ -2 \end{pmatrix} = \begin{pmatrix} 4 \\ 1 \end{pmatrix} = \overrightarrow{PR}$

Triangle Law of Vector Addition

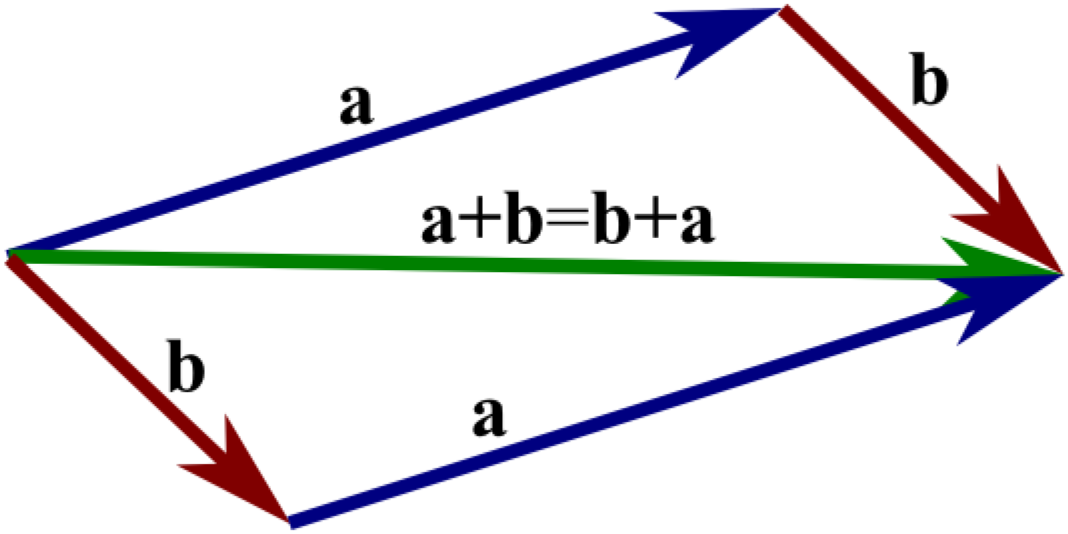
In vector addition, the intermediate letters must be the same. Since *PQR* forms a triangle, the rule is also called the triangle law of vector addition.

$\overrightarrow{PQ} + \overrightarrow{QR} = \overrightarrow{PR}$

In vector addition, the intermediate letters must be the same

Graphically we add vectors with a "head to tail" approach.

Image: The parallelogram law, or commutative law, of vector addition



The parallelogram demonstrates that one obtains the same vector by adding **a**+**b** or by adding **b**+**a**. The sum **a**+**b** is formed by putting the tail of **b** at the head of **a** and creating the vector from the tail of **a** to the head of **b**. The sum **b**+**a** is formed by putting the tail of **b** at the head of **a** and creating the vector from the tail of **b** to the head of **a**. The parallelogram shows that both of these vectors are the same diagonal of the parallelogram.