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# Computation of Runoff Formulas

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# List of 27 Computation of Runoff Formulas

## Computation of Runoff

### 1) Rainfall given Run-off

$$\text{fx } P_{\text{cm}} = \frac{R}{C_r}$$

[Open Calculator !\[\]\(a870788d6ed9b8fd294b7654a8c8526b\_img.jpg\)](#)

$$\text{ex } 12\text{cm} = \frac{6\text{cm}}{0.5}$$

### 2) Run-off Coefficient given Run-off

$$\text{fx } C_r = \frac{R}{P_{\text{cm}}}$$

[Open Calculator !\[\]\(c50c8b7b2cc2cf9ff925edec0ee94c0d\_img.jpg\)](#)

$$\text{ex } 0.5 = \frac{6\text{cm}}{12\text{cm}}$$

### 3) Run-off given Run-off Coefficient

$$\text{fx } R = C_r \cdot P_{\text{cm}}$$

[Open Calculator !\[\]\(f60b7a900783ac3fd531bfd9c111be6d\_img.jpg\)](#)

$$\text{ex } 6\text{cm} = 0.5 \cdot 12\text{cm}$$



## Ingli's Formula

### 4) Rainfall in cm for Ghat Area

$$fx \quad P_{IC} = \frac{R_{IC} + 30.5}{0.85}$$

[Open Calculator !\[\]\(a03a7eb2f4046e1d3c76772003e549ea\_img.jpg\)](#)

$$ex \quad 39.98824cm = \frac{3.49cm + 30.5}{0.85}$$

### 5) Rainfall in Inches for Ghat Area

$$fx \quad R_{PI} = \frac{R_{II} + 12}{0.85}$$

[Open Calculator !\[\]\(5361750c22c4e047a52f4eac1ec2d4cc\_img.jpg\)](#)

$$ex \quad 21.64706in = \frac{6.4in + 12}{0.85}$$

### 6) Run-off in cm for Ghat Area

$$fx \quad R_{IC} = (0.85 \cdot P_{IC}) - 30.5$$

[Open Calculator !\[\]\(b792654f2cef9719eabeb6c5be00811e\_img.jpg\)](#)

$$ex \quad 3.5cm = (0.85 \cdot 40cm) - 30.5$$

### 7) Run-off in Cm for Non Ghat Area

$$fx \quad R_{IC} = \left( \frac{P_{IC} - 17.8}{254} \right) \cdot P_{IC}$$

[Open Calculator !\[\]\(84f47badaad7772cd95667a7c387a639\_img.jpg\)](#)

$$ex \quad 3.496063cm = \left( \frac{40cm - 17.8}{254} \right) \cdot 40cm$$



8) Run-off in Inches for Ghat Area 

$$fx \quad R_{II} = (0.85 \cdot R_{PI}) - 12$$

[Open Calculator !\[\]\(e78f798d4ea5c530c9db49e7d26e6b95\_img.jpg\)](#)

$$ex \quad 8.4in = (0.85 \cdot 24in) - 12$$

9) Run-off in Inches for Non Ghat Area 

$$fx \quad R_{II} = \left( \frac{R_{PI} - 7}{100} \right) \cdot R_{PI}$$

[Open Calculator !\[\]\(05be7c7a8995decd503647c99211f7c2\_img.jpg\)](#)

$$ex \quad 4.08in = \left( \frac{24in - 7}{100} \right) \cdot 24in$$

Khosla's Formula 10) Mean Temperature in Entire Catchment given Run-off 

$$fx \quad T_f = ((R_{PI} - R_{KI}) \cdot 9.5) + 32$$

[Open Calculator !\[\]\(626ce8ac21792b9405bfddfea8e0c96a\_img.jpg\)](#)

$$ex \quad 38.0325^\circ F = ((24in - 23.75in) \cdot 9.5) + 32$$

11) Mean Temperature in Entire Catchment given Run-off in cm 

$$fx \quad T_f = ((P_{cm} - R_{KC}) \cdot 3.74) + 32$$

[Open Calculator !\[\]\(c1168d6a8b365d11e842ece304635fa7\_img.jpg\)](#)

