LOCAL WEATHER

Fig.86

Weather conditions in many places can be affected by where they are and what their landscape is like. The local weather in a deep valley will be different from that found along the coast. Cities can also have different weather conditions from the areas that surround them. Figures 87 to 93 below explain some of the important types of local weather.

AT THE COAST

Places at the coast often have **sea breezes**. The breezes can often blow in a different direction from the winds blowing across the rest of the country that day.
The land and the sea heat up and cool down at different rates. On hot days the land heats up faster than the sea. Air rises from the land, cools and sinks over the sea. The sea breeze blows inland to replace the rising air.

People sunbathing on the beach may need a windbreak to protect them from the breeze. At night, the sea cools more slowly than the land. This time the warmer air rises over the sea and cools and sinks over the land. The sea breezes at night then blow out to sea.

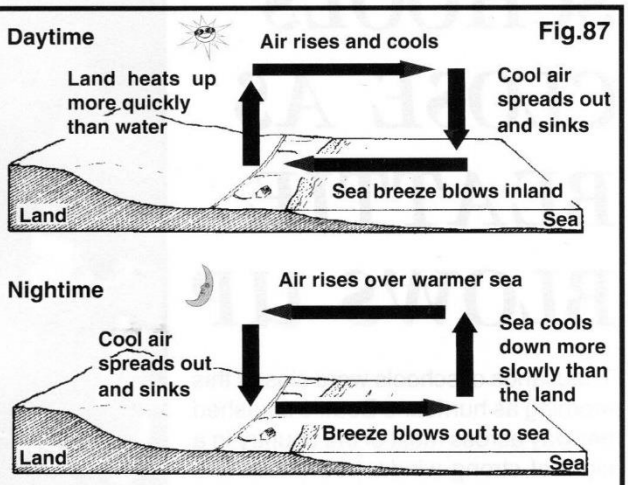


Fig.87

OVER THE RAINBOW ?

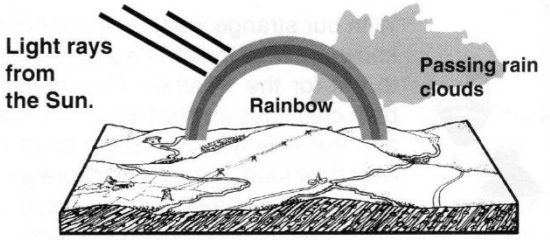


Fig.88

A rainbow is a wonderful weather event found in a small area. **Rainbows** are caused by by the Sun's rays being bent (or refracted) and reflected as they pass through millions of raindrops. For a rainbow to occur, there needs to be sunshine and rain falling at the same time. A rainbow would form a giant circle if the Earth's surface was not there.

THUNDER AND LIGHTNING

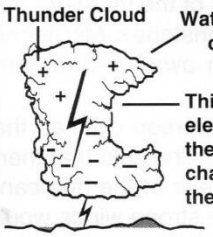
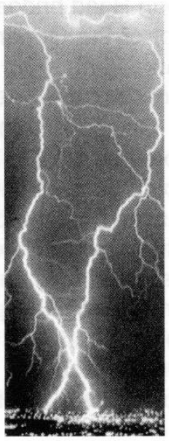


Fig.89

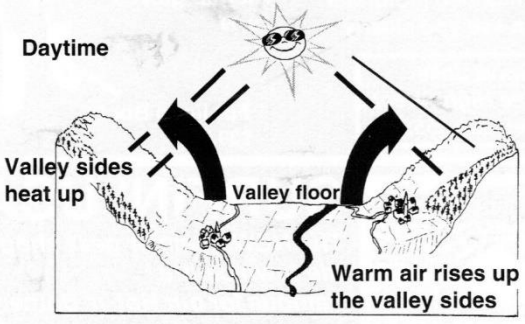


Thunderstorms form when warm, wet air rises into cold air above it. Giant thunder clouds form quickly.
Lightning strikes when energy is released at the base of the cloud.
Thunder is the sound we hear as the air is heated quickly by lightning flashes.

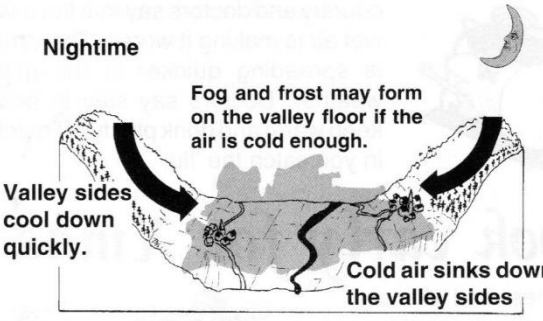
IN THE VALLEY OR GLEN

Fig.90

Valleys and glens often have different weather from their surroundings. Because they are often deep and sheltered, valleys and glens can trap heat in the daytime and then cold air at night.



During the day, local winds blow uphill. These are known as **anabatic winds**.

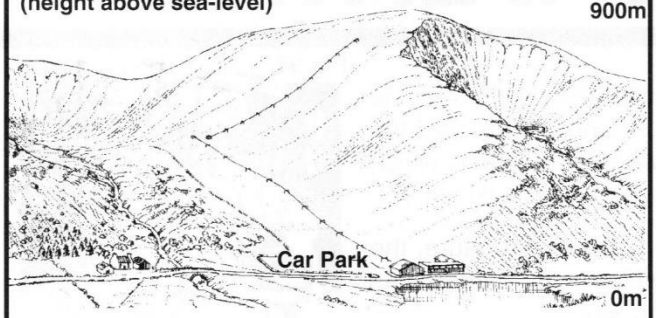


During the night, light cool winds blow downhill. These are known as **katabatic winds**.

UP THE MOUNTAIN

Fig.91

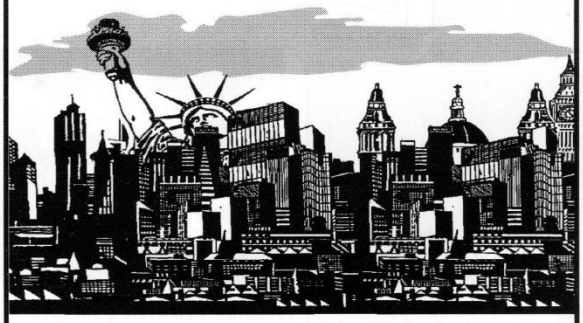
Temperature decreases with Altitude (height above sea-level)



The **temperature** (how hot or cold it is) is affected by how high a place is above sea-level. In fact, the temperature drops 1^0C for every 150 metres of climb.
For example, if it is 5^0C in the car park above, the temperature at the top of the mountain would be - 1^0C.
The rule is the **higher you climb, the colder it becomes**.
As warm air rises, it expands and cools, so the higher you go, the colder it is.

CITIES ARE HEAT ISLANDS

Fig.92

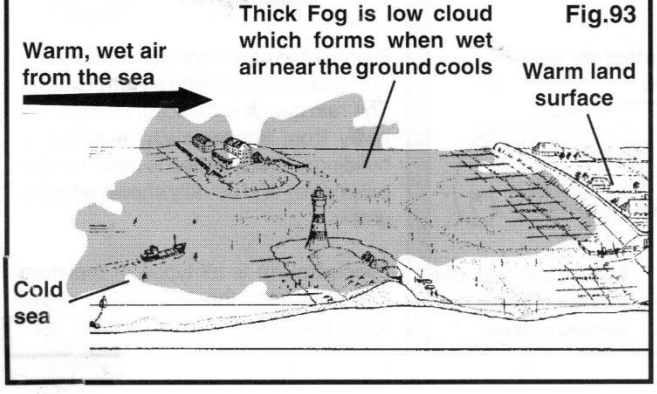


People living in large cities and towns can often be less aware of the weather than people living in countryside areas. Many buildings in large built-up areas can act as giant wind breaks. They may have central heating and double glazing.
Cities and towns often act as **heat-islands**. The many buildings and people can give off heat and raise winter temperatures. Tall buildings can also cast shadows. Fumes from vehicle exhausts and vents in buildings and pavements can cause haze or smog.

FOG

Fog can be found along the coast making it cold and the air damp. **Sea fog** forms when warm wet winds pass over cold sea. The warm air is cooled and its water droplets form fog. At night as the land cools, the fog may be blown further inland by the wind.

Fig.93



Local Weather Tasks

1 Make a copy of the **Summary** box below.

2 Look at fig.**87** then answer the following :-
i. Why do sunbathers sometimes need a windbreak on the beach ?
ii. Why do sea breezes blow inland during the day and out to sea at night ?
iii. Why could this be dangerous for bathers and people using inflatable boats ?

