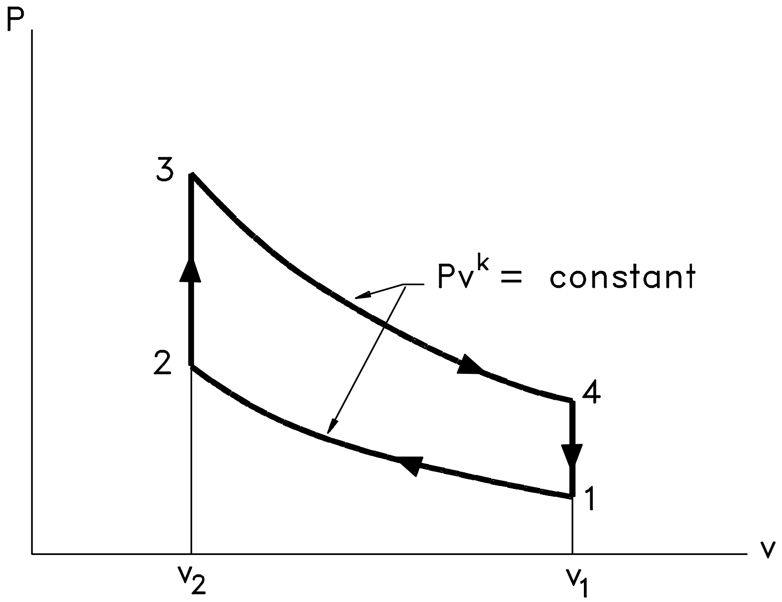
Problem: 6-1

Given: A gas engine has a cylinder bore of 50 mm, a stroke of 75 mm and a clearance volume of 21.3 cm^3.

Find: Calculate the ideal air standard cycle efficiency based on the Otto cycle.



The volume displaced by the piston is

$$\text{Swept volume} = \frac{\pi}{4} \times 50^2 \times 75 = 147200\ mm^3 = 147.2\ cm^3$$

Therefore

$$\text{Total cylinder volume} = 147.2 + 21.3 = 168.5\ cm^3$$

The compression ratio is

$$r = \frac{168.5}{21.3} = 7.914 : 1$$

The efficiency for the Otto cycle is given as

$$\begin{aligned}
\eta &= = 1 - \frac{1}{r_v^{k-1}} \\
&= 1 - \frac{1}{7.194^{0.4}} = 1 - 0.437 = 0.563 \\
&= 56.3\%
\end{aligned}$$