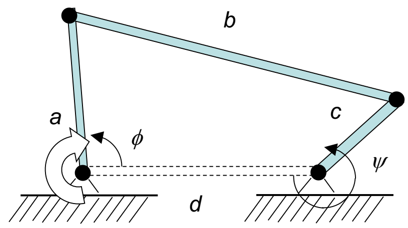
Problem 1:

Considering the mechanism shown in the figure:



where: $d = 150mm, \quad \frac{a}{d} = 0.6; \quad \frac{b}{d} = 1.4; \quad \frac{c}{d} = 0.5$

1) Compute the number of degrees of freedom present in the system:

2) Determine the correct dimension of each linkage and determine if at least one link is capable of making a full revolution

3) Calculate the output position and the angular velocity ratio for input values of 90º

Hints:

It is known that:

$$\psi = 2\arctan\left(\frac{A - \sqrt{A^2 + B^2 - C^2}}{B + C}\right)$$

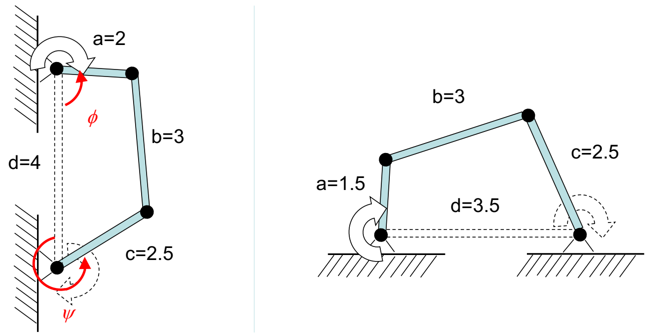
$$\frac{\dot{\psi}}{\dot{\phi}} = \frac{\sin(\phi - \psi) - K_1 \sin\phi}{\sin(\phi - \psi) - K_2 \sin\phi}$$

where:

$$\begin{cases} K_1 = \dfrac{d}{c} \\ K_2 = \dfrac{d}{a} \\ K_3 = \dfrac{a^2 - b^2 + c^2 + d^2}{2ac} \end{cases} \qquad \begin{cases} A = \sin\phi \\ B = \cos\phi - K_2 \\ C = K_1 \cos\phi - K_3 \end{cases}$$

Problem 2:

Considering the 2 mechanisms shown in the figure (where the length of each element is written next to it)



(2.A) (2.B)

For each mechanism:

1) Compute the number of degrees of freedom of present in the system:

2) Determine if at least one link is capable of making a full revolution

3) Calculate the output position and the angular velocity ratio for input values of 90º

Hints:

It is known that:

$$\psi = 2\arctan\left(\frac{A-\sqrt{A^2+B^2-C^2}}{B+C}\right)$$

$$\frac{\dot{\psi}}{\dot{\phi}} = \frac{\sin(\phi-\psi)-K_1\sin\phi}{\sin(\phi-\psi)-K_2\sin\phi}$$

$$where:$$

$$\begin{cases} K_1 = \dfrac{d}{c} \\ K_2 = \dfrac{d}{a} \\ K_3 = \dfrac{a^2-b^2+c^2+d^2}{2ac} \end{cases} \qquad \begin{cases} A = \sin\phi \\ B = \cos\phi - K_2 \\ C = K_1\cos\phi - K_3 \end{cases}$$