3 Look at fig.**88** - Rainbows.
i. When are rainbows formed ?
ii. How are rainbows formed ?

4 Look at fig.**89** - Thunder and Lightning.
i. Draw a Thunder cloud.
ii. Add the labels from fig.89 to your sketch.
iii. When do thunder clouds form ?
iv. What is the difference between Thunder and Lightning ?

5 Copy the diagrams shown in fig.**90**.
Add the labels to your copy of the diagrams

6 Study figure **91** .
i. Copy and fill in the missing words -
The higher you _____ the _____ it gets.
ii. If the temperature goes down 1^0C for every 150 m. of climb work out the following -

Car Park	Mountain Top
10^0C	^{0}C
^{0}C	0^0C

7 Why are cities often called **heat-islands** ?
Use figure **92** to help your answer.

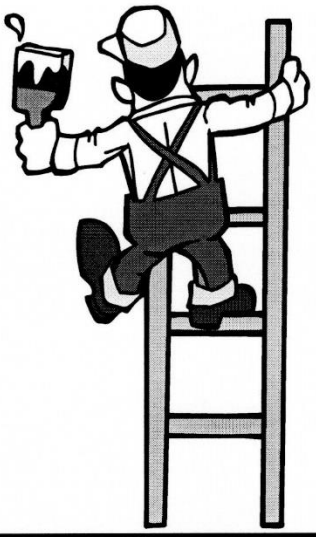
8 Look at figure **93**.
i. What is **fog** ?
ii. How does **sea fog** form ?

9 Find out about **your own** local weather.
Write a paragraph or design your own sketch or diagram to help show your local weather.

Summary

Local weather conditions can be different from the weather found in the rest of the country. Where places are and what the landscape is like affects local weather.

People and Weather



Weather affects almost everything people do and how they do it ! Painting the outside of the house can only be done when there is no rain and little wind !

1. What is **weather** ? _____

_____

_____

2. Fill in the table below by giving some examples of how the weather may affect each of the people listed.

Type of Job / Type of Weather	Farmer	Lorry Driver	Ice cream Seller	Golfer
Hot, dry & sunny			I will be very busy making and selling lots of ice cream !	
Foggy				
Snow				
Wet & windy				It will be difficult to play against the wind and rain.

3. Weather conditions affect people in many ways. Suitable types of clothing or food to eat help people cope with all types of weather, all around the planet. Fill in the table below about clothes and foods and the weather by using dictionaries, encyclopedias (including CDRom encyclopedias), fashion and weather books or by asking your parents & grandparents.

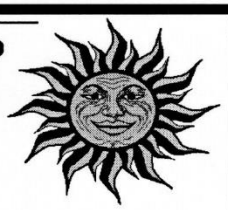
Name	Type	How it got its name	Weather used in
Bikini	Swimsuit		
Chilli	Hot spicy food		
Panama			
Ice Cream			
Sou'wester			
Ready Brek			

4. Make a list of as many **weather** songs by popular rock groups or musicians as you can find. For example, "It's a beautiful day" by Queen. Make your list on the back of this sheet.

People and Weather 2

Fill in the **weather newspaper** using the outline below. Collect or write newspaper stories about the ways in which weather affects people and their everyday lives.

DAILY SUN



NUMBER ONE FOR DAILY WEATHER NEWS

FREAK BLIZZARD HITS COUPLE HARD !

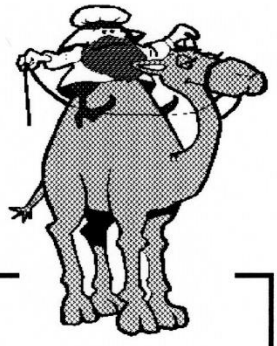
by reporter

Havoc as trees uprooted

Hurricane winds blast local park

Win a sunshine break !

Local Weather

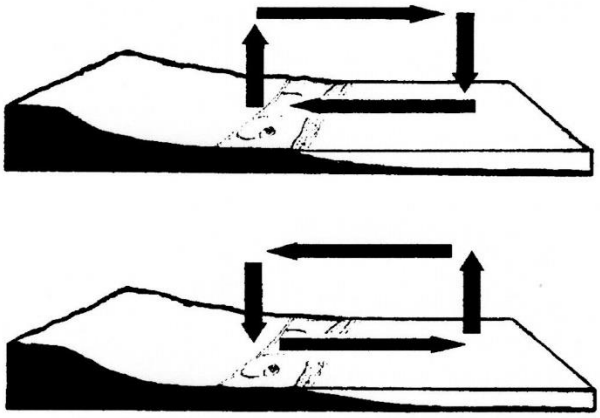


1. Weather conditions in many places are affected by where they are and what their landscape is like.

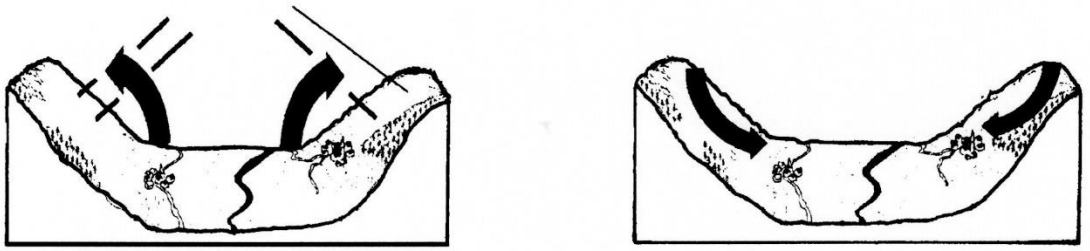
   Fill in the missing information and complete the diagrams for each important type of **local weather**.

At the Coast

Notes

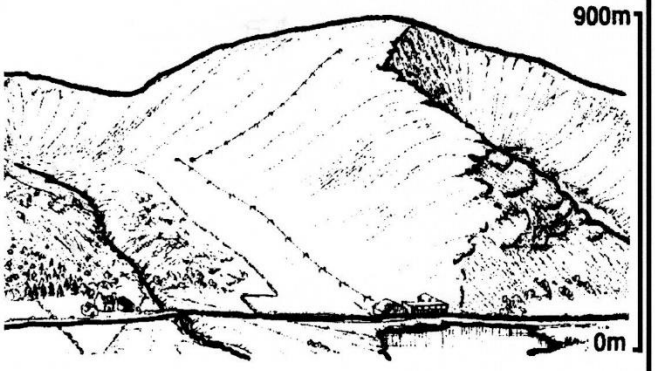


In the Valley or Glen



Up the Mountain

Notes



WEATHER WATCHING

Each day over 7,000 weather stations around the world - in cities, towns and villages; at airports; in the air and at sea - measure and then record the weather. The information is then used to make up weather forecasts which are used to inform people through newspapers, television and radio (fig.94).

To measure the different **elements** of the weather - the temperature, the precipitation, wind speed and direction, and sunshine - the instruments found at a local **weather station** must be used (fig.95)

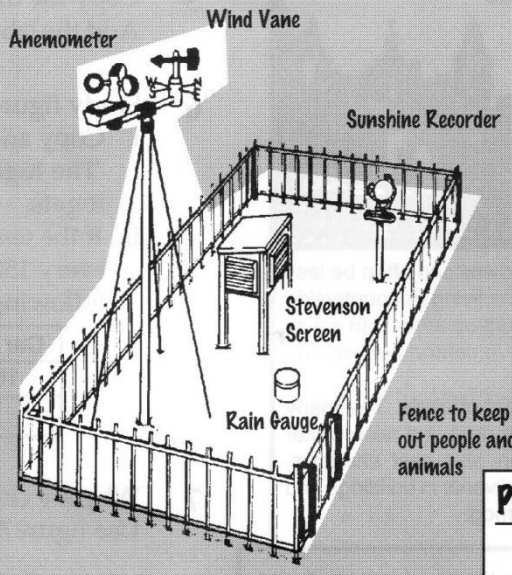
Fig.94

"The radio weather said it would be mild today but I'm frozen Jean !"

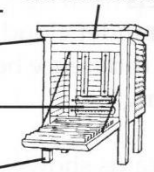
A Weather Station

Fig.95

Weather Stations like the one below are run by weather observers. By making daily weather observations (or readings) using this simple equipment, weather records can be regularly kept.

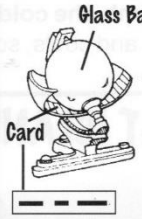


Temperature



Temperature is measured using **thermometers**. A **Stevenson Screen** houses two thermometers . A maximum thermometer for the highest daily temperature and a minimum thermometer to measure the lowest daily temperature. Both temperatures are given in Celsius.

