Analysis Techniques: Flood Analysis Example with Instaneous Peak Flow Data (Log-Pearson Type III Distribution)

Information to get started:

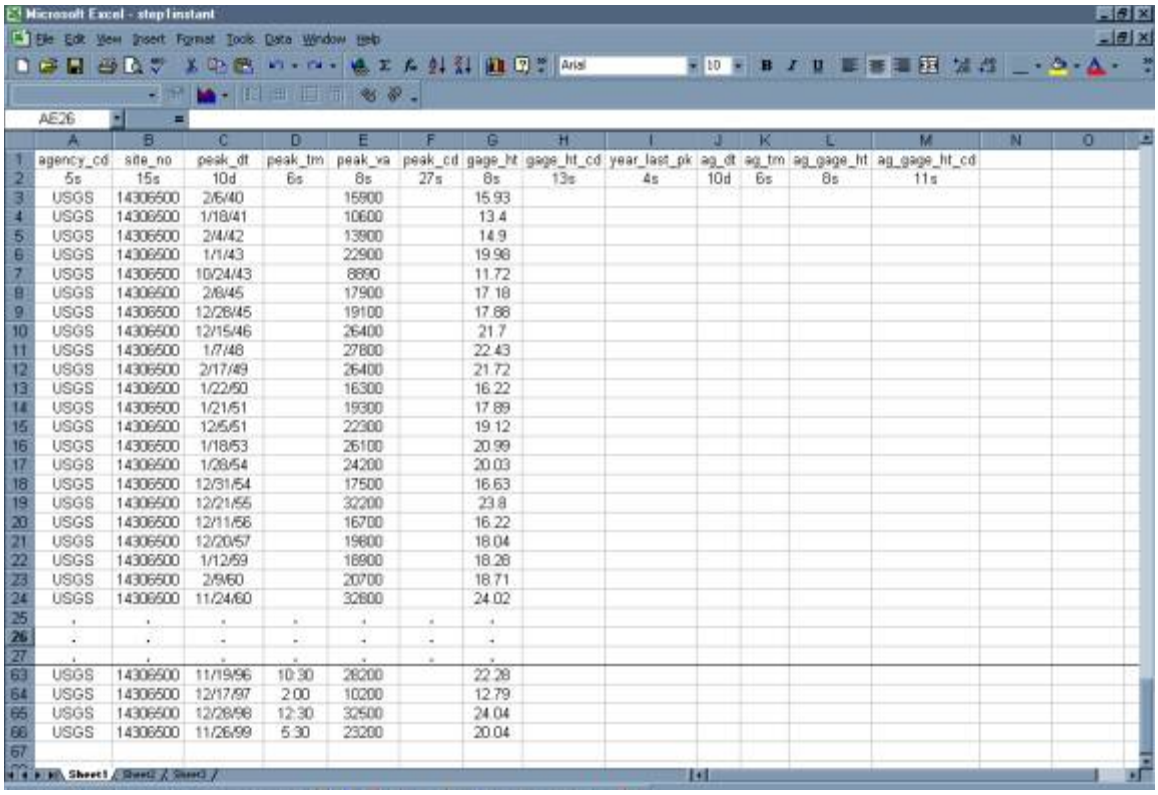
- The lesson below contains step-by-step instructions and "snapshots" of what each step looks like when carried out in a Microsoft Excel workbook. Blue shading of information in the Excel illustrations denotes changes made from the previous step. Dots placed in three consecutive rows indicate that a portion of data is hidden from sight.
- You can download an Excel workbook containing the complete data set by clicking on the "Download Data" link below. It contains each calculation step on a separate worksheet. To move between steps, click on the tabs at the bottom of the excel window.
- When you download the file, it may open in your browser window. You may wish to use the "save as" function to save the file to a local drive and then reopen it in Excel. This will make it easier to flip between the online lesson and the example workbook.
- Finally, we want to remind you that the techniques explained on this site are statistically based; therefore results must be viewed as predictions and not as facts. Please use the techniques and the information obtained from them responsibly!

Download Data

Step 1: Obtain streamflow data

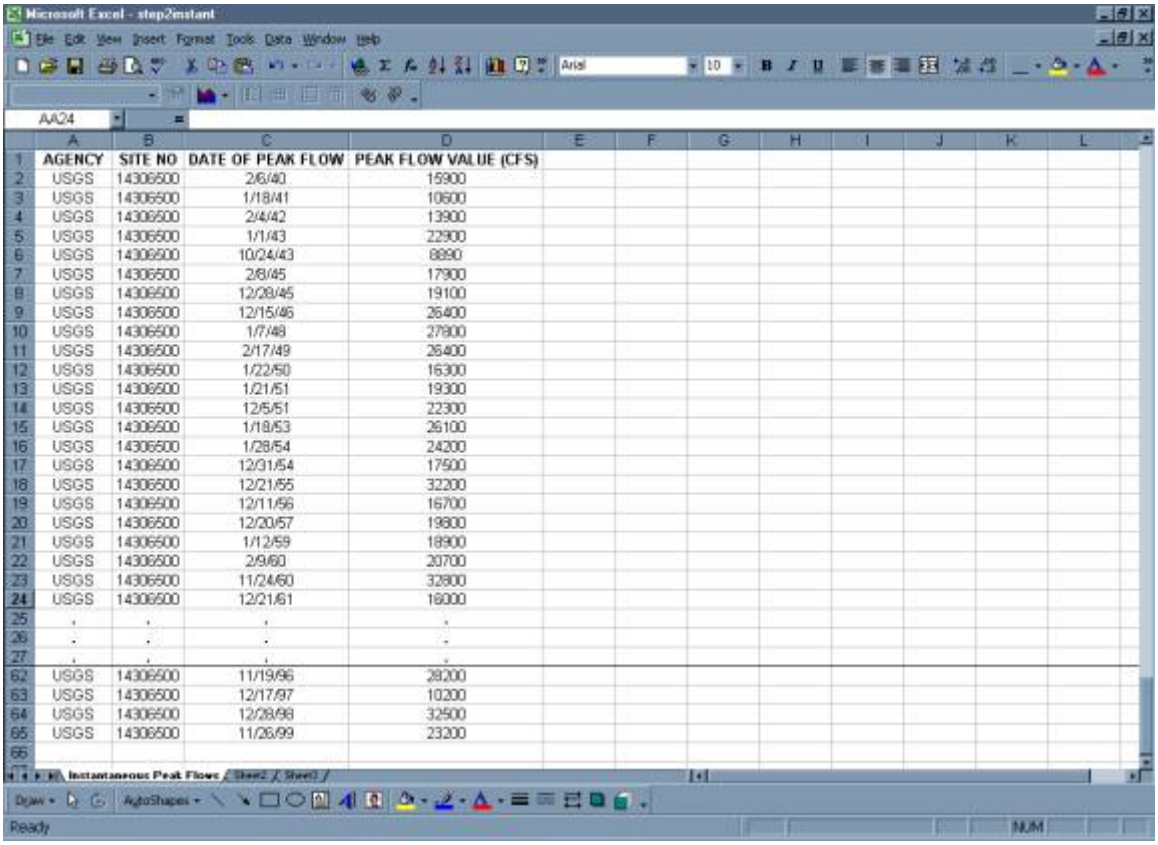
Obtain instantaneous peak streamflow data from the USGS web site.

- Go to **http://oregon.usgs.gov**
- Select Historical Water Data
- Select Surface Water
- Select Peaks
- Check box under Site Identifier for Site Name and Submit
- Type in Alsea under Site Name and select match any part and Submit
- Select gage at TIDEWATER (140306500)
- Select Tab-separated data
- For the example, copy entire data set into Excel worksheet
- Paste special as text (this will separate the data into columns)



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	agency_cd	site_no	peak_dt	peak_tm	peak_va	peak_cd	gage_ht	gage_ht_cd	year_last_pk	ag_dt	ag_tm	ag_gage_ht	ag_gage_ht_cd		
2	5s	15s	10d	6s	8s	27s	8s	13s	4s	10d	6s	8s	11s		
3	USGS	14306500	2/6/40		15900		15.93								
4	USGS	14306500	1/18/41		10600		13.4								
5	USGS	14306500	2/4/42		13900		14.9								
6	USGS	14306500	1/1/43		22900		19.98								
7	USGS	14306500	10/24/43		8890		11.72								
8	USGS	14306500	2/8/45		17900		17.18								
9	USGS	14306500	12/28/45		19100		17.88								
10	USGS	14306500	12/15/46		26400		21.7								
11	USGS	14306500	1/7/48		27800		22.43								
12	USGS	14306500	2/17/49		26400		21.72								
13	USGS	14306500	1/22/50		16300		16.22								
14	USGS	14306500	1/21/51		19300		17.89								
15	USGS	14306500	12/5/51		22300		19.12								
16	USGS	14306500	1/18/53		26100		20.99								
17	USGS	14306500	1/28/54		24200		20.03								
18	USGS	14306500	12/31/54		17500		16.63								
19	USGS	14306500	12/21/55		32200		23.8								
20	USGS	14306500	12/11/56		16700		16.22								
21	USGS	14306500	12/20/57		19800		18.04								
22	USGS	14306500	1/12/59		18900		18.28								
23	USGS	14306500	2/9/60		20700		18.71								
24	USGS	14306500	11/24/60		32800		24.02								
25	.	.	.	.	.	.	.								
26	.	.	.	.	.	.	.								
27	.	.	.	.	.	.	.								
63	USGS	14306500	11/19/96	10:30	28200		22.28								
64	USGS	14306500	12/17/97	2:00	10200		12.79								
65	USGS	14306500	12/28/98	12:30	32500		24.04								
66	USGS	14306500	11/26/99	5:30	23200		20.04								
67															

