# HEC-DSSVue Math Functions



Interactive Data Manipulation Part 1 of the Epic Trilogy!

# **HECDSS-Vue Math Functions**

Part 1 - "Where it all begins . . ."

- Successor to DSSMath
  - Basically same functionality with some enhancements, clarifications, or rearrangements
  - Over 50 math functions available
  - No migration tools available
- Interactive or scripted
  - Interface accessed through DSSVue GUI
  - Jython language opens up entire set of objects and methods

# Accessing Math Functions

- Select the pathnames on which the Math Functions will operate
- Choose the Tools->Math Functions menu
- Alternately, choose the Math Functions icon from the
   Menu Bar



File Name: Pathonics	The second secon	Precision Settings/q0h s Selected: 1	Meth Functions	tions.dss File Size: 58 KB			
Search By Parts:	A: B:		Script Editor Script Selector	×	E: F:		
Number	Part A	Part B	Part C	Part D / range		Part E	Part F
	1 FOX RIVER	LUTZ PARK	FLOW-RES OUT	22Sep2000 - 31Oct2000		15MIN	USGS-CST
	2 LAKE WINNEBAGO	FOND DU LAC	ELEV	22Sep2000 - 31Oct2000	8	IR-MONTH	COE-CST
4	3 LAKE WINNEBAGO	JEFFERSON PA	ARK ELEV	22Sep2000 - 31Oct2000		30MIN	COE-CST
	4 LAKE WINNEBAGO 5 LAKE WINNEBAGO	MEAN LAKE OSHKOSH	ELEV-STOR PRECIP	23Sep2000 - 31Oct2000	2	IR-MONTH	COE-CST

#### Math Functions Screen

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#### File Menu

- Saves the modified data in original pathname, or with user-designated changes to pathname parts
- Exits Math Functions screen

A Math Functions	
File Edit Display	
🖬 Save Ctrl+S	
🖶 Save As	RIVER/LUTZ PARK/FLOW-RES OUT/01SEP2000/15MIN/USGS-CST/
Close Ctrl+W	Functions Hydrologic Smoothing Statistics
Operator: Add	▼
<ul> <li>Constant</li> <li>Data Set</li> </ul>	
/FOX RIVER/LUTZ PARK/I /LAKE WINNEBAGO/FONI /LAKE WINNEBAGO/JEFF /LAKE WINNEBAGO/OSH	FLOW-RES OUT/01SEP2000/15MIN/USGS-CST/ O DU LAC/ELEV/01SEP2000/IR-MONTH/COE-CST/ ERSON PARK/ELEV/01SEP2000/30MIN/COE-CST/ (OSH/PRECIP/01SEP2000/IR-MONTH/COE-CST/
	Compute
No Constant entered.	

# Edit Menu

A Math Functions	
File Edit Display	
Restore Original Data	
Selected Data Set: /FOX RIVER/LUTZ PARK/FLOW-RES OUT/01SEP2000/15MIN/USGS-CST/	*
Arithmetic General Time Functions Hydrologic Smoothing Statistics	
Operator: Add	
⊙ Constant 2	
🔘 Data Set	
/FOX RIVER/LUTZ PARK/FLOW-RES OUT/01SEP2000/15MIN/USGS-CST/	
/LAKE WINNEBAGO/FOND DU LAC/ELEV/01SEP2000/IR-MONTH/COE-CST/	
/LAKE WINNEBAGO/JEFFERSON PARK/ELEV/01SEP2000/30MIN/COE-CST/	
LAKE WINNEBAGO/OSHKOSH/PRECIP/015EP2000/IR-MONTH/COE-CST/	
Compute	

'Restore Original Data' menu item abandons any unsaved edits to selected data set.

#### Display Menu

Choices in the upper portion of Display menu are toggles for controlling which data sets get tabulated or plotted.

Lower choices pop up tables or plots of the chosen data.

