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# Stats1 Chapter 1: Data Collection

## 1.5 The Large Data Set

# Name That Sampling Method!

|                        |                     |                     |                |                      |
|------------------------|---------------------|---------------------|----------------|----------------------|
| Simple Random Sampling | Systematic Sampling | Stratified Sampling | Quota Sampling | Opportunity Sampling |
|------------------------|---------------------|---------------------|----------------|----------------------|

**Suggest a suitable sampling method.**

“You wish to test lightbulbs produced by a factory in a daily batch.”

?

“You wish to survey consumer opinion on your new drink *FizzGuzz* released in the UK.”

?

“You wish to determine students’ favourite TV programmes in your school, that is fairly representative of each year group.”

?

# Name That Sampling Method!

|                        |                     |                     |                |                      |
|------------------------|---------------------|---------------------|----------------|----------------------|
| Simple Random Sampling | Systematic Sampling | Stratified Sampling | Quota Sampling | Opportunity Sampling |
|------------------------|---------------------|---------------------|----------------|----------------------|

**Suggest a suitable sampling method.**

“You wish to test lightbulbs produced by a factory in a daily batch.”

Probably **systematic sampling**, as the method of choosing items is simpler than simple random sampling (where it would be time-consuming to find specifically chosen random light bulbs). Sampling frame is known.

“You wish to survey consumer opinion on your new drink *FizzGuzz* released in the UK.”

**Quota sampling** or **opportunity sampling**. We’d realistically not have access to the sampling frame (i.e. a list of all UK residents).



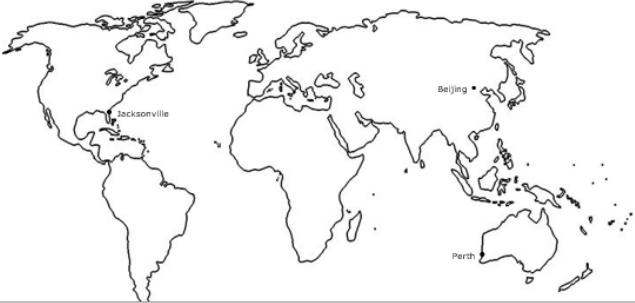
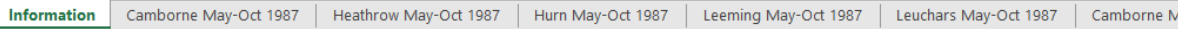
“You wish to determine students’ favourite TV programmes in your school, that is fairly representative of each year group.”

**Stratified sampling**. We (probably) have access to the sampling frame (i.e. a list of all students). Stratified sampling ensures that each stratum (year group) is proportionately represented.

# Large Data Set

All A Level exam boards are obligated to provide a 'large data set'. Data in exam questions will often be from this set, and you are encouraged to explore this data (which is publicly available) in Microsoft Excel.

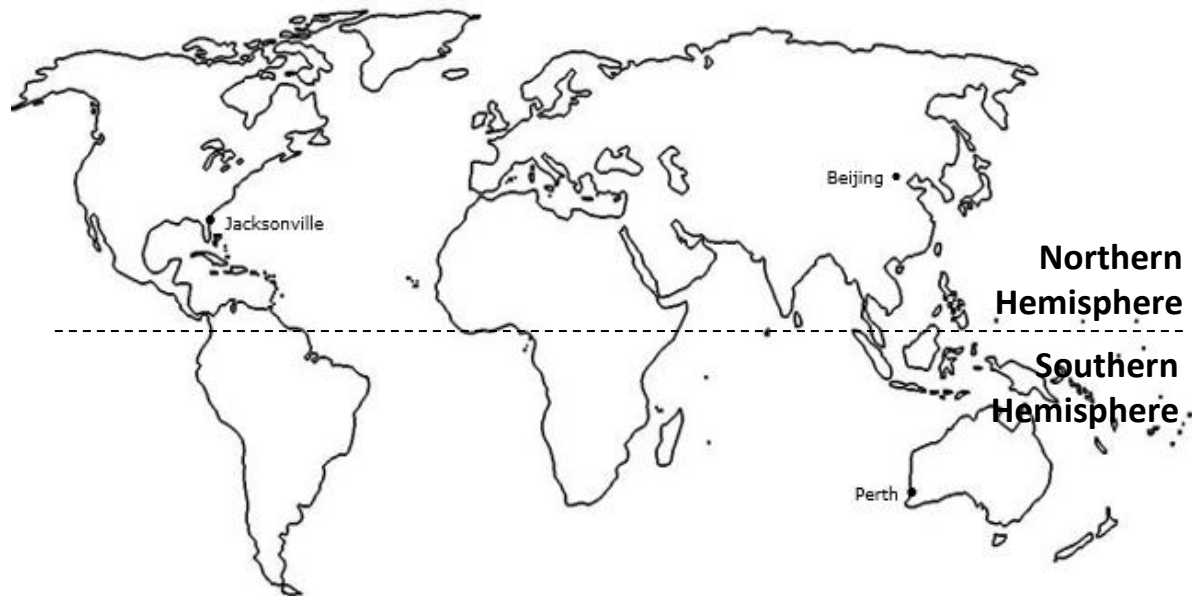
**It is important to note that you are expected to be familiar with this data set before you go into your exam, including some basic geographic knowledge!**

