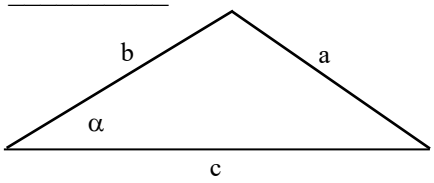
ME 481 - H01 **Name** _____

1) Print hardcopy of this sheet. Estimate angle α by eye. α 30°



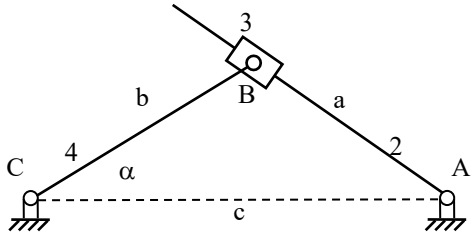
2) Write an equation to determine angle α as a function of lengths a, b and c.

Law of Cosines $a^2 = b^2 + c^2 - 2\,b\,c\,\cos\alpha$

3) Measure a, b and c using mm. a 32 mm b 35.5 mm c 56.5 mm

4) Compute α using parts 2) and 3) above. α 31.3°

5) Measure α with a protractor. α 30.5°



6) Links AC and BC are rigid. Determine $\dot{\alpha}$ when $\dot{a}$ is +10 mm/s at this position. Use link lengths from 3) above.

first time derivative of Equation 2

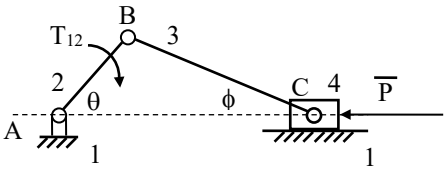
$2\,a\,\dot{a} = 2\,b\,c\,\dot{\alpha}\,\sin\alpha$

$\dot{\alpha} = \dot{a}\,a / (b\,c\,\sin\alpha)$

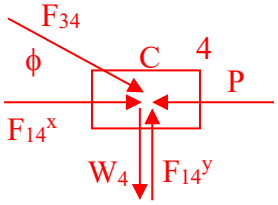
$\dot{\alpha}$ 0.3143 rad/s = 18.01 deg/s

7) What is this mechanism? inverted slider crank

8) Draw a **complete** free-body diagram of slider block 4 for static equilibrium including friction.



assume impending motion to the left



9) What is this mechanism? in-line slider crank

10) Complete the matrix multiplication.

$$\begin{bmatrix}1 & 2\\ 3 & 4\end{bmatrix}\begin{Bmatrix}5\\ 6\end{Bmatrix} = \begin{Bmatrix}17\\ 39\end{Bmatrix}$$

11) Invert the matrix.

$$\begin{bmatrix}1 & 2\\ 3 & 4\end{bmatrix}^{-1} = \begin{bmatrix}-2 & 1\\ 1.5 & -0.5\end{bmatrix}$$

$\text{inv} = [\,\text{cofac}\,]^T / \det$

$\det = -2$

$$\text{cofac} = \begin{bmatrix}4 & -3\\ -2 & 1\end{bmatrix}$$