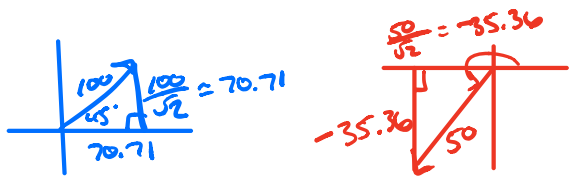# V7 - Find Resultant Vectors (More difficult problems)
Assume all angles are given in standard position.

1. George throws a headless doll 100 feet at an angle of 45°. Upon landing, George throws the doll again at 225° for 50 feet. What is the resulting vector in polar coordinates?
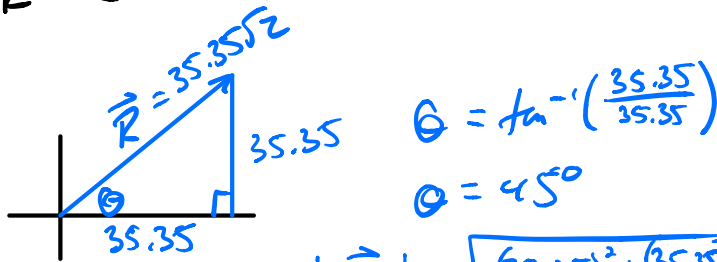
$\vec{a} = (100, 45°)$

$\vec{a} = \langle 70.71, 70.71 \rangle$

$\vec{b} = (50, 225°)$

$\vec{b} = \langle -35.36, -35.36 \rangle$

$\frac{50}{\sqrt{2}} = 35.36$

$\frac{100}{\sqrt{2}} = 70.71$

$\vec{R} = \langle 70.71 - 35.36, 70.71 - 35.36 \rangle$

$\vec{R} = \langle 35.35, 35.35 \rangle$

$\vec{R} = 35.35\sqrt{2}$

$\theta = \tan^{-1}\left(\frac{35.35}{35.35}\right)$

$\theta = 45°$

$\|\vec{R}\| = \sqrt{(35.35)^2 + (35.35)^2}$

$\|\vec{R}\| \approx 49.99$

$\vec{R} = (49.99, 45°)$
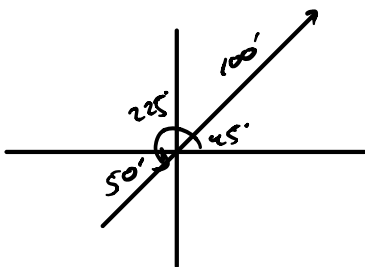
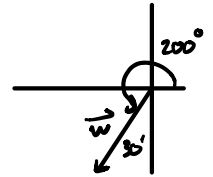2. George throws a dolless head 25 feet at an angle of 140°. After running and picking it up, he throws the head again 30 feet at an angle of 200°. What is the resulting vector in polar coordinates?

$x = r\cos\theta \quad\quad y = r\sin\theta$
$x = 25\cos(140°) \quad y = 25\sin(140°)$
$x = -19.15 \quad\quad y = 16.07$

$\vec{v} = \langle -19.15, 16.07 \rangle$

$\vec{w} = \langle r\cos\theta, r\sin\theta \rangle$
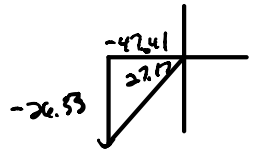$= \langle 30\cos(200°), 30\sin(200°) \rangle$
$\vec{w} = \langle -28.19, -10.26 \rangle$

$\vec{R} = \langle -19.15, 16.07 \rangle$
$+ \langle -28.19, -10.26 \rangle$
$\vec{R} = \langle -47.41, -26.33 \rangle$

MAG θ

$\vec{R} = (54.23, 207.17°)$

$\|\vec{R}\| = \sqrt{(-47.41)^2 + (-26.33)^2}$
$\|\vec{R}\| = 54.23$

$\theta' = \tan^{-1}\left(\frac{26.33}{47.41}\right)$

$\theta' = 27.17°$

$\theta = 180° + 27.17$
$= 207.17°$