|    | A  | B  | C | D | E | F | G | H | I | J | K | L | M | N | O |
|----|--|--|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1  | <br>Pearson   |    |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 2  | <b>Introduction</b>  |  |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 3  | Pearson have provided this large data set, which will support the assessment of Statistics in the A level Mathematics Paper 3 and AS Mathematics Paper 2. Students are required to become familiar with the data set in advance of the final assessment.   |  |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 4  | To support the use of the large data set in the teaching of the statistics content, tasks such as: <ul style="list-style-type: none"><li>• selecting a sample</li><li>• cleaning the data</li><li>• creating diagrams from the data</li><li>• calculating summary statistics such as mean, standard deviation</li><li>• calculating regression equations and correlation coefficients where applicable</li><li>• hypothesis testing</li></ul> must be carried out by students during their course of study. Students should use technology such as spreadsheets or other statistical packages to explore the data. |  |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 5  | See the specifications A level Mathematics (3MA0) and AS Mathematics (8MA0) for further information  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 6  |  |  |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 7  | <b>Data set source</b>   |  |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 8  | The data set consists of weather data samples provided by the Met Office for five UK weather stations and three overseas weather stations in the time periods May to October 1987 and May to October 2015. The weather stations are labelled on the maps shown: <ul style="list-style-type: none"><li>• in the UK - Camborne, Heathrow, Hum, Leeming and Leuchars</li><li>• overseas - Beijing, Jacksonville and Perth</li></ul> Further information around our data source can be accessed at <a href="http://www.metoffice.gov.uk/">http://www.metoffice.gov.uk/</a>   |  |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 9  |  |  |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 10 | <b>Dataset variables and explanatory notes</b>   |  |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 11 | The Met Office provides data for a number of different weather variables. Our data set includes data for eleven variables recorded across the weather stations during the set periods of time:<br><br><b>Daily Mean Temperature</b><br>Air temperatures are recorded by thermometers in a louvered screen 1.25 metres above short grass, except at some Weather Centre's and Climate Data Logger stations, where observations are made from a non-standard roof top exposure   |  |   |   |   |   |   |   |   |   |   |   |   |   |   |
|    |  |  |   |   |   |   |   |   |   |   |   |   |   |   |   |

Edexcel's data set concerns **weather data from a number of weather stations**. Let's explore what you might be expected to know...

[https://qualifications.pearson.com/content/dam/pdf/A%20Level/Mathematics/2017/specification-and-sample-assesment/Pearson%20Edexcel%20GCE%20AS%20and%20AL%20Mathematics%20data%20set%20-%20Issue%201%20\(1\).xls](https://qualifications.pearson.com/content/dam/pdf/A%20Level/Mathematics/2017/specification-and-sample-assesment/Pearson%20Edexcel%20GCE%20AS%20and%20AL%20Mathematics%20data%20set%20-%20Issue%201%20(1).xls)

# What You Need To Be Familiar With...



**1**

You should know the names and rough locations of the 5 UK weather stations, as well as the 3 international weather stations.

**The data was recorded for:**

- May-Oct 1987
- May-Oct 2015

All the following are daily...

2

You should be familiar with the variables involved and their respective units.

### Total rainfall

(in mm)

tr/trace means less than 0.05mm

### Mean Windspeed

kn/knot is "nautical mile per hour".  $1\text{kn} = 1.15\text{mph}$   
Windspeed also given on Beaufort Scale:

0 = Calm < 1kn  
1-3 = Light 1-10kn  
4 = Moderate 11-16kn  
5 = Fresh 17-21kn

### Mean Visibility

How far (in metres) can be seen into the horizon during daylight hours.

### Wind Direction

### Mean Pressure

In hectopascals (hPa)

### Mean temperature

(in °C)

Textbook claims this is max temp for UK, but it is mean temp for all locations.

### Total sunshine

(nearest  $\frac{1}{10}$  of an hour)

**Maximum Gust**  
(in kn) is highest instantaneous wind speed.

### Humidity

is the % of air saturation with water vapour. 100% is the maximum % water content air can contain.

### Mean Cloud Cover

Oktas means the number of  $\frac{1}{8}$ ths of the sky covered.