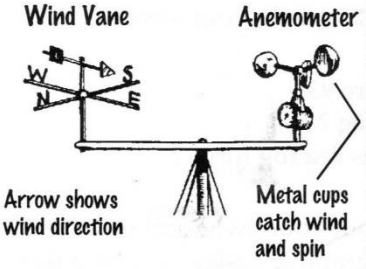
Sunshine and Clouds



Hours of sunshine each day can be measured with a **Sunshine Recorder**. The glass ball magnifies sunlight and burns a strip across the recording card.

Weather observers record how cloudy the sky is. They do this by working out how many eighths of the sky (or **oktas**) is covered by cloud. **4 oktas** means half the sky is cloudy. **0 oktas** means there is a clear sky. **9 oktas** means the sky cannot be seen.

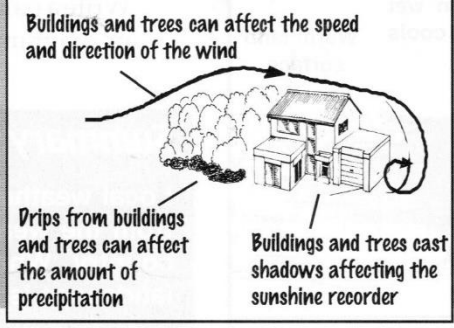
Wind Direction and Speed



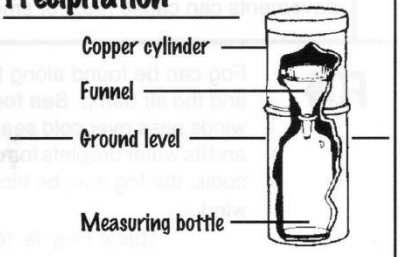
A **Wind Vane** measures the direction of the wind. The direction of the wind is where it blows **from**.
Wind Speed is measured using an **Anemometer**. Either placed high above ground or held up by hand, the anemometer gives wind speed in kilometres per hour (or knots).
Both are sited away from any kind of shelter such as buildings or trees.

Choosing a Site for the Station

Weather Station - built away from buildings, walls and trees, in open areas.



Precipitation

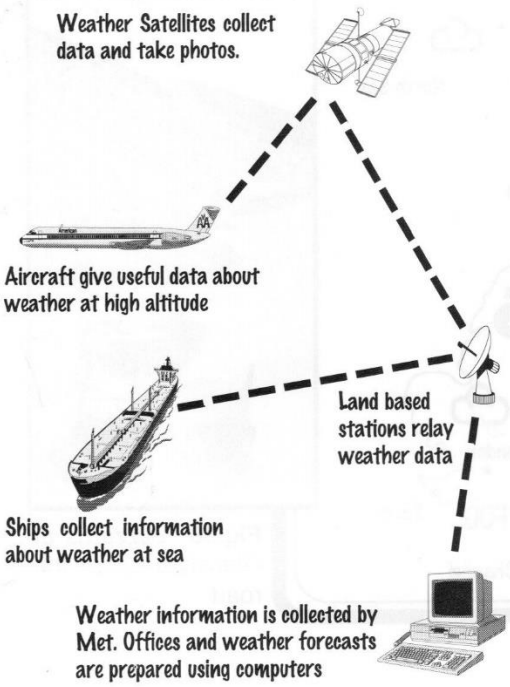


Rainfall and other types of precipitation are measured by using a **Rain Gauge**. The rain gauge is sunk into the ground away from shelter such as trees or buildings. Precipitation is measured in millimetres and usually shown on a bar graph.

Precipitation is all types of moisture that falls from the sky - rain, snow, sleet, hail and dew.

Around the world, weather information (often called **weather data**) is collected from readings made at the same time each day by many different methods, from local weather stations to orbitting satellites (fig.96).

Aircraft, Ships and Weather Satellites



Weather information is collected by the British Meteorological Office (the **Met. Office**) based at Bracknell near London. From here **weather forecasts** (what the weather is likely to be in the next few hours) are sent out.

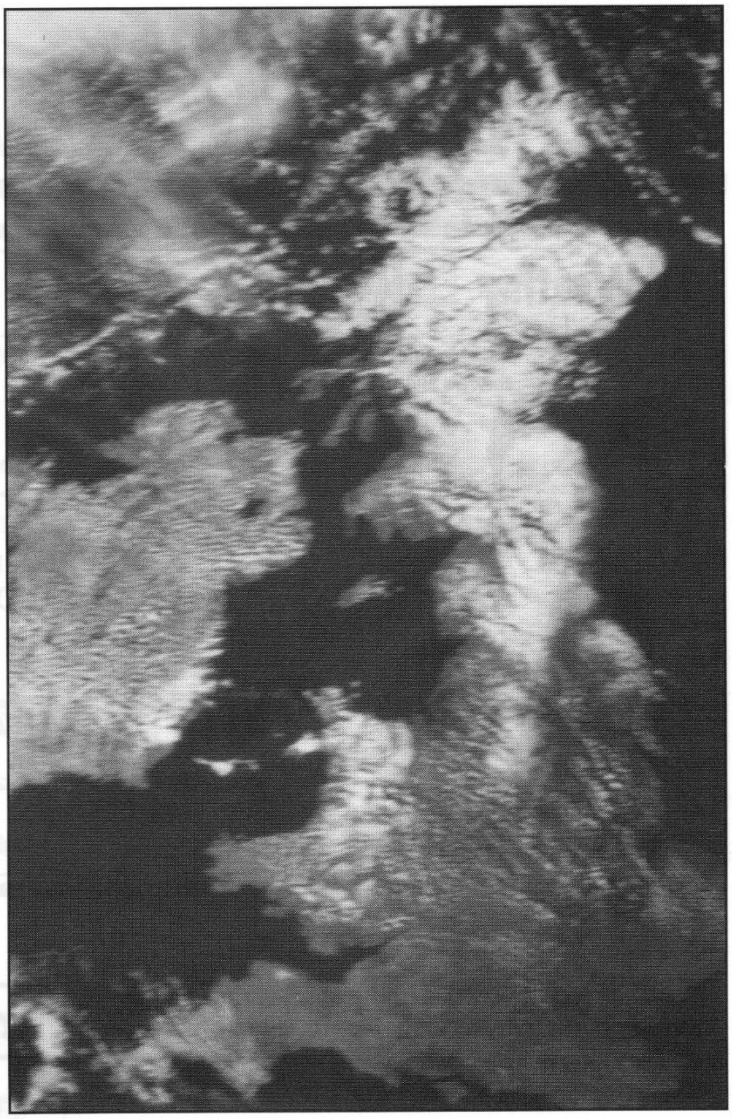


Fig.96 A weather satellite photograph of the British Isles.

Weather Watching Tasks

1 Make a list of the ways in which you can find information about the weather.

2 Study figure **95** and then answer the following questions.

i. What are the four main weather **elements** ?

ii. For each weather element, list the following
   a. Its **name**
   b. What it means
   c. The **instrument** used to measure it
   d. Its **unit of measurement** (e.g. millimetres)

iii. How do buildings and trees affect the readings taken in a weather station ?

iv. What other things could affect these readings ?

3 Write a sentence to explain the meaning of each of the following weather words -

Oktas **Weather Forecast**
Minimum Thermometer

4 Look at figure **96**.
In which **season** was this satellite photo of the British Isles taken ? Why ?

5 How is weather information (or **data**) collected by the **Met. Office** ?

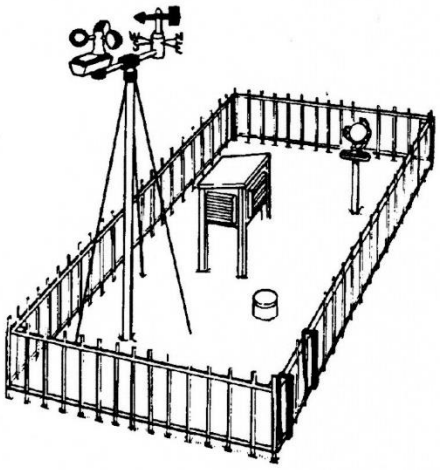
6 Write your own forecast based on today's weather. If you have a school weather station you could use today's data.

Summary

Weather stations measure the main elements of the weather - temperature, precipiation, wind speed and direction and sunshine. Weather data is also collected by satellite, aircraft and ships.

