



# Peak Drainage Discharge Formula Formulas

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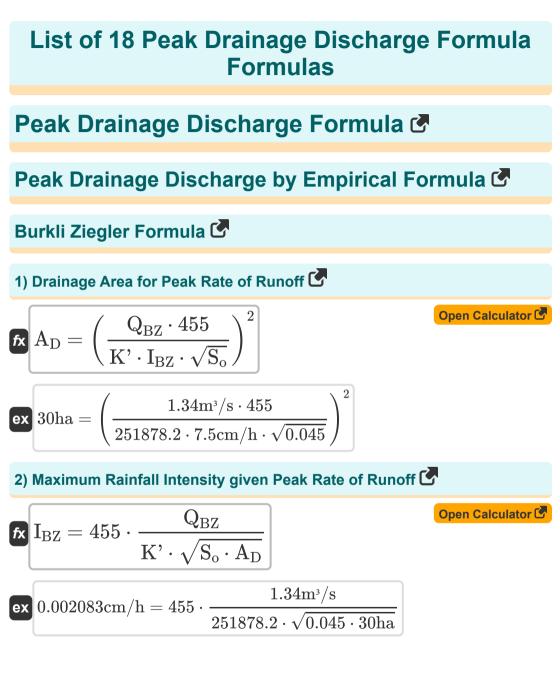
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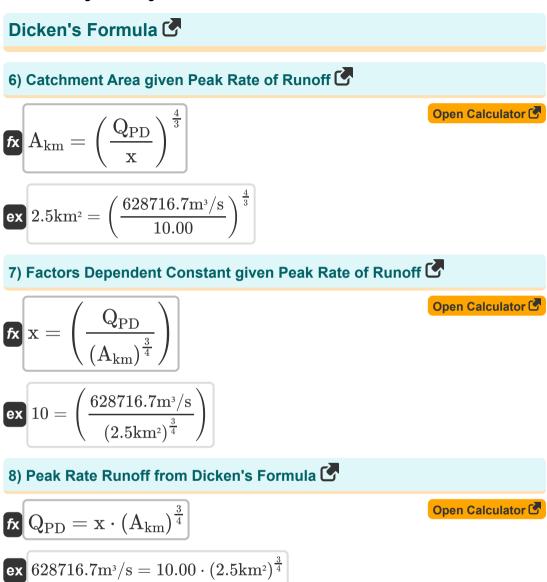
3) Peak Rate of Runoff from Burkli-Ziegler Formula 🕑

$$\begin{array}{l} \text{fx} \ \mathbf{Q}_{\mathrm{BZ}} = \left( \frac{\mathrm{K}' \cdot \mathrm{I}_{\mathrm{BZ}} \cdot \mathrm{A}_{\mathrm{D}}}{455} \right) \cdot \sqrt{\frac{\mathrm{S}_{\mathrm{o}}}{\mathrm{A}_{\mathrm{D}}}} \end{array}$$

4) Runoff Coefficient for Peak Rate of Runoff

$$\label{eq:K} \begin{split} \text{K}' &= \frac{455 \cdot \text{Q}_{\text{BZ}}}{I_{\text{BZ}} \cdot \sqrt{S_o \cdot A_D}} \\ \text{ex} \ 251878.2 &= \frac{455 \cdot 1.34 \text{m}^3/\text{s}}{7.5 \text{cm/h} \cdot \sqrt{0.045 \cdot 30 \text{ha}}} \\ \text{5) Slope of Ground Surface given Peak Rate of Runoff } \\ \text{fx} \ \begin{split} \text{S}_o &= \left(\frac{Q_{\text{BZ}} \cdot 455}{I_{\text{BZ}} \cdot \text{K}' \cdot \sqrt{A_D}}\right)^2 \\ \text{ex} \ 0.045 &= \left(\frac{1.34 \text{m}^3/\text{s} \cdot 455}{7.5 \text{cm/h} \cdot 251878.2 \cdot \sqrt{30 \text{ha}}}\right)^2 \end{split}$$









#### Dredge or Burge's Formula 🕑

#### 9) Catchment Area given Peak Rate of Runoff from Dredge Formula

fx 
$$A_{
m km}=rac{{
m Q_d}\cdot{
m (L)}^{rac{2}{3}}}{19.6}$$

ex 
$$2.5 \mathrm{km^2} = rac{212561.2 \mathrm{m^3/s} \cdot (3.5 \mathrm{km})^{rac{2}{3}}}{19.6}$$

#### 10) Peak Rate of Runoff from Dredge Formula

fx 
$$Q_d = 19.6 \cdot \left(rac{A_{km}}{(L)^{rac{2}{3}}}
ight)$$
 ex  $212561.2 {
m m}^3/{
m s} = 19.6 \cdot \left(rac{2.5 {
m km}^2}{(3.5 {
m km})^{rac{2}{3}}}
ight)$ 

