

## Notes for parents (1).

**The purpose of the activity is to help your child to:**

- Read temperatures from a thermometer
- Calculate the result of wind chill using positive and negative numbers
- Calculate the result of heat index using fractions or percentages

**Here is what to do:**

Read the problem statement together and discuss what the problem means. Children will have experience of feeling very cold when a wind is blowing or very hot in the summer when they feel 'sweaty' due to high humidity.

*What do you think wind chill factor might mean?*

Wind chill factor is a measure of the feeling of coldness due to the wind taking warm air away from the surface of the skin. The faster the wind speed the more negative the wind chill factor is though the base temperature also has an impact. Look at the thermometers together and try to measure the temperatures. Two scales are on each thermometer, one for degrees Fahrenheit and one for Celsius. In New Zealand, like most nations, Celsius is the accepted scale though Fahrenheit is still used in the Americas.

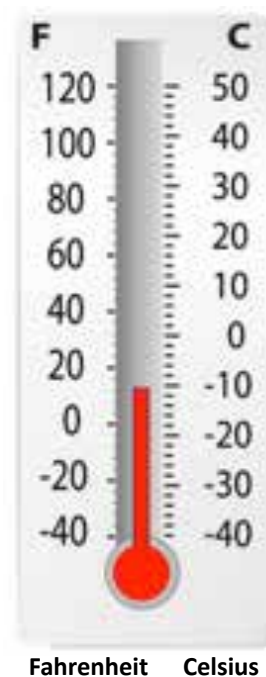
*What is significant about 0°C (zero degrees Celsius)?*

The Celsius scale is based of the freezing temperature of water, 0°C, and the boiling temperature at sea level, 100°C. Therefore, a temperature of -10°C is extremely cold by New Zealand standards.

Where in New Zealand might you experience a temperature of -10°C?

Inland and high-country places are the most likely locations for consistent sub-zero temperatures in winter. The lowest temperature ever recorded was -25.6 °C in Ranfurly, Central Otago. However, temperatures at high altitudes like the summit of Mount Aoraki/Cook can be colder.

Focus on the wind chill factor.



## Notes for parents (2).

*How do you work out what the temperature really feels like?*

Your child may need support combining the temperature and wind chill factor. Use the thermometer to track taking away 15 and 7 degrees respectively.

$$-10 - 15 = -25^{\circ}\text{C}$$

$$2 - 7 = -5^{\circ}\text{C}$$

If reading the scale properly is difficult for your child refer to Points to Note below.

Heat index is a measure of the effect of humidity. Dampness in the air restricts the ability of human bodies to sweat and use evaporation as a means of cooling. The heat index works in a different way to wind chill factor because it adds on a fraction of the base temperature.

For example, the dog picture shows a temperature of  $30^{\circ}\text{C}$  but the experienced temperature is one-sixth of  $30^{\circ}\text{C}$  plus the  $30^{\circ}\text{C}$  itself. One way to calculate the temperature the dog feels is to express one and one sixth as  $1\frac{1}{6}$  or as  $\frac{7}{6}$  and calculating:

$$1\frac{1}{6} \times 30 = 36$$

$$\frac{7}{6} \times 30 = 36$$

Note that  $1\frac{1}{6} \times 30$  can be done in two parts  $1 \times 30 + \frac{1}{6} \times 30$ .

The increase in base temperature for the bottom right picture is given as a percentage (25%).

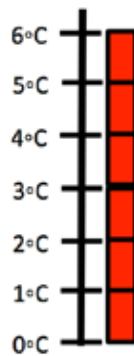
*Do you know other ways to show 25%?*

Your child might know that useful ways to think about 25% is as a decimal, 0.25, or as a fraction,  $\frac{1}{4}$ . The felt temperature is 125% of  $40^{\circ}\text{C}$ . This can be calculated in many ways:

$$1.25 \times 40 = 50^{\circ}\text{C} \text{ or } \frac{5}{4} \times 40 = 50^{\circ}\text{C} \text{ or } 40 \times 125\% = 50^{\circ}\text{C}$$

### Points to note:

Reading scales is an important measurement skill. The marks on a scale represent the 'endpoint' not the middle of units. For example, the mark labelled  $6^{\circ}\text{C}$  is the place where 6 units of  $1^{\circ}\text{C}$  come to. The mark is not pointing to the middle of the unit.



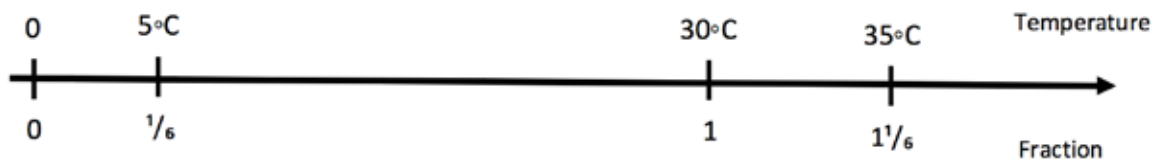
## Notes for parents (3). Activity next page.

Reading a scale also requires equal partitioning to find out what unit each extra mark means. In the thermometer shown there are five equal parts of each space of  $10^{\circ}\text{C}$ . Each mark measures one fifth of 10, so  $2^{\circ}\text{C}$ .

To find out what a given mark measures children need to work up or back from given points. For example, above the liquid in the thermometer reaches 3 marks above 10 and two marks below 20 so indicates a temperature of  $16^{\circ}\text{C}$ .

The calculation of a fraction or percentage multiplied by a whole number is made more difficult in these problem by the fact that the result must be added to the original temperature. One way to organise the calculation is to use a double number line. Take the calculation of a heat index of  $+1\%$  when the base temperature is  $30^{\circ}\text{C}$ .

Using a double number line:

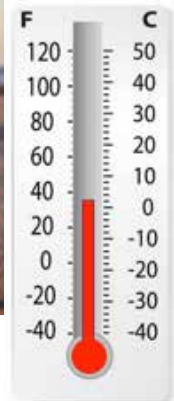


Just looking at a thermometer is not enough to tell you how cold or hot you feel. The wind chill factor makes you feel colder in cool conditions. It is the result of the wind taking warm air away from your skin.

Look at these individuals. What does the air temperature really feel like to them?

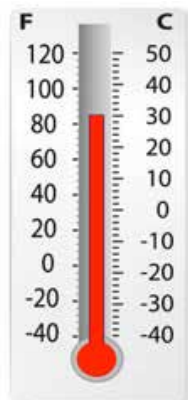


**The wind chill factor is -15°C**

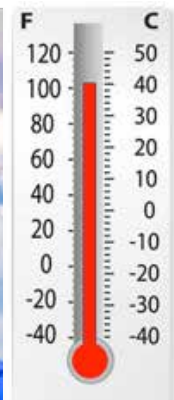


**The wind chill factor is -7°C**

Just like wind chill factor is a result of wind speed, the heat index is a result of the amount of water in the air. If humidity is high your body cannot use evaporation to cool itself and you feel hotter.



**Add on one sixth of the temperature  
70% humidity**



**Add on 25% of the temperature  
43% humidity**