|    | A                                    | B                                       | C                                     | D                                      | E                                     | F  | G                                   | H                                 | I                              | J                          | K                         | L                             | M                  | N  |                    |
|----|--------------------------------------|---|---------------------------------------|--|---------------------------------------|--|-------------------------------------|-----------------------------------|--------------------------------|----------------------------|---------------------------|-------------------------------|--------------------|--|--------------------|
| 1  | CAMBORNE                             |   | © Crown Copyright Met Office 2015     |  |                                       |  |                                     |                                   |                                |                            |                           |                               |                    |  |                    |
| 2  | NGR = 1627E 4067N                    |   |                                       |  |                                       |  |                                     |                                   |                                |                            |                           |                               |                    |  |                    |
| 3  | Altitude = 87 metres                 |   |                                       |  |                                       |  |                                     |                                   |                                |                            |                           |                               |                    |  |                    |
| 4  | Latitude = 50:22N Longitude = 05:33W |   |                                       |  |                                       |  |                                     |                                   |                                |                            |                           |                               |                    |  |                    |
| 5  |                                      |   |                                       |  |                                       |  |                                     |                                   |                                |                            |                           |                               |                    |  |                    |
|    | Date                                 | Daily Mean Temperature (0900-0900) (°C) | Daily Total Rainfall (0900-0900) (mm) | Daily Total Sunshine (0000-2400) (hrs) | Daily Mean Windspeed (0000-2400) (kn) | Daily Mean Windspeed (0000-2400) (Beaufort conversion) | Daily Maximum Gust (0000-2400) (kn) | Daily Maximum Relative Humidity % | Daily Mean Total Cloud (oktas) | Daily Mean Visibility (Dm) | Daily Mean Pressure (hPa) | Daily Mean Wind Direction (o) | Cardinal Direction | Daily Max Gust Corresponding Direction (o) | Cardinal Direction |
| 7  | 01/05/1987                           | 10.7                                    | 3.1                                   | n/a                                    | n/a                                   | n/a  | n/a                                 | 100                               | 7                              | 2000                       | 1018                      | 360                           | N                  | 20   | NNE                |
| 8  | 02/05/1987                           | 8.9                                     | 0.1                                   | n/a                                    | n/a                                   | n/a  | n/a                                 | 91                                | 3                              | 3200                       | 1020                      | 320                           | NW                 | 330  | NNW                |
| 9  | 03/05/1987                           | 8.1                                     | 0                                     | n/a                                    | n/a                                   | n/a  | n/a                                 | 77                                | 5                              | 3600                       | 1029                      | 350                           | N                  | 350  | N                  |
| 10 | 04/05/1987                           | 8.2                                     | 0                                     | n/a                                    | n/a                                   | n/a  | n/a                                 | 83                                | 5                              | 4100                       | 1036                      | 350                           | N                  | 350  | N                  |
| 11 | 05/05/1987                           | 9.8                                     | 0                                     | n/a                                    | n/a                                   | n/a  | n/a                                 | 86                                | 5                              | 2700                       | 1036                      | 10                            | N                  | 10   | N                  |
| 12 | 06/05/1987                           | 9.3                                     | 0                                     | n/a                                    | n/a                                   | n/a  | n/a                                 | 100                               | 1                              | 1000                       | 1033                      | 330                           | NNW                | 340  | NNW                |
| 13 | 07/05/1987                           | 10.9                                    | 0                                     | n/a                                    | n/a                                   | n/a  | n/a                                 | 100                               | 3                              | 600                        | 1031                      | 350                           | N                  | 350  | N                  |
| 14 | 08/05/1987                           | 10.5                                    | tr                                    | n/a                                    | n/a                                   | n/a  | n/a                                 | 89                                | 1                              | 2400                       | 1025                      | 110                           | N                  | 110  | N                  |
| 15 | 09/05/1987                           | 10.9                                    | 0                                     | n/a                                    | n/a                                   | n/a  | n/a                                 | 95                                | 3                              | 900                        | 1017                      | 360                           | N                  | 360  | N                  |
| 16 | 10/05/1987                           | 9.9                                     | 0                                     | n/a                                    | n/a                                   | n/a  | n/a                                 | 79                                | 4                              | 4100                       | 1018                      | 10                            | N                  | 10   | N                  |
| 17 | 11/05/1987                           | 8.8                                     | 6                                     | n/a                                    | n/a                                   | n/a  | n/a                                 | 95                                | 7                              | 2500                       | 1017                      | 270                           | W                  | 260  | W                  |
| 18 | 12/05/1987                           | 10.2                                    | tr                                    | n/a                                    | n/a                                   | n/a  | n/a                                 | 97                                | 5                              | 2400                       | 1009                      | 310                           | NW                 | 310  | NW                 |
| 1  | 13/05/1987                           | 2.2                                     | n/a                                   | n/a                                    | n/a                                   | n/a  | n/a                                 | 77                                | 4                              | 4600                       | 1016                      | 340                           | NNW                | 340  | NNW                |
| 2  | 14/05/1987                           | tr                                      | 5.9                                   | 16                                     | Moderate                              | 3  | 95                                  | 7                                 | 3100                           | 1008                       | 290                       | WNW                           | 270                | W  |                    |
| 3  | 15/05/1987                           | 0                                       | 12.3                                  | 13                                     | Moderate                              | 2  | 77                                  | 4                                 | 4500                           | 1012                       | 10                        | N                             | 10                 | N  |                    |
| 4  | 16/05/1987                           | tr                                      | 11.6                                  | 6                                      | Light                                 | 1  | 92                                  | 4                                 | 3700                           | 1015                       | 290                       | WNW                           | 290                | WNW  |                    |

Wind Direction

Mean Pressure  
In hectopascals (hPa)

Mean temperature

3

You should have a vague idea of the range of values for each location.

| UK Location (2015) | Temp Range | Wind Speed Range |
|--------------------|------------|------------------|
| Camborne           | 10-20      | 3-18             |
| Heathrow           | 8-29       | 3-19             |
| Hurn               | 6-24       | 2-19             |
| Leeming            | 4-23       | 3-17             |
| Leuchars           | 4-19       | 3-23             |

Mean wind speed in UK across full period was roughly 9 nm. But 4 nm in Beijing (i.e. lower), 5 in Jacksonville (again lower), 8 in Perth (similar to UK).

| World Location (2015) | Temp Range | Wind Speed Range |
|-----------------------|------------|------------------|
| Beijing               | 8-33       | 2-9              |
| Jacksonville          | 15-31      | 1-12             |
| Perth                 | 8-25       | 4-14             |

Beijing temp range relatively large.  
Min Jacksonville temp high.  
Perth similar to UK.

