



Computation of Runoff Formulas

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Examples!

Conversions!

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List of 27 Computation of Runoff Formulas

Computation of Runoff

1) Rainfall given Run-off

fx $m P_{cm} = rac{R}{C_r}$

2) Run-off Coefficient given Run-off

 $m C_r = rac{R}{P_{cm}}$

3) Run-off given Run-off Coefficient

fx $R = C_{
m r} \cdot P_{
m cm}$

 $|\mathbf{ex}| 6 \mathrm{cm} = 0.5 \cdot 12 \mathrm{cm}$

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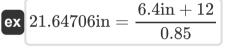
Ingli's Formula 🗗

4) Rainfall in cm for Ghat Area

$$extstyle{P_{
m IC}} = rac{ ext{R}_{
m IC} + 30.5}{0.85}$$

$$= \frac{3.49 \text{cm} + 30.5}{0.85}$$

$$m R_{PI}=rac{R_{II}+12}{0.85}$$



6) Run-off in cm for Ghat Area

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

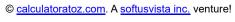
$$\begin{array}{c|c} \textbf{ex} & 3.5 \text{cm} = (0.85 \cdot 40 \text{cm}) - 30.5 \\ \hline & - \end{array}$$

7) Run-off in Cm for Non Ghat Area

$$m R_{IC} = \left(rac{P_{IC}-17.8}{254}
ight) \cdot P_{IC}$$

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







8) Run-off in Inches for Ghat Area

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

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- $8.4 ext{in} = (0.85 \cdot 24 ext{in}) 12$
- 9) Run-off in Inches for Non Ghat Area
- $m R_{II} = \left(rac{R_{PI}-7}{100}
 ight) \cdot R_{PI}$

Khosla's Formula 🗗

10) Mean Temperature in Entire Catchment given Run-off

- fx $\mathrm{T_f} = ((\mathrm{R_{PI}} \mathrm{R_{KI}}) \cdot 9.5) + 32$
- $ext{ex} [38.0325\,^{\circ} ext{F} = ((24 ext{in} 23.75 ext{in})\cdot 9.5) + 32]$
- 11) Mean Temperature in Entire Catchment given Run-off in cm
- $ag{K} T_{
 m f} = (({
 m P}_{
 m cm} {
 m R}_{
 m KC}) \cdot 3.74) + 32$
- $\texttt{ex} \ 38.0214\, ^{\circ} \texttt{F} = ((12 \texttt{cm} 10.39 \texttt{cm}) \cdot 3.74) + 32$





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12) Rainfall in cm by Khosla's Formula 🛂

$$\left| ext{P}_{ ext{cm}} = ext{R}_{ ext{KC}} + \left(rac{ ext{T}_{ ext{f}} - 32}{3.74}
ight)
ight|$$

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

13) Rainfall in Inches by Khosla's Formula 🗗

 $m R_{PI} = R_{KI} + \left(rac{T_f - 32}{9.5}
ight)$

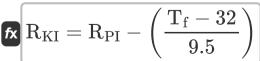


$$ext{ex} \ 23.99865 ext{in} = 23.75 ext{in} + \left(rac{38 ext{ }^{\circ} ext{F} - 32}{9.5}
ight)$$

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

 $\left| \mathrm{R_{KC}} = \mathrm{P_{cm}} - \left(rac{\mathrm{T_f} - 32}{3.74}
ight)
ight|$





$$ext{ex} \ 23.75135 ext{in} = 24 ext{in} - \left(rac{38 ext{ }^{\circ} ext{F} - 32}{9.5}
ight)$$



Lacey's Formula 🗗

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

fx $S = rac{-304.8 \cdot F_{
m m} \cdot R_{
m LC}}{R_{
m LC} \cdot P_{
m cm} - P_{
m cm} \cdot P_{
m cm}}$

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

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

 $ext{S} = rac{-120 \cdot ext{F}_{ ext{m}} \cdot ext{R}_{ ext{LI}}}{ ext{R}_{ ext{LI}} \cdot ext{R}_{ ext{PI}} - ext{R}_{ ext{PI}} \cdot ext{R}_{ ext{PI}}}$

Open Calculator

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

 $\mathbf{F}_{\mathrm{m}} = rac{\mathrm{S} \cdot \left(\mathrm{R_{LC}} \cdot \mathrm{P_{cm}} - \mathrm{P_{cm}^2}
ight)}{-304.8 \cdot \mathrm{R_{LC}}}$

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



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

ن

$$\mathrm{F_m} = rac{\mathrm{S} \cdot \left(\mathrm{R_{LI}} \cdot \mathrm{R_{PI}} - \mathrm{R_{PI}^2}
ight)}{-120 \cdot \mathrm{R_{LI}}} \Bigg|$$

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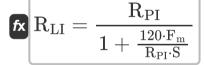
$$= 1.481015 = \frac{1.70 \cdot \left(8.84 \text{in} \cdot 24 \text{in} - (24 \text{in})^2\right)}{-120 \cdot 8.84 \text{in}}$$

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



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



$$=$$
 $8.84383 ext{in} = rac{24 ext{in}}{1 + rac{120 \cdot 1.48}{24 ext{in} \cdot 1.70}}$



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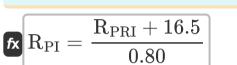
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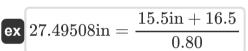
Parker's Formula 🗗

22) Rainfall for Catchment in British Isles

$$m R_{PI} = rac{R_{PRI} + 14}{0.94}$$

23) Rainfall for Catchment in East USA





24) Rainfall for Catchment in Germany

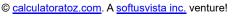
$$m R_{PI} = rac{R_{PRI} + 16}{0.94}$$

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

25) Run-off for Catchment in British Isles

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







26) Run-off for Catchment in East USA

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

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- $\texttt{ex} \ 12.70394 \text{in} = (0.80 \cdot 24 \text{in}) 16.5$
- 27) Run-off for Catchment in Germany
- fx $m R_{PRI} = (0.94 \cdot
 m R_{PI}) 16$

Variables Used

- Cr Runoff Coefficient
- Fm Monsoon Duration Factor
- Pcm Rainfall Depth (Centimeter)
- PIC Rainfall Depth in CM for Ingli's Formula (Centimeter)
- R Runoff Depth (Centimeter)
- RIC 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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- Computation of Runoff Formulas
- Evaporation and Transpiration
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- Flood Discharge Formulae
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