37.25 Two compressors with the same pressure ratio are used in series. Air at $60°F$ and $14.7psia$ enters the first compressor. Air exits the second compressor at $400psia$. What is the pressure entering the second compressor?

A. $77psia$

B. $193psia$

C. $207psia$

D. $323psia$

Consider the air entering the first compressor as State 1, the air exiting the first compressor and entering the second compressor as State 2, and the air exiting the second compressor as State 3. The pressures at States 1 and 3 are given.

$$P_1 = 14.7psia$$

$$P_3 = 400psia$$

Set up a proportion setting the pressure ratios for the two compressors equal. Solve for the pressure at State 2.

$$\frac{P_2}{P_1} = \frac{P_3}{P_2}$$

$$P_2^2 = P_1 P_3$$

$$P_2 = \sqrt{P_1 P_3} = \sqrt{(14.7psia)\,(400psia)} = 76.7psia$$

Answer A