



Outdoor music festivals give a lot of people a lot of pleasure. In this activity you will use weather records to consider which would be the best month to hold a festival.

Information sheet Monthly temperature data for the years 2001–2010

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2001	3.2	4.2	4.9	7.3	12.0	13.7	16.5	16.4	13.0	13.0	7.1	3.4
2002	5.3	6.6	7.2	8.8	11.5	13.9	15.4	16.6	13.9	9.7	8.2	5.4
2003	4.2	3.7	7.2	9.3	11.6	15.5	17.0	17.7	14.0	8.9	7.9	4.7
2004	4.9	5.0	6.2	9.1	11.7	15.0	15.4	17.1	14.4	10.3	7.5	5.3
2005	5.7	4.0	6.8	8.6	11.0	15.0	16.3	15.8	14.8	12.7	6.0	4.3
2006	4.0	3.6	4.6	8.3	11.8	15.5	19.1	15.9	16.3	12.6	7.9	6.1
2007	6.6	5.7	6.9	10.9	11.6	14.7	15.1	15.3	13.7	10.7	7.2	4.8
2008	6.3	5.2	5.9	7.7	12.9	13.8	16.0	16.0	13.2	9.5	6.8	3.5
2009	2.9	4.0	6.7	9.5	11.7	14.5	15.9	16.4	14.0	11.2	8.3	3.0
2010	1.2	2.6	5.8	8.6	10.5	14.9	16.9	15.2	13.6	10.2	5.1	-0.5

Mean

The mean temperature for a month is given by the formula

$$\text{mean} \rightarrow \bar{x} = \frac{\sum x}{n}$$

← sum of the temperatures

← number of years

Think about...

Why does the mean provide a good representative value?
 In what circumstances might the median (the middle value) be better?

Standard deviation

The **standard deviation** is a measure of spread that tells you how much the temperatures vary from year to year.

The standard deviation is given by the formula

$$\sigma_n = \sqrt{\frac{\sum (x - \bar{x})^2}{n}}$$

Note you do not need to learn this formula.

You just need to know how to find it using a calculator or spreadsheet.

Think about

- why $x - \bar{x}$ is squared in the formula
- why the sum is divided by n
- what the standard deviation would be if every year had exactly the same temperature
- how the standard deviation will increase as the spread increases.

Using a spreadsheet to work out the mean and standard deviation

To find the mean use the formula $\bar{x} = \frac{\Sigma x}{n}$

or use the spreadsheet function **=AVERAGE**

To find the standard deviation, use the spreadsheet formula **=STDEVP**

Try these

- 1 Find the mean and standard deviation of the July temperatures.
(Check that your answers agree with those given below.)
- 2 Find the mean and standard deviation of the August temperatures.
(Check that your answers agree with those given below.)

Think about...

The table gives the mean and standard deviation for July and August.

	Mean	Standard deviation
July	16.36 °C	1.10 °C
August	16.24 °C	0.73 °C

What do these results tell you about the temperature in these months?

The mean has been used rather than the median or mode.

Why does the mean provide a good representative value?

In what circumstances might the median be better?

Would you get more reliable results if you used data from a longer period?

Try this

Use the data you have been given to investigate which would be the best month to hold an outdoor festival.

Use a spreadsheet to find means and standard deviations for rainfall and hours of sunshine as well as for temperature for relevant months.

Summarise your findings in a brief report using the figures you have calculated to back up your recommendation.

(You will have to decide for yourself which are the most important weather factors!)

At the end of the activity

- Why is the mean a good representative value?
- What is measured by standard deviation?
- Can you predict next year's weather reliably from previous data?

Extension

Include statistical charts or graphs in your report to illustrate some of the data. Describe what they show, and how they help you to decide when to have the music festival.