#### From new A Level sample assessment materials:

"A meteorologist believes that there is a relationship between the daily mean windspeed,  $w$  kn, and the daily mean temperature,  $t$  °C. A random sample of 9 consecutive days is taken from past records from a town in the UK in July and the relevant data is given in the table below. ...

Using the same 9 days, a location from the large data set gave  $\bar{t} = 27.2$  and  $\bar{w} = 3.5$ .

(d) Using your knowledge of the large data set, suggest, giving your reason, the location that gave rise to these statistics."

(Note to teachers: I will not otherwise use SAM questions in these slides. I made one exception here!)

**4**

You should have a vague idea of the range of values for each variable for the data set as a whole.

| Variable                     | Typical value(s)   |
|------------------------------|--|
| Gust (UK only)               | 8 – 52 nm  |
| Rainfall                     | 0 – 60 mm in UK, but more extreme maximums elsewhere (e.g. 102mm in Perth) |
| Pressure                     | 988 – 1038 hPa   |
| Wind Speed on Beaufort scale | Max is 'fresh' (5). Most Light or Moderate.                                |
| Sunshine (UK only)           | 0 – 16 hrs   |
| Cloud Cover                  | 0 – 8 ocktas (i.e. full spread)  |



# Example Questions

## Hurn

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| Date       | Daily Max Temp (09-00-0900 C) | Daily Total Rainfall (0900-0900) (mm) | Daily Total Sunshine (0000-2400) (hrs) | Daily Mean Windspeed (0000-2400) (kn) | Daily Mean Windspeed (0000-2400) (Beaufort conversion) | Daily Maximum Gust (0000-2400) (kn) |
|------------|-------------------------------|---------------------------------------|--|---------------------------------------|--|-------------------------------------|
| 01/06/1987 | 15.1                          | 0.6                                   | 4.5                                    | 7                                     | Light  | 19                                  |
| 02/06/1987 | 12.5                          | 4.7                                   | 0                                      | 7                                     | Light  | 22                                  |
| 03/06/1987 | 13.8                          | tr                                    | 5.6                                    | 11                                    | Moderate   | 25                                  |
| 04/06/1987 | 15.5                          | 5.3                                   | 7.8                                    | 7                                     | Light  | 17                                  |
| 05/06/1987 | 13.1                          | 19                                    | 0.5                                    | 10                                    | Light  | 33                                  |
| 06/06/1987 | 13.8                          | 0                                     | 8.9                                    | 19                                    | Fresh  | 46                                  |
| 07/06/1987 | 13.2                          | tr                                    | 3.8                                    | 11                                    | Moderate   | 27                                  |
| 08/06/1987 | 12.9                          | 1                                     | 1.7                                    | 9                                     | Light  | 19                                  |
| 09/06/1987 | 11.2                          | tr                                    | 5.4                                    | 6                                     | Light  | 19                                  |
| 10/06/1987 | 9.2                           | 1.3                                   | 9.7                                    | 4                                     | Light  | n/a                                 |
| 11/06/1987 | 12.6                          | 0                                     | 12.5                                   | 6                                     | Light  | 18                                  |
| 12/06/1987 | 10.4                          | 0                                     | 11.9                                   | 5                                     | Light  | n/a                                 |
| 13/06/1987 | 9.6                           | 0                                     | 8.6                                    | 5                                     | Light  | 15                                  |
| 14/06/1987 | 10.2                          | 0                                     | 13.1                                   | 5                                     | Light  | 18                                  |
| 15/06/1987 | 9.2                           | 3.7                                   | 7.1                                    | 4                                     | Light  | 25                                  |
| 16/06/1987 | 10.4                          | 5.6                                   | 8.3                                    | 6                                     | Light  | 25                                  |
| 17/06/1987 | 12.8                          | 0.1                                   | 5.3                                    | 10                                    | Light  | 27                                  |
| 18/06/1987 | 13.0                          | 7.4                                   | 3.2                                    | 9                                     | Light  | 24                                  |
| 19/06/1987 | 14.0                          | tr                                    | 0.4                                    | 12                                    | Moderate   | 33                                  |
| 20/06/1987 | 12.6                          | 0                                     | 7.7                                    | 6                                     | Light  | 17                                  |

As previously noted, the **actual** data set has mean temperature for all locations. I changed to maximum temperature for this example for consistency with the textbook.

[Textbook]

(a) Describe the type of data represented by daily total rainfall.

Alison is investigating daily maximum gust. She wants to select a sample of size 5 from the first 20 days in Hurn in June 1987. She uses the first two digits of the date as a sampling frame and generates five random numbers between 1 and 20.

b) State the type of sample selected by Alison.

c) Explain why Alison's process might not generate a sample of size 5.

a

?

b

?

c

?

