AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING

SPECIALIZED ENGINEERING PROGRAMS,
MECHANICAL ENGINEERING PROGRAMS

Tutorial 2

MDP 212 Mechanics of Machines

Instructor Name: Dr. M.M. Hedaya,

2.1 Design a double slider mechanism to draw an ellipse with major and minor axes equal to 18 cm and 6 cm respectively.

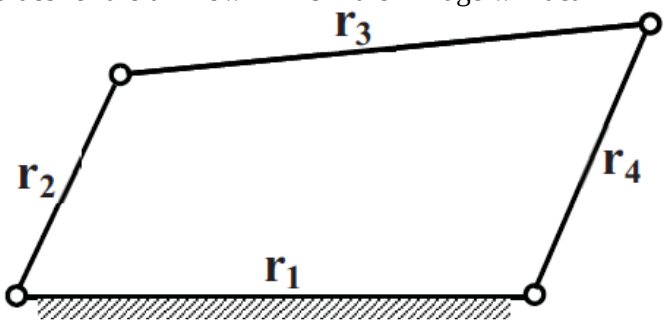
2.2 Design a slider mechanism to produce a stroke equal to 10 cm with quick return ratio 7:8.

2.3 Design an aligned quick return mechanism to produce an oscillating angle equal to 60°, the radius of the crank is 10 cm. Determine the time ratio.

2.4 Design a mechanism to produce a harmonic motion with an amplitude of 5 cm .

2.5 For each of the following dimensions, find the range of values for the unknown links if the linkage will act
a) Crank rocker.
b) Drag mechanism.
c) Double rocker.

	r_1	r_2	r_3	r_4
a	----	100	300	360
b	80	220	120	----
c	100	200	----	250



2.6 Design a four-bar mechanism that converts continuous rotation into oscillating motion (crank rocker mechanism). Given that the crank length $r_2 = 100\ mm$, coupler length $r_3 = 200\ mm$ and follower length $r_4 = 300\ mm$.
a) Find the range of the fixed link r1 to get a crank rocker linkage.
b) Determine the specific value of r1 such that the transmission angle larger than 45°.
c) Calculate the stroke of the follower and determine the time ratio of the linkage.

2.7 Design a four-bar mechanism to drive link AB, 6 cm long to oscillate about fixed hinge A, with 40º rocking angle.

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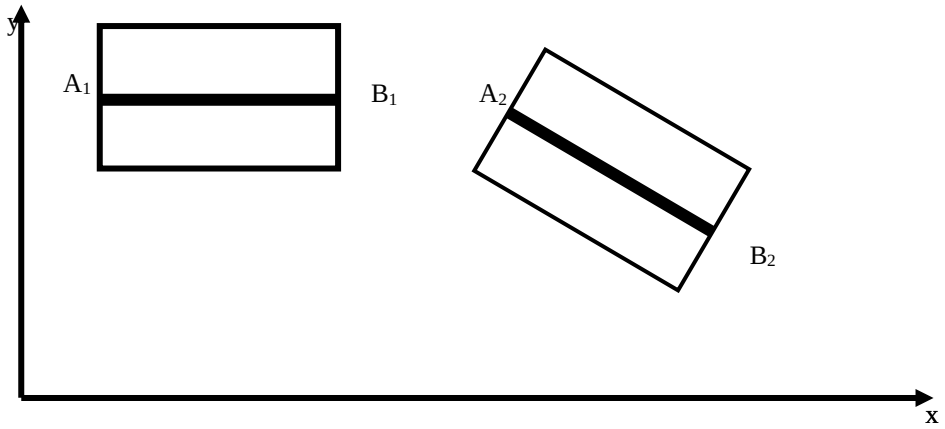
2.8 The windshield wiper shown is derived by a four-bar mechanism connected to its extension. Design a mechanism to derive the link OB with 70 º rocking angle, where the forward time to return time is 1.25: 1. The length of OB is 5 cm.

2.9 Design a four-bar mechanism to move the shown object from position 1 to position 2, where the times for go and return are equal. Consider the output is the rocker.



