Question 1

1 Power = 16HP
Pressure increase = 34lbf/in²
VFR = 2.168m³/min

P_{in} = 16HP
ΔP = 34lbf/in²
Q = 2.168m³/min

$$\eta = \frac{2.168m^3}{60sec} \times \frac{34lbf}{in^2} \times \frac{1}{16HP}$$

* 60seconds make 1 minute
* $\eta = \frac{Q\Delta P}{P_{in}}$

Conversion

* 1 HP = 550lbf·ft/s
  16HP = x
  x = 8800lbf·ft/s = P_{in}
* $1m^3 = 35.315ft^3$
  $2.168m^3 = x$
  $x = 76.5629ft^3/60sec = Q$
* $1in^2 = 6.944\times10^{-3}ft^2$
  ~~x = b~~

$$\eta = \frac{76.5629\cancel{ft^3}}{60\cancel{sec}} \times \frac{34\cancel{lbf}}{6.944\times10^{-3}ft^2} \times \frac{\cancel{sec}}{8800\cancel{lbf}\cdot\cancel{ft}}$$

$$\eta = \frac{76.5629\times34}{60\times6.944\times10^{-3}\times8800}$$

$= 0.7099\times100$
$\approx 70.9\%$