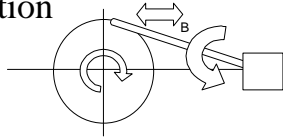


## Chapter 12

### Plane Motion Relative Motion



Miami University

1

## Objectives

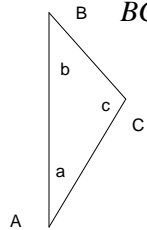
- Review of Sine and Cosine Laws
- Linear Relative Motion
- Planar Relative Motion
- Angular Relative Motion

2

## Review of Cosine Law

- Cosine Law:

$$BC^2 = AC^2 + AB^2 - 2(AC)(AB)\cos a$$

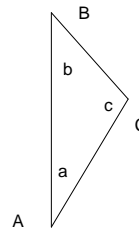


3

## Review of Sine Law

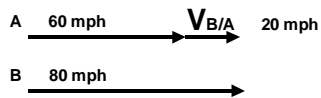
- Sine Law:

$$\frac{\sin a}{BC} = \frac{\sin b}{AC} = \frac{\sin c}{AB}$$



4

## Linear Relative Motion

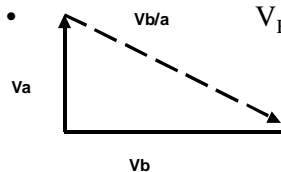


- $V_A = 60 \text{ mph}$
- $V_B = 80 \text{ mph}$
- $V_B = V_A + V_{B/A}$
- Note: Subscripts MUST cancel

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## Planar Relative Motion

- $V_A = 40 \text{ mph} \uparrow$
- $V_B = 60 \text{ mph} \rightarrow$
- $V_B = V_A + V_{B/A}$
- $V_{B/A} = \text{Hypotenuse}$



6

## Displacement & Acceleration

- We have shown relative velocities.
- You can use the same technique for relative displacement and accelerations
- Displacement:  $s_B = s_A + s_{B/A}$
- Acceleration  $a_B = a_A + a_{B/A}$

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## Book Examples

- Example 12-4: Sliding Bar
- Example 12-5: Rotating Linkage

8

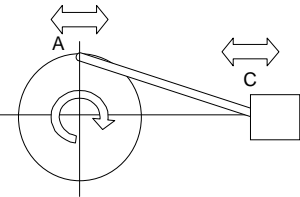
## Linkage Rules

- Convert rotation to tangential movement (example:  $v = r\omega$ )
- Determine motion at other end of linkage (example: next link rotates about a pin)
- Use vector triangle to solve for unknown vector (be sure vector equation is correct)

9

## Connecting Rods

- Note that point A and C both move horizontally at this point. Which means that  $V_{C/A} = 0$  when A is at 12 and 6 o'clock position.



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## Week 6 Homework

- Chapter 12
  - Prob. 6, 8, 9, 16, & 26
- Read Sections 12-2 & 12-3

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