Temperature has a lot of effect on us, and on all living things.

You must already know that some places get hotter than other places. Some parts of India get very hot, and some parts get very cold. Some places on the earth are always quite cold. Some places are usually hot. And some places remain neither very hot, nor very cold.
How do we measure how hot a place is? Let’s find out.

Measuring Our Body Temperature

Sometimes when we fall ill we get a fever. That means our body is warmer than usual - its temperature has increased. A thermometer can be used to find out how high a fever is.

A thermometer is a small glass tube filled with a liquid like mercury or coloured alcohol. The liquid expands when it is heated.

The scale is marked on the side of the tube.

When we put the end of the thermometer inside our mouth, the liquid gets heated by the heat of our body and expands. It goes far up inside the glass tube. When it reaches the temperature of our body, it stops expanding.

The point on the scale where the liquid comes to a stop shows us our body temperature.

Just as we have two different units for measuring distance (kilometres or miles), we have two different units for measuring temperature: degrees Celsius (°C) or degrees Fahrenheit (°F). The little circle (°) means ‘degrees’.

The thermometers that are used to tell our body temperature usually have units of Fahrenheit. A healthy person’s body has a temperature of about 98.6 degrees Fahrenheit (98.6°F). If we measure in units of Celsius, this is 37 degrees Celsius (37°C).

How do you find out your body temperature with a thermometer?

The Temperature of Air

Just as we can measure our body’s temperature, we can also measure the temperature of air. But for this a different kind of thermometer is used, and its scale is usually in Celsius units (as shown on the right).

Bring a Celsius thermometer to the classroom. Note what temperature the thermometers shows. This is the present temperature of air in your classroom.

Beware!

Mercury is a very poisonous metal. It is a liquid at room temperature. You should never touch mercury. Even the invisible, odourless fumes that mercury gives off are dangerous to breathe. In case you break a mercury thermometer, you should let an adult carefully scoop up the mercury onto a piece of paper without touching it and bury it somewhere safe.

Try to get thermometers that are filled with coloured alcohol instead of mercury, since they are safer. The alcohol is usually coloured red.

118 Temperature
To get an idea of other temperatures, measure and note the temperature of the following things. Before you start measuring, guess the temperature of each one.

<table>
<thead>
<tr>
<th>Thing</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>A bucket of water</td>
<td></td>
</tr>
<tr>
<td>Water in a mutka</td>
<td></td>
</tr>
<tr>
<td>Ice</td>
<td></td>
</tr>
<tr>
<td>A glass of cold water</td>
<td></td>
</tr>
<tr>
<td>Warm bath water</td>
<td></td>
</tr>
</tbody>
</table>

It is safer and advisable to use thermometers that have a scale of -10°C to 110°C. Using such a thermometer, also measure and note the temperature of boiling water and hot tea.

For the next week, measure the air temperature each day at the same time and place. (Remember to choose a place that is in the shade.) Each day before you measure, write down your guess. Keep your record in a separate notebook.

Place ______________________________________________________________________________________________________________________
Time ______________________________________________________________________________________________________________________
Month ____________________________________________________________________________________________________________________

<table>
<thead>
<tr>
<th>Date</th>
<th>Air Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Guess</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If you measure the temperature for a week in different months throughout the year, you will be able to see the temperature differences that occur between the summer, winter, monsoon, and other seasons.

Record the temperature every day for one week for a few different months.

Calculate the average temperature for each week that you make measurements.

Discuss the variations between different weeks.

The Meteorological Department

This is a department of the government that has its offices in many different parts of the country. Each office records the daily temperatures. All the countries of the world have such weather bureaus recording the temperatures of various places. Thus, we can get information about the temperatures of numerous places all over the world, for every day, every month and every year.

Official temperatures are measured at a distance of 1.6 metres above the ground under a structure that provides shade from the sun and exposure to air, and is away from any walls that might radiate heat.