# Example Questions

## Hurn

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| Date       | Daily Max Temp (09-00-0900 C) | Daily Total Rainfall (0900-0900) (mm) | Daily Total Sunshine (0000-2400) (hrs) | Daily Mean Windspeed (0000-2400) (kn) | Daily Mean Windspeed (0000-2400) (Beaufort conversion) | Daily Maximum Gust (0000-2400) (kn) |
|------------|-------------------------------|---------------------------------------|--|---------------------------------------|--|-------------------------------------|
| 01/06/1987 | 15.1                          | 0.6                                   | 4.5                                    | 7                                     | Light  | 19                                  |
| 02/06/1987 | 12.5                          | 4.7                                   | 0                                      | 7                                     | Light  | 22                                  |
| 03/06/1987 | 13.8                          | tr                                    | 5.6                                    | 11                                    | Moderate   | 25                                  |
| 04/06/1987 | 15.5                          | 5.3                                   | 7.8                                    | 7                                     | Light  | 17                                  |
| 05/06/1987 | 13.1                          | 19                                    | 0.5                                    | 10                                    | Light  | 33                                  |
| 06/06/1987 | 13.8                          | 0                                     | 8.9                                    | 19                                    | Fresh  | 46                                  |
| 07/06/1987 | 13.2                          | tr                                    | 3.8                                    | 11                                    | Moderate   | 27                                  |
| 08/06/1987 | 12.9                          | 1                                     | 1.7                                    | 9                                     | Light  | 19                                  |
| 09/06/1987 | 11.2                          | tr                                    | 5.4                                    | 6                                     | Light  | 19                                  |
| 10/06/1987 | 9.2                           | 1.3                                   | 9.7                                    | 4                                     | Light  | n/a                                 |
| 11/06/1987 | 12.6                          | 0                                     | 12.5                                   | 6                                     | Light  | 18                                  |
| 12/06/1987 | 10.4                          | 0                                     | 11.9                                   | 5                                     | Light  | n/a                                 |
| 13/06/1987 | 9.6                           | 0                                     | 8.6                                    | 5                                     | Light  | 15                                  |
| 14/06/1987 | 10.2                          | 0                                     | 13.1                                   | 5                                     | Light  | 18                                  |
| 15/06/1987 | 9.2                           | 3.7                                   | 7.1                                    | 4                                     | Light  | 25                                  |
| 16/06/1987 | 10.4                          | 5.6                                   | 8.3                                    | 6                                     | Light  | 25                                  |
| 17/06/1987 | 12.8                          | 0.1                                   | 5.3                                    | 10                                    | Light  | 27                                  |
| 18/06/1987 | 13.0                          | 7.4                                   | 3.2                                    | 9                                     | Light  | 24                                  |
| 19/06/1987 | 14.0                          | tr                                    | 0.4                                    | 12                                    | Moderate   | 33                                  |
| 20/06/1987 | 12.6                          | 0                                     | 7.7                                    | 6                                     | Light  | 17                                  |

As previously noted, the **actual** data set has mean temperature for all locations. I changed to maximum temperature for this example for consistency with the textbook.

[Textbook]

(a) Describe the type of data represented by daily total rainfall.

Alison is investigating daily maximum gust. She wants to select a sample of size 5 from the first 20 days in Hurn in June 1987. She uses the first two digits of the date as a sampling frame and generates five random numbers between 1 and 20.

b) State the type of sample selected by Alison.

c) Explain why Alison's process might not generate a sample of size 5.

a

Continuous quantitative data.

b

Simple random sample.

c

Some of the data values are not available (n/a).

# Example Questions

## Hurn

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| Date       | Daily Max Temp (09-00-0900 C) | Daily Total Rainfall (0900-0900) (mm) | Daily Total Sunshine (0000-2400) (hrs) | Daily Mean Windspeed (0000-2400) (kn) | Daily Mean Windspeed (0000-2400) (Beaufort conversion) | Daily Maximum Gust (0000-2400) (kn) |
|------------|-------------------------------|---------------------------------------|--|---------------------------------------|--|-------------------------------------|
| 01/06/1987 | 15.1                          | 0.6                                   | 4.5                                    | 7                                     | Light  | 19                                  |
| 02/06/1987 | 12.5                          | 4.7                                   | 0                                      | 7                                     | Light  | 22                                  |
| 03/06/1987 | 13.8                          | tr                                    | 5.6                                    | 11                                    | Moderate   | 25                                  |
| 04/06/1987 | 15.5                          | 5.3                                   | 7.8                                    | 7                                     | Light  | 17                                  |
| 05/06/1987 | 13.1                          | 19                                    | 0.5                                    | 10                                    | Light  | 33                                  |
| 06/06/1987 | 13.8                          | 0                                     | 8.9                                    | 19                                    | Fresh  | 46                                  |
| 07/06/1987 | 13.2                          | tr                                    | 3.8                                    | 11                                    | Moderate   | 27                                  |
| 08/06/1987 | 12.9                          | 1                                     | 1.7                                    | 9                                     | Light  | 19                                  |
| 09/06/1987 | 11.2                          | tr                                    | 5.4                                    | 6                                     | Light  | 19                                  |
| 10/06/1987 | 9.2                           | 1.3                                   | 9.7                                    | 4                                     | Light  | n/a                                 |
| 11/06/1987 | 12.6                          | 0                                     | 12.5                                   | 6                                     | Light  | 18                                  |
| 12/06/1987 | 10.4                          | 0                                     | 11.9                                   | 5                                     | Light  | n/a                                 |
| 13/06/1987 | 9.6                           | 0                                     | 8.6                                    | 5                                     | Light  | 15                                  |
| 14/06/1987 | 10.2                          | 0                                     | 13.1                                   | 5                                     | Light  | 18                                  |
| 15/06/1987 | 9.2                           | 3.7                                   | 7.1                                    | 4                                     | Light  | 25                                  |
| 16/06/1987 | 10.4                          | 5.6                                   | 8.3                                    | 6                                     | Light  | 25                                  |
| 17/06/1987 | 12.8                          | 0.1                                   | 5.3                                    | 10                                    | Light  | 27                                  |
| 18/06/1987 | 13.0                          | 7.4                                   | 3.2                                    | 9                                     | Light  | 24                                  |
| 19/06/1987 | 14.0                          | tr                                    | 0.4                                    | 12                                    | Moderate   | 33                                  |
| 20/06/1987 | 12.6                          | 0                                     | 7.7                                    | 6                                     | Light  | 17                                  |

