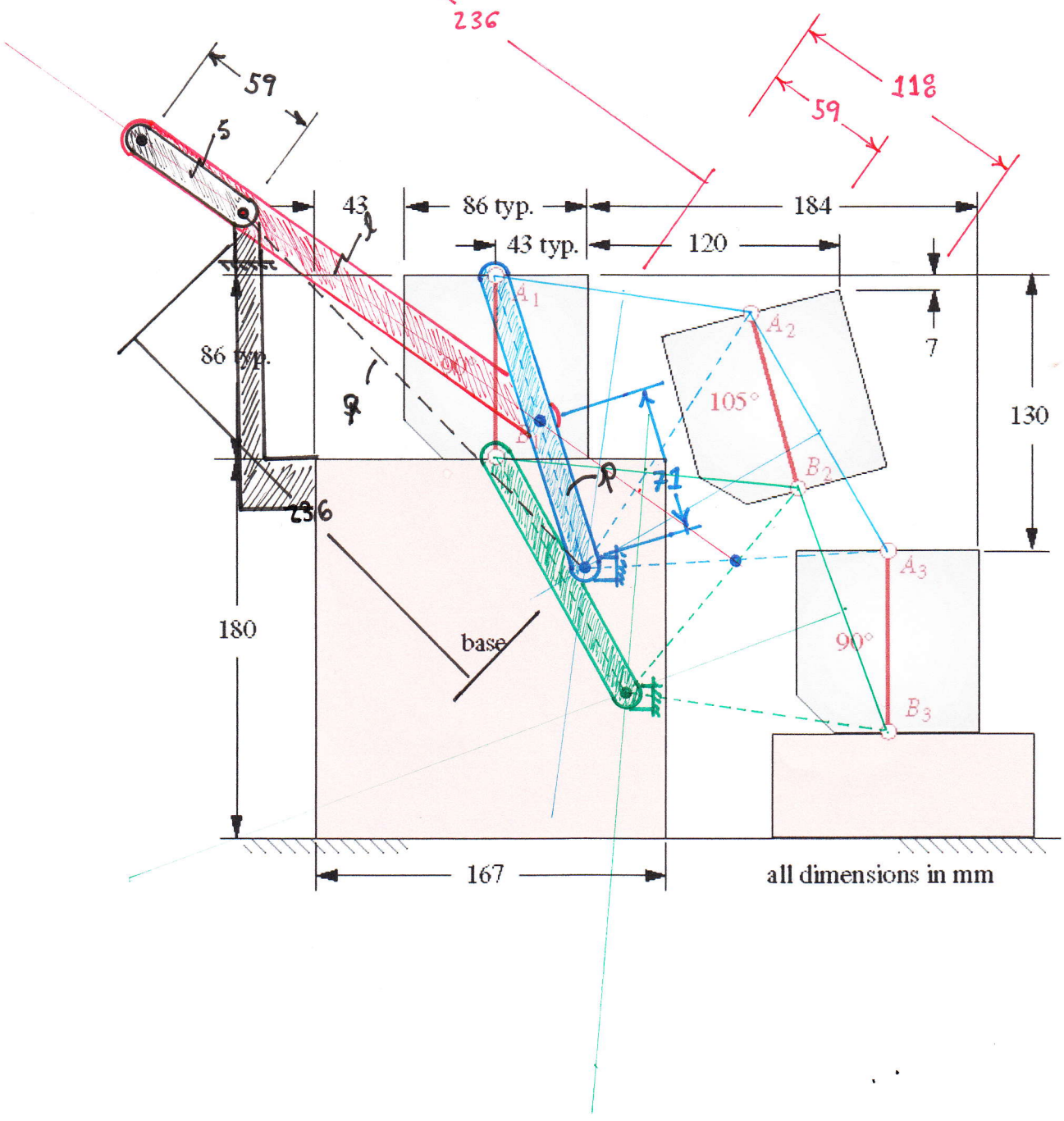
NAME: SOLUTION

PROBLEM 1 (25 pts): A box sits on top of the base and needs to be moved to the platform while moving through the three positions shown. The ground pivots have to be located on the box.