$$ex \quad 38.0214^\circ F = ((12cm - 10.39cm) \cdot 3.74) + 32$$




12) Rainfall in cm by Khosla's Formula 

$$fx \quad P_{cm} = R_{KC} + \left( \frac{T_f - 32}{3.74} \right)$$

Open Calculator 

$$ex \quad 11.99428cm = 10.39cm + \left( \frac{38^\circ F - 32}{3.74} \right)$$

13) Rainfall in Inches by Khosla's Formula 

$$fx \quad R_{PI} = R_{KI} + \left( \frac{T_f - 32}{9.5} \right)$$

Open Calculator 


$$ex \quad 23.99865in = 23.75in + \left( \frac{38^\circ F - 32}{9.5} \right)$$

14) Run-off in cm by Khosla's Formula 

$$fx \quad R_{KC} = P_{cm} - \left( \frac{T_f - 32}{3.74} \right)$$

Open Calculator 

$$ex \quad 10.39572cm = 12cm - \left( \frac{38^\circ F - 32}{3.74} \right)$$

15) Run-off in Inches by Khosla's Formula 

$$fx \quad R_{KI} = R_{PI} - \left( \frac{T_f - 32}{9.5} \right)$$

Open Calculator 

$$ex \quad 23.75135in = 24in - \left( \frac{38^\circ F - 32}{9.5} \right)$$



## Lacey's Formula

### 16) Catchment Factor given Run-off in cm by Lacey's Formula

$$\text{fx } S = \frac{-304.8 \cdot F_m \cdot R_{LC}}{R_{LC} \cdot P_{cm} - P_{cm} \cdot P_{cm}}$$

[Open Calculator !\[\]\(950a62bbddad88d64435fd35607dfc42\_img.jpg\)](#)

$$\text{ex } 1.699351 = \frac{-304.8 \cdot 1.48 \cdot 0.519\text{cm}}{0.519\text{cm} \cdot 12\text{cm} - 12\text{cm} \cdot 12\text{cm}}$$

### 17) Catchment Factor given Run-off in Inches by Lacey's Formula

$$\text{fx } S = \frac{-120 \cdot F_m \cdot R_{LI}}{R_{LI} \cdot R_{PI} - R_{PI} \cdot R_{PI}}$$

[Open Calculator !\[\]\(73002692dd5e7a64e60946be3158e719\_img.jpg\)](#)

$$\text{ex } 1.698834 = \frac{-120 \cdot 1.48 \cdot 8.84\text{in}}{8.84\text{in} \cdot 24\text{in} - 24\text{in} \cdot 24\text{in}}$$

### 18) Monsoon Duration Factor given Run-off in cm by Lacey's Formula

$$\text{fx } F_m = \frac{S \cdot (R_{LC} \cdot P_{cm} - P_{cm}^2)}{-304.8 \cdot R_{LC}}$$

[Open Calculator !\[\]\(104fbf564e2e5a8fbd84f31656d114c7\_img.jpg\)](#)

$$\text{ex } 1.480565 = \frac{1.70 \cdot (0.519\text{cm} \cdot 12\text{cm} - (12\text{cm})^2)}{-304.8 \cdot 0.519\text{cm}}$$



## 19) Monsoon Duration Factor given Run-off in Inches by Lacey's Formula



$$fx \quad F_m = \frac{S \cdot (R_{LI} \cdot R_{PI} - R_{PI}^2)}{-120 \cdot R_{LI}}$$

Open Calculator

$$ex \quad 1.481015 = \frac{1.70 \cdot (8.84in \cdot 24in - (24in)^2)}{-120 \cdot 8.84in}$$

## 20) Run-off in cm by Lacey's Formula

$$fx \quad R_{LC} = \frac{P_{cm}}{1 + \frac{304.8 \cdot F_m}{P_{cm} \cdot S}}$$

Open Calculator

$$ex \quad 0.51919cm = \frac{12cm}{1 + \frac{304.8 \cdot 1.48}{12cm \cdot 1.70}}$$

