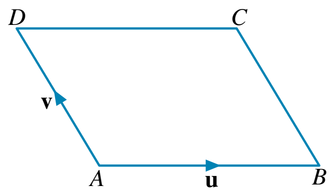
Chapter 4 Vectors In Two Dimensions

Class Activity 1

1.



In the diagram, $ABCD$ is a parallelogram. Let $\overrightarrow{AB} = \mathbf{u}$ and $\overrightarrow{AD} = \mathbf{v}$.

(a) Express each of the following as a single vector.

(i) $\overrightarrow{AB} + \overrightarrow{BC}$

$$\begin{aligned}\overrightarrow{AB} + \overrightarrow{BC} &= \overrightarrow{AB} + \overrightarrow{AD}\\ &= \overrightarrow{AC}\end{aligned}$$

(ii) $\overrightarrow{AD} + \overrightarrow{DC}$

$$\begin{aligned}\overrightarrow{AD} + \overrightarrow{DC} &= \overrightarrow{AD} + \overrightarrow{AB}\\ &= \overrightarrow{AC}\end{aligned}$$

(b) Express the following in terms of **u** and **v**.

(i) $\overrightarrow{AB} + \overrightarrow{BC}$

$$\begin{aligned}\overrightarrow{AB} + \overrightarrow{BC} &= \overrightarrow{AB} + \overrightarrow{AD}\\ &= \mathbf{u} + \mathbf{v}\end{aligned}$$

(ii) $\overrightarrow{AD} + \overrightarrow{DC}$

$$\begin{aligned}\overrightarrow{AD} + \overrightarrow{DC} &= \overrightarrow{AD} + \overrightarrow{AB}\\ &= \mathbf{v} + \mathbf{u}\end{aligned}$$

(c) What is the relationship between $\mathbf{u} + \mathbf{v}$ and $\mathbf{v} + \mathbf{u}$?

As $\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AD} + \overrightarrow{DC} = \overrightarrow{AC}$, we have $\mathbf{u} + \mathbf{v} = \mathbf{v} + \mathbf{u}$.
i.e. addition of vectors satisfies the commutative law.

2.

The diagram shows two straight lines ABC and PQR with $AB = QR$ and $BC = PQ$.

(a) Express each of the following as a single vector.

(i) $\overrightarrow{AB} + \overrightarrow{BC}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

(ii) $\overrightarrow{PQ} + \overrightarrow{QR}$

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

(b) Does the triangle law of vector addition hold in each of the above cases?

Yes, the triangle law of vector addition holds.