1a. Using graphical methods locate the position of the ground pivots and draw the mechanism that will accomplish the task on the figure below.



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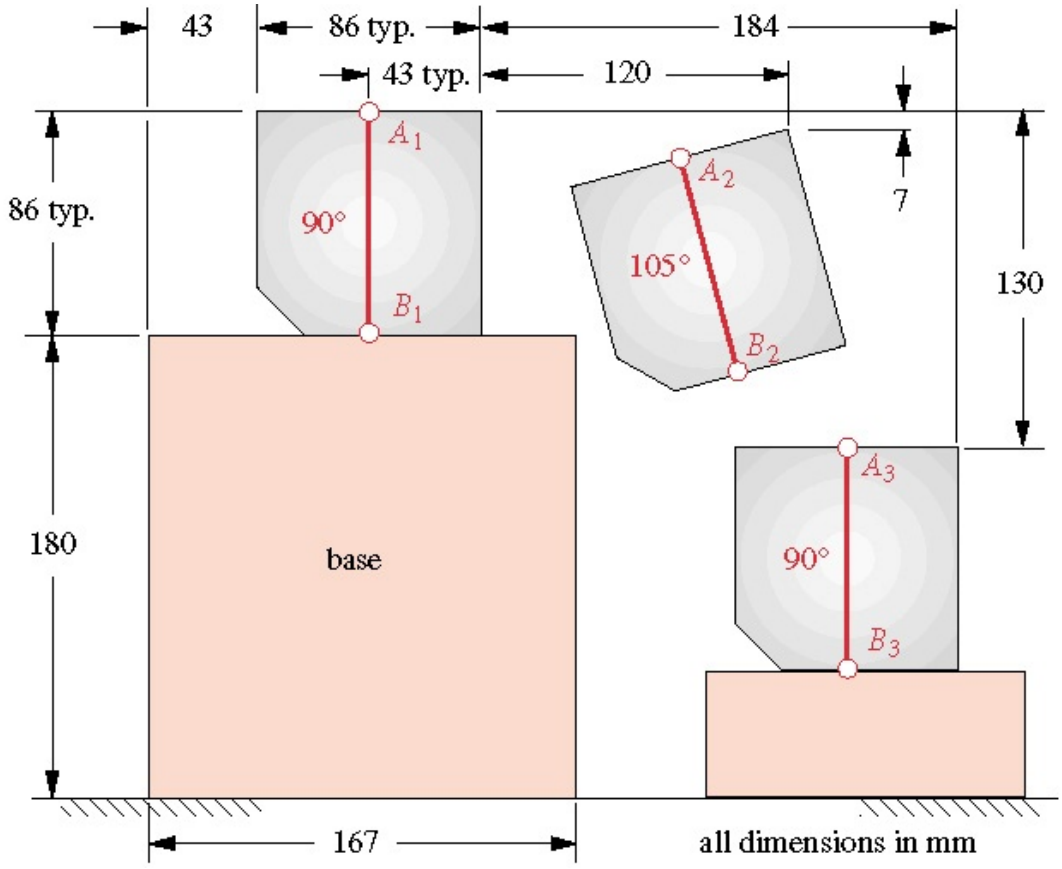


1b. Draw a drive dyad off the link that connects the ground to point A. Show how this dyad would be attached to the base.