## 21) Run-off in Inches by Lacey's Formula

$$fx \quad R_{LI} = \frac{R_{PI}}{1 + \frac{120 \cdot F_m}{R_{PI} \cdot S}}$$

Open Calculator

$$ex \quad 8.84383in = \frac{24in}{1 + \frac{120 \cdot 1.48}{24in \cdot 1.70}}$$



## Parker's Formula

### 22) Rainfall for Catchment in British Isles

$$\text{fx } R_{\text{PI}} = \frac{R_{\text{PRI}} + 14}{0.94}$$

[Open Calculator !\[\]\(96cc62f861fdd6e50510c0224a756dff\_img.jpg\)](#)

$$\text{ex } 22.35299\text{in} = \frac{15.5\text{in} + 14}{0.94}$$

### 23) Rainfall for Catchment in East USA

$$\text{fx } R_{\text{PI}} = \frac{R_{\text{PRI}} + 16.5}{0.80}$$

[Open Calculator !\[\]\(f95dab70c751fda7d824b8b03650f7aa\_img.jpg\)](#)

$$\text{ex } 27.49508\text{in} = \frac{15.5\text{in} + 16.5}{0.80}$$

### 24) Rainfall for Catchment in Germany

$$\text{fx } R_{\text{PI}} = \frac{R_{\text{PRI}} + 16}{0.94}$$

[Open Calculator !\[\]\(e9474ce1d70442456f8fe9c393ea149c\_img.jpg\)](#)

$$\text{ex } 23.19065\text{in} = \frac{15.5\text{in} + 16}{0.94}$$

### 25) Run-off for Catchment in British Isles

$$\text{fx } R_{\text{PI}} = (0.94 \cdot R_{\text{PI}}) - 14$$

[Open Calculator !\[\]\(9db214d549b9aeebe72aa11d3a5c4b1a\_img.jpg\)](#)

$$\text{ex } 17.04819\text{in} = (0.94 \cdot 24\text{in}) - 14$$





## 26) Run-off for Catchment in East USA

$$\text{fx } R_{\text{PRI}} = (0.80 \cdot R_{\text{PI}}) - 16.5$$

[Open Calculator !\[\]\(c3d993ca47bfe2a953c700506ce31fa0\_img.jpg\)](#)

$$\text{ex } 12.70394\text{in} = (0.80 \cdot 24\text{in}) - 16.5$$

## 27) Run-off for Catchment in Germany

$$\text{fx } R_{\text{PRI}} = (0.94 \cdot R_{\text{PI}}) - 16$$

[Open Calculator !\[\]\(17413706fd4997a1a4bdf85c6864eee1\_img.jpg\)](#)

$$\text{ex } 16.26079\text{in} = (0.94 \cdot 24\text{in}) - 16$$





## Variables Used

- $C_r$  Runoff Coefficient
- $F_m$  Monsoon Duration Factor
- $P_{cm}$  Rainfall Depth (*Centimeter*)
- $P_{IC}$  Rainfall Depth in CM for Inglis's Formula (*Centimeter*)
- $R$  Runoff Depth (*Centimeter*)
- $R_{IC}$  Runoff Depth in CM for Inglis' Formula (*Centimeter*)
- $R_{II}$  Runoff Depth in Inches for Inglis' Formula (*Inch*)
- $R_{KC}$  Runoff Depth in CM for Khosla's Formula (*Centimeter*)
- $R_{KI}$  Runoff Depth in Inches for Khosla's Formula (*Inch*)
- $R_{LC}$  Runoff Depth in CM for Lacey's Formula (*Centimeter*)
- $R_{LI}$  Runoff Depth in Inches for Lacey's Formula (*Inch*)
- $R_{PI}$  Rainfall Depth in Inches (*Inch*)
- $R_{PRI}$  Runoff Depth in Inches for Parker's Formula (*Inch*)
- $S$  Catchment Factor
- $T_f$  Temperature (*Fahrenheit*)



## Constants, Functions, Measurements used

- **Measurement: Length** in Centimeter (cm), Inch (in)  
*Length Unit Conversion* 
- **Measurement: Temperature** in Fahrenheit (°F)  
*Temperature Unit Conversion* 



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