



**DEFINITION.** A position vector is the arrow in each class with tail (initial point) at the origin. If the tip (terminal point) is at the point  $A(a_1, a_2)$ , we write

$$\mathbf{a} = \overrightarrow{OA} = \langle a_1, a_2 \rangle.$$

In  $\langle a_1, a_2 \rangle$ ,  $a_1$  and  $a_2$  are called the components of  $\mathbf{a}$ —  $a_1$  is the first component,  $a_2$  the second component.

From the Pythagorean Theorem,

$$\|\mathbf{a}\| = \|\langle a_1, a_2 \rangle\| = \sqrt{a_1^2 + a_2^2}.$$

**NOTE.** The magnitude of  $\mathbf{a}$  is often called the norm or 2-norm of  $\mathbf{a}$ , and is sometimes denoted  $\|\mathbf{a}\|_2$ .

For  $\mathbf{a} = \overrightarrow{OA} = \langle a_1, a_2 \rangle$  and  $\mathbf{b} = \overrightarrow{OB} = \langle b_1, b_2 \rangle$ ,

$$\mathbf{a} = \mathbf{b} \iff A = B \iff a_1 = b_1 \text{ and } a_2 = b_2.$$

$\iff$  means “if and only if” ( $\implies$  is “only if” and  $\impliedby$  is “if”).