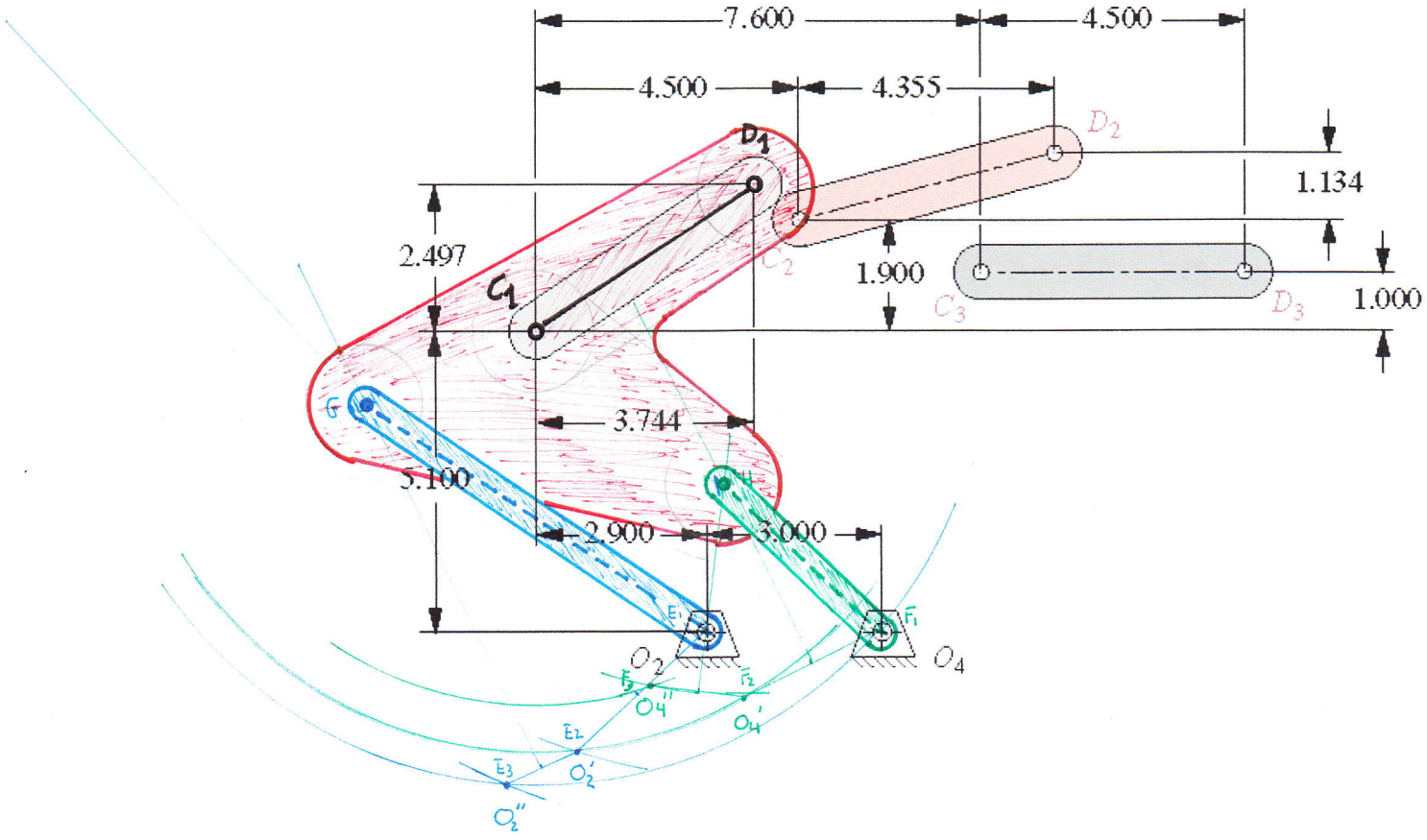
1c. Demonstrate that the drive dyad is a Grashof mechanism. Make sure there is enough information to demonstrate what you are doing.

$S+L \leq P+Q$

$59+236 \leq 71+236$

$295 \leq 307$ ✓

PROBLEM 2 (25 pts): Synthesize a mechanism that moves CD through the three positions shown and that is fixed to the ground at O_2 and O_4.



