# Solutions to Hydrology Problems

1. **Problem 1:** A storm produces 25 mm of rainfall over a 5-hour period. Determine the average rainfall intensity.

   **Solution:** The average rainfall intensity $I$ is calculated by dividing the total rainfall by the duration. Here, $I = \frac{25\,mm}{5\,hours} = 5\,mm/hour$.

   **Video Solution:** `https://www.youtube.com/watch?v=rzAsamRqVk0`

2. **Problem 2:** A watershed has an area of 2 $km^2$. Using the Rational Method with a runoff coefficient of 0.6 and a rainfall intensity of 50 mm/hr, determine the peak runoff.

   **Solution:** The Rational Method calculates peak runoff $Q$ using $Q = 0.0028 \times C \times I \times A$, where $C$ is the runoff coefficient, $I$ is the rainfall intensity in mm/hr, and $A$ is the area in hectares. Converting 2 $km^2$ to hectares gives 200 hectares. Thus, $Q = 0.0028 \times 0.6 \times 50 \times 200 = 16.8\,m^3/s$.

   **Video Solution:** `https://www.youtube.com/watch?v=brNpLh21UCg`

3. **Problem 3:** A soil sample has an infiltration rate of 5 mm/hr. If a rainfall event lasts for 3 hours with a constant intensity of 12 mm/hr, determine the total infiltration volume over a 500 $m^2$ area.

   **Solution:** The infiltration volume $V$ is calculated by multiplying the infiltration rate by the duration and the area. Here, $V = 5\,mm/hr \times 3\,hours \times 500\,m^2 = 7500\,liters$.

   **Video Solution:** `https://www.youtube.com/watch?v=DKJZs1NlBC4`

4. **Problem 4:** A groundwater well draws water from an unconfined aquifer with a hydraulic conductivity of 10 m/day. If the water table drops by 3 m over a horizontal distance of 500 m, determine the Darcy velocity.

   **Solution:** Darcy's Law states that the velocity $v$ is $v = K \times i$, where $K$ is the hydraulic conductivity and $i$ is the hydraulic gradient. Here, $i = \frac{\Delta h}{L} = \frac{3\,m}{500\,m} = 0.006$. Thus, $v = 10\,m/day \times 0.006 = 0.06\,m/day$.

   **Video Solution:** `https://www.youtube.com/watch?v=YvTV5TmtQOU`

5. **Problem 5:** A river section has a base flow of 2 $m^3$/s. After a storm event, the peak runoff contribution from a watershed is 8 $m^3$/s. Determine the total river discharge during the peak event.

   **Solution:** The total river discharge during the peak event is the sum of the base flow and the peak runoff. Therefore, the total discharge is $2\,m^3/s + 8\,m^3/s = 10\,m^3/s$.

   **Video Solution:** `https://www.youtube.com/watch?v=o4dGElYCDPM`