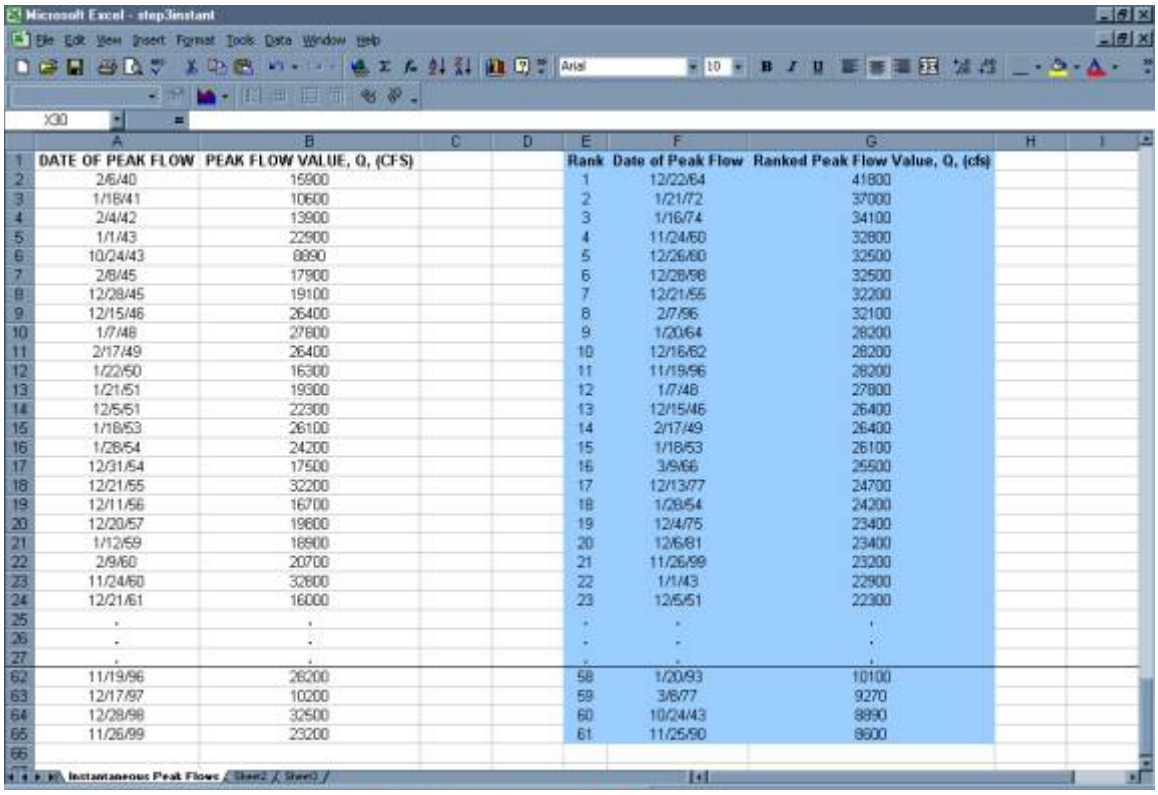
Step 2: Organize the information in a table.



	A	B	C	D	E	F	G	H	I	J	K	L
1	AGENCY	SITE NO	DATE OF PEAK FLOW	PEAK FLOW VALUE (CFS)								
2	USGS	14306500	2/6/40	15900								
3	USGS	14306500	1/18/41	10600								
4	USGS	14306500	2/4/42	13900								
5	USGS	14306500	1/1/43	22900								
6	USGS	14306500	10/24/43	8890								
7	USGS	14306500	2/8/45	17900								
8	USGS	14306500	12/28/45	19100								
9	USGS	14306500	12/15/46	26400								
10	USGS	14306500	1/7/48	27800								
11	USGS	14306500	2/17/49	26400								
12	USGS	14306500	1/22/50	16300								
13	USGS	14306500	1/21/51	19300								
14	USGS	14306500	12/5/51	22300								
15	USGS	14306500	1/18/53	26100								
16	USGS	14306500	1/28/54	24200								
17	USGS	14306500	12/31/54	17500								
18	USGS	14306500	12/21/55	32200								
19	USGS	14306500	12/11/56	16700								
20	USGS	14306500	12/20/57	19800								
21	USGS	14306500	1/12/59	18900								
22	USGS	14306500	2/9/60	20700								
23	USGS	14306500	11/24/60	32800								
24	USGS	14306500	12/21/61	18000								
25	.	.	.	.								
26	.	.	.	.								
27	.	.	.	.								
62	USGS	14306500	11/19/96	28200								
63	USGS	14306500	12/17/97	10200								
64	USGS	14306500	12/28/98	32500								
65	USGS	14306500	11/26/99	23200								
66												

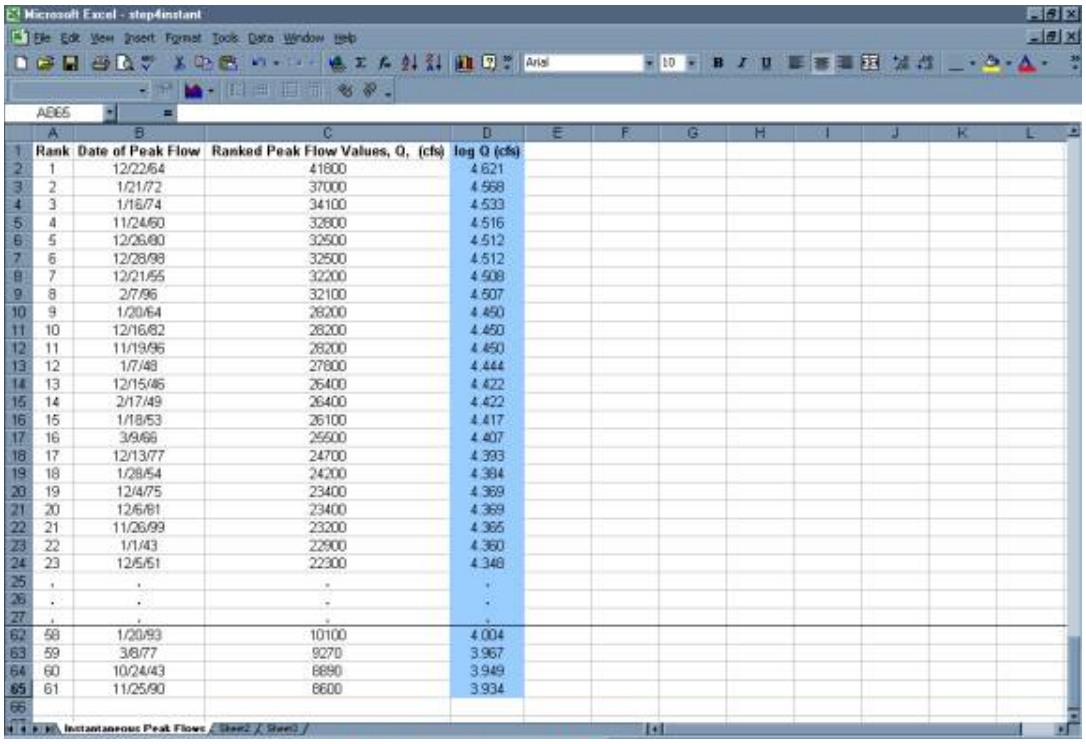
Step 3: Rank the data from largest discharge to smallest discharge.

- Add a column for Rank and number each streamflow value from 1 to n (the total number of values in your dataset).



	A	B	C	D	E	F	G	H	I
1	DATE OF PEAK FLOW	PEAK FLOW VALUE, Q, (CFS)			Rank	Date of Peak Flow	Ranked Peak Flow Value, Q, (cfs)		
2	2/6/40	15900			1	12/22/64	41800		
3	1/18/41	10600			2	1/21/72	37000		
4	2/4/42	13900			3	1/16/74	34100		
5	1/1/43	22900			4	11/24/60	32800		
6	10/24/43	8890			5	12/26/60	32500		
7	2/6/45	17900			6	12/28/98	32500		
8	12/28/45	19100			7	12/21/55	32200		
9	12/15/46	26400			8	2/7/96	32100		
10	1/7/48	27800			9	1/20/64	28200		
11	2/17/49	26400			10	12/16/62	28200		
12	1/22/50	16300			11	11/19/96	28200		
13	1/21/51	19300			12	1/7/48	27800		
14	12/5/51	22300			13	12/15/46	26400		
15	1/18/53	26100			14	2/17/49	26400		
16	1/28/54	24200			15	1/18/53	26100		
17	12/31/54	17500			16	3/9/66	25500		
18	12/21/55	32200			17	12/13/77	24700		
19	12/11/56	16700			18	1/28/54	24200		
20	12/20/57	19600			19	12/4/75	23400		
21	1/12/59	18900			20	12/6/81	23400		
22	2/9/60	20700			21	11/26/99	23200		
23	11/24/60	32800			22	1/1/43	22900		
24	12/21/61	16000			23	12/5/51	22300		
25	.	.			.	.	.		
26	.	.			.	.	.		
27	.	.			.	.	.		
62	11/19/96	26200			58	1/20/93	10100		
63	12/17/97	10200			59	3/8/77	9270		
64	12/28/98	32500			60	10/24/43	8890		
65	11/26/99	23200			61	11/25/90	8600		
66									

