



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

$$\bar{x} = \frac{\sum x}{n}$$

mean → \bar{x} ← sum of the temperatures
 n ← 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?

There are two ways of using a calculator to work out the mean.

Try these

1 Use your calculator in the usual COMP mode to work out:

$$\bar{x} = \frac{16.5 + 15.4 + 17.0 + 15.4 + 16.3 + 19.1 + 15.1 + 16.0 + 15.9 + 16.9}{10}$$

You should get 16.36

2 Now use your scientific calculator in Stats mode.

- a** Enter the data for July.
- b** Check that you have entered all the data by obtaining a value for n , the number of data items.
- c** Check that the mean $\bar{x} = 16.36$

Standard deviation

The **standard deviation** is a measure of spread that tells you how much the temperatures vary from year to year. If every year had exactly the same temperature for July, the standard deviation would be zero.

The standard deviation is usually represented by σ_n or s_n

It is given by the formula
$$\sigma_n = \sqrt{\frac{\sum (x - \bar{x})^2}{n}}$$

Note that you do not need to learn this formula.

In examinations you will be expected to find it using the **Stats** mode on your calculator.

Try these

- 1 Check that the standard deviation for July, $\sigma_n = 1.10$ °C (to 2 d.p.)
- 2 Use your calculator to find the mean and the standard deviation of the August temperatures. (Check 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?
- 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 your calculator 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.