[Textbook] Calculate:

- The mean daily maximum temperature for the first five days of June in Hurn in 1987.
- The median daily total rainfall for the week of 14<sup>th</sup> June to 20<sup>th</sup> June inclusive.
- The median daily total rainfall for the same week in Perth was 19.00mm. Karl states that more southerly countries experience higher rainfall during June. State with a reason whether your answer to part (b) supports this statement.

a

?

b

?

c

?

# Example Questions

## Hurn

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| Date       | Daily Max Temp (09-00-0900 C) | Daily Total Rainfall (0900-0900) (mm) | Daily Total Sunshine (0000-2400) (hrs) | Daily Mean Windspeed (0000-2400) (kn) | Daily Mean Windspeed (0000-2400) (Beaufort conversion) | Daily Maximum Gust (0000-2400) (kn) |
|------------|-------------------------------|---------------------------------------|--|---------------------------------------|--|-------------------------------------|
| 01/06/1987 | 15.1                          | 0.6                                   | 4.5                                    | 7                                     | Light  | 19                                  |
| 02/06/1987 | 12.5                          | 4.7                                   | 0                                      | 7                                     | Light  | 22                                  |
| 03/06/1987 | 13.8                          | tr                                    | 5.6                                    | 11                                    | Moderate   | 25                                  |
| 04/06/1987 | 15.5                          | 5.3                                   | 7.8                                    | 7                                     | Light  | 17                                  |
| 05/06/1987 | 13.1                          | 19                                    | 0.5                                    | 10                                    | Light  | 33                                  |
| 06/06/1987 | 13.8                          | 0                                     | 8.9                                    | 19                                    | Fresh  | 46                                  |
| 07/06/1987 | 13.2                          | tr                                    | 3.8                                    | 11                                    | Moderate   | 27                                  |
| 08/06/1987 | 12.9                          | 1                                     | 1.7                                    | 9                                     | Light  | 19                                  |
| 09/06/1987 | 11.2                          | tr                                    | 5.4                                    | 6                                     | Light  | 19                                  |
| 10/06/1987 | 9.2                           | 1.3                                   | 9.7                                    | 4                                     | Light  | n/a                                 |
| 11/06/1987 | 12.6                          | 0                                     | 12.5                                   | 6                                     | Light  | 18                                  |
| 12/06/1987 | 10.4                          | 0                                     | 11.9                                   | 5                                     | Light  | n/a                                 |
| 13/06/1987 | 9.6                           | 0                                     | 8.6                                    | 5                                     | Light  | 15                                  |
| 14/06/1987 | 10.2                          | 0                                     | 13.1                                   | 5                                     | Light  | 18                                  |
| 15/06/1987 | 9.2                           | 3.7                                   | 7.1                                    | 4                                     | Light  | 25                                  |
| 16/06/1987 | 10.4                          | 5.6                                   | 8.3                                    | 6                                     | Light  | 25                                  |
| 17/06/1987 | 12.8                          | 0.1                                   | 5.3                                    | 10                                    | Light  | 27                                  |
| 18/06/1987 | 13.0                          | 7.4                                   | 3.2                                    | 9                                     | Light  | 24                                  |
| 19/06/1987 | 14.0                          | tr                                    | 0.4                                    | 12                                    | Moderate   | 33                                  |
| 20/06/1987 | 12.6                          | 0                                     | 7.7                                    | 6                                     | Light  | 17                                  |

[Textbook] Calculate:

- The mean daily maximum temperature for the first five days of June in Hurn in 1987.
- The median daily total rainfall for the week of 14<sup>th</sup> June to 20<sup>th</sup> June inclusive.
- The median daily total rainfall for the same week in Perth was 19.00mm. Karl states that more southerly countries experience higher rainfall during June. State with a reason whether your answer to part (b) supports this statement.

**a**  $70.0 \div 5 = 14.0 \text{ }^{\circ}\text{C} \text{ (1dp)}$

**b** Values in ascending order:  
0, 0, tr, 0.1, 3.7, 5.6, 7.4.  
 $\therefore$  Median is 0.1mm.

**c** Perth is in Australia, which is south of the UK, and the median rainfall was higher. However, this is a very small sample from a single location in each country so does not provide enough evidence to support Karl's statement.