<mark>/ M</mark> ath I	unctions	
File Edit	Display	
Selected Da	Original data with computed     All Data Sets	/-RES OUT/01SEP2000/15MIN/USGS-CST/
Arithmetic		Smoothing Statistics
Operator:	Tabulate in Excel	
⊙ Const	ant	
/FOX RIVE /LAKE WII /LAKE WII /LAKE WII	ER/LUTZ PARK/FLOW-RES OUT/01SEP20 NNEBAGO/FOND DU LAC/ELEV/01SEP20 NNEBAGO/JEFFERSON PARK/ELEV/01SE NNEBAGO/OSHKOSH/PRECIP/01SEP200	00/15MIN/USGS-CST/ 00/IR-MONTH/COE-CST/ P2000/30MIN/COE-CST/ D/IR-MONTH/COE-CST/
	Comp	ute
No Constar	it entered.	



# Toolbar

A Math Functions	
F <mark>ile Edit Display</mark>	
Selected Data Set: //LAKE WINNEBAGO/FOND DU LAC/ELEV/01SEP2000/IR-MONTH/COE-CST/	~
Arithmetic General Time Functions Hydrologic Smoothing Statistics	
Operator: Add	
⊙ Co <u>n</u> stant	
🔿 D <u>a</u> ta Set	
/LAKE WINNEBAGO/FOND DU LAC/ELEV/01SEP2000/IR-MONTH/COE-CST/	
<u>C</u> ompute	
No Constant entered.	

Alternate mechanisms for File/Save, File/Save As, Display/Plot, and Display/Tabulate.

# **Operator Selection**

- Select the operator from the pull down menu.
- Many operators need two data sets for the computation
  - Selected is the primary
  - Choose secondary from lower screen

A Math Functions	
<u>File E</u> dit <u>D</u> isplay	
🖬 🖶   🔟 🏗 🜌	
Selected Data Set: /FOX RIVER/LUTZ	PARK/FLOW-RES OUT/01SEP2000/15MIN/USGS-CST/ 💽
Arithmetic General Time Functions I	Hydrologic Smoothing Statistics
Operator: Add	
Consta Subtract     Multiply     Data S Divide     If or priver Exponentiation	T/015EP2000/15MIN/USCS-CST/
/LAKE WIN Absolute Value /LAKE WIN Square Root /LAKE WIN Log e Log Base 10 Sine Cosine Tangent Inverse Accumulation	//01SEP2000/IR-MONTH/COE-CST/ ELEV/01SEP2000/30MIN/COE-CST/ /01SEP2000/IR-MONTH/COE-CST/
Successive Differences Time Derivative	Compute



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A Math Functions	
Eile Edit Display	
Selected Data Set: //LAKE WINNEBAGO/FOND DU LAC/ELEV/01SEP2000/IR-MONTH/COE-CST/	~
Arithmetic General Time Functions Hydrologic Smoothing Statistics	
Operator: Add	
⊙ Co <u>n</u> stant	
🔘 D <u>a</u> ta Set	
/LAKE WINNEBAGO/FOND DU LAC/ELEV/01SEP2000/IR-MONTH/COE-CST/	
Compute	
No Constant entered.	

List contains paths selected when Math Functions module launches. Selected line becomes the data set in memory

# Selected Data Sets

- Choose from paths selected when Math Functions module launches.
- Some functions permit an operation to be applied simultaneously to multiple data sets.