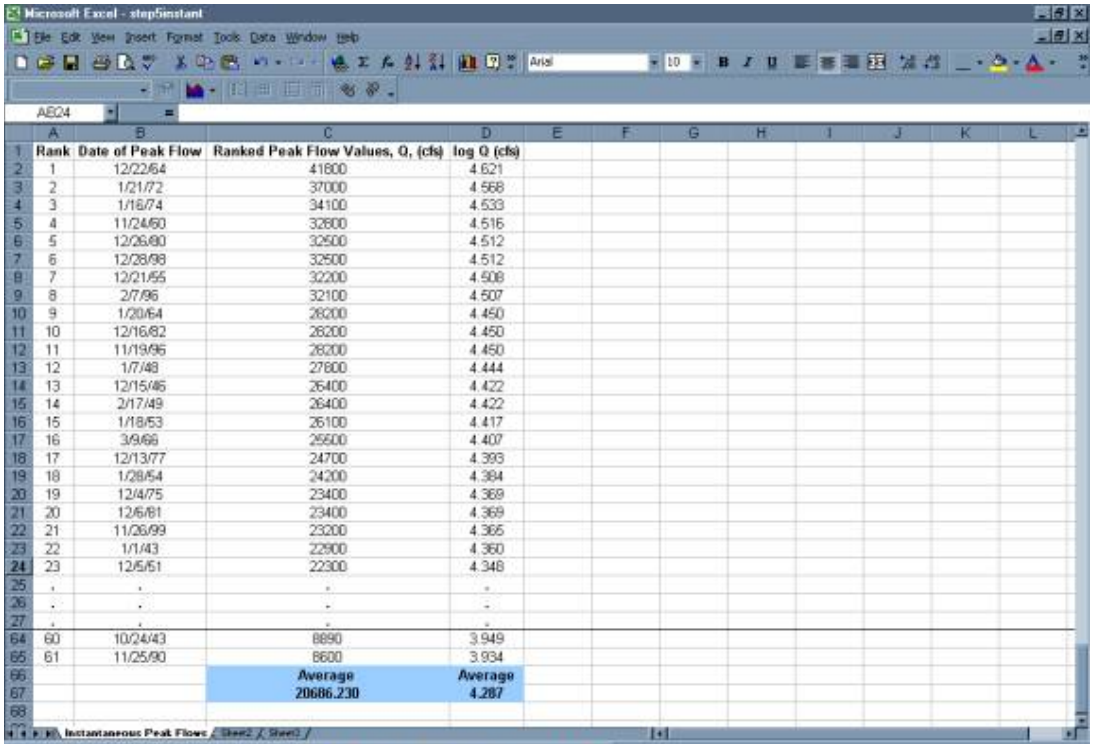
Step 4: Create a column with the log of each max or peak streamflow using the Excel formula {log (Q)} and copy command.



Microsoft Excel - step4instant

Rank	Date of Peak Flow	Ranked Peak Flow Values, Q, (cfs)	log Q (cfs)
1	12/22/64	41800	4.621
2	1/21/72	37000	4.568
3	1/16/74	34100	4.533
4	11/24/60	32800	4.516
5	12/26/80	32500	4.512
6	12/28/98	32500	4.512
7	12/21/55	32200	4.508
8	2/7/96	32100	4.507
9	1/20/64	28200	4.450
10	12/16/82	28200	4.450
11	11/19/96	28200	4.450
12	1/7/48	27800	4.444
13	12/15/46	26400	4.422
14	2/17/49	26400	4.422
15	1/18/53	26100	4.417
16	3/9/66	25500	4.407
17	12/13/77	24700	4.393
18	1/28/54	24200	4.384
19	12/4/75	23400	4.369
20	12/6/81	23400	4.369
21	11/26/99	23200	4.365
22	1/1/43	22900	4.360
23	12/5/51	22300	4.348
.	.	.	.
.	.	.	.
.	.	.	.
58	1/20/93	10100	4.004
59	3/8/77	9270	3.967
60	10/24/43	8890	3.949
61	11/25/90	8600	3.934

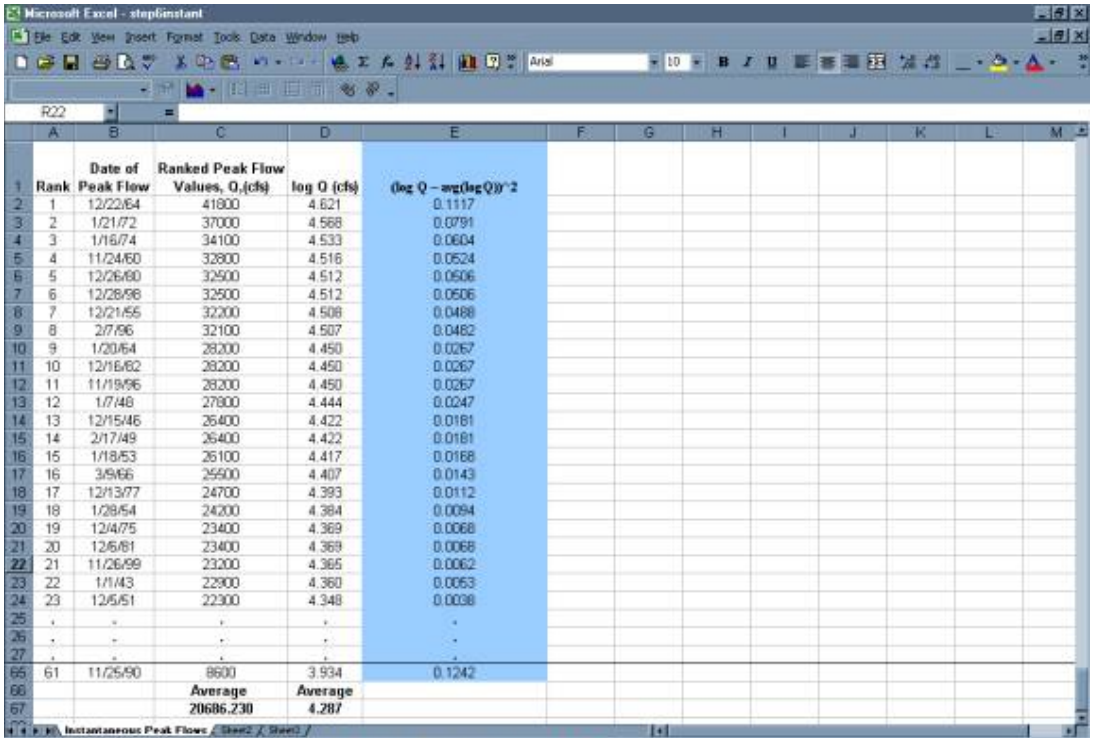
Step 5: Calculate the Average Max Q or Peak Q and the Average of the log (Q)



Microsoft Excel - step5instant

Rank	Date of Peak Flow	Ranked Peak Flow Values, Q, (cfs)	log Q (cfs)
1	12/22/64	41800	4.621
2	1/21/72	37000	4.568
3	1/16/74	34100	4.533
4	11/24/60	32800	4.516
5	12/26/80	32500	4.512
6	12/28/98	32500	4.512
7	12/21/55	32200	4.508
8	2/7/96	32100	4.507
9	1/20/64	28200	4.450
10	12/16/82	28200	4.450
11	11/19/96	28200	4.450
12	1/7/48	27800	4.444
13	12/15/46	26400	4.422
14	2/17/49	26400	4.422
15	1/18/53	26100	4.417
16	3/9/66	25500	4.407
17	12/13/77	24700	4.393
18	1/28/54	24200	4.384
19	12/4/75	23400	4.369
20	12/6/81	23400	4.369
21	11/26/99	23200	4.365
22	1/1/43	22900	4.360
23	12/5/51	22300	4.348
.	.	.	.
.	.	.	.
.	.	.	.
60	10/24/43	8890	3.949
61	11/25/90	8600	3.934
		Average	Average
		20686.230	4.287

Step 6: Create a column with the excel formula {(log Q – avg(logQ))^2}



Microsoft Excel - step6instant

File Edit View Insert Format Tools Data Window Help

R22 =

	A	B	C	D	E
1	Rank	Date of Peak Flow	Ranked Peak Flow Values, Q, (cfs)	log Q (cfs)	(log Q – avg(logQ))^2
2	1	12/22/64	41800	4.621	0.1117
3	2	1/21/72	37000	4.568	0.0791
4	3	1/16/74	34100	4.533	0.0604
5	4	11/24/60	32800	4.516	0.0524
6	5	12/26/80	32500	4.512	0.0506
7	6	12/28/98	32500	4.512	0.0506
8	7	12/21/55	32200	4.508	0.0488
9	8	2/7/96	32100	4.507	0.0482
10	9	1/20/64	28200	4.450	0.0267
11	10	12/16/82	28200	4.450	0.0267
12	11	11/19/96	28200	4.450	0.0267
13	12	1/7/48	27800	4.444	0.0247
14	13	12/15/46	26400	4.422	0.0181
15	14	2/17/49	26400	4.422	0.0181
16	15	1/18/53	26100	4.417	0.0168
17	16	3/9/66	25500	4.407	0.0143
18	17	12/13/77	24700	4.393	0.0112
19	18	1/28/54	24200	4.384	0.0094
20	19	12/4/75	23400	4.369	0.0068
21	20	12/6/81	23400	4.369	0.0068
22	21	11/26/99	23200	4.365	0.0062
23	22	1/1/43	22900	4.360	0.0053
24	23	12/5/51	22300	4.348	0.0038
25	.	.	.	.	.
26	.	.	.	.	.
27	.	.	.	.	.
65	61	11/25/90	8600	3.934	0.1242
66			Average	Average	
67			20686.230	4.287	

