# Calculation of the required pumping discharge quantity Q, to succeed the desirable water drawdown, modeling the excavation as one big well

# Input Data

Permeability index (K): 1.90E-06 m/s  
Hydraulic head of the original water table (H): 90.0 m  
Excavation depth from surface-lower water table (hd0): 7.6 m  
Ground water table depth, from surface (hwl): 0.9 m  
Length of excavation area (a): 60.0 m  
Width of excavation area (b): 25.0 m

# Output Results

ANALYSIS RESULTS   
  
Required flow drawdown (hd): 6.70 m  
Hydraulic head at maximum dewatering 6.70 m  
Radius of influence of Well or Point Source (r1): 27.71 m  
Equivalent radius of the well (rw): 21.85 m  
Total Radius of influence of Well (R): 49.56 m  
Pumping rate (Q): 0.0085 m3

# Formulas

hd = hd0 - hwl  
hw = H - hd  
r1 = 3000 \* (H - hw) \* sqrt(K)  
rw = sqrt(a \* b / pi)  
R = r1 + rw  
Q = (pi \* K \* (H^2 - hw^2)) / ln(R / rw)  
Qls = Q \* 1000

# Symbolic Number Operations

hd = hd0 - hwl  
hd = 7.6 - 0.9  
hd = 6.70 m  
  
hw = H - hd  
hw = 90.0 - 6.70  
hw = 83.30 m  
  
r1 = 3000 \* (H - hw) \* sqrt(K)  
r1 = 3000 \* (90.0 - 83.30) \* sqrt(1.9e-06)  
r1 = 27.71 m  
  
rw = sqrt(a \* b / pi)  
rw = sqrt(60.0 \* 25.0 / pi)  
rw = 21.85 m  
  
R = r1 + rw  
R = 27.71 + 21.85  
R = 49.56 m  
  
Q = (pi \* K \* (H^2 - hw^2)) / ln(R / rw)  
Q = (pi \* 1.9e-06 \* (90.0^2 - 83.30^2)) / ln(49.56 / 21.85)  
Q = 0.0085 m3  
  
Qls = Q \* 1000  
Qls = 0.0085 \* 1000  
Qls = 8.46366550252774 m3