Weather Watching

Weather Station



1. Weather **elements** are measured every day at weather stations around the world. What are *weather elements* ?

_____

_____

_____

2. Write the names of the following weather recording instruments in the correct place on the **weather station** above.

Choose from: Rain gauge, Wind Vane Stevenson Screen, Anemometer, Sunshine Recorder.

3. For each weather instrument **A** to **E** :-

   i. Write its **name** in the box

   ii. Say which weather **element** it is designed to measure.

   iii. Say which **unit of measurement** (e.g. millimetres) it uses.

   iv. Say where it should be **placed** to work best, e.g. on the ground, etc.

4. Why are the thermometers kept in a **Stevenson Screen** ?

_____

_____

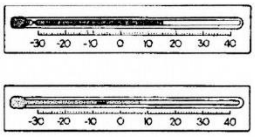
_____

_____

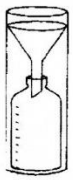
5. Why not try keeping your own **weather records** for a month ?

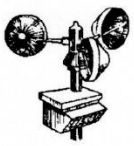
   Use the following weather *record sheets* to help you keep records for a month.

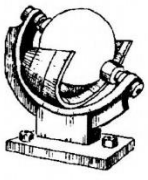
Maximum & Minimum Thermometers



Temperature is measured in ^{0}C. Thermometers are best kept in a Stevenson Screen in a weather station.







Weather Watching

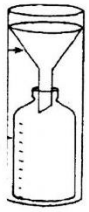
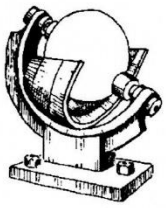
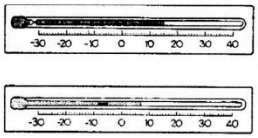
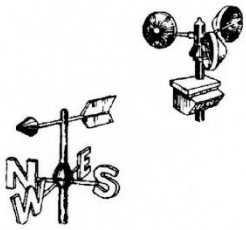
1. Cut out each of these boxes and stick them into the correct spaces in the table on the next sheet. You will need to think carefully about where the boxes should go on the table.

Cut out

Weather Element

SUNSHINE	**TEMPERATURE**	**WIND SPEED & DIRECTION**	**PRECIPITATION**

Weather Instrument (picture)

Weather Instrument (name)

WIND VANE & ANEMOMETER	**THERMOMETERS**	**RAIN GAUGE**	**SUNSHINE RECORDER**

Measured in units of

Hours	**mm**	**^{0}C**	**Knots & Direction**

Where to place the weather instrument

In the ground	**Away from shade**	**In a Stevenson Screen**	**Away from buildings, walls and trees**

TABLE OF WEATHER INSTRUMENTS

WEATHER ELEMENT				
WEATHER INSTRUMENT (picture)				
WEATHER INSTRUMENT (name)				
MEASURED IN UNITS OF				
WHERE TO PLACE WEATHER INSTRUMENT				

Weather Watching for a month

To record the weather over a month you must measure the following elements :-

Elements	**Temperature**	**Precipitation**	**Wind Speed & Direction**	**Cloud Cover**
Instrument	**Thermometers**	**Rain Gauge**	**Anemometer/Vane**	**Eye**

Use the following record sheets to keep weather records for the month.

Temperature Record

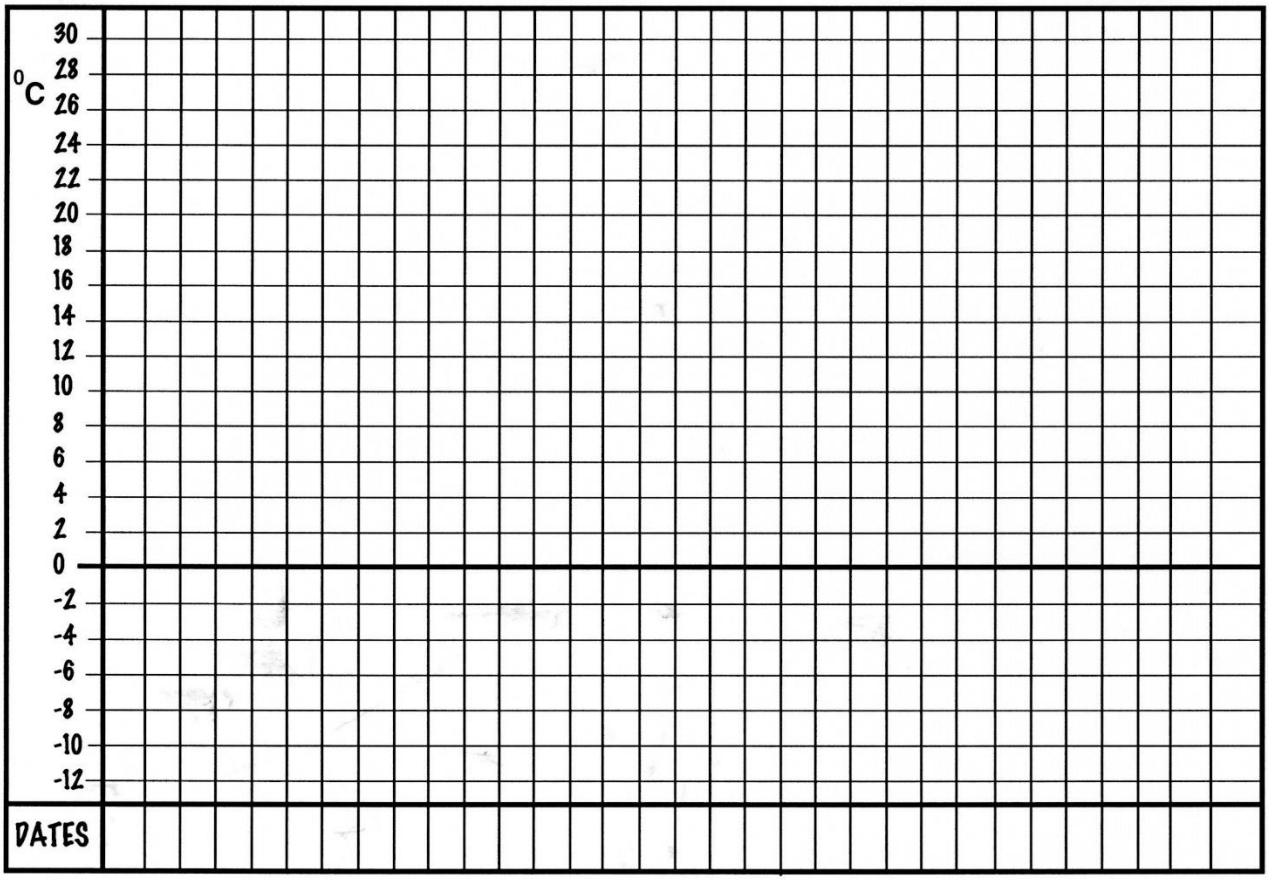
Record the temperature using an outdoor **thermometer** - the best type to use is a **maximum** and **minimum thermometer**.

Write the date on which you will begin to record the temperature on the grid below. Also write in the date you will stop.

Mark the maximum temperature in with a **red** pen and the minimum temperature in **blue** pen. Remember to join up the max and min temperature lines across the graph as the month goes on.

Can you work out the following from your temperature graph ?