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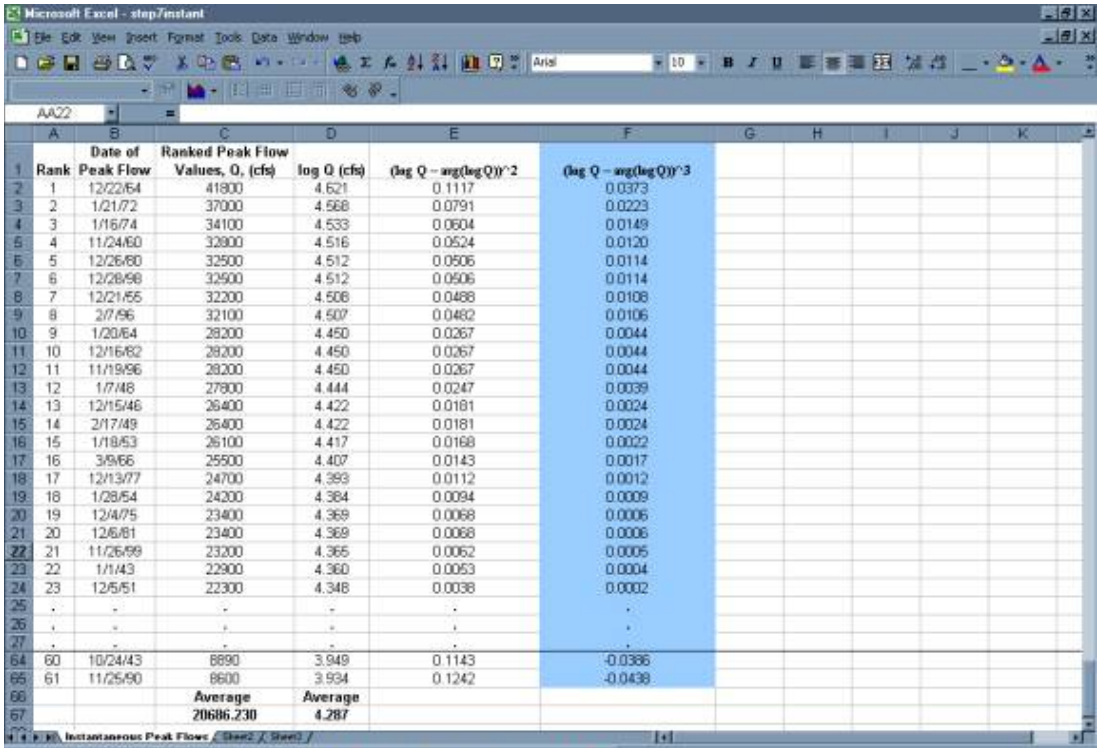
Step 7: Create a column with the excel formula {(log Q – avg(logQ))^3



Microsoft Excel - step7instant

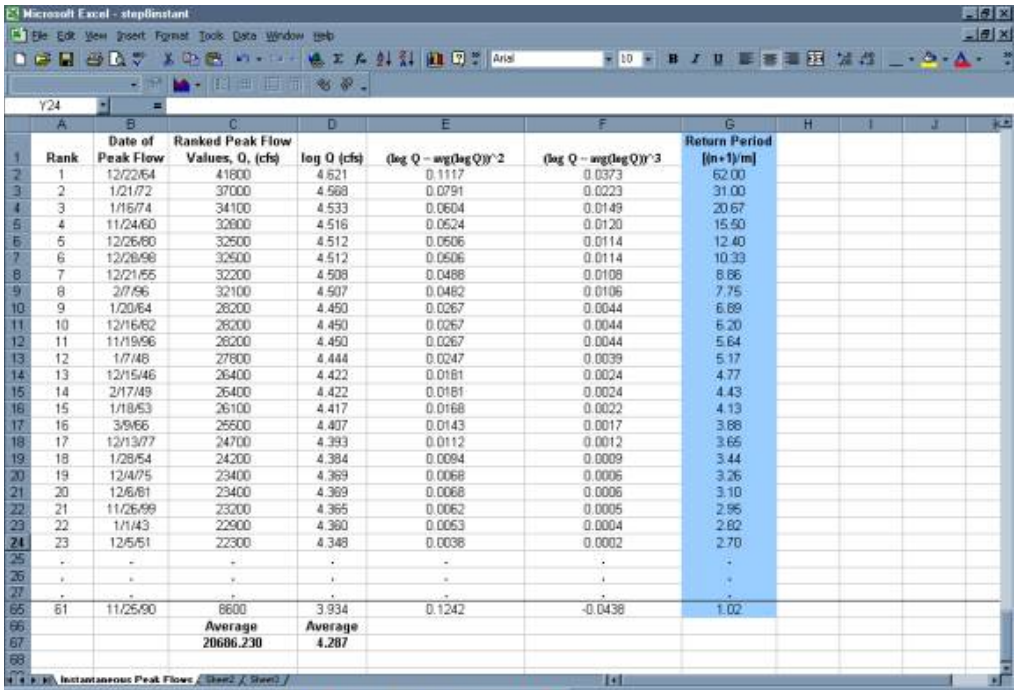
File Edit View Insert Format Tools Data Window Help

AA22 =

	A	B	C	D	E	F	G	H	I	J	K
1	Rank	Date of Peak Flow	Ranked Peak Flow Values, Q, (cfs)	log Q (cfs)	(log Q – avg(logQ))^2	(log Q – avg(logQ))^3					
2	1	12/22/64	41800	4.621	0.1117	0.0373					
3	2	1/21/72	37000	4.568	0.0791	0.0223					
4	3	1/16/74	34100	4.533	0.0604	0.0149					
5	4	11/24/60	32800	4.516	0.0524	0.0120					
6	5	12/26/80	32500	4.512	0.0506	0.0114					
7	6	12/28/98	32500	4.512	0.0506	0.0114					
8	7	12/21/55	32200	4.508	0.0488	0.0108					
9	8	2/7/96	32100	4.507	0.0482	0.0106					
10	9	1/20/64	28200	4.450	0.0267	0.0044					
11	10	12/16/82	28200	4.450	0.0267	0.0044					
12	11	11/19/96	28200	4.450	0.0267	0.0044					
13	12	1/7/48	27800	4.444	0.0247	0.0039					
14	13	12/15/46	26400	4.422	0.0181	0.0024					
15	14	2/17/49	26400	4.422	0.0181	0.0024					
16	15	1/18/53	26100	4.417	0.0168	0.0022					
17	16	3/9/66	25500	4.407	0.0143	0.0017					
18	17	12/13/77	24700	4.393	0.0112	0.0012					
19	18	1/28/54	24200	4.384	0.0094	0.0009					
20	19	12/4/75	23400	4.369	0.0068	0.0006					
21	20	12/6/81	23400	4.369	0.0068	0.0006					
22	21	11/26/99	23200	4.365	0.0062	0.0005					
23	22	1/1/43	22900	4.360	0.0053	0.0004					
24	23	12/5/51	22300	4.348	0.0038	0.0002					
25	.	.	.	.	.	.					
26	.	.	.	.	.	.					
27	.	.	.	.	.	.					
64	60	10/24/43	8890	3.949	0.1143	-0.0386					
65	61	11/25/90	8600	3.934	0.1242	-0.0438					
66			Average	Average							
67			20686.230	4.287							

Instantaneous Peak Flows / Sheet2 / Sheet3 /

Step 8: Create a column with the return period (Tr) for each discharge using Excel formula {(n+1)/m}. Where n = the number of values in the dataset and m = the rank.



