	CY	J	F	M	A	M	J	J	A	S	O	N	D
1996	1							1					
1997	2											3	
1998	3				2	2			5			5	
1999	4								2		1	1	
2000	5		1	3			4	3		1		5	
2001	6			1	8		1		1	1	4	2	3
2002	7				1	1		5	4		1		
2003	8			2		3	4				7	4	
2004	9							6	2		1	2	
2005	10	6						1		10			
2006	11												2

X-Class solar flares are among the most powerful, explosive events on the solar surface. They can cause short-wave radio interference, satellite malfunctions and can even cause the premature re-entry of satellites into the atmosphere.

The table above lists the number of X-class flares detected on the sun during the last sunspot cycle which lasted from 1996 to about 2008. The second column also gives the year from the start of the 11-year sunspot cycle in 1996. The counts are listed by year (rows) and by month (columns). Study this table and answer the following questions to learn more about how common these flares are.

Problem 1 – For the years and months considered, is the distribution of months with flares a uniform distribution? Explain.

Problem 2 - The sunspot cycle can be grouped into pre-maximum (1997,1998, 1999), maximum (2000,2001,2002) and post-maximum (2003,2004,2005). For each group, calculate A) The percentage of months with no flares; and B) The average number of weeks between flares.

Problem 3 – For each group, what is the median number of flares that occurs in the months that have flares? (Note: If needed, you may round the answer upwards to the next integer)

Problem 4 – Taken as a whole, what is the average number of flares per month during the entire 11-year sunspot cycle?

Problem 5 – We are currently in Year-3 of the current sunspot cycle, which began in 2007. About how many X-class flares would you predict for this year using the tabulated flares from the previous sunspot cycle as a guide, and what is the average number of weeks between these flares for this year?

Problem 1 – For the years and months considered, is the distribution of months with flares a uniform distribution? Explain. Answer; If you shaded in all the months with flares you would see that most occur between 1999-2002 so the distribution is not random, and is not uniform.

Problem 2 - The sunspot cycle can be grouped into pre-maximum (1997,1998, 1999), maximum (2000,2001,2002) and post-maximum (2003,2004,2005). For each group, calculate A) the percentage of months with no flares, and B) The average number of weeks between flares. Answer: A) Pre-Maximum, N = 28 months so P = 100%x28/36 = 78% . Maximum; N = 17 months so P = 100% x 17/36 = 47%; post-maximum N= 24 months so P = 100% x 24/36 = 67%. B) pre-maximum N = 22 flares so T = 36 months/22 flares = 1.6 months. Maximum: N = 50 flares so T = 36 mo/50 = 0.7 months; post-maximum: N = 48 flares so T = 36 mo/48 = 0.8 months.

Problem 3 – For each group, what is the median number of flares that occurs in the months that have flares? Answer: Pre-maximum: 1,1,2,2,2,3,5,5 median = (2+2)/2 = 2. Maximum: 1,1,1,1,1,1,1,1,1,2,3,3,3,4,4,4,5,8 median = (1 + 2)/2 = 1.5, which can be rounded to 2; post-maximum 1,1,2,2,2,3,4,6,6,7 median = (2+3)/2 = 2.5, which can also be rounded to 3.

Problem 4 – Taken as a whole, what is the average number of flares per month during the entire 11-year sunspot cycle? Answer: There were 122 flares detected during the 132 months of the sunspot cycle, so the average is 122 flares/132 months = 0.9 , which can be rounded to **1 flare/month**.

	CY	J	F	M	A	M	J	J	A	S	O	N	D	
1996	1							1						1
1997	2											3		3
1998	3				2	2			5			5		14
1999	4								2		1	1		4
2000	5		1	3			4	3		1		5		17
2001	6			1	8		1		1	1	4	2	3	21
2002	7				1	1		5	4		1			12
2003	8			2		3	4				7	4		20
2004	9							6	2		1	2		11
2005	10	6						1		10				17
2006	11												2	2
		6	1	6	11	6	9	16	14	12	14	22	5	

Problem 5 – We are in Year-3 of the current sunspot cycle, which began in 2007. About how many X-class flares would you predict for this year using the tabulated flares from the previous sunspot cycle as a guide, and what is the average number of weeks between these flares for this year? Answer: From the table we find for Year 3 that there were 14, X-class flares. Since there are 12 months in a year, this means that the average time between flares is about 14/12 = **1.2 months**.