single selection function

multiple selection function

• Selection(s) become the data set in memory

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File Edit Display		
🗟 🖶 🔟 🏗		
Selected Data Set: /LAKE WINNEBAG	O/JEFFERSON PARK/ELEV/01SEP2000/30MIN/COE-CST/	1
Arithmetic General Time Conversion	Hydrologic Smoothing Statistics	
Operator: Add		
	1	
O Constant		
💿 Data Set		
/FOX RIVER/LUTZ PARK/FLOW-RES (	OUT/01SEP2000/15MIN/USGS-CST/	
/LAKE WINNEBAGO/JEFFERSON PA	RK/ELEV/01SEP2000/30MIN/COE-CST/	
	Compute	
A Math Functions		)[
Math Functions File Edit Display	<b>—</b> —	)[
Math Functions File Edit Display	<b>—</b> —	
Math Functions File Edit Display	PARK/FLOW-RES OUT/01 SEP2000/15MIN/USGS-CST/	
Math Functions         File       Edit       Display         Image: I	PARK/FLOW-RES OUT/01SEP2000/15MIN/USGS-CST/	
Math Functions         File       Edit       Display         Image: Selected Data Set:       /FOX RIVER/LUTZ         Arithmetic       General       Time Conversion         Operator:       Absolute Value       Image: Selected Value	PARK/FLOW-RES OUT/01SEP2000/15MIN/USGS-CST/	)(
Math Functions File Edit Display Elected Data Set: /FOX RIVER/LUTZ Arithmetic General Time Conversion Operator: Absolute Value	PARK/FLOW-RES OUT/01 SEP2000/1 5MIN/USGS-CST/	)(
Math Functions         File       Edit       Display         Image: Selected Data Set:       /FOX RIVER/LUTZ         Arithmetic       General       Time Conversion         Operator:       Absolute Value       Image: Selected Data Set (above)	PARK/FLOW-RES OUT/01SEP2000/15MIN/USGS-CST/ Hydrologic Smoothing Statistics	
Math Functions   File   Edit   Display   Edit   Display   Selected Data Set:   /FOX RIVER/LUTZ   Arithmetic   General   Time Conversion   Operator:   Absolute Value   Single Selected Data Set (above)   Single Selected Data Sets (below)	PARK/FLOW-RES OUT/01 SEP2000/15MIN/USGS-CST/	
Math Functions   File Edit Display   Edit Display   Selected Data Set:   /FOX RIVER/LUTZ   Arithmetic General Time Conversion   Operator:   Absolute Value   Single Selected Data Set (above)   Single Selected Data Sets (below   /FOX RIVER/LUTZ PARK/FLOW-RES (Conversion)	PARK/FLOW-RES OUT/01SEP2000/15MIN/USGS-CST/ Hydrologic Smoothing Statistics	
Math Functions     File   Edit   Display     Selected Data Set:   /FOX RIVER/LUTZ     Arithmetic   General   Time Conversion   Operator:   Absolute Value     Single Selected Data Set (above)     Multiple Selected Data Sets (below   /FOX RIVER/LUTZ PARK/FLOW-RES (C)     /LAKE WINNEBAGO/JEFFERSON PARE	PARK/FLOW-RES OUT/01SEP2000/15MIN/USGS-CST/ Hydrologic Smoothing Statistics  V) DUT/01SEP2000/15MIN/USGS-CST/ LEV/01SEP2000/IR-MONTH/COE-CST/ RK/ELEV/01SEP2000/30MIN/COE-CST/	
Math Functions     File   Edit   Display     Selected Data Set:   /FOX RIVER/LUTZ     Arithmetic   General   Time Conversion   Operator:   Absolute Value     Single Selected Data Set (above)     Single Selected Data Set (below)   Multiple Selected Data Sets (below)     /FOX RIVER/LUTZ PARK/FLOW-RES OF   /LAKE WINNEBAGO/FOND DU LAC/ED	PARK/FLOW-RES OUT/01SEP2000/15MIN/USGS-CST/ Hydrologic Smoothing Statistics  V) DUT/01SEP2000/15MIN/USGS-CST/ LEV/01SEP2000/IR-MONTH/COE-CST/ RK/ELEV/01SEP2000/30MIN/COE-CST/	
▲ Math Functions         File       Edit       Display         ■       ■       ■       ■         Selected Data Set:       /FOX RIVER/LUTZ         Arithmetic       General       Time Conversion         Operator:       Absolute Value       ✓         O Single Selected Data Set (above)       ✓       ✓         O Multiple Selected Data Sets (below       /FOX RIVER/LUTZ PARK/FLOW-RES OF         /LAKE WINNEBAGO/JEFFERSON PARE	PARK/FLOW-RES OUT/01SEP2000/15MIN/USGS-CST/ Hydrologic Smoothing Statistics //) DUT/01SEP2000/15MIN/USGS-CST/ LEV/01SEP2000/30MIN/COE-CST/ RK/ELEV/01SEP2000/30MIN/COE-CST/	
Math Functions     File   Edit   Display     Selected Data Set:   /FOX RIVER/LUTZ     Arithmetic   General   Time Conversion   Operator:   Absolute Value     O Single Selected Data Set (above)     O Multiple Selected Data Sets (below   /FOX RIVER/LUTZ PARK/FLOW-RES OF   /LAKE WINNEBAGO/FOND DU LAC/E   /LAKE WINNEBAGO/JEFFERSON PAR	PARK/FLOW-RES OUT/01 SEP2000/15MIN/USGS-CST/ Hydrologic Smoothing Statistics	