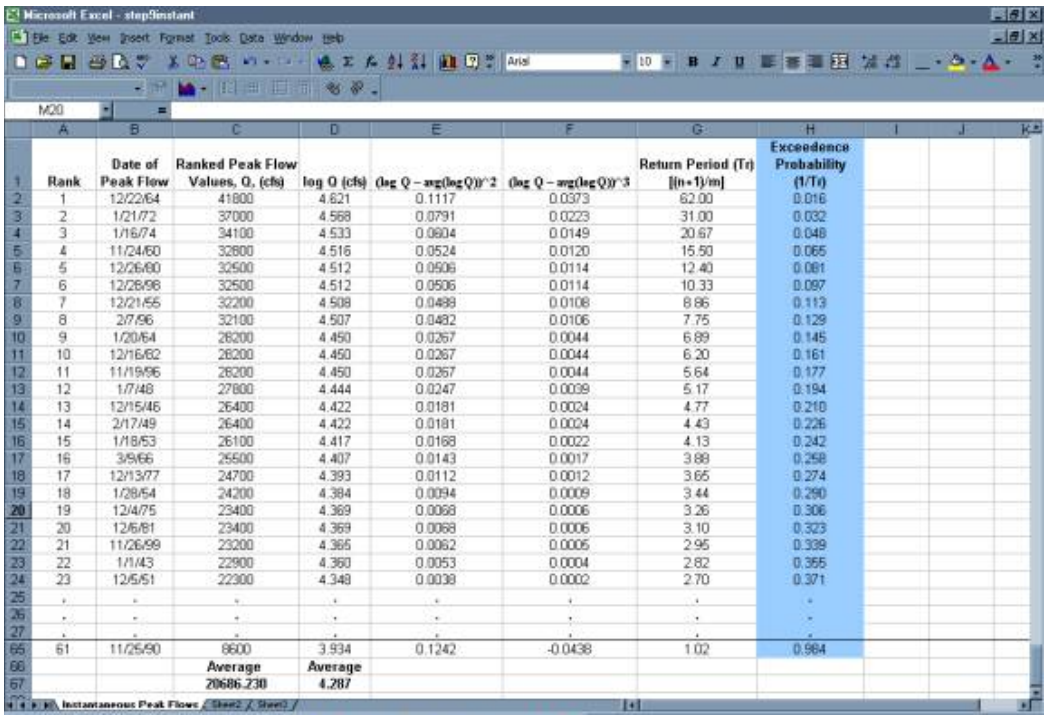
Microsoft Excel - step8instant

Y24 =

	A	B	C	D	E	F	G	H	I	J
1	Rank	Date of Peak Flow	Ranked Peak Flow Values, Q, (cfs)	log Q (cfs)	(log Q – avg(log Q))^2	(log Q – avg(log Q))^3	Return Period [(n+1)/m]			
2	1	12/22/64	41800	4.621	0.1117	0.0373	62.00			
3	2	1/21/72	37000	4.568	0.0791	0.0223	31.00			
4	3	1/16/74	34100	4.533	0.0604	0.0149	20.67			
5	4	11/24/60	32800	4.516	0.0524	0.0120	15.50			
6	5	12/26/80	32500	4.512	0.0506	0.0114	12.40			
7	6	12/28/98	32500	4.512	0.0506	0.0114	10.33			
8	7	12/21/55	32200	4.508	0.0488	0.0108	8.86			
9	8	2/7/96	32100	4.507	0.0482	0.0106	7.75			
10	9	1/20/64	28200	4.450	0.0267	0.0044	6.89			
11	10	12/16/62	28200	4.450	0.0267	0.0044	6.20			
12	11	11/19/96	28200	4.450	0.0267	0.0044	5.64			
13	12	1/7/48	27800	4.444	0.0247	0.0039	5.17			
14	13	12/15/46	26400	4.422	0.0181	0.0024	4.77			
15	14	2/17/49	26400	4.422	0.0181	0.0024	4.43			
16	15	1/18/53	26100	4.417	0.0168	0.0022	4.13			
17	16	3/9/66	25600	4.407	0.0143	0.0017	3.88			
18	17	12/13/77	24700	4.393	0.0112	0.0012	3.65			
19	18	1/28/54	24200	4.384	0.0094	0.0009	3.44			
20	19	12/4/75	23400	4.369	0.0068	0.0006	3.26			
21	20	12/6/81	23400	4.369	0.0068	0.0006	3.10			
22	21	11/26/99	23200	4.365	0.0062	0.0005	2.95			
23	22	1/1/43	22900	4.360	0.0053	0.0004	2.82			
24	23	12/5/51	22300	4.348	0.0038	0.0002	2.70			
25	.	.	.	.	.	.	.			
26	.	.	.	.	.	.	.			
27	.	.	.	.	.	.	.			
65	61	11/25/90	8600	3.934	0.1242	-0.0438	1.02			
66			Average	Average						
67			20686.230	4.287						
68										

Instantaneous Peak Flows / Sheet2 / Sheet3

Step 9: Complete the table with a final column showing the exceedence probabilityof each discharge using the excel formula {=1/Return Period or 1/Tr} and the copy command.



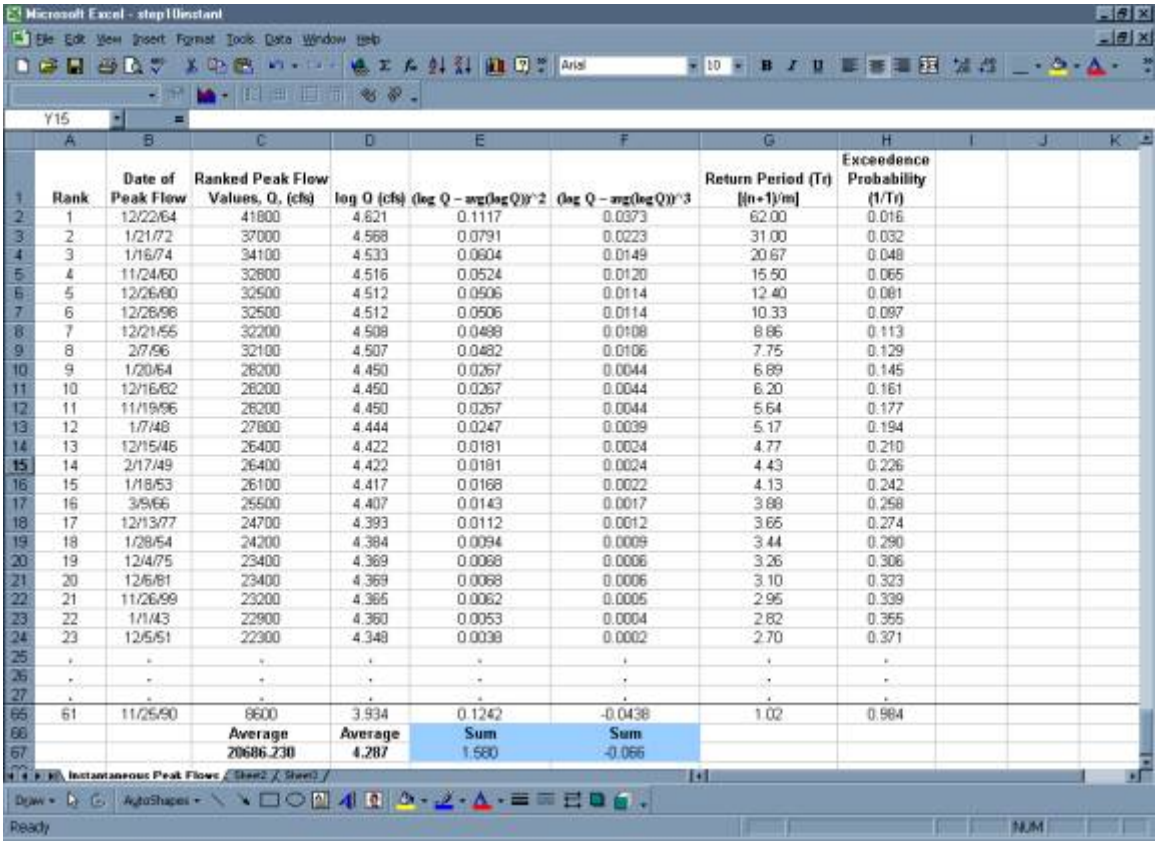
Microsoft Excel - step9instant

M20 =

	A	B	C	D	E	F	G	H	I	J
1	Rank	Date of Peak Flow	Ranked Peak Flow Values, Q, (cfs)	log Q (cfs)	(log Q – avg(log Q))^2	(log Q – avg(log Q))^3	Return Period (Tr) [(n+1)/m]	Exceedence Probability (1/Tr)		
2	1	12/22/64	41800	4.621	0.1117	0.0373	62.00	0.016		
3	2	1/21/72	37000	4.568	0.0791	0.0223	31.00	0.032		
4	3	1/16/74	34100	4.533	0.0604	0.0149	20.67	0.048		
5	4	11/24/60	32800	4.516	0.0524	0.0120	15.50	0.065		
6	5	12/26/80	32500	4.512	0.0506	0.0114	12.40	0.081		
7	6	12/28/98	32500	4.512	0.0506	0.0114	10.33	0.097		
8	7	12/21/55	32200	4.508	0.0488	0.0108	8.86	0.113		
9	8	2/7/96	32100	4.507	0.0482	0.0106	7.75	0.129		
10	9	1/20/64	28200	4.450	0.0267	0.0044	6.89	0.145		
11	10	12/16/62	28200	4.450	0.0267	0.0044	6.20	0.161		
12	11	11/19/96	28200	4.450	0.0267	0.0044	5.64	0.177		
13	12	1/7/48	27800	4.444	0.0247	0.0039	5.17	0.194		
14	13	12/15/46	26400	4.422	0.0181	0.0024	4.77	0.210		
15	14	2/17/49	26400	4.422	0.0181	0.0024	4.43	0.226		
16	15	1/18/53	26100	4.417	0.0168	0.0022	4.13	0.242		
17	16	3/9/66	25600	4.407	0.0143	0.0017	3.88	0.258		
18	17	12/13/77	24700	4.393	0.0112	0.0012	3.65	0.274		
19	18	1/28/54	24200	4.384	0.0094	0.0009	3.44	0.290		
20	19	12/4/75	23400	4.369	0.0068	0.0006	3.26	0.306		
21	20	12/6/81	23400	4.369	0.0068	0.0006	3.10	0.323		
22	21	11/26/99	23200	4.365	0.0062	0.0005	2.95	0.339		
23	22	1/1/43	22900	4.360	0.0053	0.0004	2.82	0.355		
24	23	12/5/51	22300	4.348	0.0038	0.0002	2.70	0.371		
25	.	.	.	.	.	.	.	.		
26	.	.	.	.	.	.	.	.		
27	.	.	.	.	.	.	.	.		
65	61	11/25/90	8600	3.934	0.1242	-0.0438	1.02	0.984		
66			Average	Average						
67			20686.230	4.287						
68										

Instantaneous Peak Flows / Sheet2 / Sheet3

Step 10: Calculate the Sum for the {(logQ – avg(logQ))^2} and the {(logQ – avg(logQ))^3} columns.