Note: Always measure the air temperature in the shade, not in the sun. Keeping a thermometer in the sun may cause it to rise to a temperature that is much higher than the air temperature. The thermometer might even break!
High and Low Temperatures

You must already know that when water reaches a temperature around 100°C it starts boiling, and at about zero (0°C) it freezes into ice. That's why these temperatures are known as the boiling point and the freezing point.

There is no place on the earth where the air temperature gets 'boiling hot'. It never reaches 100°C. But there are many places where the air temperature has reached 0°C and even lower. Do you know how temperatures are written when they are lower than 0°C? They are written by writing a negative sign (-) in front of the temperature.

Let's say that the temperature of a certain place is 5°C below 0. Then we'll say it's minus five degrees Celsius (-5°C).

Which temperature is greater: 5°C or -5°C?
At which of these two temperatures will we feel colder?
How many degrees difference is there between -5° and 5°?
Write in short form each of the following temperatures:
88 degrees below zero, Celsius
38 degrees above freezing, Celsius
32 degrees below freezing, Celsius
Did you note the temperature in your classroom today? 88 degrees below zero Celsius is how many degrees lower than the temperature you measured?
The temperature of a normal human body is 37°C. Therefore 50°C is how much hotter than normal body temperature?
How much colder than the normal body temperature is -5°C?
Arrange the following temperatures in order from the highest to the lowest:
12°C, -16°C, 29°C, 0°C, -4°C
At which of the above temperatures will we feel hottest?
At which of the above temperature will we feel coldest?

Fill in the blank under each of the following thermometers to tell what temperature it shows.
Extreme Temperatures

Sometimes it gets extremely hot or extremely cold. Table 1 shows some of the lowest (minimum) air temperatures that have ever been recorded in various places. Table 2 shows some of the highest (maximum) air temperatures.

Table 1: Cold Extremes

<table>
<thead>
<tr>
<th>Place</th>
<th>Date</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vostok Station, Antarctica</td>
<td>21 July 1983</td>
<td>-89.2°C</td>
</tr>
<tr>
<td>Oimyakon, Siberia, Russia</td>
<td>6 Feb 1933</td>
<td>-68°C</td>
</tr>
<tr>
<td>Northice, Greenland</td>
<td>9 Jan 1954</td>
<td>-66°C</td>
</tr>
<tr>
<td>Snag, Yukon, Canada</td>
<td>3 Feb 1947</td>
<td>-63°C</td>
</tr>
<tr>
<td>Prospect Creek, Alaska, USA</td>
<td>23 Jan 1971</td>
<td>-62°C</td>
</tr>
<tr>
<td>Charlotte Pass, New S.Wales, Australia</td>
<td>29 June 1994</td>
<td>-22°C</td>
</tr>
</tbody>
</table>

Table 2: Hot Extremes

<table>
<thead>
<tr>
<th>Place</th>
<th>Date</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Azizia (Al Aziziyah), Libya</td>
<td>13 Sept 1922</td>
<td>57.8°C</td>
</tr>
<tr>
<td>Death Valley, California, USA</td>
<td>10 July 1913</td>
<td>56.7°C</td>
</tr>
<tr>
<td>Tirat Tsvi, Israel</td>
<td>21 June 1942</td>
<td>54°C</td>
</tr>
<tr>
<td>Pad I dan, Pakistan</td>
<td>23 May 2002</td>
<td>50.6°C</td>
</tr>
<tr>
<td>Cloncurry, Queensland, Australia</td>
<td>16 Jan 1889</td>
<td>53°C</td>
</tr>
<tr>
<td>Seville, Spain</td>
<td>4 Aug 1881</td>
<td>50°C</td>
</tr>
</tbody>
</table>

Use your Atlas to find the locations of the places in Tables 1 and 2. Mark their (approximate) positions on the following map. Mark the coldest places in blue and the hottest places in red.
The Temperature Keeps Changing Throughout the Day

The temperature rises and falls during the day. So much variation can take place in the temperature from the morning to the evening and then the night! In some places the temperature can change by more than 20 or 30°C in one day!

