Vectors microworld
short description

The microworld is developed to support mathematics teaching / learning on secondary education level (age 12 - 18) in different countries. There is a translation of texts utility attached, instruction and a workbook.

Aims of the microworld

The aim of this microworld is to introduce different ways of presenting vectors: graphic representation, analytic representation in Cartesian coordinates system, analytic by length and direction (circular coordinates system) and by means of colors (model of space of colors). The exercises show the connections between different vector representations and help to understand what is vector and how it can be represented.

The exercises are "open". There are possibilities of different kinds of activity, gathering the experience, answering questions: what will happen when we change...?

Model

Vectors are different from numbers. A number may be presented by a point on numbers axis. It is than connected with the distance between this point and zero on the axis. If we try to represent in a similar way a vector on a plane we should draw a coordinate system, find a point, connect the point with the centre of coordinate system and show the point by drawing an arrow (to point out which end of segment is our point). The segment with an arrow at the end is a graphic representation of a vector. In this representation vector has:

- value (length) – segment length,
- direction – an angle between a segment and X axis counted anticlockwise,
- sense – shown by an arrow,
- spot – the centre of coordinates system.

Vector on the plane is than explicitly represented by two numbers: X coordinate and Y coordinate of the point so it may be written as a pair of numbers [x y]. Those numbers are vector components.
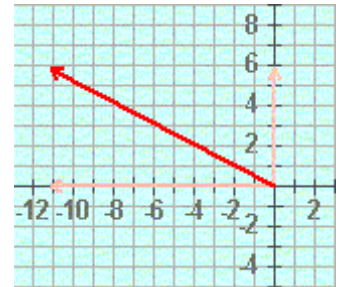
Parts of microworld

1. Vector and its components

The first page is for try out. A student should practice how to change vector arrow and watch carefully changes of components in a brackets. He can also try all the tools.

2. Fit vector to given components

The second page allows students to see connection between number components and vector arrow and to develop concept of coordinates in a plane system.

3. Fit vector to a given one

The third page allows to compare vector arrows to develop when vectors are equal and to introduce vector arrow attributes.

4. Fit components to the vector

The fourth page shows how the graphic form of vector is changing when we change components. Of course vector is changed. If we change any component then either length or direction of a vector or both are changing.

5. Fit length and direction to the vector

The fifth page shows how the graphic form of vector is changing when we change vectors length or direction.

6. Fit a color to a given one

The sixth page presents other example of a vector. Any color is a mixture of three fundamental colors: red, green and blue (RGB model). So color may be represented by vector with 3 components showing saturation of red, green and blue respectively.
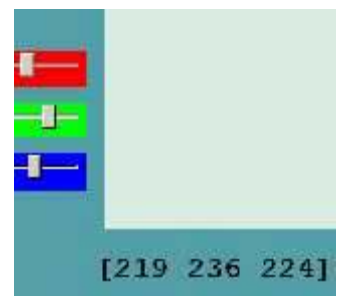
The microworld is a product of CoLabs project prepared by Polish team from OEIiZK. The idea was developed by Andrzej Walat, programming is done mainly by Witold Kranas, many improvements are due to Katarzyna Olędzka, Polish teachers, co-operating in a project and international partners giving devices. Microworld is prepared in two versions:

- Imagine Project,   • WWW page (http://colabs.oeiizk.waw.pl/wektor.php).

Both versions are equally functional and may be used by students.