1477 (Hard):

$\vec{v}_c = 7\vec{j}$

$\vec{v}_{wc} = a\vec{i} - a\vec{j}$

$\vec{v}_p = -1\vec{i}$

$\vec{v}_{wp} = b\vec{i} + b\vec{j}$

$\vec{v}_w$ same for both.

$\vec{v}_w = \vec{v}_{wp} + \vec{v}_p$

and $\vec{v}_w = \vec{v}_{wc} + \vec{v}_c$

$\vec{v}_{wp} + \vec{v}_p = \vec{v}_{wc} + \vec{v}_c$

$\Rightarrow b\vec{i} + b\vec{j} - \vec{i} = a\vec{i} - a\vec{j} + 7\vec{j}$.

$\vec{i}$ comp: $b - 1 = a \Rightarrow b - a = 1$

$\vec{j}$ comp: $b = 7 - a \Rightarrow b + a = 7$

SOLVE: $2b = 8$

$b = 4$

and so $a = 3$

$\therefore \vec{v}_w = 4\vec{i} + 4\vec{j} - 1\vec{i}$.

$\vec{v}_w = 3\vec{i} + 4\vec{j}$.

$\therefore |\vec{v}_w| = |3\vec{i} + 4\vec{j}| = 5$.

and Direction is E θN when $\theta = \tan^{-1}\frac{4}{3}$

$\theta = 53.13^\circ$