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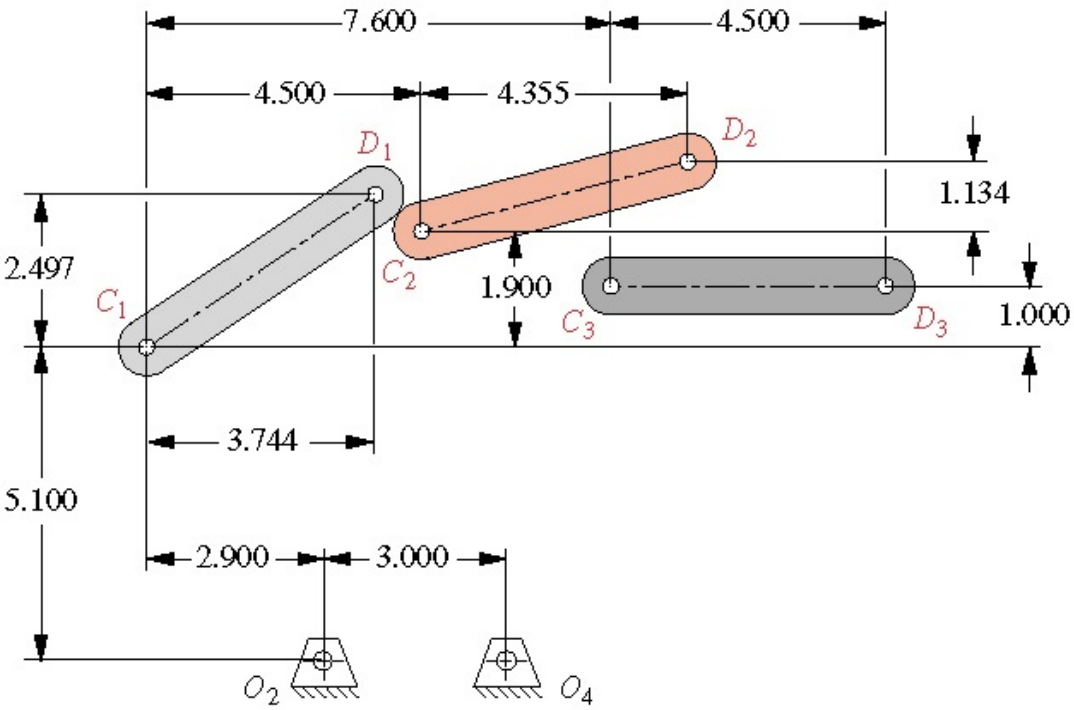
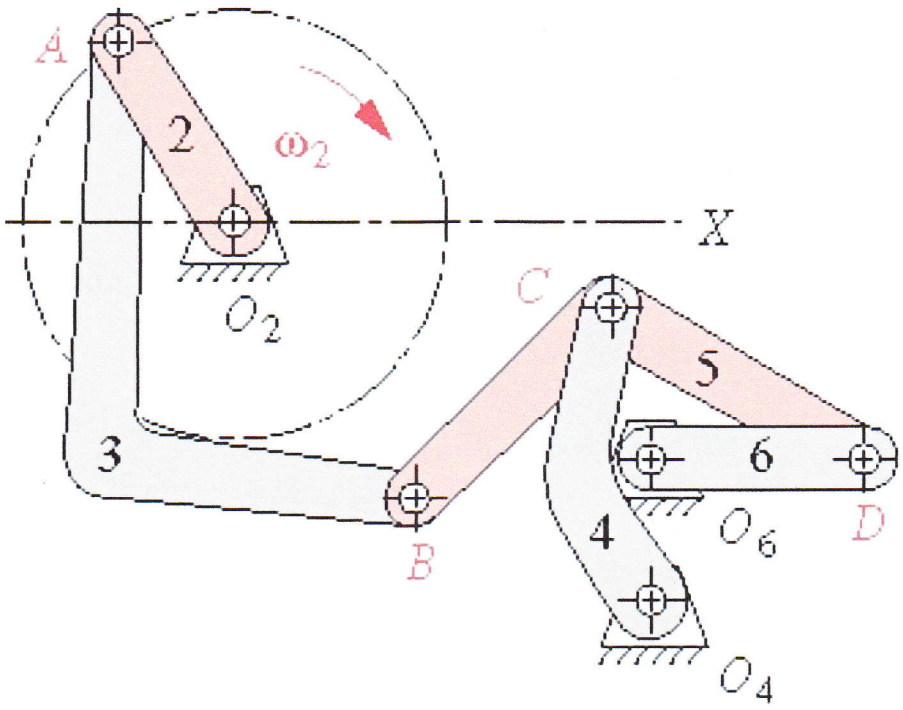
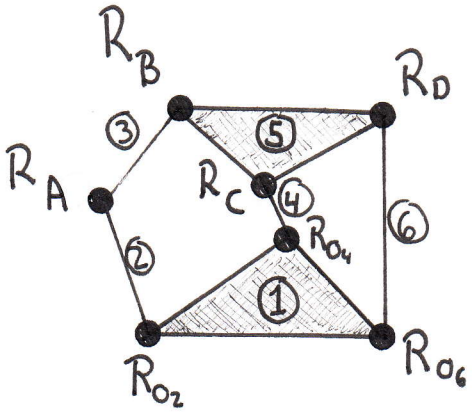