a. the **daily average temperature** **b.** the **monthly average temperature**



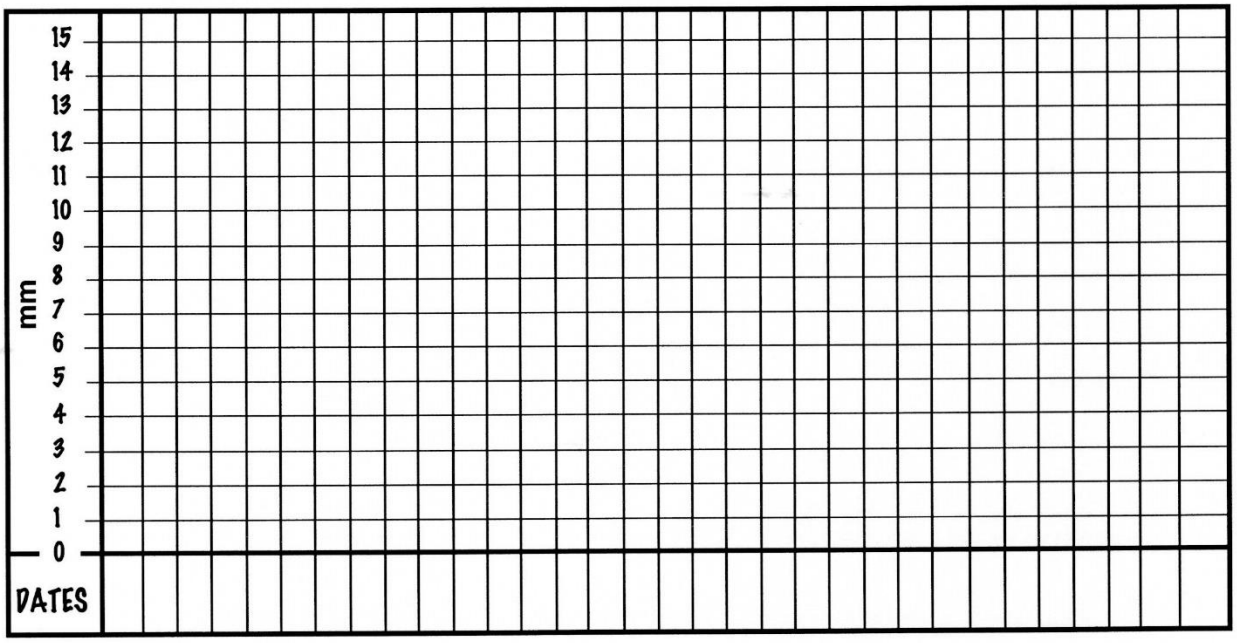
Weather Watching for a month

Precipitation Record

Record the amount of **precipitation** which falls each day throughout the month.
Write the date on which you will begin to record the amount of precipitation on the grid below.
Also write in the date you will stop.

Shade in the daily amounts in **blue** pencil.

Can you work out the **monthly total precipitation ?**



Wind Speed & Direction Record

Record the wind **speed** and **direction** on each day throughout the month.

To record wind **speed** you should either use an **anemometer** or the **Beaufort Scale** shown on the following page. Record the speed of the wind on the graphs provided.

To record the **direction** of the wind, use either a wind **vane** or a **compass**. Wind direction should be recorded on the **wind rose diagram** on the following page.

Can you use your **weather data** (information collected) to answer the following questions ?

a. In which direction did the wind most often blow during the month ?
b. How many **calm days** were there during the month ?
c. Draw a **bar graph** to show the wind force each day. Give the graph a title.
d. On which day was the wind **strongest** ?
e. Can you give reasons for the days on which the wind was strongest or calmest ?
(Hint: you may need to look at a weather map from a newspaper)

Weather Watching for a month

WIND SPEED

THE BEAUFORT SCALE

Force	Description	Effects
0	CALM	Smoke rises vertically.
1	LIGHT AIR	The direction of the wind is shown by the movement of smoke.
2	LIGHT BREEZE	The wind can be felt on your face and you can hear leaves rustle.
3	GENTLE BREEZE	Leaves and small twigs are moving all the time.
4	MODERATE	The wind can lift dust and small bits of paper like crisp packets.
5	FRESH WIND	Small trees sway.
6	STRONG WINDS	Large branches (more than 5cm) can be moved and people with umbrellas have difficulty holding on to them.
7	MODERATE GALE	Whole trees move and people find it difficult to walk against the wind.
8	GALE	Breaks twigs off small trees and affects cars on open roads.
9	STRONG GALE	Slight structural damage with slates being knocked off roofs and chimney pots being dislodged.
10	WHOLE GALE	Trees are uprooted. Small sheds can be blown down. Scaffolding can be dislodged. Considerable damage.
11-12	HURRICANE	This is very rare in Britain. There is widespread damage with buildings blown down, cars overturned, trees knocked over and roofs damaged.

WIND SPEED

DATE	SPEED	DATE	SPEED

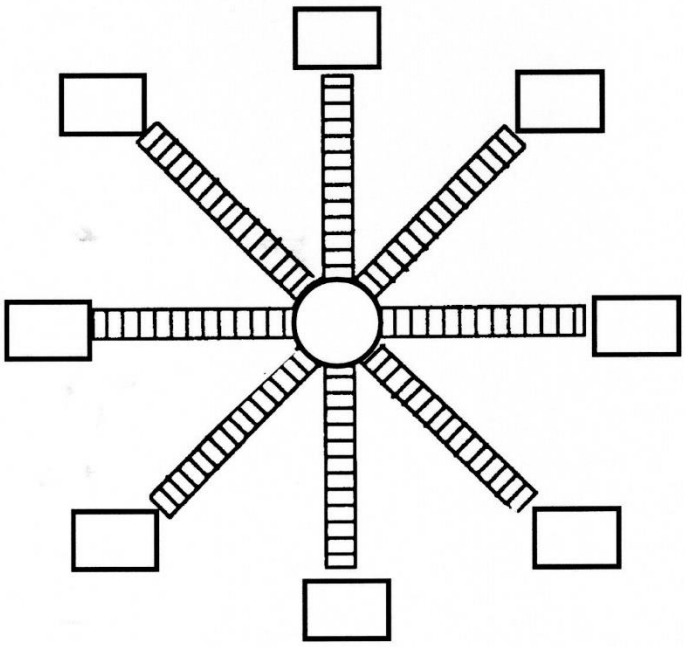
WIND ROSE

Write in the eight directions on the wind rose alongside.

Shade in one box for every day.

Record the Calm Days below.

CALM DAYS



WEATHER REPORTS

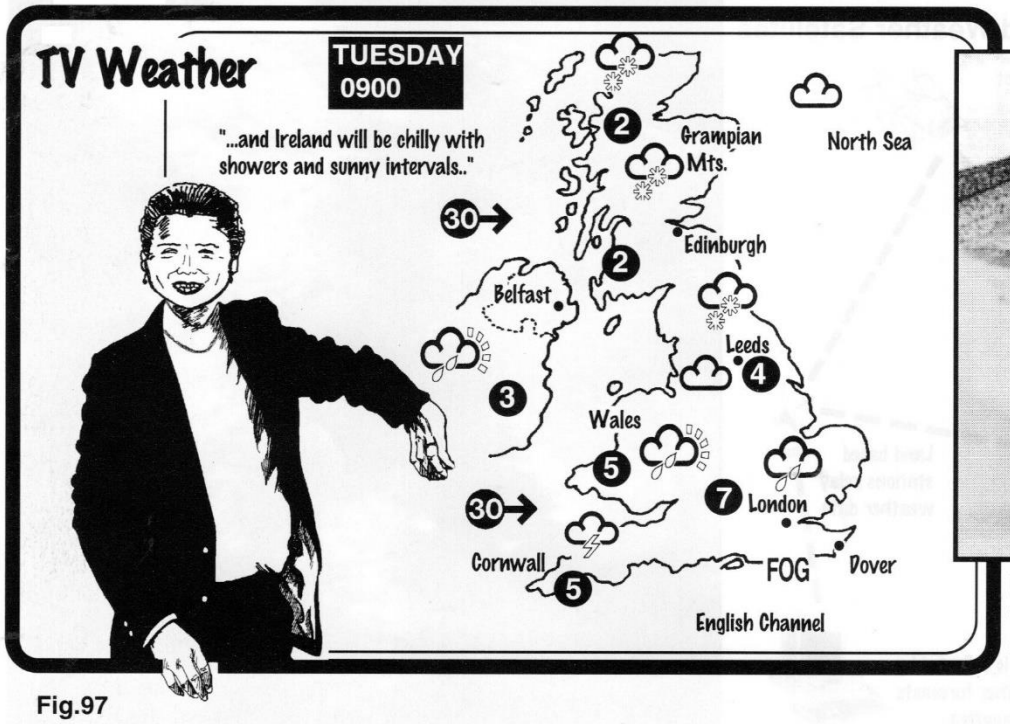


Fig.97

Fig.98 Blizzards at Glenshee close the road

Weather reports can be found in newspapers, on the radio, on television and by telephone. Every day we use words such as wet, windy, cold, dry, hot, freezing and so on.

In order to forecast the weather for the next few hours or the days ahead, meteorologists study weather data they receive from weather centres such as those in Glasgow or Bracknell.
They look closely for weather features such as wind direction, cloud patterns and at information on air pressure. Meteorologists use computer programs which can help predict the weather as well as their own knowledge when making forecasts about the weather.

Television forecasters are often trained meteorologists who make up their own forecasts. They use weather information, satellite images and weather maps to inform the general public about the likely weather ahead (figure 97). A key to symbols used in television weather forecasts can help to explain the weather forecast (fig.99).

Telephone weather services provide detailed information about the weather. Forecasts about approaching bad weather such as thick fog, gale force winds and heavy snowfalls are often very important for travellers (fig.98).

