

## Chapter 15 Problem 40 †

### Given

$$l = 50 \text{ cm} = 0.50 \text{ m}$$

$$w = 90 \text{ cm} = 0.90 \text{ m}$$

$$P_{in} = 0.75 \text{ atm}$$

$$P_{out} = 0.25 \text{ atm}$$

### Solution

Find the force required to pull the window inward.

The forces acting on the window are the outside pressure and the inside pressure.

$$F = F_{in} - F_{out} = AP_{in} - AP_{out}$$

$$F = A(P_{in} - P_{out}) = lw(P_{in} - P_{out})$$

Substitute in the known values gives

$$F = (0.50 \text{ m})(0.90 \text{ m})(.75 \text{ atm} - .25 \text{ atm})$$

$$F = 0.225 \text{ atm} \cdot \text{m}^2$$

Convert the atmospheres into Pascal's gives

$$F = 0.225 \text{ atm} \cdot \text{m}^2 \left( \frac{1.013 \times 10^5 \text{ N/m}^2}{1 \text{ atm}} \right)$$

$$F = 2.28 \times 10^4 \text{ N}$$

The passenger will not be able to exert this kind of force.

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†Problem from Essential University Physics, Wolfson