Rank	Date of Peak Flow	Ranked Peak Flow Values, Q, (cfs)	log Q (cfs)	(log Q – avg(log Q))^2	(log Q – avg(log Q))^3	Return Period (Tr) [(n+1)/m]	Exceedence Probability (1/Tr)
1	12/22/64	41800	4.621	0.1117	0.0373	62.00	0.016
2	1/21/72	37000	4.568	0.0791	0.0223	31.00	0.032
3	1/16/74	34100	4.533	0.0604	0.0149	20.67	0.048
4	11/24/60	32800	4.516	0.0524	0.0120	15.50	0.065
5	12/26/80	32500	4.512	0.0506	0.0114	12.40	0.081
6	12/26/96	32500	4.512	0.0506	0.0114	10.33	0.097
7	12/21/55	32200	4.508	0.0488	0.0108	8.86	0.113
8	2/7/96	32100	4.507	0.0482	0.0106	7.75	0.129
9	1/20/64	28200	4.450	0.0267	0.0044	6.89	0.145
10	12/16/62	28200	4.450	0.0267	0.0044	6.20	0.161
11	11/19/96	28200	4.450	0.0267	0.0044	5.64	0.177
12	1/7/48	27800	4.444	0.0247	0.0039	5.17	0.194
13	12/15/46	26400	4.422	0.0181	0.0024	4.77	0.210
14	2/17/49	26400	4.422	0.0181	0.0024	4.43	0.226
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16	3/9/66	25500	4.407	0.0143	0.0017	3.88	0.258
17	12/13/77	24700	4.393	0.0112	0.0012	3.65	0.274
18	1/28/54	24200	4.384	0.0094	0.0009	3.44	0.290
19	12/4/75	23400	4.369	0.0068	0.0006	3.26	0.306
20	12/6/81	23400	4.369	0.0068	0.0006	3.10	0.323
21	11/26/99	23200	4.365	0.0062	0.0005	2.95	0.339
22	1/1/43	22900	4.360	0.0053	0.0004	2.82	0.355
23	12/5/51	22300	4.348	0.0038	0.0002	2.70	0.371
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
61	11/25/90	8600	3.934	0.1242	-0.0438	1.02	0.984
		Average	Average	Sum	Sum		
		20686.230	4.287	1.580	-0.066		

Step 11: Calculate the variance, standard deviation, and skew coefficient as follows:

variance =

$$\frac{\sum_{i}^{n}(\log Q - avg(\log Q))^{\wedge}2}{n-1}$$

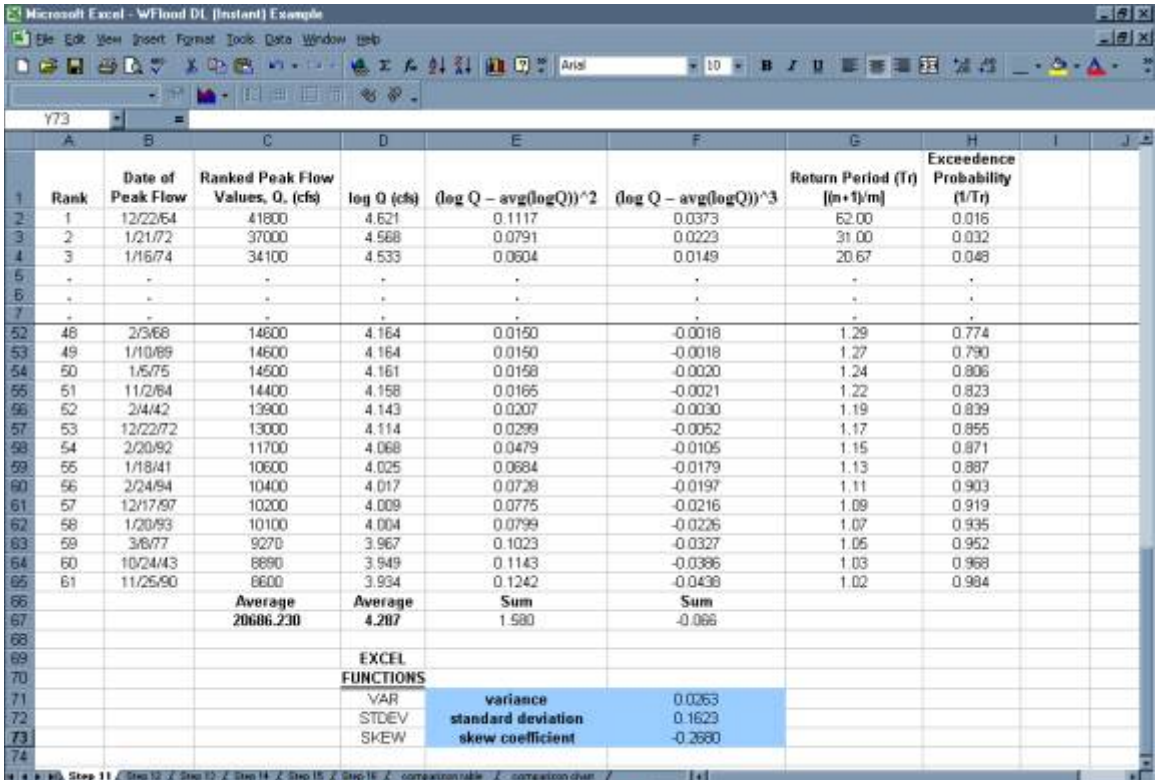
standard deviation =

$$\sigma \log Q = \sqrt{variance}$$

skew coefficient =

$$\frac{n \times \sum_{i}^{n}(\log Q - avg(\log Q))^{\wedge}3}{(n-1)(n-2)(\sigma \log Q)^{\wedge}3}$$

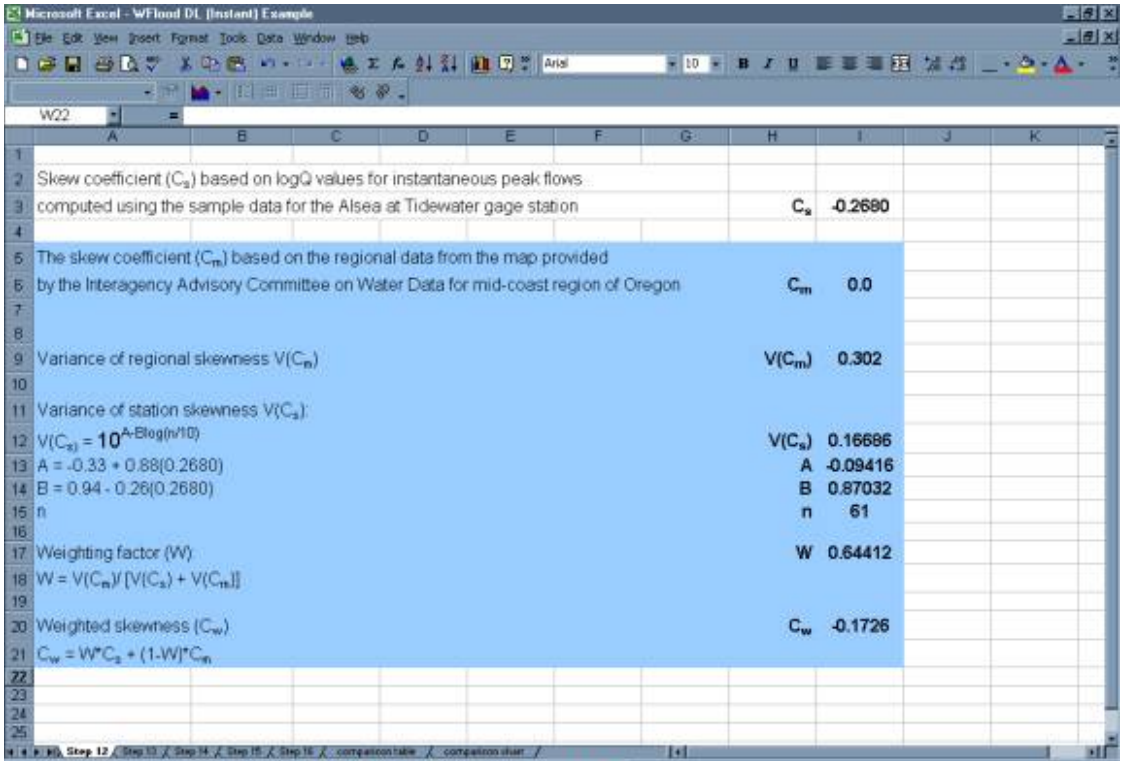
Excel functions can also be used to calculate the variance (=VAR( )), standard deviation (=STDEV( )), and skewness coefficient (=SKEW( )).