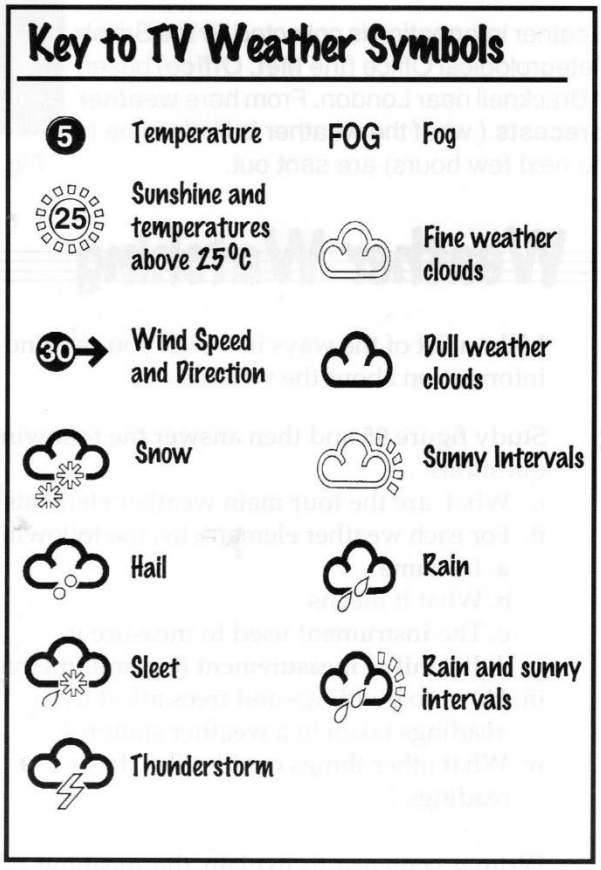
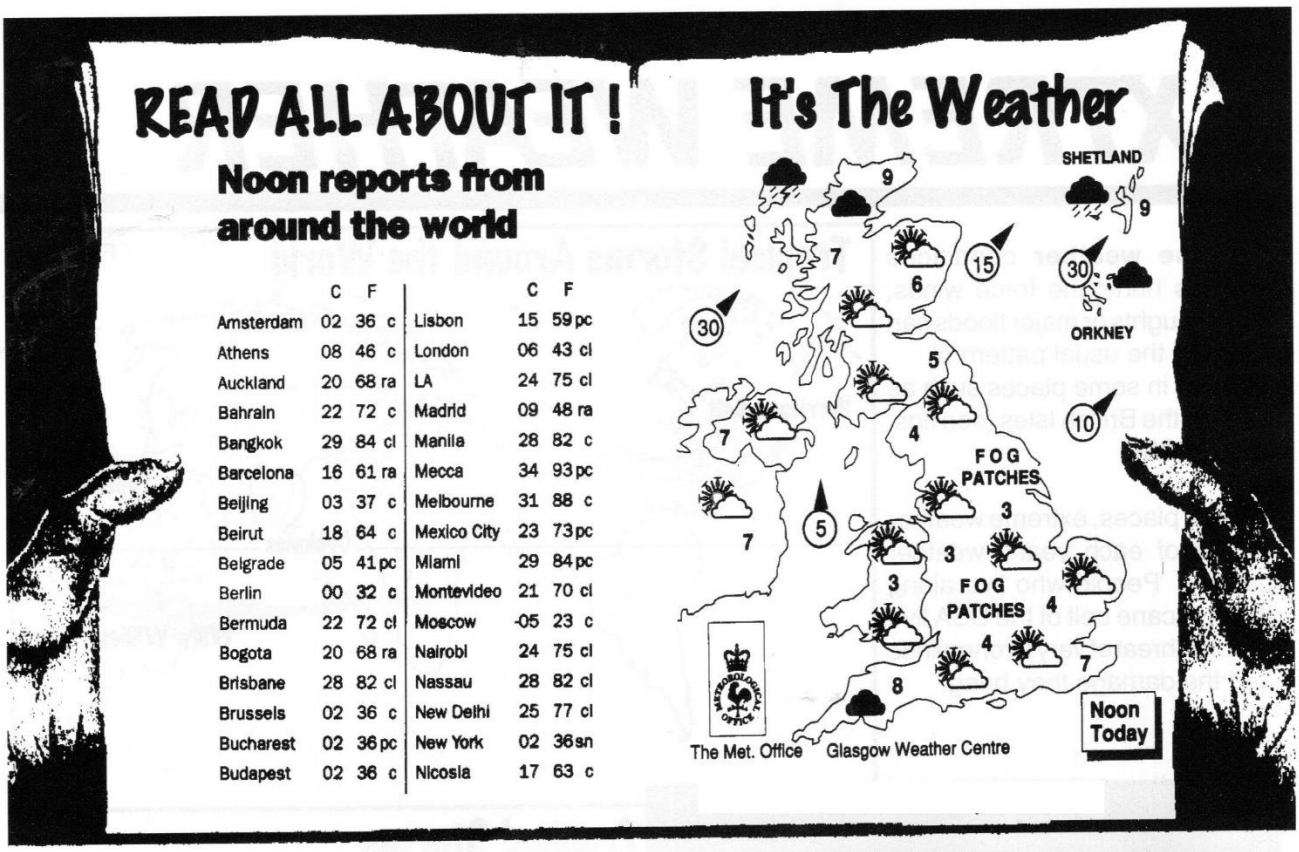


Fig.99 Weather symbols used on the Television weather forecasts.



	C	F		C	F
Amsterdam	02	36 c	Lisbon	15	59 pc
Athens	08	46 c	London	06	43 cl
Auckland	20	68 ra	LA	24	75 cl
Bahrain	22	72 c	Madrid	09	48 ra
Bangkok	29	84 cl	Manila	28	82 c
Barcelona	16	61 ra	Mecca	34	93 pc
Beijing	03	37 c	Melbourne	31	88 c
Beirut	18	64 c	Mexico City	23	73 pc
Belgrade	05	41 pc	Miami	29	84 pc
Berlin	00	32 c	Montevideo	21	70 cl
Bermuda	22	72 cl	Moscow	-05	23 c
Bogota	20	68 ra	Nairobi	24	75 cl
Brisbane	28	82 cl	Nassau	28	82 cl
Brussels	02	36 c	New Delhi	25	77 cl
Bucharest	02	36 pc	New York	02	36 sn
Budapest	02	36 c	Nicosia	17	63 c

Fig.100 Newspaper weather report

Meteorologists also give up to date weather information to newspapers and radio stations for their weather reports. National radio stations such as Radio One and BBC Scotland give general forecasts for the whole country throughout the day and night. Local radio stations such as Radio Clyde, like local TV stations, give more detailed information for their area.

Newspaper forecasts are not as up to date. The weather information they use has usually been issued at midday on the day before it appears in the paper (fig.100). **Internet** weather information is kept up to date every hour and severe weather warnings can also be broadcast by radio and TV stations as soon as they receive it.

Weather Reports

Tasks

1 Where do **television weather forecasters** get their information from ?

2 Copy the following **TV weather symbols** and then say what they stand for.

3 Look at figure **97**.
Write a weather forecast for
i. **Scotland**
ii. **Southern England**
iii. **Leeds**

4 Study figure **98** carefully.
Make a list of people for whom up to date weather reports are very important.

5 Look at figure **100** and then answer the following questions.
i. Which areas of the U.K. will be -
a. **Cloudy**? b. Wet with **heavy rain** ?
c. **Windiest**? d. **Calmest** (little wind) ?

ii. Noon reports from around the world - which city is the
a. **Coldest**? b. **Warmest** ?

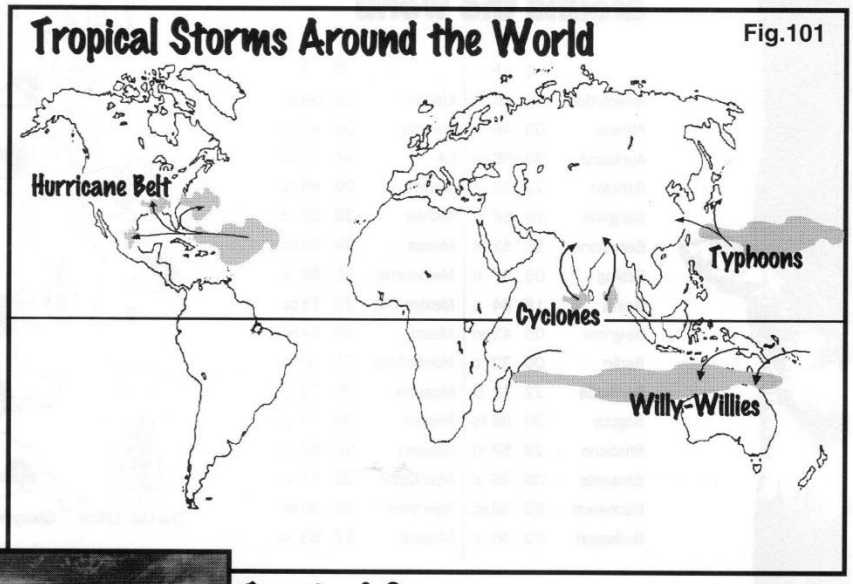
Summary

Weather reports can be found in daily newspapers, on radio, television and by telephone. Weather forecasts giving up to date weather information are very important especially for travellers.

