DETERMINE BUCKLING LOAD (P_{cr}), BASED ON THE EULER EQUATION FOR AN 8' LONG WOOD 2"x4" (USE FULL DIMENSIONS)
ENDS PINNED ∴ K = 1.00 , E = 1500 KSI
IF F_y = 6 KSI, WHAT IS MINIMUM LENGTH FOR WHICH THE EULER EQUATION IS VALID?

EULER EQUATION:

$$P_{cr} = \frac{\pi^2 EA}{(KL/r)^2}$$

$E = 1500$ KSI
$A = 2 \times 4 = 8 \text{ in}^2$
$K = 1.0$
$L = 8' = 96''$
$I = 4(2)^3/12 = 2.67 \text{ in}^4$
$r = \sqrt{I/A} = 0.577$

$$P_{cr} = \frac{\pi^2 (1500)\, 8}{(96/.577)^2}$$

$$P_{cr} = 4.28^K$$

MIN. VALID LENGTH:

$$f_{cr} = \frac{\pi^2 E}{(KL/r)^2}$$

$$6 = \frac{\pi^2 (1500)}{(L/.577)^2}$$

$$\sqrt{6} = \frac{\sqrt{\pi^2 (1500)}}{L/.577}$$

$$L = \frac{\sqrt{\pi^2 (1500)}}{\sqrt{6}/.577} = 28.66'' \text{ (minimum)}$$