Can the students in your class take on the job of measuring the outdoor temperature (in the shade) every hour or every two hours for 24 hours in one day? How could you do it? If you can do it, you can get an idea of how the temperature changes throughout one day. You could then find out what was the maximum (highest) temperature and what time of day it occurred. You could also find out the minimum (lowest) temperature and when was the coldest time of the day.

Of course, the temperatures will be different in different places and at different times of the year.

<table>
<thead>
<tr>
<th>Time</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 midnight</td>
<td>16°C</td>
</tr>
<tr>
<td>2 am</td>
<td>13°C</td>
</tr>
<tr>
<td>4 am</td>
<td>10°C</td>
</tr>
<tr>
<td>6 am</td>
<td>8°C</td>
</tr>
<tr>
<td>8 am</td>
<td>8°C</td>
</tr>
<tr>
<td>10 am</td>
<td>13°C</td>
</tr>
<tr>
<td>12 noon</td>
<td>20°C</td>
</tr>
<tr>
<td>2 pm</td>
<td>23°C</td>
</tr>
<tr>
<td>4 pm</td>
<td>24°C</td>
</tr>
<tr>
<td>6 pm</td>
<td>23°C</td>
</tr>
<tr>
<td>8 pm</td>
<td>20°C</td>
</tr>
<tr>
<td>10 pm</td>
<td>18°C</td>
</tr>
</tbody>
</table>
We can make graphs to show how the temperatures rose and fell that day in Chandigarh. Here are two graphs of the same data.

This bar graph is just like a row of thermometers.

To make this line graph, we just drew one point at the top of each bar and then connected the points. The thin vertical dashed lines show the times of sunrise and sunset.

Answer the following questions about the above temperatures for 10 January in Chandigarh:

What was the maximum (highest) temperature?
What was the minimum (lowest) temperature?
When did the temperature start increasing?
When did the temperature start decreasing?
When was the warmest part of the day?
When was the coolest part of the day?
Why were those times the warmest and coolest?
Discuss what factors may determine when the warmest and coolest times will be.
Do you think the warmest and coolest times will be the same in your area?

The Average, Maximum, and Minimum Temperatures

Suppose we want to know what the temperature was on 10 January 2000 in Chandigarh. Can we use just one number to get some idea of the temperature for the whole day? There are ways to do this.

One way is to find the average temperature.

The horizontal dashed line in the above line graph shows the average (or mean) temperature for the day.
If you know the maximum temperature for each day of a month, you can calculate the **average (mean) maximum temperature** for the month. You simply add up the maximum temperature of every day of the month, and then divide by the total number of days in the month. For example, you will add 31 maximum temperatures for January and then divide by 31.

Similarly, the **average minimum temperature** can be calculated by adding up all the minimum temperatures and dividing by the total number of days.

The same kind of calculation has been done for each month in Bhopal. The following Table gives the average maximum and minimum temperatures that were found. The average maximum monthly temperatures for the entire year were then plotted, as shown on the right.

### Average Monthly Temperatures in Bhopal (°C)

<table>
<thead>
<tr>
<th>Month</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAX</td>
<td>25</td>
<td>29</td>
<td>34</td>
<td>38</td>
<td>41</td>
<td>37</td>
<td>31</td>
<td>32</td>
<td>29</td>
<td>29</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>MIN</td>
<td>10</td>
<td>12</td>
<td>17</td>
<td>22</td>
<td>26</td>
<td>25</td>
<td>23</td>
<td>22</td>
<td>21</td>
<td>18</td>
<td>14</td>
<td>11</td>
</tr>
</tbody>
</table>
From June through December, the average minimum monthly temperature keeps falling in Bhopal. Does the average maximum monthly temperature also keep falling?

What is the difference between the maximum and minimum temperature in May?

What is the difference between the maximum and minimum temperature in August?

Based on your answers to the above two questions, is there a larger difference between the maximum and minimum temperatures in the summer or in the rainy season in Bhopal?

