

# Monday warm-up: Statics, II

Prof. Jordan C. Hanson

November 19, 2025

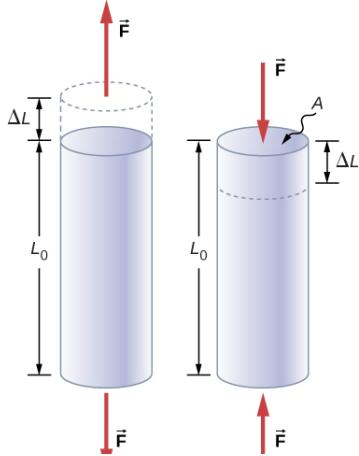


Figure 1: Stress is  $F/A$ , and strain is  $\Delta L/L_0$ .

## 1 Memory Bank

- Young's Modulus,  $Y$ , has units of  $\text{N m}^{-2}$ , and it relates the change in length  $\Delta L$  of a system of original length  $L_0$  and cross-sectional area  $A$  subject to a force  $F$ :

$$\frac{\Delta L}{L_0} = \frac{1}{Y} \frac{F}{A} \quad (1)$$

Summarized as  $\text{stress} = Y \times \text{strain}$ .

- Shear Modulus,  $S$ , has units of  $\text{N m}^{-2}$ , and it relates the sideways change in length  $\Delta x$  of a system of length  $L_0$  and cross-sectional area  $A$  subject to a force  $F$ :

$$\frac{\Delta x}{L_0} = \frac{1}{S} \frac{F}{A} \quad (2)$$

Summarized as  $\text{stress} = S \times \text{sheer}$ .

## 2 Stress, Strain, and Elastic Modulus

1. By how