# Exercise 1.5

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# Homework Exercise

Questions 3 and 4 in this exercise use the following extracts from the large data set.

| <b>LEEMING</b><br>© Crown Copyright Met Office 2015 |                             |                           |                            |                           |
|---|-----------------------------|---------------------------|----------------------------|---------------------------|
| Date  | Daily mean temperature (°C) | Daily total rainfall (mm) | Daily total sunshine (hrs) | Daily mean windspeed (kn) |
| 01/06/2015  | 8.9                         | 10                        | 5.1                        | 15                        |
| 02/06/2015  | 10.7                        | tr                        | 8.9                        | 17                        |
| 03/06/2015  | 12.0                        | 0                         | 10.0                       | 8                         |
| 04/06/2015  | 11.7                        | 0                         | 12.8                       | 7                         |
| 05/06/2015  | 15.0                        | 0                         | 8.9                        | 9                         |
| 06/06/2015  | 11.6                        | tr                        | 5.4                        | 17                        |
| 07/06/2015  | 12.6                        | 0                         | 13.9                       | 10                        |
| 08/06/2015  | 9.4                         | 0                         | 9.7                        | 7                         |
| 09/06/2015  | 9.7                         | 0                         | 12.1                       | 5                         |
| 10/06/2015  | 11.0                        | 0                         | 14.6                       | 4                         |

| <b>HEATHROW</b><br>© Crown Copyright Met Office 2015 |                             |                           |                            |                           |
|--|-----------------------------|---------------------------|----------------------------|---------------------------|
| Date   | Daily mean temperature (°C) | Daily total rainfall (mm) | Daily total sunshine (hrs) | Daily mean windspeed (kn) |
| 01/06/2015   | 12.1                        | 0.6                       | 4.1                        | 15                        |
| 02/06/2015   | 15.4                        | tr                        | 1.6                        | 18                        |
| 03/06/2015   | 15.8                        | 0                         | 9.1                        | 9                         |
| 04/06/2015   | 16.1                        | 0.8                       | 14.4                       | 6                         |
| 05/06/2015   | 19.6                        | tr                        | 5.3                        | 9                         |
| 06/06/2015   | 14.5                        | 0                         | 12.3                       | 12                        |
| 07/06/2015   | 14.0                        | 0                         | 13.1                       | 5                         |
| 08/06/2015   | 14.0                        | tr                        | 6.4                        | 7                         |
| 09/06/2015   | 11.4                        | 0                         | 2.5                        | 10                        |
| 10/06/2015   | 14.3                        | 0                         | 7.2                        | 10                        |

# Homework Exercise

- 1 From the eight weather stations featured in the large data set, write down:
  - a the station which is furthest north
  - b the station which is furthest south
  - c an inland station
  - d a coastal station
  - e an overseas station.
- 2 Explain, with reasons, whether daily maximum relative humidity is a discrete or continuous variable.
- 3
  - a Work out the mean of the daily total sunshine for the first 10 days of June 2015 in:
    - i Leeming
    - ii Heathrow.
  - b Work out the range of the daily total sunshine for the first 10 days of June 2015 in:
    - i Leeming
    - ii Heathrow.
  - c Supraj says that the further north you are, the fewer the number of hours of sunshine. State, with reasons, whether your answers to parts **a** and **b** support this conclusion.
- 4 Calculate the mean daily total rainfall in Heathrow for the first 10 days of June 2015. Explain clearly how you dealt with the data for 2/6/2015, 5/6/2015 and 8/6/2015.
- 5 Dominic is interested in seeing how the average monthly temperature changed over the summer months of 2015 in Jacksonville. He decides to take a sample of two days every month and average the temperatures before comparing them.
  - a Give one reason why taking two days a month might be:
    - i a good sample size
    - ii a poor sample size.
  - b He chooses the first day of each month and the last day of each month. Give a reason why this method of choosing days might not be representative.
  - c Suggest a better way that he can choose his sample of days.

**Hint**

State in your answer whether Leeming is north or south of Heathrow.



# Homework Exercise

- 6 The table shows the mean daily temperatures at each of the eight weather stations for August 2015:

|                           | Camborne | Heathrow | Hurn | Leeming | Leuchars | Beijing | Jacksonville | Perth |
|---------------------------|----------|----------|------|---------|----------|---------|--------------|-------|
| Mean daily mean temp (°C) | 15.4     | 18.1     | 16.2 | 15.6    | 14.7     | 26.6    | 26.4         | 13.6  |

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- a Give a geographical reason why the temperature in August might be lower in Perth than in Jacksonville.
- b Comment on whether this data supports the conclusion that coastal locations experience lower average temperatures than inland locations.
- 7 Brian calculates the mean cloud coverage in Leeming in September 1987. He obtains the answer 9.3 oktas. Explain how you know that Brian's answer is incorrect.
- 8 The large data set provides data for 184 consecutive days in 1987. Marie is investigating daily mean windspeeds in Camborne in 1987.
- a Describe how Marie could take a systematic sample of 30 days from the data for Camborne in 1987. (3 marks)
- b Explain why Marie's sample would not necessarily give her 30 data points for her investigation. (1 mark)



# Homework Exercise

You will need access to the large data set and spreadsheet software to answer these questions.

