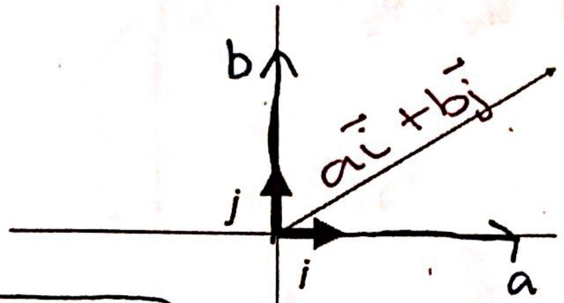
Example: Find a unit vector in the direction of **v** = <-3, 2>.

$\vec{v} = \sqrt{(-3)^2 + (2)^2} = \sqrt{9+4} = \sqrt{13}$ | $\vec{u} = \dfrac{\langle -3, 2\rangle}{\sqrt{13}}$

$= \left\langle \dfrac{-3}{\sqrt{13}}, \dfrac{2}{\sqrt{13}} \right\rangle$

$= \left\langle \dfrac{-3\sqrt{13}}{13}, \dfrac{2\sqrt{13}}{13} \right\rangle$

Standard Unit Vectors:



$\boxed{\langle a, b\rangle = a\vec{i} + b\vec{j}}$

i = standard unit vector <1,0>
j = standard unit vector <0,1>

Any vector $\vec{v} = \langle a, b\rangle$ can be written as a linear combination of the two standard unit vectors.

Example: Let P=(-1, 5) and Q = (3,2). Write $\overline{PQ}$ as a linear combination of **i** + **j**.

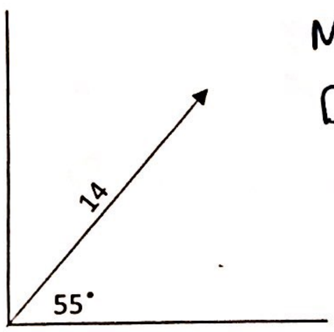
$\vec{PQ} = \langle 3 - -1, 2 - 5\rangle = \langle 4, -3\rangle \rightarrow a\vec{i} + b\vec{j} \rightarrow \boxed{4\vec{i} - 3\vec{j}}$

Finding/Using Direction Angles

If **v** is given a direction angle θ, the components of **v** can be computed using the formula:

$$\boxed{\mathbf{v} = \langle |v|\cos\theta,\ |v|\sin\theta \rangle}$$

Example: Find the component form of vector **v**.



Magnitude $= |\vec{v}| = 14$ and

Direction Angle $= \theta = 55°$

$\vec{v} = \langle 14\cos(55°), 14\sin(55°)\rangle$

$= \boxed{\langle 8.03, 11.47\rangle}$

Example: Find the magnitude and direction angle of **v** = <-2, -5>.

QIII

$|\vec{v}| = \sqrt{(-2)^2 + (-5)^2}$

$= \sqrt{4+25}$

$= \sqrt{29}$

$\langle -2, -5\rangle = \langle \sqrt{29}\cos\theta, \sqrt{29}\sin\theta\rangle$

$-2 = \sqrt{29}\cos\theta$ $\quad$ $-5 = \sqrt{29}\sin\theta$

QIII → $\boxed{\theta = 111.8°}$ or $\theta = \cancel{-68.2°}$ ← QIV