EXTREME WEATHER

Extreme weather conditions such as hurricane force winds, long droughts or major floods can interrupt the usual pattern of weather in some places such as parts of the British Isles (see figs. 101 to 105).

In other places, extreme weather is part of each year's weather pattern. People who live along the hurricane belt of the USA live with the threat of very strong winds and the damage they bring.



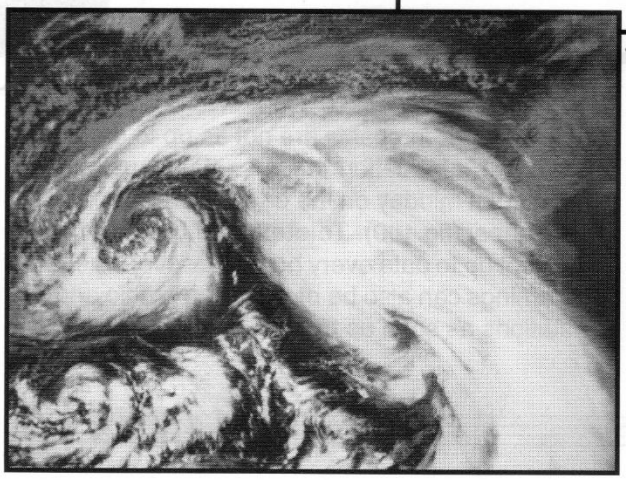


Fig.102 A satellite photo of a hurricane

Tropical Storms

Tropical storms have different names in different areas of the world (fig.101). In the USA they are known as **hurricanes**. Over India and Bangladesh they are **cyclones**. **Typhoons** are found over China and Japan and in Northern Australia tropical storms are called **Willy-Willies**. Tropical storms are found where the air is hot and very wet. A giant spiral forms often hundreds of kilometres across (fig.102). High winds whip up seas and destroy almost everything in their path. Tropical storms bring death to thousands and lead to flooding and destruction of property on a vast scale. The track of tropical storms can be plotted by satellites and warnings can be given to people in the path of the storms.

Droughts and Floods

1995 saw the worst **drought** (lack of rainfall) in Britain for 20 years. Lakes and reservoirs were at a very low level and some areas of the country had water shortages which lasted for over 4 months. In other areas of the world, such as Southern Africa, droughts can last over ten years. Millions of people, animals and plants die after years of suffering.

Floods take place when tropical storms occur; when heavy rains last for days; after snow melts quickly; where there are rising sea-levels or after undersea earthquakes.

Fig.103 A Lake District reservoir during the 1995 drought.

HURRICANE WINDS BATTER SCOTLAND

Hurricane-force winds turned Scotland into a disaster area yesterday, bringing down trees and damaging buildings, overturning lorries and disrupting air, rail and ferry services.
The casualty list included :
* 20 patients had to leave a baby ward in Ninewells Hospital Dundee as part of the roof blew away
* Fallen trees blocked all the roads around Drumnadrochit by Loch Ness for 10 hours
* The Forth Road, Erskine and Tay bridges were closed to cars and lorries as winds of 120kph battered Central Scotland
* 3 fishing boats were swept up onto the High Street in Buckie as 15 metre waves smashed down the harbour wall
* 105 people had to spend last night in a village hall in Plockton as power lines and roofing were ripped apart by the hurricane
* The new Stornoway ferry was grounded on rocks at Ullapool
* All main roads in the West of Scotland were closed by police .

Scotland is counting the cost of the storm and mopping up this morning.

Fig.104

Extreme weather can also be found by looking at record-breaking weather conditions around the world. Meteorologists keep records and study weather events of the past. Most weather data is stored by computer nowadays and the extreme weather events of today can be easily compared with those on record.

RECORD WEATHER EXTREMES

The Wettest Place is Mount Wai-'ale-'ale in Hawaii. It rains there on 350 days each year and there are 11,684 millimetres of rain a year.

The Driest Place on Earth is the Atacama Desert in Chile, South America. The Atacama has had no rain in over 400 years and holds the world record for the **longest drought.**

The Hottest Place with the highest ever-recorded temperature is Al 'Aziziyah in Libya, North Africa. The temperature reached 58 C in the shade !

The Sunniest Place on Earth is the Sahara Desert in Africa with over 4300 hours of sunshine a year.

The Highest Wind Speed was recored on Mount Washington, USA at over 371 kph.

The Longest Lasting Rainbow was seen over North Wales. The rainbow lasted over 3 hours.

The Largest Hailstone fell on Coffeyville, Kansas, USA. It weighed in at 750 g.

The Greatest Snowfall fell on Mount Rainier, USA. Over 31, 102 millimetres fell in 1971.

The Coldest Place is Vostok, Antarctica where the temperatures dropped below -89 C !

Fig.105

Extreme Weather

1 i. Make a list of the types of **extreme weather**.
ii. Give an example for each type of extreme weather.

2 i. Using a blank world map, make a copy of fig.**101**.
ii. What are **Tropical Storms** ?
iii. What are they called in -
a. **India**
b. **Japan**
c. **Australia**
iv. Where are **hurricanes** found ?

3 What does a Tropical storm look like from a satellite above the Earth ? (Hint: look at fig.**102**).

4 Study fig.**104** carefully.
How did hurricane-like winds turn Scotland into a disaster area ?

5 i. Look at fig.**103**.
What is a **drought** ?
ii. Write a **newspaper report** like fig.**104** about the drought and its effects.

6 i. Why do **floods** happen ?
ii. Find out when the last big flood happened in the area in which you live.

7 Extreme weather can often make the record books. Study fig.**105**.
i. Use an **atlas** and find each place listed as a world record holder of weather extremes.
ii. Make your own list of record weather extremes for the place in which you live or your country.

Summary

Extreme weather includes Tropical storms, droughts and floods. Most weather extremes cause damage and loss of life.

People & Weather - Test 1

Name	Class	Date	/40

1. What is **weather** ? _____

_____

_____ (3)

2. Sort out the following weather words into the correct boxes according to their meaning. (10)

Weather words :

Showers, gale, cool, wet, calm, freezing, snow, dry, windy, mild.

Temperature	Wind	Precipitation

3. What does **precipitation** mean ?

_____

_____

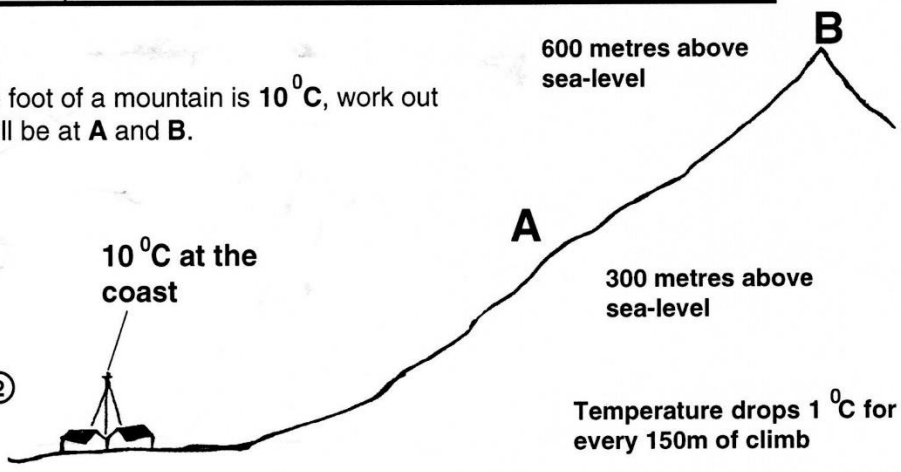
_____ (2)

4. Fill in the table below by naming either the type of weather, the name of the instrument or the unit of measurement. Write in **one** example of your own in the last line of the table.