- 1
  - a Find the mean daily mean pressure in Beijing in October 1987.
  - b Find the median daily rainfall in Jacksonville in July 2015.
  - c
    - i Draw a grouped frequency table for the daily mean temperature in Heathrow in July and August 2015. Use intervals  $10 \leq t < 15$ , etc.
    - ii Draw a histogram to display this data.
    - iii Draw a frequency polygon for this data.
- 2
  - a
    - i Take a simple random sample of size 10 from the data for daily mean windspeed in Leeming in 1987.
    - ii Work out the mean of the daily windspeeds using your sample.
  - b
    - i Take a sample of the last 10 values from the data for daily mean windspeed in Leuchars in 1987.
    - ii Work out the mean of the daily mean windspeeds using your sample.
  - c State, with reasons, which of your samples is likely to be more representative.
  - d Suggest two improvements to the sampling methods suggested in part a.
  - e Use an appropriate sampling method and sample size to estimate the mean windspeeds in Leeming and Leuchars in 1987. State with a reason whether your calculations support the statement 'Coastal locations are likely to have higher average windspeeds than inland locations'.

**Hint** You can use the **Countif** command in a spreadsheet to work out the frequency for each class.

# Homework Answers

- 1
  - a Leuchars
  - b Perth
  - c ANY ONE FROM: Leeming, Heathrow, Beijing
  - d ANY ONE FROM: Leuchars, Hurn, Camborne, Jacksonville, Perth
  - e ANY ONE FROM: Beijing, Jacksonville, Perth
- 2 Continuous – it can take any value in the range 0 to 100
- 3
  - a
    - i 10.14 hours
    - ii 7.6 hours
  - b
    - i 9.5 hours
    - ii 12.8 hours
  - c The mean of the daily total sunshine in Leeming is higher than that in Heathrow. Leeming is north of Heathrow, so these data do not support Supraj's conclusion.
- 4 0.14 mm, treat tr. as 0 in numerical calculations.
- 5
  - a
    - i Covers several months
    - ii Small sample size
  - b Two consecutive days chosen all the time – not random, possibly have similar weather.
  - c Number the days and choose a simple random sample.
- 6
  - a Perth is in the southern hemisphere so August is a winter month
  - b The lowest temperatures in the UK are at coastal locations (Camborne and Leuchars). The highest temperature is at an inland location (Beijing). There is some evidence to support this conclusion.
- 7 Oktas measure the cloud coverage in eighths. The highest value is 8 which represents full cloud coverage.
- 8
  - a She needs to select days at regular intervals in an ordered list. Put the days into date order. Select every sixth day ( $184 \div 30 = 6.13$ ).
  - b Some of the data values might not be available (n/a).

# Homework Answers

Large data set

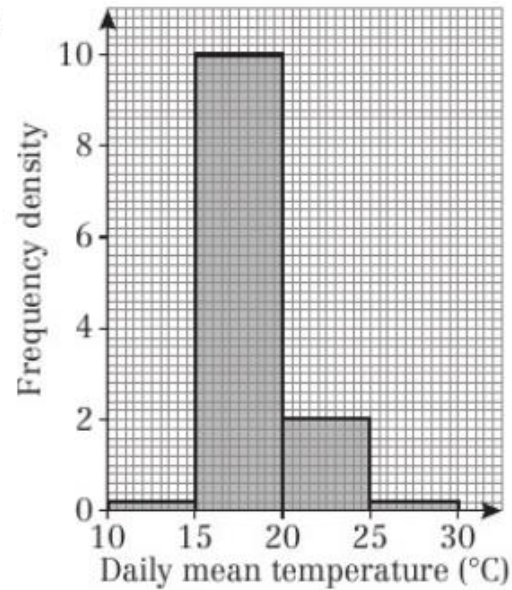
1 a 1020 hPa

b 0.0 mm

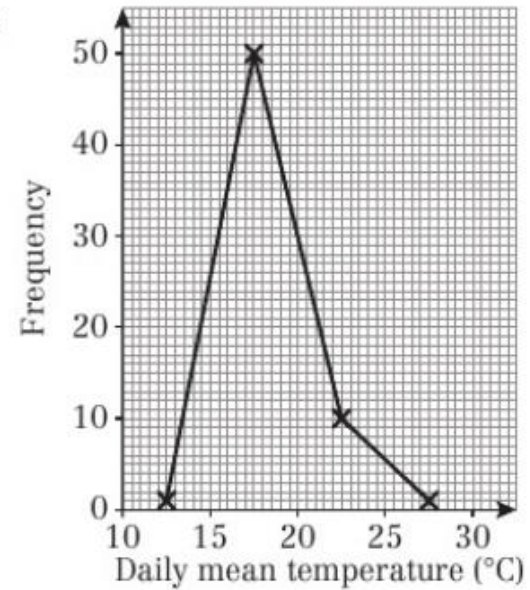
c i

| Temperature, $t$ (°C) | Frequency |
|-----------------------|-----------|
| $10 \leq t < 15$      | 1         |
| $15 \leq t < 20$      | 50        |
| $20 \leq t < 25$      | 10        |
| $25 \leq t < 30$      | 1         |

ii



iii



2 Students' own answer.