Use the data in the Table to plot the average minimum monthly temperatures for Bhopal on the same graph. The first two months have already been done for you.

Look at the data and the graphs to answer the following questions about Bhopal:

How cold does it usually get in November in Bhopal?

Which month has the highest maximum temperature in Bhopal? What is the average maximum temperature for that month?

What is the difference between the highest maximum temperature and the lowest maximum temperature in the year?

Which three months get the hottest in Bhopal?

Which three months get the coldest?

What is the average maximum temperature in January in Bhopal?

Different Places Have Different Temperatures

You know that different places have different temperatures. Do you know why they have different temperatures? There are many reasons. Now let's find out how it varies in different places.

Places that are near the sea usually have different temperatures than places far away from the sea. Temperatures differ on the top of a mountain and at its foot. And you already know that temperature changes as we go north or south from the Equator.

Do you think it gets extremely hot in this mangrove swamp near the coast?
Places Near and Far from the Sea have Different Temperatures

We have already seen the average temperatures of Bhopal. Bhopal is far away from the sea. Now let's look at the temperatures of a city that lies next to the sea: Mumbai.

**Average Monthly Temperatures in Mumbai(°C)**

<table>
<thead>
<tr>
<th>Month</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAX</td>
<td>30</td>
<td>30</td>
<td>31</td>
<td>32</td>
<td>33</td>
<td>32</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>32</td>
<td>33</td>
<td>31</td>
</tr>
<tr>
<td>MIN</td>
<td>19</td>
<td>20</td>
<td>23</td>
<td>25</td>
<td>27</td>
<td>26</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>23</td>
<td>21</td>
</tr>
</tbody>
</table>

Plot the average maximum monthly temperatures on the following graph that already shows the average minimum temperatures in Mumbai.

Which month has the lowest minimum temperature in Mumbai? How much is it?

Which is the hottest month in Mumbai? How much was the average maximum temperature for that month?

Compare the temperatures of Bhopal and Mumbai to answer the following:

* In January, which place is colder?
* In June, which place is hotter?
* In which place, Bhopal or Mumbai, does the temperature remain more or less the same throughout the year?

Moderate and Extreme Climates

Why does the temperature in Mumbai not change much throughout the year? Because it is on the seashore! It's difficult for the sun to heat up or cool down the sea. Since the sea doesn't get too hot or cold, the air above the sea also doesn't get too hot or cold. Therefore places near the sea usually have temperatures that remain fairly constant throughout the year. They have what is known as a **moderate** climate.

In contrast to this, Bhopal is far away from the sea. There is no moderating influence of the sea in Bhopal. In the summers the ground temperature rises very high and this heats up the air. In winters the ground temperature falls and the air is also cold. This is called an **extreme** climate (that is, one with great differences between maximum and minimum temperatures).

An Experiment

* Does the sun heat up water just as quickly as it heats up soil? Can you design an experiment that tells you the answer to this question? Discuss your design for an experiment and what results you expect. Then try out the experiment and see what happens.
**Height and Temperature**

At the peak of summer some people go from the plains to hilly places such as Pachmarhi or Shimla to avoid the heat. Even in the summer months the temperatures on high hills are low. The highest parts of a mountain generally have the lowest temperatures. Temperature decreases with elevation (height).

Look at the graphs showing the average monthly temperatures of Delhi and Shimla. You can see quite clearly that in each month of the year the temperature of Shimla is far lower than that of Delhi.

Delhi is at an elevation (height) of about 200 metres above sea level, while Shimla is at an elevation of about 2200 metres above sea level.

Usually, for every 1000 meters increase in elevation, the temperature falls by about 6°C.

