Investigation

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Investigation 1 Directed numbers

1 Temperature

Winter weather reports sometimes describe the temperature as 'below zero'; for example, '3 degrees below zero'. We measure temperature in degrees Celsius. The freezing point of water is the zero for the Celsius system. So if the temperature is below the freezing point of water, it is below zero. What is the new temperature if it is:

a 5°C and the thermometer drops by 4°C? b 5°C and the thermometer drops by 5°C?
c 5°C and the thermometer drops by 6°C? d 5°C and the thermometer drops by 7°C?
e 5°C and the thermometer drops by 8°C? f 10°C and the thermometer drops by 13°C?

2 Golf

In golf, each hole is given a **par** score. The par score is the number of strokes or shots that it should take a golfer to complete the hole. For example, if a hole is rated as a par 4, the golfer should expect to need 4 strokes to complete the hole. The number of strokes taken is the golfer's score. If the golfer's score is greater than par, it is said to be 'over par'. If the golfer's score is less than par, it is said to be 'under par'. When two or more golfers compete, the *lowest* score wins!

a If the hole is:

   i   par 4 and the golfer's score is 5, the player is _____ over par.
   ii   par 4 and the golfer's score is 6, the player is _____ over par.
   iii par 4 and the golfer's score is 4, the player is _____ with par.
   iv   par 4 and the golfer's score is 3, the player is _____ under par.
   v   par 4 and the golfer's score is 2, the player is _____ under par.
   vi   par 4 and the golfer's score is 1, the player is _____ under par.
   vii par 5 and the golfer's score is 6, the player is _____ _____ par.
   viii par 5 and the golfer's score is 3, the player is _____ _____ par.
   ix   par 3 and the golfer's score is 2, the player is _____ _____ par.

b Find the meanings of the golfing terms Eagle, Albatross and Birdie.
c Find some other golfing terms to describe scores.

3 Time

The modern western calendar commences with the birth of Christ. Times before this are said to be BC. Times after this are said to be AD. The pyramids in Egypt were built in about 2600 BC. The Sydney Olympic Games were held in 2000 AD.

a Stonehenge was built about 1650 years before Christ, or in about _____ BC.
b The Parthenon temple was built 438 years before Christ, or in _____ BC.
c Give the date of an event occurring 150 years after Christ.
d Give the date of an event occurring 550 years after Christ.
e Give the date of an event occurring 250 years before Christ.
f Give the date of an event occurring 1050 years before Christ.
g Find the meanings of AD and BC.
h In recent years, the terms BCE and CE have been used instead of BC and AD. Find the meanings of BCE and CE.

4 **Sea-level**

The starting point for the measurement of the height of land and landmarks is sea-level. Mt Kosciuszko is 1745 m above sea-level. The wreck of the *Titanic* was found 3800 m below sea-level.

a A diver on the Great Barrier Reef swims down 8 m. She is 8 m _____ sea-level.

b A diver is looking at the ocean from a cliff 15 m above the water. He is _____ sea-level.

c Describe the position of a diver 10 m below sea-level.

d A diver is swimming 10 m above sea-level. How can this be?

Investigation 2 Temperature scales

There are several temperature scales: Celsius (or Centigrade), Fahrenheit and Kelvin.

1 For each of these scales, find the value of the freezing point of water at sea-level.

2 For each of these scales, find the value of the boiling point of water at sea-level.

3 For each scale, find the reasoning behind the position of zero.

4 Find out about absolute zero.

5 Air is mostly ($\frac{4}{5}$ or 80%) nitrogen. Find the boiling point of liquid nitrogen.