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# Components of a Hydrograph Formulas

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# List of 12 Components of a Hydrograph Formulas

## Components of a Hydrograph

### 1) Discharge at Initial Time

$$\text{fx } Q_0 = \frac{Q_t}{K_r^t}$$

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

$$\text{ex } 49.99843\text{m}^3/\text{s} = \frac{1.4162\text{m}^3/\text{s}}{(0.1683)^{2\text{s}}}$$

### 2) Discharge at Initial Time in Alternative Form of Exponential Decay

$$\text{fx } Q_0 = \frac{Q_t}{\exp(-a \cdot t)}$$

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

$$\text{ex } 49.99771\text{m}^3/\text{s} = \frac{1.4162\text{m}^3/\text{s}}{\exp(-1.782 \cdot 2\text{s})}$$

### 3) Discharge concerning Recession Constant

$$\text{fx } Q_t = Q_0 \cdot K_r^t$$

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

$$\text{ex } 1.416245\text{m}^3/\text{s} = 50\text{m}^3/\text{s} \cdot (0.1683)^{2\text{s}}$$



#### 4) Discharge given Storage

$$fx \quad Q_t = S \cdot a$$

[Open Calculator !\[\]\(cbe80b694ebd74fcfe136a095b608235\_img.jpg\)](#)

$$ex \quad 178.2\text{m}^3/\text{s} = 100\text{m}^3 \cdot 1.782$$

#### 5) Discharge in Alternative Form of Exponential Decay

$$fx \quad Q_t = Q_0 \cdot \exp(-a \cdot t)$$

[Open Calculator !\[\]\(3e2231b1ad3ca8da8658228c00dd08e0\_img.jpg\)](#)

$$ex \quad 1.416265\text{m}^3/\text{s} = 50\text{m}^3/\text{s} \cdot \exp(-1.782 \cdot 2\text{s})$$

#### 6) Drainage Area given Time Interval from Peak in Straight-Line Method of Baseflow Separation

$$fx \quad A_D = \left( \frac{N}{0.83} \right)^{\frac{1}{0.2}}$$

[Open Calculator !\[\]\(0d5ec72f61334709c3fc9450209b754f\_img.jpg\)](#)

$$ex \quad 616.9015\text{m}^2 = \left( \frac{3\text{d}}{0.83} \right)^{\frac{1}{0.2}}$$

#### 7) Recession Constant

$$fx \quad K_r = K_{rs} \cdot K_{ri} \cdot K_{rb}$$

[Open Calculator !\[\]\(b64b40baaee5acddc1eab8538ba84754\_img.jpg\)](#)

$$ex \quad 0.1683 = 0.2 \cdot 0.85 \cdot 0.99$$



8) Recession Constant for Base Flow 

$$fx \quad K_{rb} = \frac{K_r}{K_{rs}} \cdot K_{ri}$$

Open Calculator 


$$ex \quad 0.715275 = \frac{0.1683}{0.2} \cdot 0.85$$

9) Recession Constant for Interflow 

$$fx \quad K_{ri} = \frac{K_r}{K_{rs}} \cdot K_{rb}$$

Open Calculator 


$$ex \quad 0.833085 = \frac{0.1683}{0.2} \cdot 0.99$$

10) Recession Constant for Surface Storage 

$$fx \quad K_{rs} = \frac{K_r}{K_{ri}} \cdot K_{rb}$$

Open Calculator 

$$ex \quad 0.19602 = \frac{0.1683}{0.85} \cdot 0.99$$

11) Storage Remaining at any Time t 

$$fx \quad S = \frac{Q_t}{a}$$

Open Calculator 

$$ex \quad 0.794725m^3 = \frac{1.4162m^3/s}{1.782}$$



## 12) Time Interval from Peak in Straight-Line method of Baseflow Separation

$$\text{fx } N = 0.83 \cdot A_D^{0.2}$$

[Open Calculator !\[\]\(e2376d476d06eb31946dc01a69a4403a\_img.jpg\)](#)

$$\text{ex } 2.983378\text{d} = 0.83 \cdot (600\text{m}^2)^{0.2}$$







## Variables Used

- **a** Constant 'a' for Discharge in Exponential Decay
- **A<sub>D</sub>** Drainage Area (*Square Meter*)
- **K<sub>r</sub>** Recession Constant
- **K<sub>rb</sub>** Recession Constant for Baseflow
- **K<sub>ri</sub>** Recession Constant for Interflow
- **K<sub>rs</sub>** Recession Constant for Surface Storage
- **N** Time Interval (*Day*)
- **Q<sub>0</sub>** Discharge at Time t=0 (*Cubic Meter per Second*)
- **Q<sub>t</sub>** Discharge at Time t (*Cubic Meter per Second*)
- **S** Total Storage in Channel Reach (*Cubic Meter*)
- **t** Time (*Second*)



## Constants, Functions, Measurements used

- **Function:** **exp**, exp(Number)  
*Exponential function*
- **Measurement:** **Time** in Second (s), Day (d)  
*Time Unit Conversion* 
- **Measurement:** **Volume** in Cubic Meter (m<sup>3</sup>)  
*Volume Unit Conversion* 
- **Measurement:** **Area** in Square Meter (m<sup>2</sup>)  
*Area Unit Conversion* 
- **Measurement:** **Volumetric Flow Rate** in Cubic Meter per Second (m<sup>3</sup>/s)  
*Volumetric Flow Rate Unit Conversion* 



## Check other formula lists

- **Components of a Hydrograph Formulas** 

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