37.67 **A $1600rpm$ centrifugal pump with an 8 inch impeller requires $7.5bhp$ when delivering $250gpm$ of water at a head of $75ft$. What is the new capacity when the impeller diameter is increased to 12 inches?**

A. $250GPM$

B. $305GPM$

C. $375GPM$

D. $560GPM$

Make a table to organize the given information. Distinguish the two operational states as Case 1 and Case 2. There is more information about Case 1 than required to solve the problem. There is also more that could be specified about Case 2 than is necessary.

Case 1	Case 2
$n_1 = 1600rpm$	$n_2 = n_1$
$D_1 = 8in$	$D_2 = 12in$
$bhp_1 = 7.5hp$	
$Q_1 = 250gpm$	$Q_2 = ?$
$\Delta h_1 = 75ft\,H_2O$	

Look up Pump Affinity Laws in the reference handbook and select the equation which relates volume flow rate and diameter. The relationship is linear; i.e. a 50% increase in the diameter of the impeller drives a 50% increase in the volume flow rate, provided all other parameters remain unchanged. Substitute and solve for Q_2.

$$\frac{Q_2}{Q_1} = \frac{D_2}{D_1} \rightarrow Q_2 = Q_1\left(\frac{D_2}{D_1}\right)$$

$$Q_2 = (250gpm)\left(\frac{12in}{8in}\right) = 375gpm$$

Answer C