PROBLEM 3 (25 pts): Answer the following question for the mechanism shown below.



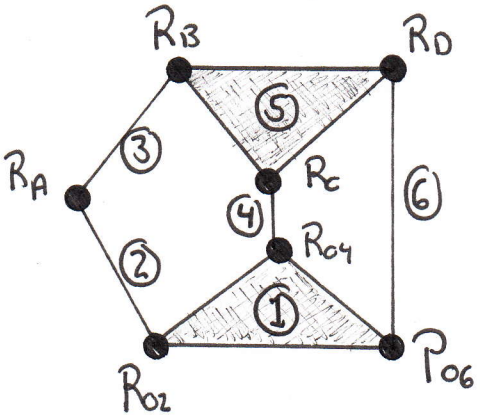
3a: Draw the isomer for the linkage shown above. Make sure to label revolute joints with an R, prismatic joints with a P, and base points with a B.



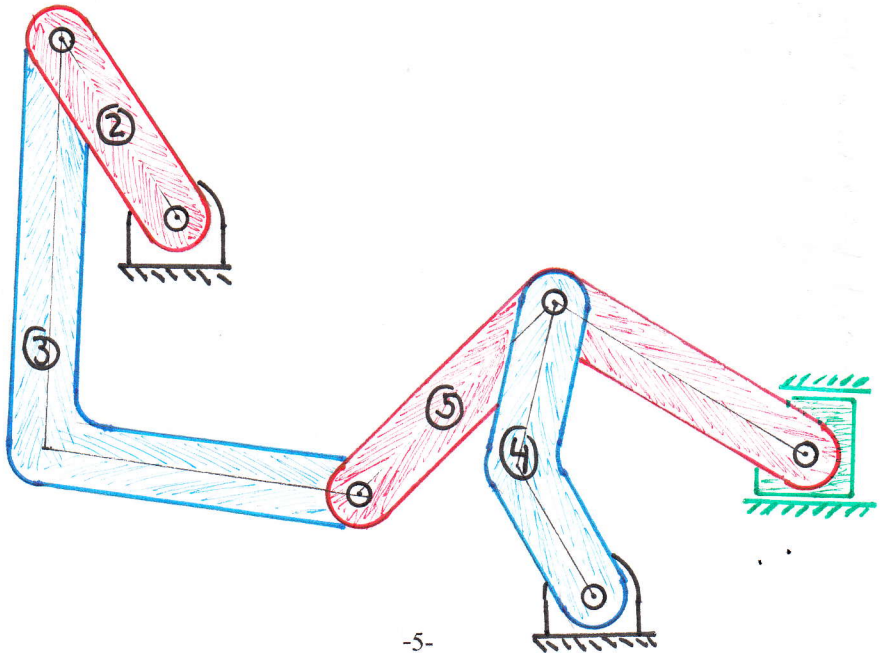
3b: How many degrees of freedom does this linkage have in its current configuration.

$$F = 3(N-1)-2J$$
$$= 3(6-1)-2(7)$$
$$= 15 - 14 = \boxed{1}$$

3c: Turn one of the revolute joints on the isomer into a prismatic joint and sketch the resulting isomer. Label the all the joints on the isomer. Draw the resulting mechanism.