Type of Weather	Instrument used to measure the weather	Unit of measurement
Sun		
	Anemometer	
		Millimetres

(9)

5. If the temperature at the foot of a mountain is **10 ^{0}C**, work out what the temperature will be at **A** and **B**.

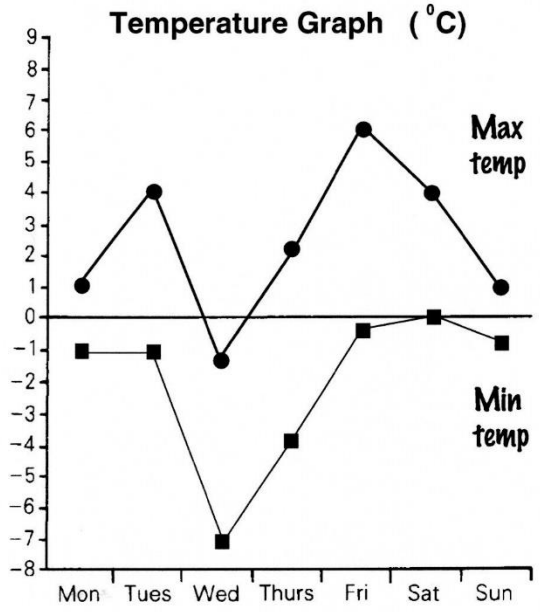


Temperature at **A** = _____

Temperature at **B** = _____ (2)

People & Weather - Test 2

Study the **weather graphs** carefully.



6. Finish the graph for precipitation -

Sat 2mm Sun 6mm. ②

7. What was the -

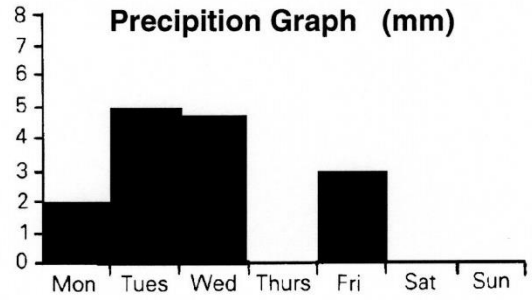
i. Highest temperature _____

ii. Lowest temperature _____

iii. Wettest day _____

iv. Total amount of precipitation that fell that week ?

_____ ④



8. Was the sky clear or cloudy on Wednesday night ?

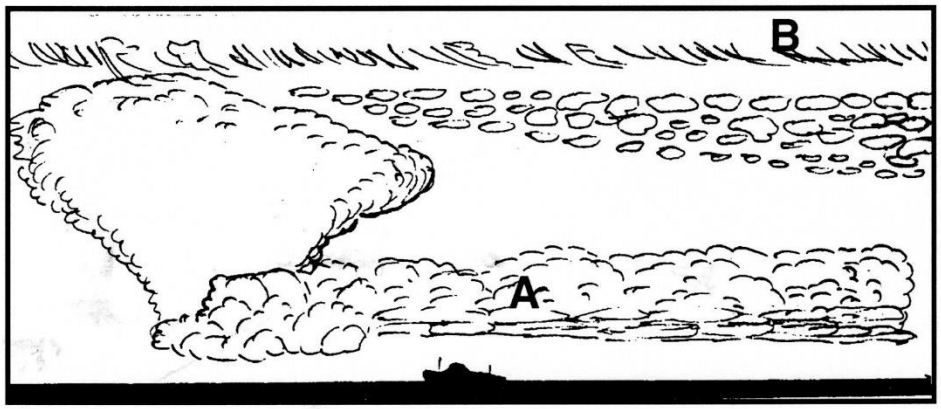
_____ ①

9. On which day did it **snow** in the afternoon ?

_____ ①

10. What was the **average temperature** on **Tuesday** ?

_____ ②



Look at the cloud diagram above.

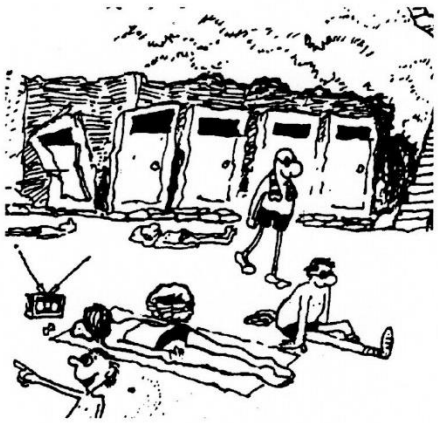
11. Name **cloud types** **A.** _____ **B.** _____ ②

12. Which **cloud** brings **Thunder** _____ ? ①

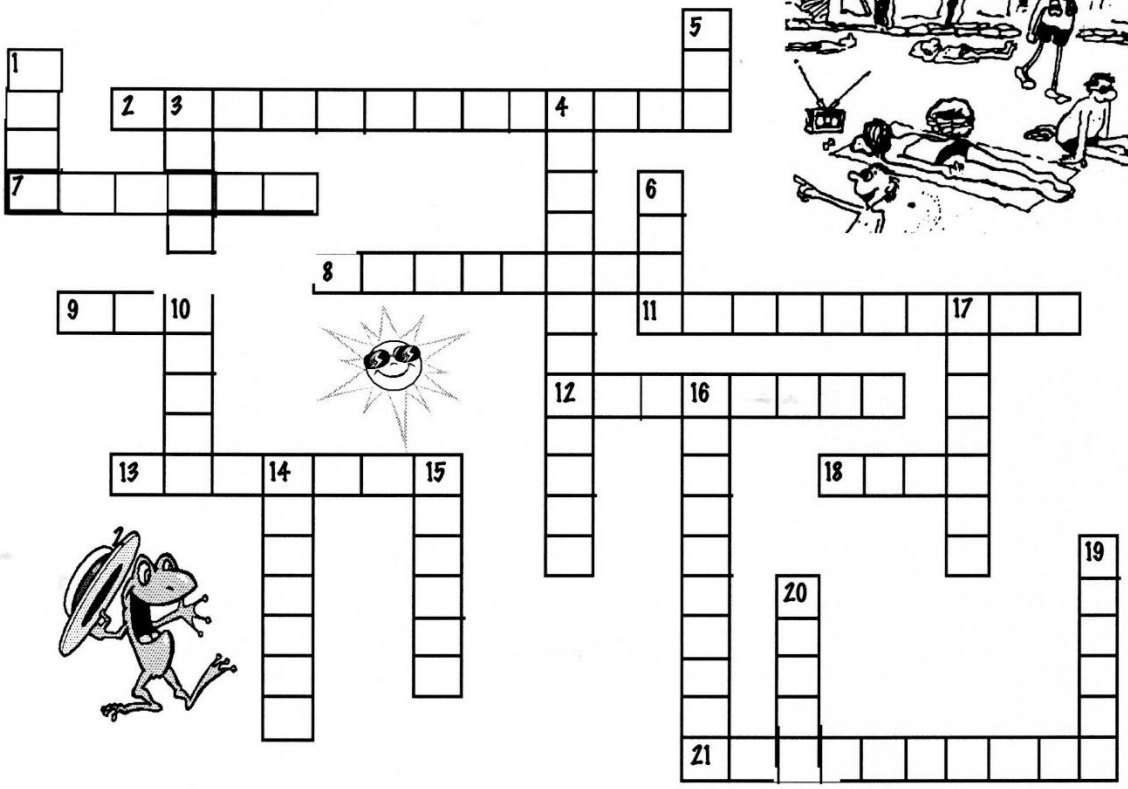
13. Draw the TV weather symbol for **sunny intervals**

[ ] ①

Weather Words



1. You are about to investigate (find out) the answers to the clues given below in order to fill in the crossword !



Down

1. The Headquarters of the British Meteorological Society.
3. This falls a lot !
4. Measured by thermometers.
5. A Campbell-Stokes measures this.
6. An eigth of the sky.
10. Other half of 3 down - used to measure precipitation.
14. A small,quickly rotating local wind.
15. What we get about the weather.
16. Tropical storm (1).
17. Accompanies lightning.
19. Made of condensed water vapour and of three main types.
20. Not rain and not snow ?

Across

2. All forms of moisture which fall from the sky
7. Other half of 1 down.
8. Source of TV weather data.
9. Thick and white.
11. Used to measure wind speed.
12. Tropical storm (2).
13. Day to day changes in the atmosphere at a particular place.
18. Moving air.
21. Out of this world source of weather data.

Next

Answer the following questions on the back of this sheet.

2. Sort out the crossword clues into **groups** - you decide what the groups are to be !

3. Find out the address and telephone number of the answer to clue 1 Down/ 7 Across.

4. Which elements of the weather do not appear on the crossword above ?