#### Inglis Formula 🕑

### 11) Catchment Area given Peak Rate of Runoff from Inglis Formula

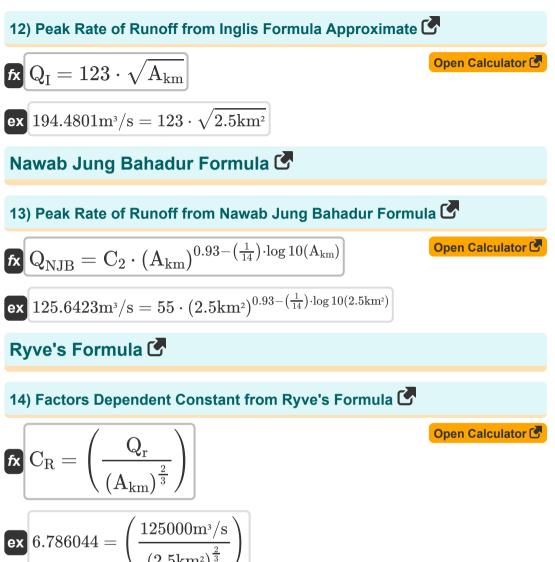
fx 
$$A_{km} = \left(\frac{Q_I}{123}\right)^2$$
  
ex  $2.499998 \text{km}^2 = \left(\frac{194.48 \text{m}^3/\text{s}}{123}\right)^2$ 



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### Peak Drainage Discharge by Rational Formula 🚰

### 15) Catchment Area given Peak Rate of Runoff and Rainfall Intensity 🕑

$$fx \quad A_c = \frac{36 \cdot Q_R}{C_r \cdot P_c}$$

$$ex \quad 14.92539ha = \frac{36 \cdot 4166.67m^3/s}{0.5 \cdot 2.01cm/h}$$

$$fx \quad C_r = \frac{36 \cdot Q_R}{A_c \cdot P_c}$$

$$ex \quad 0.497513 = \frac{36 \cdot 4166.67m^3/s}{15.0ha \cdot 2.01cm/h}$$

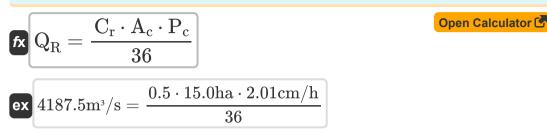
$$fx \quad P_c = \frac{36 \cdot Q_R}{A_c \cdot C_r}$$

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ex 
$$2.000002 \text{cm/h} = \frac{36 \cdot 4166.67 \text{m}^3/\text{s}}{15.0 \text{ha} \cdot 0.5}$$



### 18) Peak Rate of Runoff in Rational Formula 🕑







# Variables Used

- A<sub>c</sub> Area of Catchment (Hectare)
- A<sub>D</sub> Drainage Area (Hectare)
- Akm Catchment Area in KM (Square Kilometer)
- C<sub>2</sub> Coefficient
- C<sub>r</sub> Runoff Coefficient
- C<sub>R</sub> Ryve's Coefficient
- **I<sub>BZ</sub>** Intensity of Rainfall in Burkli Zeigler (Centimeter per Hour)
- K' Runoff Coefficient for Burkli Zeigler
- L Length of Drain (Kilometer)
- **P**<sub>c</sub> Critical Rainfall Intensity (Centimeter per Hour)
- QBZ Peak Rate of Runoff for Burkli Zeigler (Cubic Meter per Second)
- Qd Peak Rate of Runoff from Dredge Formula (Cubic Meter per Second)
- QI Peak Rate of Runoff for Inglish (Cubic Meter per Second)
- Q<sub>NJB</sub> Peak Rate of Runoff for Nawab Jung Bahadur (Cubic Meter per Second)
- **QPD** Peak Rate of Runoff from Dickens Formula (Cubic Meter per Second)
- **Q**<sub>r</sub> Peak Rate of Runoff in ryves formula (Cubic Meter per Second)
- Q<sub>R</sub> Peak Drainage Discharge by Rational Formula (Cubic Meter per Second)
- So Slope of the ground
- X Constant





## **Constants, Functions, Measurements used**

- Function: log10, log10(Number) The common logarithm, also known as the base-10 logarithm or the decimal logarithm, is a mathematical function that is the inverse of the exponential function.
- Function: sqrt, sqrt(Number)
   A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.
- Measurement: Length in Kilometer (km) Length Unit Conversion
- Measurement: Area in Hectare (ha), Square Kilometer (km<sup>2</sup>) Area Unit Conversion
- Measurement: **Speed** in Centimeter per Hour (cm/h) Speed Unit Conversion
- Measurement: Volumetric Flow Rate in Cubic Meter per Second (m<sup>3</sup>/s) Volumetric Flow Rate Unit Conversion





#### 11/11

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- Concentration Formulas
- Channel Flow Time and Time of
   Peak Drainage Discharge Formula Formulas
  - Rainfall Intensity Formulas

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