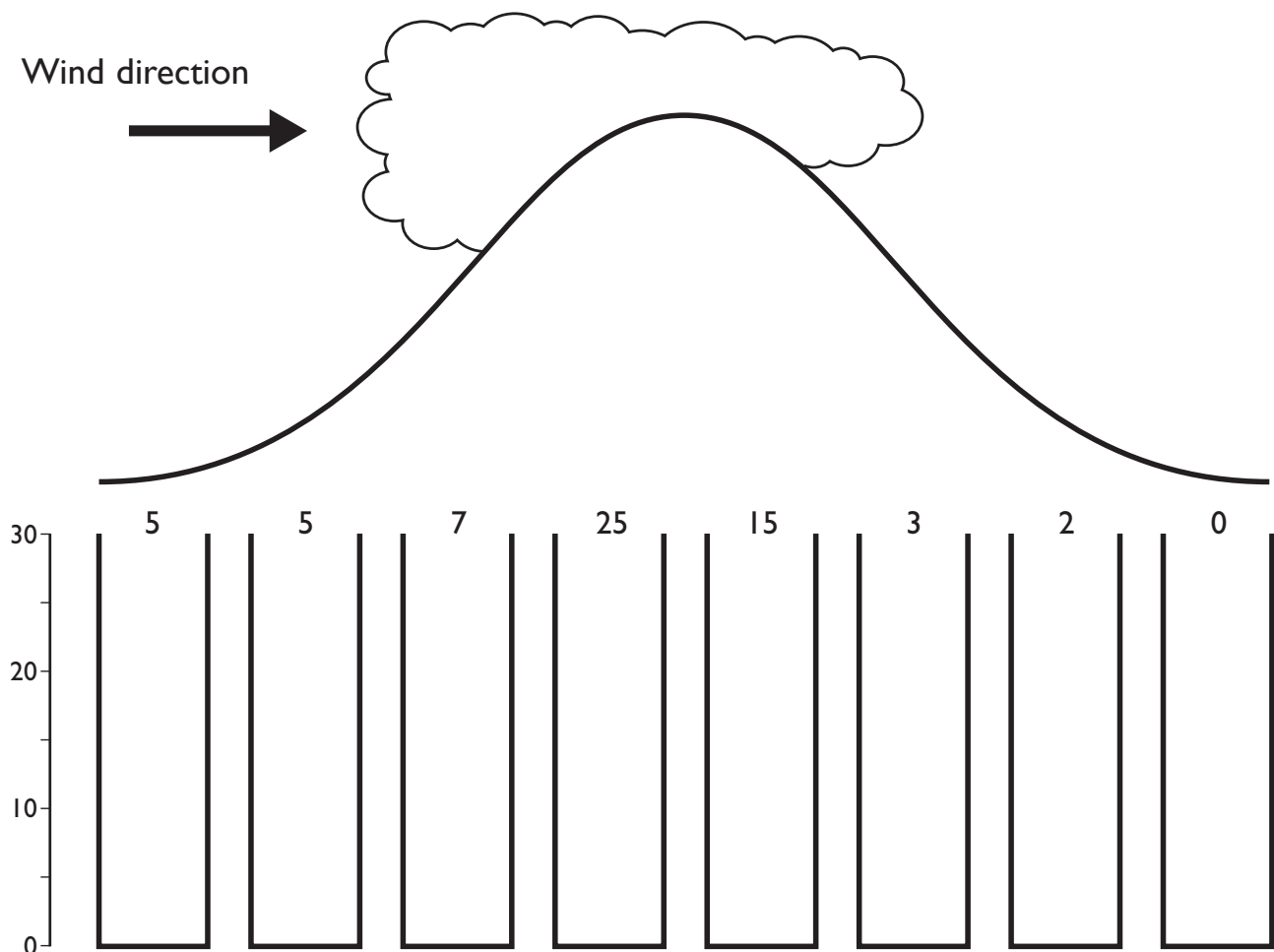


Rainshadow

This is a side view of a hill. Below it are some raingauges showing the amount of rain collected in each during a day.

Q1. Complete the column chart of the rainfall at each site. Use the scale on the left and the numbers at the top of each gauge to work out how tall each column should be. Shade the columns in blue.



Q2. Does the rainfall vary with height across the hill?

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Q3. Is there any difference between the amount of rain that fell on each side of the hill?

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Background

Weather of hills and mountains

Hills and mountains produce their own kind of weather – wetter on the exposed (windward) and drier on the sheltered (leeward) side.

As air flows towards mountains, it is forced to rise and cool. On the windward side of mountains, cooling air eventually has to shed some of its moisture. As a result the windward side of mountains is often masked in cloud even when the surrounding land has clear skies. This mountain rain, called *relief rain*, is extra rain – that is, in addition to the rain that might occur elsewhere in the area.

On the leeward side of the mountains, the air sinks and warms. As a result it can hold all of the remaining moisture, and the clouds formed on the windward side of the mountains evaporate. The leeward side is often called the *rainshadow region*, because it will rain much less here.

In some areas, especially those close to very high mountains, the mountains may force so much water from the air that almost none is left for the lowland beyond. In these cases a desert forms. The 'rainshadow deserts' in the southwestern United States, and in Argentina and Chile, are examples of this kind of extreme effect.

Students should be encouraged to think about patterns of rainfall, not just the rain that falls at a single location. This worksheet is designed to help them practise their graphical skills as well as their understanding of how rainfall varies with altitude.

The use of raingauges at the base of each column should help those who are not used to drawing charts to see where to place each column. In this kind of chart, the rainfall columns do not touch each other.

The pattern shown below has been designed to help you to show rainshadow effects. You may wish to discuss rainshadow effects at this point, or you may prefer to leave this for a later part of the course.

At its simplest level, rainfall is seen to increase with altitude.

More observant students will notice that the peak of rainfall is ahead of the highest peak of the hill. This can be made clearer by asking students to draw a smooth curve through the tops of each column.

The moist air was moving from left to right, so the right side of the diagram is a rainshadow effect. Notice that no rain fell on the plain in the rainshadow zone, even though 5 mm of rain fell on the plain ahead of it.

The peak of rainfall often comes before the top of the hill if most of the moisture has already been converted into raindrops on the windward side of the hill. If most of the moisture has already gone, increasing height will not 'wring' much more moisture from it. Hill tops are not therefore, necessarily the wettest places. An extreme example of this can be found in the Himalayas where the foothills are saturated with rainfall but the mountain peaks have (as snow) quite small amounts of precipitation.

Answers

Q1. See chart below.

Q2. In general, the rain falls on higher elevations.

Q3. The rainfall increases with the height of the windward side of the hill, but falls off more rapidly with height on the leeward side. This is the rainshadow effect.