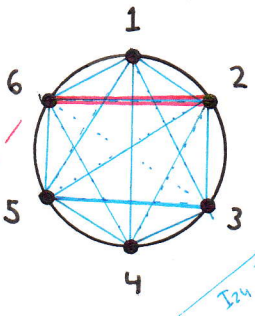


THIS IS ONE OF MANY SOLUTIONS TO THIS PROBLEM.



PROBLEM 4 (25 pts): For the mechanism shown below, the velocity of point A is 2m/s in the upward vertical position.

4a. What is the velocity of the slider and in what direction is the velocity vector?



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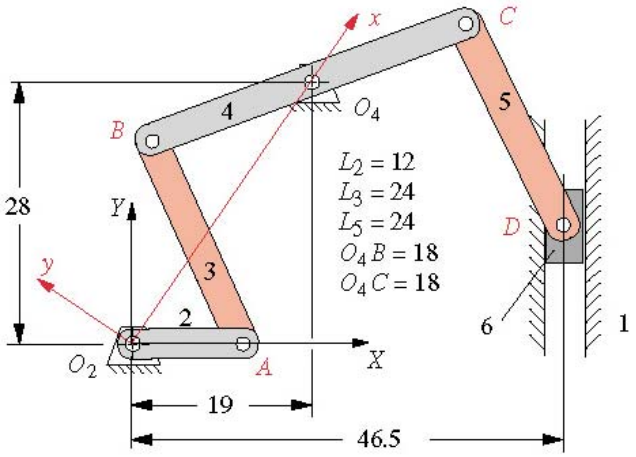


4b. Determine the mechanical advantage for this system?

$P_{IN} = P_{OUT}$

$T_{in} \cdot \omega_{in} = F_{out} V_{out}$

$F_{in} \cdot d_{in} \cdot V_{in} / r_{in} = F_{out} \cdot V_{out}$ (1)

MECHANICAL ADVANTAGE IS DEFINED AS

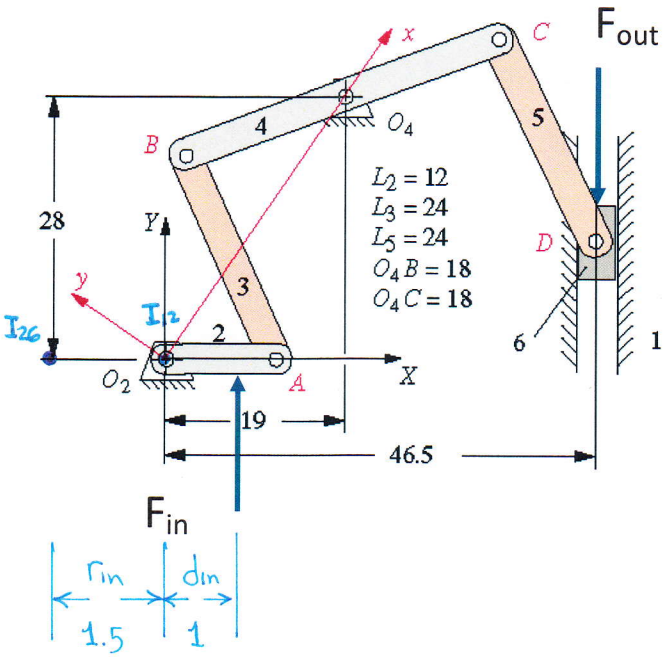
$MA = \frac{F_{out}}{F_{in}}$

REWRITING (1)

$MA = \frac{F_{out}}{F_{in}} = \frac{d_{in}}{r_{in}} \cdot \frac{V_{in}}{V_{out}}$ (2)

THE VELOCITY OF INPUT LINK 2 (V_{in}) AND OUTPUT LINK 6 (V_{out}) ARE THE SAME AT I_{26}. (3) CAN NOW BE REWRITTEN

$MA = \frac{F_{out}}{F_{in}} = \frac{d_{in}}{r_{in}} = \frac{1}{1.5} = \frac{2}{3} = \boxed{0.66}$



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