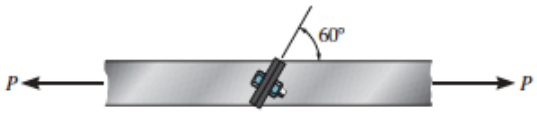
CE 270
Fall 2011
Solutions – Homework 3

**•1–81.** The tension member is fastened together using *two* bolts, one on each side of the member as shown. Each bolt has a diameter of 0.3 in. Determine the maximum load $P$ that can be applied to the member if the allowable shear stress for the bolts is $\tau_{allow} = 12$ ksi and the allowable average normal stress is $\sigma_{allow} = 20$ ksi.

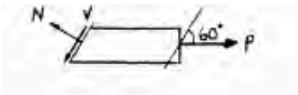



$\nwarrow + \Sigma F_y = 0; \quad N - P \sin 60° = 0$

$$P = 1.1547\,N \qquad (1)$$

$\swarrow + \Sigma F_x = 0; \quad V - P \cos 60° = 0$

$$P = 2\,V \qquad (2)$$




**Assume failure due to shear:**

$$\tau_{allow} = 12 = \frac{V}{(2)\frac{\pi}{4}(0.3)^2}$$

$V = 1.696$ kip

From Eq. (2),

$P = 3.39$ kip

Assume failure due to normal force:

$$\sigma_{allow} = 20 = \frac{N}{(2)\frac{\pi}{4}(0.3)^2}$$

$N = 2.827$ kip

From Eq. (1),

$P = 3.26$ kip (controls) **Ans.**

(For fundamental problem solutions please see the back of your course textbook)