

# Exploring extreme weather – measures of dispersion

## Pupil activities

Before you start, read Exploring extreme weather - Measures of dispersion in Excel. You should also have a copy of the Excel workbook from which the tables below are from if you want to look at the formulas or use the spreadsheet do to any calculations.

All data are for Keswick (Cumbria, UK).

**Average temperature**  
(month) (°C)

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Jan	4.1	6.7	6.3	3.4	1.5	3.4	5.2	4.2	5.9	4.7
Feb	4.0	5.2	5.8	4.1	1.8	6.3	5.0	3.4	5.9	4.0
Mar	3.7	6.7	5.5	6.4	5.2	6.0	8.5	2.4	7.3	5.8
Apr	7.8	10.5	7.5	9.1	8.2	11.4	7.1	4.9	10.1	7.8
May	11.2	11.2	13.2	11.2	10.1	11.7	10.9	10.1	11.8	9.8
Jun	14.6	14.4	13.3	14.3	14.8	13.1	12.6	13.5	15.0	13.2
Jul	18.1	14.7	15.8	15.6	15.3	14.6	14.6	18.0	16.5	14.5
Aug	15.1	14.5	15.3	15.5	14.4	14.4	15.6	16.0	14.2	15.0
Sep	15.4	12.7	12.6	13.1	13.5	14.1	12.6	13.1	14.2	12.4
Oct	12.1	10.5	8.9	10.8	10.0	12.0	8.5	11.9	11.4	10.2
Nov	8.2	7.5	6.4	7.7	4.6	9.6	6.4	5.7	8.3	9.1
Dec	5.9	4.6	3.1	2.7	-1.0	5.8	4.4	7.2	5.1	8.8

1st Quartile	5.9
3rd Quartile	13.4
IQR	7.5
Average	9.6
Mode	#N/A
Median	9.9

Year	SD	Mean
All	4.321446484	9.6
2006	4.85623339	10.0
2007	3.547448663	9.9
2008	4.150039292	9.5
2009	4.468238756	9.5
2010	5.47202112	8.2
2011	3.726927222	10.2
2012	3.734073177	9.3
2013	5.03175155	9.2
2014	3.786788847	10.5
2015	3.507387021	9.6

- Looking at the monthly average temperature data can you **describe** the **distribution** of the first and third quartiles of temperature? **Is there** a clear pattern?
- The Winter and Spring of 2014 were unusually mild – they fall into the inter-quartile range (i.e. the middle 50% of temperatures recorded).
  - **Which** two years had an unusually warm Autumn?
  - **Which** summers were unusually warm?
  - Can you **identify** the four coldest winters (temperatures are all in the first quartile)?
- The average temperature for all of the data is 9.6C, and the IQR is 7.5C. **Does this suggest** temperature varies significantly? **Why?**

**Challenge Yourself** (standard deviation is not an examinable skill)

- Look at the Standard Deviation (SD) figures. **In which** year was the weather most extreme, and **how** can you **determine** that using the Standard Deviation alone?

**Average rainfall**  
(month) (mm)

	Year									
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
January	97.2	218.2	273.0	212.0	66.0	184.6	138.3	107.0	237.4	279.2
February	74.0	90.4	95.6	23.6	43.0	181.2	75.2	48.6	280.2	101.2
March	118.0	137.0	143.0	110.9	104.6	70.4	34.4	54.5	115.0	136.6
April	87.4	46.4	65.6	59.8	40.6	68.4	91.8		69.8	70.8
May	118.2	88.0	23.0	131.4	23.0	192.2	75.4		78.4	135.6
June	10.0	156.4	163.6	55.2	41.2	81.4	252.4	68.4	27.8	55.2
July	27.6	123.6	140.6	213.8	181.2	84.6	123.2	128.8	67.2	130.4
August	119.2	72.2	157.4	225.0	107.2	117.2	179.8	105.8	183.8	122.0
September	139.8	138.8	200.0	49.2	169.0	178.1	157.8	110.6	12.4	39.4
October	198.8	88.0	341.8	127.4	129.8	165.4	161.8	213.6	290.2	71.6
November	269.2	116.6	110.2	504.4	181.4	170.0	218.3	96.4	146.6	361.0
December	349.0	198.3	121.8	157.2	34.4	267.8	203.4	376.4	200.4	589.0

1st Quartile	73.0
3rd Quartile	181.2
IQR	108.2
Average	139.8
Mode	68.4
Median	121.9

Year	SD	Mean
All	94.37159625	139.8
2006	92.77398462	134.0
2007	48.51618859	122.9
2008	83.30601552	153.0
2009	123.9723365	155.8
2010	57.77093416	93.5
2011	59.29019206	146.8
2012	62.72160048	142.7
2013	92.9698279	131.0
2014	91.63332121	142.4
2015	153.9492413	174.3

- Looking at the monthly average rainfall data can you **describe** the **distribution** of the first and third quartiles of temperature? **Is there** a clear pattern?
- Which **four** years had an unusually dry spring?
- Which year** had an especially wet summer?
- Which** year had a particularly changeable summer (alternating between wetter and drier)?
- Why** might there be no data in April and May 2013?
- The average rainfall for all of the data is 139.8mm, and the IQR is 108.2mm. Does this suggest rainfall varies significantly? **Why?**

**Challenge Yourself** (Standard Deviation is not an examinable skill)

- Look at the Standard Deviation (SD) figures. In which year was the weather most extreme, and how can you determine that using the Standard Deviation alone?