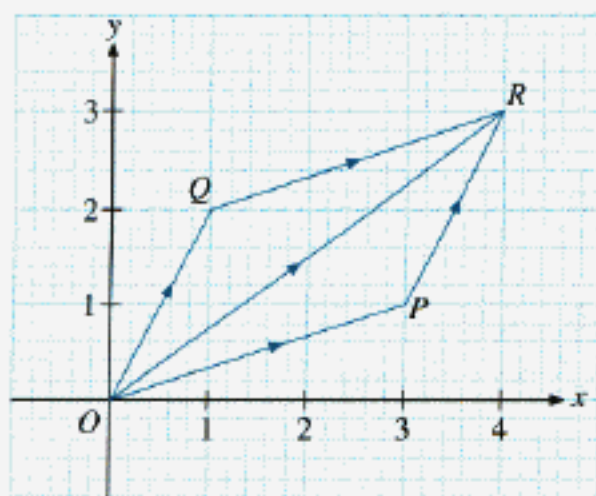


2.2 POSITION VECTORS AND COLUMN VECTORS

Examples

(a)



Consider the vectors \vec{OP} , \vec{OQ} , \vec{OR} , \vec{PR} and \vec{QR} . The first three vectors which have their initial points at the origin are said to be in the standard position. Such vectors are referred to as **position vectors**. The other two (\vec{PR} and \vec{QR}) are not position vectors. The terminal points of the position vectors \vec{OP} , \vec{OQ} and \vec{OR} are (3, 1), (1, 2) and (4, 3) respectively.

These position vectors can be expressed in terms of column vectors as follows:

$$\vec{OP} = \begin{pmatrix} 3 \\ 1 \end{pmatrix}, \quad \vec{OQ} = \begin{pmatrix} 1 \\ 2 \end{pmatrix}, \quad \vec{OR} = \begin{pmatrix} 4 \\ 3 \end{pmatrix}$$

From the figure, we see that $\vec{OP} + \vec{PR} = \vec{OR}$.

But $\vec{PR} = \vec{OQ}$.

Thus $\vec{OP} + \vec{OQ} = \vec{OR}$.

In terms of column vectors, we have $\begin{pmatrix} 3 \\ 1 \end{pmatrix} + \begin{pmatrix} 1 \\ 2 \end{pmatrix} = \begin{pmatrix} 4 \\ 3 \end{pmatrix}$.

Notice that $\begin{pmatrix} 4 \\ 3 \end{pmatrix}$ can also be obtained by adding the corresponding components

of $\begin{pmatrix} 3 \\ 1 \end{pmatrix}$ and $\begin{pmatrix} 1 \\ 2 \end{pmatrix}$. This example suggests, in general, that

$$\begin{pmatrix} a \\ b \end{pmatrix} + \begin{pmatrix} c \\ d \end{pmatrix} = \begin{pmatrix} a + c \\ b + d \end{pmatrix}$$

Note that $\vec{OP} + \vec{OQ} = \vec{OR}$ may be referred to as the Parallelogram Law of Vector Addition.

4.3 COMBINED EVENTS

Examples

(a) Consider an experiment involving the following two tasks.

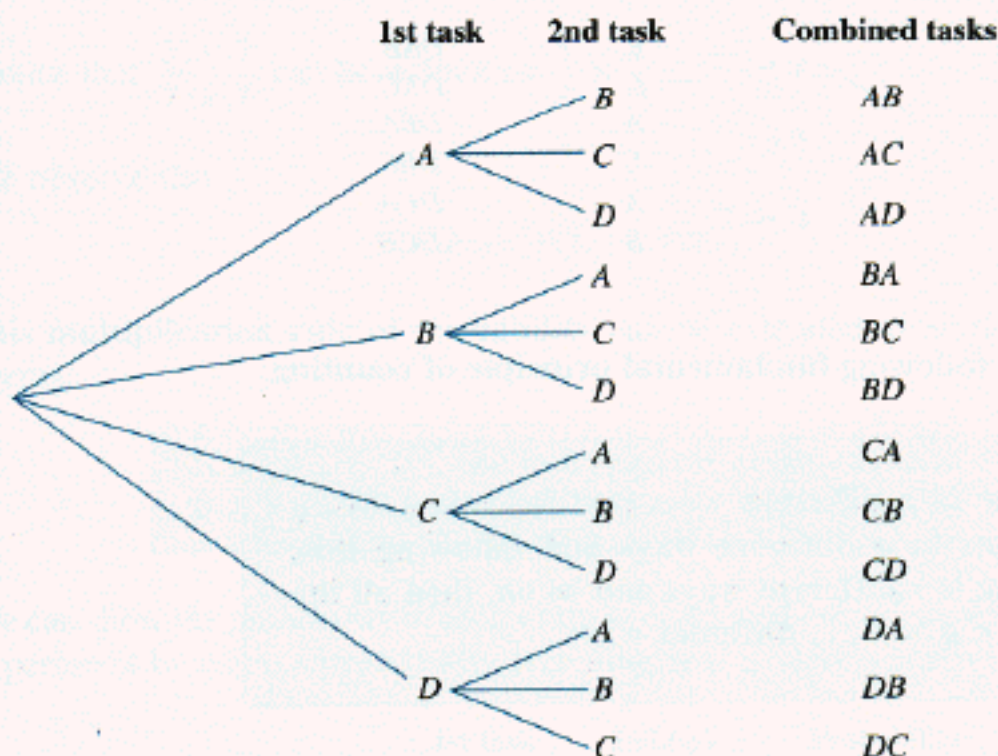
1st task: A card is drawn from a box containing 4 cards labelled A , B , C and D .

2nd task: A second card is drawn from the remaining 3 cards.

The first task can be done in 4 ways, and following this, the second task can be done in 3 ways.

We can count the number of ways in which the two combined tasks can be done with the help of a tree diagram.

Starting from a point, we draw 4 line segments, one for each way in which the first task can be done. From each of these line segments, we can branch out in 3 ways, and so we draw 3 more line segments.



We see from the tree diagram that the two combined tasks can be done in (4×3) ways.

Let us extend the experiment to include a third task of drawing another card following the second task.