2.10 Resolve problem 2.9, where the ratio between the forward time to return time is 1.25: 1.

2.11 Resolve problem 2.9 using the coupler as the output and add a mechanism to derive one of the rockers.

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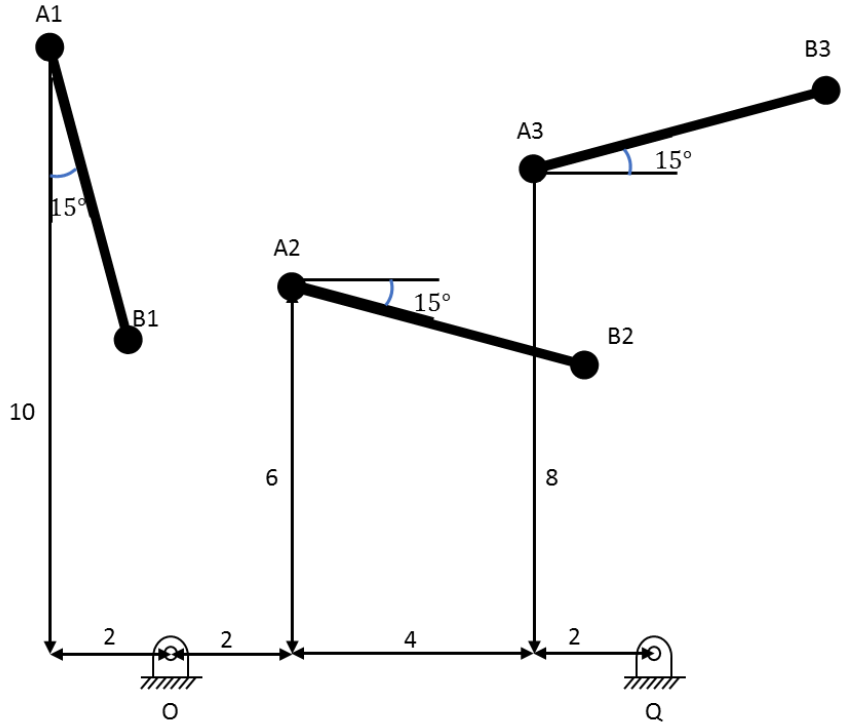
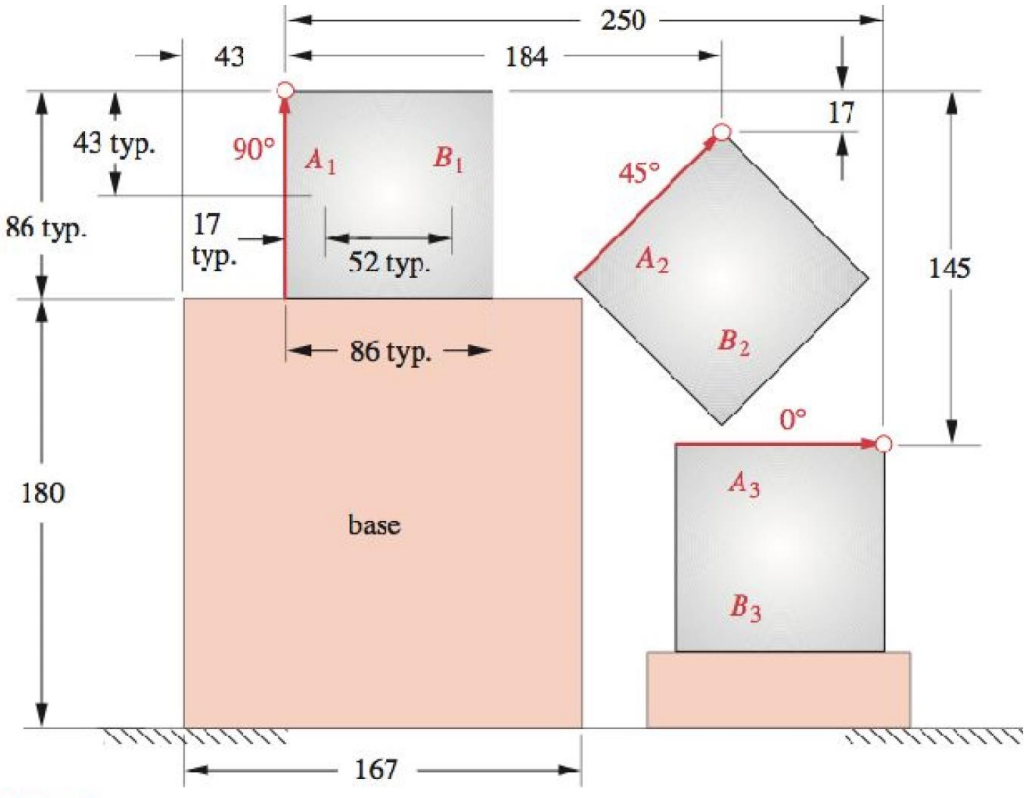
2.12 Design a four-bar mechanism to move link AB, 5cm length, between the three shown positions with equal time. Design another four-bar mechanism to drive the rocking mechanism.

2.13 Resolve problem 2.12 considering that the rocking hinges should be O and Q.



2.14 Design a four-bar mechanism to give the three positions shown in the following figure. Add a driver dyad to limit its motion to thr rsnge of positions designed, making it asixbar.All fixed pivots should be on the base.



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2.15 Design a four-bar mechanism to give the three positions shown in the following figure using shown fixed pivots. The shown mechanism is drawn with its real dimension.