Rank	Date of Peak Flow	Ranked Peak Flow Values, Q, (cfs)	log Q (cfs)	(log Q – avg(logQ))^2	(log Q – avg(logQ))^3	Return Period (Tr) [(n+1)/m]	Exceedence Probability (1/Tr)
1	12/22/64	41800	4.621	0.1117	0.0373	62.00	0.016
2	1/21/72	37000	4.568	0.0791	0.0223	31.00	0.032
3	1/16/74	34100	4.533	0.0604	0.0149	20.67	0.048
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
48	2/3/68	14600	4.164	0.0150	-0.0018	1.29	0.774
49	1/10/89	14600	4.164	0.0150	-0.0018	1.27	0.790
50	1/5/75	14500	4.161	0.0158	-0.0020	1.24	0.806
51	11/2/84	14400	4.158	0.0165	-0.0021	1.22	0.823
52	2/4/42	13900	4.143	0.0207	-0.0030	1.19	0.839
53	12/22/72	13000	4.114	0.0299	-0.0052	1.17	0.855
54	2/20/92	11700	4.068	0.0479	-0.0105	1.15	0.871
55	1/18/41	10600	4.025	0.0684	-0.0179	1.13	0.887
56	2/24/94	10400	4.017	0.0728	-0.0197	1.11	0.903
57	12/17/97	10200	4.009	0.0775	-0.0216	1.09	0.919
58	1/20/93	10100	4.004	0.0799	-0.0226	1.07	0.935
59	3/8/77	9270	3.967	0.1023	-0.0327	1.05	0.952
60	10/24/43	8890	3.949	0.1143	-0.0386	1.03	0.968
61	11/25/90	8600	3.934	0.1242	-0.0439	1.02	0.984
		Average	**Average**	**Sum**	**Sum**		
		20686.230	**4.287**	1.580	-0.066		

EXCEL FUNCTIONS		
VAR	**variance**	0.0263
STDEV	**standard deviation**	0.1623
SKEW	**skew coefficient**	-0.2680

Step 12: Calculate weighted skewness



Skew coefficient (C_s) based on logQ values for instantaneous peak flows
computed using the sample data for the Alsea at Tidewater gage station — C_s = **-0.2680**

The skew coefficient (C_m) based on the regional data from the map provided
by the Interagency Advisory Committee on Water Data for mid-coast region of Oregon — C_m = **0.0**

Variance of regional skewness $V(C_m)$ — $V(C_m)$ = **0.302**

Variance of station skewness $V(C_s)$:
$V(C_s) = 10^{A-B\log(n/10)}$ — $V(C_s)$ = **0.16686**
$A = -0.33 + 0.88(0.2680)$ — A = **-0.09416**
$B = 0.94 - 0.26(0.2680)$ — B = **0.87032**
n — n = **61**

Weighting factor (W) — W = **0.64412**
$W = V(C_m)/[V(C_s) + V(C_m)]$

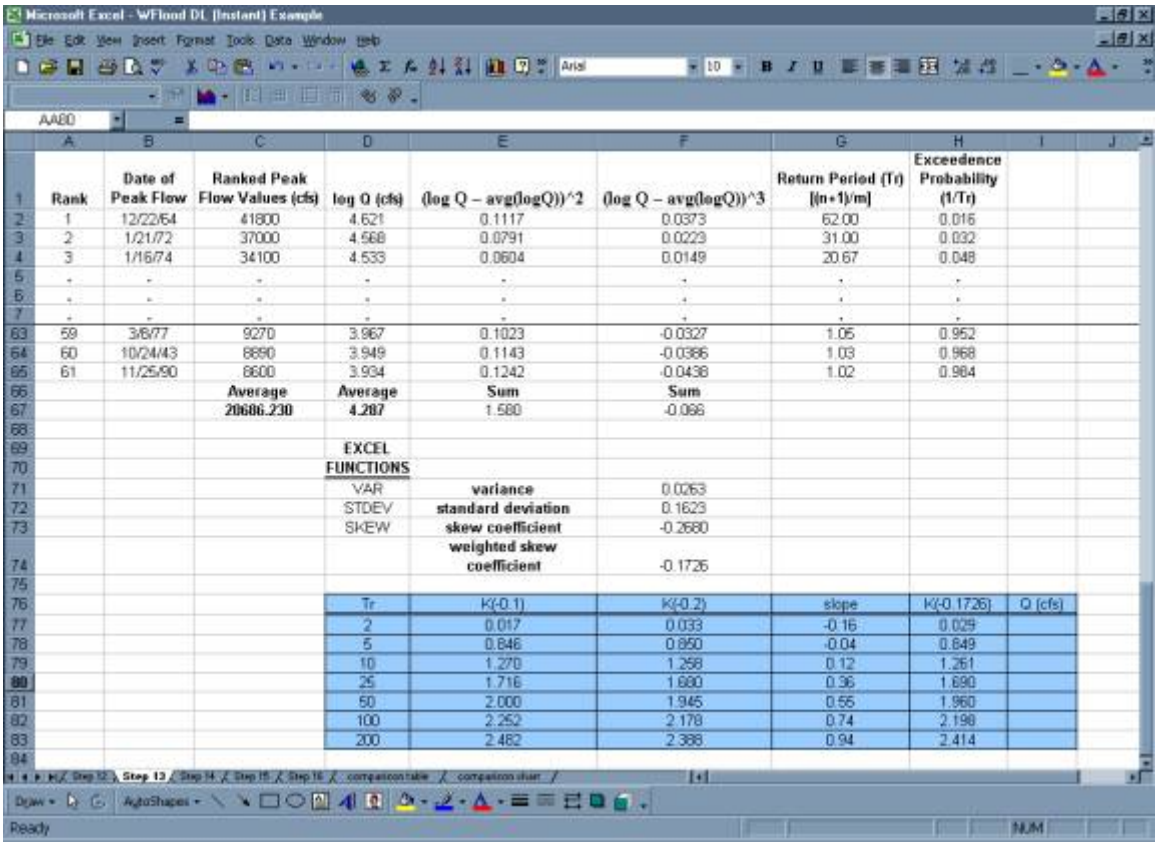
Weighted skewness (C_w) — C_w = **-0.1726**
$C_w = W*C_s + (1-W)*C_m$

Show Me

Step 13: Calculate k values

- Use the **frequency factor table** and the skew coefficient to find the **k values** for the 2,5,10,25,50,100, and 200 **recurrence intervals**.
- If the skew coefficient is between two given skew coefficients in the table than you can linearly extrapolate between the two numbers to get the appropriate k value. To view the frequency factor table click on the button below.

Show Me



Rank	Date of Peak Flow	Ranked Peak Flow Values (cfs)	log Q (cfs)	(log Q – avg(logQ))^2	(log Q – avg(logQ))^3	Return Period (Tr) [(n+1)/m]	Exceedence Probability (1/Tr)
1	12/22/64	41800	4.621	0.1117	0.0373	62.00	0.016
2	1/21/72	37000	4.568	0.0791	0.0223	31.00	0.032
3	1/16/74	34100	4.533	0.0604	0.0149	20.67	0.048
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
59	3/8/77	9270	3.967	0.1023	-0.0327	1.05	0.952
60	10/24/43	8890	3.949	0.1143	-0.0386	1.03	0.968
61	11/25/90	8600	3.934	0.1242	-0.0438	1.02	0.984
		Average	Average	Sum	Sum		
		20686.230	4.287	1.580	-0.096		

EXCEL FUNCTIONS

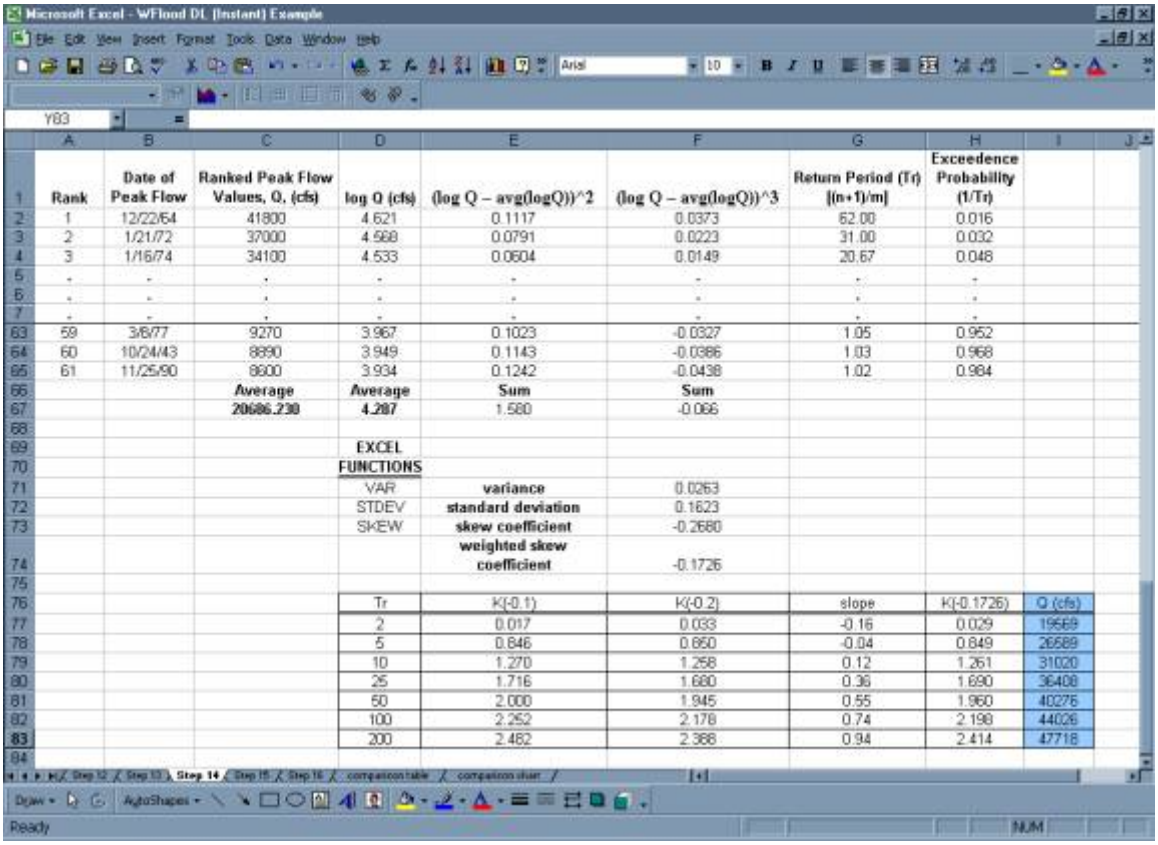
VAR	variance	0.0263
STDEV	standard deviation	0.1623
SKEW	skew coefficient	-0.2680
	weighted skew coefficient	-0.1726