### Functions and Operators

A Math Functions	
<u>F</u> ile <u>E</u> dit <u>D</u> isplay	
Selected Data Set: //LAKE WINNEBAGO/FOND DU LAC/ELEV/01SEP2000/IR-MONTH/COE-CST/	~
Arithmetic General Time Functions Hydrologic Smoothing Statistics	
Operator: Add	
⊙ Co <u>n</u> stant	
🔿 D <u>a</u> ta Set	
/LAKE WINNEBAGO/FOND DU LAC/ELEV/01SEP2000/IR-MONTH/COE-CST/	
<u>C</u> ompute	
No Constant entered.	

- > Each of six tabs contains a number of operators.
- > Drop down menu contains list of operators in that category
- Some operators specific to time-series or paired data.
- Parameters vary between operators.

# Math Functions Categories

- Arithmetic
- General
- Time Functions
- Hydrologic
- Smoothing
- Statistics



### Arithmetic Operations – Part 1

- Add constant, data set
- Subtract
- Multiply
- Divide
- Exponentiation
- Absolute Value
- Square Root
- Log e
- Log Base 10

stant,	uala	301	
cons	tant,	data	set
cons	tant,	data	set
cons	tant,	data	set
pow	er		



#### Add Data Sets



# Arithmetic Operations – Part 2

- Sine
- Cosine
- Tangent
- Inverse (1/x)
  - 1/0.0 becomes missing
- Accumulation
  - E.g. incremental precipitation to cumulative
  - Missing values treated as zero
- Successive Differences
  - Difference, regardless of time interval
  - E.g. cumulative precipitation to incremental
- Time Derivative
  - Successive Difference per unit time

### Accumulation



#### Time Derivative



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# General Functions – Part 1

- Units Conversion
  - Metric (SI) to English
  - English to Metric (SI)
- Set Units
  - Units
  - Conversion multiplier
- Set Type
  - Will not modify the data; only sets the type field
- Round to nearest whole number
- Truncate to whole number

# General Functions – Part 2

- Round off
  - To number of significant digits
  - To decimal position (2 means nearest 100, -2 means nearest 0.01)
- Estimate missing values
  - Maximum number of consecutive missing values
  - Interpolate cumulative precipitation
- Replace specific values
- Screen using minimum and maximum
  - Minimum, maximum, and change in values
  - Sets values not passed to missing or flags

# General Functions – Part 3

- Screen with forward moving average
  - Compares change to forward moving average
  - Number to average specified by user
- Merge time series
  - Primary and secondary
  - Replace missing values (not average)
- Merge paired data
- Paired Data operations
  - Set the horizontal axis or swap parameters
  - Reorder to ascending and remove duplicate values
  - Resample points
- Generate data pairs
  - E.g., generate a rating table from stage and flow time series data sets

### Generate Data Pairs

🔺 Math Functions
File Edit Display
Selected Data Set: //// BASIN/RIVERSIDE////GENERATED DATA PAI 💌
/MY BASIN/RIVERSIDE/FLOW/01MAR1990/1HOUR/OB Time Conversiol /MY BASIN/RIVERSIDE/STAGE/01MAR1990/1HOUR/OB Arithr /MY BASIN/RIVERSIDE////GENERATED DATA PAIRS/
Operator: Generate Data Pairs
Data Set
/MY BASIN/RIVERSIDE/FLOW/01MAR1990/1HOUR/OBS/
MY BASIN/RIVERSIDE/STAGE/01MAR1990/1HOUR/OBS/
🔽 Sorted
Compute
Selected Data Set not a Time Series



