

Consider the loading on the beam shown below where the beam is supported by a pin joint at B and a roller support at C. Using integration techniques, determine the slope of the displacement at B and the displacement of end D of the beam. In your work, explicitly show the following steps:

- a) Draw FBD of beam and determine the reactions at B and C.
- b) Make a mathematical cut in beam between B and C (at a location “x”).
  - i. Draw an FBD of the beam between B and the cut at “x”.
  - ii. Determine the bending moment,  $M(x)$ , in the beam at “x”.
  - iii. Integrate  $M(x)$  to find  $\theta(x)$ .
  - iv. Integrate  $\theta(x)$  to find  $v(x)$ .
  - v. Evaluate  $\theta(0)$ .
- c) Make a mathematical cut in the beam between C and D. Repeat Steps i.-iv. above to find  $\theta(x)$  and  $v(x)$  for “x” between C and D.
- d) Evaluate  $v(2a)$ .