Tr	K(-0.1)	K(-0.2)	slope	K(-0.1726)	Q (cfs)
2	0.017	0.033	-0.16	0.029	
5	0.846	0.850	-0.04	0.849	
10	1.270	1.258	0.12	1.261	
25	1.716	1.680	0.36	1.690	
50	2.000	1.945	0.55	1.960	
100	2.252	2.178	0.74	2.198	
200	2.482	2.388	0.94	2.414	

Step 14: Using the general equation, list the discharges associated with each recurrence interval

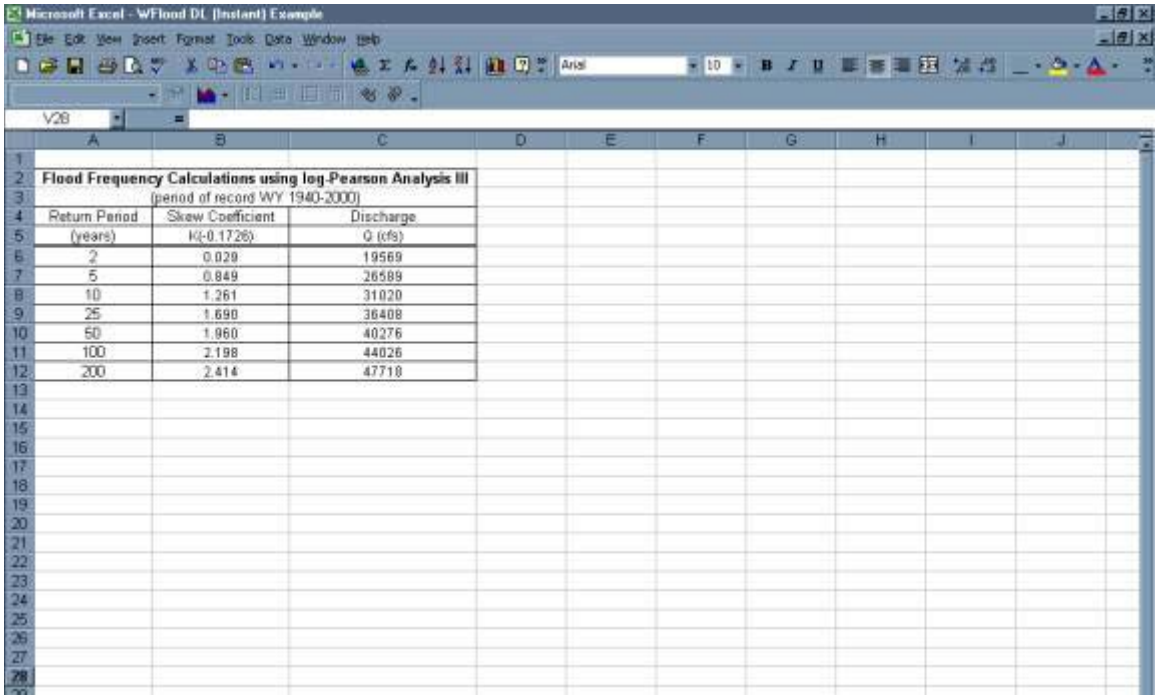
general equation =

$$\log QTr = avg(\log Q) + [K\ (Tr, Cs)] \times \sigma \log Q$$



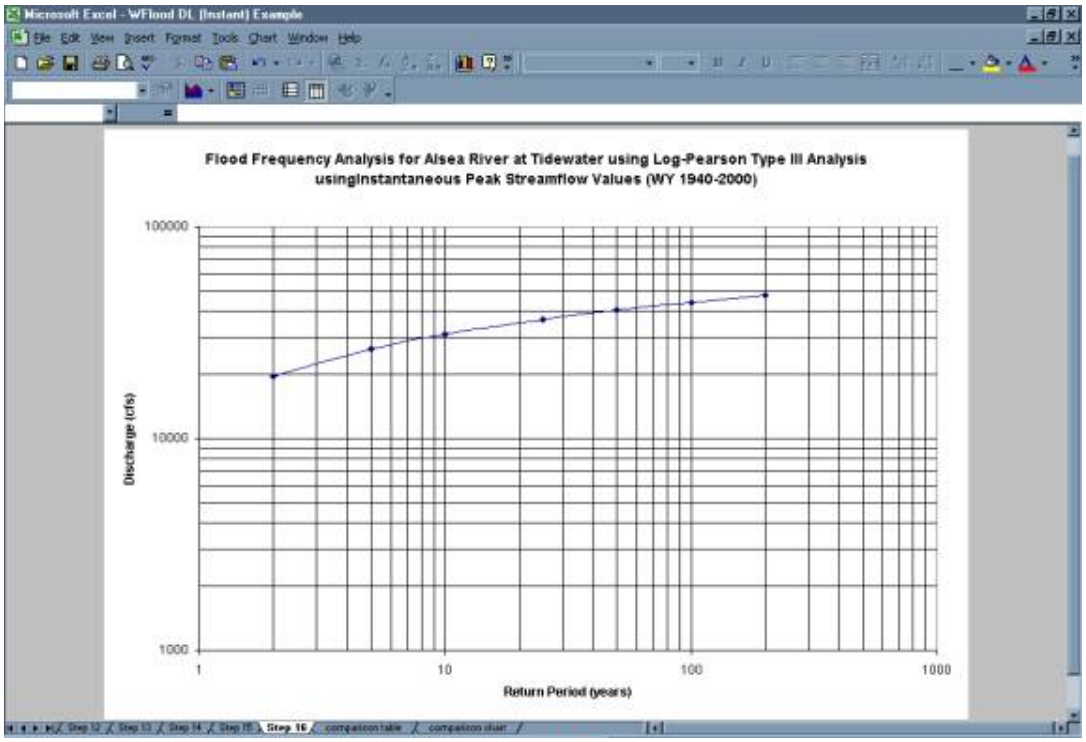
	A	B	C	D	E	F	G	H	I	J
1	Rank	Date of Peak Flow	Ranked Peak Flow Values, Q, (cfs)	log Q (cfs)	(log Q – avg(logQ))^2	(log Q – avg(logQ))^3	Return Period (Tr) [(n+1)/m]	Exceedence Probability (1/Tr)		
2	1	12/22/64	41800	4.621	0.1117	0.0373	62.00	0.016		
3	2	1/21/72	37000	4.568	0.0791	0.0223	31.00	0.032		
4	3	1/16/74	34100	4.533	0.0604	0.0149	20.67	0.048		
5	.	.	.	.	.	.	.	.		
6	.	.	.	.	.	.	.	.		
7	.	.	.	.	.	.	.	.		
63	59	3/6/77	9270	3.967	0.1023	-0.0327	1.05	0.952		
64	60	10/24/43	8890	3.949	0.1143	-0.0386	1.03	0.968		
65	61	11/25/90	8600	3.934	0.1242	-0.0438	1.02	0.984		
66			Average	Average	Sum	Sum				
67			20686.230	4.287	1.580	-0.066				
68										
69				EXCEL						
70				FUNCTIONS						
71				VAR	variance	0.0263				
72				STDEV	standard deviation	0.1623				
73				SKEW	skew coefficient	-0.2680				
74					weighted skew coefficient	-0.1726				
75										
76				Tr	K(-0.1)	K(-0.2)	slope	K(-0.1726)	Q (cfs)	
77				2	0.017	0.033	-0.16	0.029	19569	
78				5	0.846	0.850	-0.04	0.849	26589	
79				10	1.270	1.258	0.12	1.261	31020	
80				25	1.716	1.680	0.36	1.690	36408	
81				50	2.000	1.945	0.55	1.960	40276	
82				100	2.252	2.178	0.74	2.198	44026	
83				200	2.482	2.388	0.94	2.414	47718	
84										

Step 15: Create table of Discharge values found using the log – Pearson analysis



	A	B	C	D	E	F	G	H	I	J
1										
2	Flood Frequency Calculations using log-Pearson Analysis III									
3	(period of record WY 1940-2000)									
4	Return Period	Skew Coefficient	Discharge							
5	(years)	K(-0.1726)	Q (cfs)							
6	2	0.029	19569							
7	5	0.849	26589							
8	10	1.261	31020							
9	25	1.690	36408							
10	50	1.960	40276							
11	100	2.198	44026							
12	200	2.414	47718							

Step 16: Create Plot



Below is a comparison of flood frequency analysis completed using mean daily data versus instantaneous discharge data. As can be seen, had you completed this analysis using mean daily data, the result would have been an underestimation of the discharges associated with each return period.