36.64 A pump designed to operate at $100gpm$ and 50 feet of head is determined to be oversized. The pump's impeller diameter is decreased by 20%. What is the resulting pressure developed by the pump after this change?

A. $26ft$

B. $32ft$

C. $40ft$

D. $50ft$

Lookup Pump Affinity Laws in the reference handbook and choose the formula where head pressure changes as a function of Impeller Diameter Change, where h_1, the head pressure provided by the pump before the impeller diameter change, is known, and h_2 is to be determined. The actual diameter is unknown, but the 20% reduction implies the following ratio of the diameters.

$$\frac{h_2}{h_1} = \left(\frac{D_2}{D_1}\right)^2 \rightarrow h_2 = h_1 \left(\frac{D_2}{D_1}\right)^2$$

$$D_2 = (1 - .2)\, D_1 \rightarrow \frac{D_2}{D_1} = .8$$

The volume flow rate, Q, will also change; however, that is extra information and does not impact the pressure.

Substitute and solve for h_2.

$$h_2 = h_1 \left(\frac{D_2}{D_1}\right)^2 = (50ft)\,(.8)^2 = 32ft$$

Answer B