---

**How many meters higher than Delhi is Shimla?**

*Based on the difference in elevation, calculate about how much difference in temperature there should be between the two places.*

**Which month has the highest maximum temperature in Shimla? How much is it?**

**Which month has the highest maximum temperature in Delhi? How much is it?**

**In September the average maximum temperature in Shimla is _____ °C while in Delhi it is _____ °C.**

**Which is colder: Delhi in January or Shimla in July?**

**Take another look at the Extreme Temperatures in Table 1 at the beginning of the Chapter. Which places in this Table are cold because they are on mountains passes or mountain summits?**

---

Since the temperature does not get so high at higher elevations, there is also a difference in the kinds of plants that grow high on hills and mountains. You can read about this in the chapter on mountains.
Temperatures in Places Near and Far from the Equator

In Class 6 we read about Indonesia, which is situated on the Equator. We also read about Iran and Japan, which are more to the north, and about the arctic tundra, which is even further north. We came to know that equatorial regions like Indonesia are quite hot throughout the year and they have no winter. As we go north or south from the equator it becomes colder, and there are separate summer and winter seasons. A look at the temperatures of places near and far from the equator will illustrate this quite clearly.

Given in the Graph on the right are the average maximum temperatures of three places: Singapore, Tokyo, and Vladivostok; as shown in the Key. In the last column of the Key, the average temperature for the whole year is shown. This is calculated by adding up all the maximum and minimum temperature readings for every month and then dividing by the total number of readings. Thus, we get to know the average temperature on an average day in the year. We might use this number to answer a question like, “Is Singapore, on average, warmer than Shanghai?”

Places near the Equator usually get more heat. Places further away from the Equator often have lower average temperatures for the year.

Which of the three places shown in the Graph is located near the Equator?

What is the average yearly temperature in that place?

Does it usually get much warmer in the summer than in the winter there?

Does it get as warm in the summer in Vladivostok as it does in the winter in Singapore?

Does it usually get warmer in July in Singapore or in Shanghai?

Which of the three places on the Graph has the most extreme climate (i.e. the greatest difference between the average maximum temperatures in winter and summer)?

What is the warmest month in Shanghai?

Which of the three places on the Graph is farthest from the Equator?

What is the average yearly temperature there?

Which month has the lowest average maximum temperature in this place?
Temperature Maps

India is a vast, sprawling country and the temperature varies in its different regions. If we want to find out which places are hotter and which are colder, we can use a temperature map.

Look in your Atlas to find the map of India that shows the average (mean) temperatures in January. This average temperature is the average of the maximum and minimum temperatures for the month of January.

In this map India has been divided into different sections, each marked with a different colour. By referring to the key you can find out the average temperature in January in each of these sections.

<table>
<thead>
<tr>
<th>Place</th>
<th>Lat.</th>
<th>Temperature in January</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hyderabad, A.P.</td>
<td>17N</td>
<td>between 20 and 22.5°C</td>
</tr>
<tr>
<td>Chandigarh</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agra, U.P.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Madurai, T.N.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

According to this map, there is no place in India that has an average January temperature higher than 30°C. (Remember, this is the average. There may be some January days in some places that do get hotter than 30°C.)

**Why is the North Cooler in Winter?**

Why do you think the north of India remains cooler than the south in winters? Maybe the following data can help figure out one answer to this difficult question. The Table below shows the times of sunrise and sunset on 10 January in the same four cities.

<table>
<thead>
<tr>
<th>Times of Sunrise and Sunset on 10 January</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place</td>
</tr>
<tr>
<td>------------------------</td>
</tr>
<tr>
<td>Chandigarh</td>
</tr>
<tr>
<td>Agra</td>
</tr>
<tr>
<td>Hyderabad</td>
</tr>
<tr>
<td>Madurai</td>
</tr>
</tbody>
</table>

**Use the above Table to answer the following questions:**

1. In which of these four cities does the sun rise first?
2. In which of these cities does the sun set last?
3. How long is the daytime in each of the four cities? (The daytime is the number of hours between sunrise and sunset.)
4. Are the cities that are further north having longer or shorter daytimes than the cities to the south?
5. Based on your answers to the above questions, can you think of one reason why the north of India remains cooler than the south in winter?
India Heats Up

Look at the map of India in your Atlas that shows the average temperatures in April.

