Calculating the Weather

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Starter worksheet

Meteorologists use many different techniques and formulae to calculate and predict the weather. But one part of maths that they have to use a great deal is **percentages**.

When water evaporates it turns into **vapour** in the air. The amount of water vapour in the air is changes at different temperatures and in different places.

Can you think of somewhere that might have a tiny amount of water in the air? What about a place with lots of water in the air?

Meteorologists measure the amount of water vapour in the air to find the **relative humidity**.

The relative humidity is the percentage of the maximum water the air could hold (at a specific temperature) that is actually in the air. So, a relative humidity of 51% would mean that the air contained 51% of the water it could hold at that temperature. This how to calculate relative humidity:

$$\text{Relative humidity} = \frac{\text{Grams of water per cubic metre of air}}{\text{Most grams of water per cubic metre the air can hold}} \times 100$$

Here are some relative humidity data for different world cities, recorded on a day in October.

Use the formula to fill in the gaps in the table.

City	Temperature (°c)	Relative humidity (%)	Water Vapour (g/m³)	Maximum Vapour (g/m³)
Cape Town	21		9.18	18
Dubai	28		2.75	25
London	7		4.06	7.8
Moscow	7	90		7.8
Mumbai	36	72		42
New Orleans	17	35	5.08	
Rio de Janeiro	23	92	18.86	
Rome	21	86		18
Timbuktu	38	23	11.04	

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Core worksheet

When investigating the weather, it is often useful to compare data to long term averages. This gives meteorologists a sense of how weather conditions over a small period, often a month, relate to larger climate and weather patterns. Percentages are particularly helpful for making such comparisons, especially when investigating **rainfall** and **hours of sunshine**. There are two different ways to do this: calculate the percentage anomaly or calculate the percentage difference.

1. Calculate the percentage anomaly

This means that you turn your information into a percentage of the average.
So, if 79.8mm of rainfall fell one January and the average January rainfall was 95mm the anomaly would be 79.8 ÷ 95 which is 84% as a percentage.

The table below contains information from the Met Office about hours of sunshine each month in the UK in 2006. **Calculate the sunshine percentage anomaly for each month**.

2. Calculate the percentage difference

This means that you turn the difference between your information and the average into a percentage of the average. The method is:

$$\text{Percentage difference} = \frac{\text{New value} - \text{average}}{\text{Average}} \times 100$$

A **negative** answer shows there has been a percentage **decrease** and a **positive** answer shows there has been a percentage **increase**. Using the table, **find the percentage difference of sunshine for each month**.

Compare your percentage anomalies and percentage differences. What do you notice?

Month	Sunshine [hours] 2006	Sunshine [hours] 1961-90 average
January	45	43.9
February	67.9	63.1
March	89	100.6
April	164.2	141.9
May	179.6	179
June	210.3	175.9
July	253.3	167.1
August	137.9	158.1
September	140.1	120.2
October	86.6	88.5
November	78.6	58.3
December	43.3	39.3