Suppose we have a triangle with one vertex at the origin. We can express two sides of the triangle as vectors $||\overrightarrow{u}|| = \langle a, b \rangle$ and $||\overrightarrow{v}|| = \langle c, d \rangle$

We wish to write the area of the triangle in terms of a, b, c, d
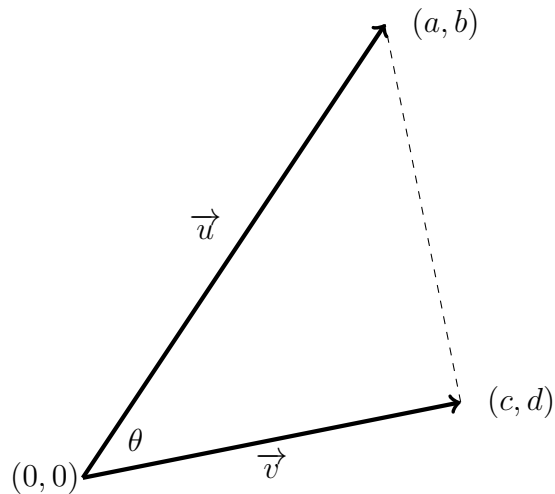
1. Write the area of the triangle using $\sin \theta$, $||\overrightarrow{u}||$ and $||\overrightarrow{v}||$

2. Find the direction of $\overrightarrow{u}$. That is, find θ_u in terms of a and b

3. Find the direction of $\overrightarrow{v}$. That is, find θ_v in terms of c and d

4. Express θ in terms of θ_u and θ_v

5. Express $\sin \theta$ using inverse trig functions and a, b, c, d

6. Use the angle sum/difference formula to write $\sin \theta$ in terms of a, b, c, d

7. Write the area of the triangle in terms of a, b, c, d

8. If $\overrightarrow{u} = (5, 1)$ and $\overrightarrow{v} = (4, -2)$, find the area.

9. If $\overrightarrow{u} = (4, -2)$ and $\overrightarrow{v} = (5, 1)$, find the area. Do you need to adjust the formula?