<table>
<thead>
<tr>
<th>Place</th>
<th>Temperature in April</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hyderabad</td>
<td>between 30 and 32.5°C</td>
</tr>
<tr>
<td>Chandigarh</td>
<td></td>
</tr>
<tr>
<td>Agra</td>
<td></td>
</tr>
<tr>
<td>Madurai</td>
<td></td>
</tr>
</tbody>
</table>

If you look carefully at this map in your Atlas you will find the average (mean) temperature of almost all of India has gone up over 25°C. What a change from the situation in January! Only in the higher parts of the Himalayas and in the North Easter hills does the average temperature still remain below 25°C. That is to say, in just three months almost the entire landmass of India has gotten quite hot.

Exercises

1. Colour each of the thermometers on the right to show the temperature written underneath.

2. What’s the difference between the highest temperature in Table 2 and the lowest temperature in Table 1?

3. Water freezes at 0°C (32°F) and boils at 100°C (212°F). The normal human body temperature is 37°C (98.6°F). Rohini’s body temperature rose from 37°C to 38°C. Harish’s body temperature rose from 98.6°F to 99.6°F. Who had the higher fever, Rohini or Harish?

4. A girl in Srinagar noticed one morning that the puddles of water that were outside her house had frozen into ice. What might the air temperature have been that morning? Tick the correct answer and give reasons why it is correct and why each of the others are incorrect.
   a) 4°C
   b) 10°C
   c) -3°C
   d) -88°C

34°C  26.5°C  -7°C  11.1°C  31.9°C  -0.5°C  42°C  -3°C
5. Suppose the temperature in Moscow was -8 deg C at 10 am on 6 December. Twenty-four hours later it was 12°C higher. What was the temperature at 10 am on 7 December?

6. In Bhopal, the average maximum temperature for January is 25°C. Therefore: (tick one)
   a) The maximum temperature on 8 January is 25°C.
   b) The temperature never goes higher than 25°C throughout January.
   c) The temperature at 12 noon on 12 January is 25°C.
   d) The maximum temperature on 28 January, 2003 could have been 27°C.

7. Delhi and Mumbai are both situated on plains and their height above sea level is less than 300 meters. Why is there so much difference in their monthly average temperatures? In which months are the average temperatures in these two cities most similar? Can you explain why?

8. Given below are the average monthly minimum and maximum temperatures of Jodhpur. Make a line graph of them. Which are the hottest and coldest months of the year?

```
<table>
<thead>
<tr>
<th>Place</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>23</td>
<td>26</td>
<td>33</td>
<td>38</td>
<td>41</td>
<td>39</td>
<td>34</td>
<td>33</td>
<td>33</td>
<td>33</td>
<td>29</td>
<td>25</td>
</tr>
<tr>
<td>B</td>
<td>-3</td>
<td>1</td>
<td>6</td>
<td>12</td>
<td>17</td>
<td>21</td>
<td>25</td>
<td>24</td>
<td>21</td>
<td>14</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>C</td>
<td>31</td>
<td>32</td>
<td>33</td>
<td>32</td>
<td>32</td>
<td>29</td>
<td>29</td>
<td>29</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>31</td>
</tr>
</tbody>
</table>
```

9. Given here are the average maximum temperatures of three places: A, B, and C. Make Graphs of them. What can you guess about each place by looking at the Table and Graphs?

10. Give three possible explanations for the differences between the average temperatures in Thiruvananthapuram and Shimla in January (refer to your Atlas).

11. Between Bhopal, Delhi, Mumbai and Shimla, which two places show a similar temperature pattern? How can you explain the similarity between these two places?

12. Look at the graph on the right and answer the questions below.
   a) Does this look like the temperature graph of a place by the sea? Explain.
   b) What is the average highest temperature in July in Bangalore?
   c) How warm does it usually get in December in Bangalore?
   d) How cool does it usually get in June in Bangalore?
   e) Is there a bigger difference between night and day temperatures in May or in August in Bangalore?
   f) When is summer in Bangalore?