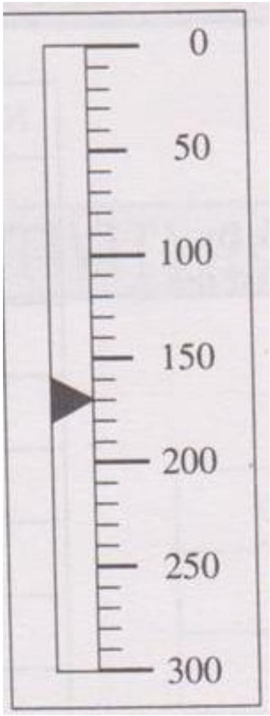
# 'How To' Guide – Reading Scales

**Scales** are used to measure all continuous data (measurements), even though the word itself is so often only associated with mass. Height, mass, temperature, time and more can all be measured using a scale. Scales contain numbers written evenly along a piece of equipment which are used to measure the piece of data in question. Difficulty for some arises when these numbers do not go up in '1s'.

## Example 1

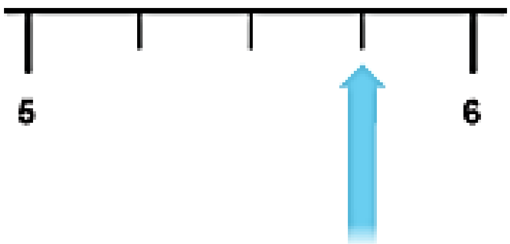



1. Pick 2 numbers on the scale. I pick 50 and 100.
2. Find the difference between them. That's 50.
3. Count how many marks on the scale it takes to get from one to the other. That's 5.
4. Divide these. 50 ÷ 5 = 10. So each mark on the scale represents 10.
5. Find the value on your scale below where you want to measure. That's 150.
6. From here, keep adding 10 until you reach your marker. 150 + 10 + 10 = 170.
7. The above scale reads 170.

## How we teach it

- The first step is to work out what the scale is going up in. In other words, we need to find out what value each mark on the scale represents.
- Pick 2 points on the scale that has values. Work out the difference between these values.
  E.g. the difference between 0 and 50 is 50, the difference between 20 and 40 is 20.
- Count how many marks on the scale it takes to get from your first number to your second.
- Divide the difference by the amount of marks between the numbers. This will tell you value that your scale is going up in.
- Look at where the arrow or marker on your scale is. Find the labelled number below it. From that number, count up with the value of each mark until you reach your needed value.

## Example 2




In this scale, the difference between 5 and 6 is 1.
The space has been divided into 4, so each mark represents 1 ÷ 4 = 0.25.
The arrow is pointing to 5 + 0.25 + 0.25 + 0.25 = 5.75.

## Common mistakes

- Students assume that it is always half way between two numbers. It is not (see example 2).
- Reading is rushed and students do not properly read the two numbers that their arrow is between.
- Scales are misread. This is especially true for protractors, where there are two scales present.
- Not properly working out what the scale is going up in. For example, if the marker is right in the middle of 400 and 600, the answer is 500. However, some students put 450 because they haven't looked at it properly.

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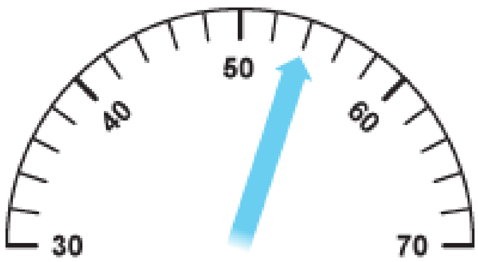
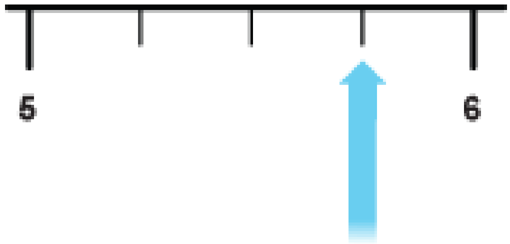
## Example 3



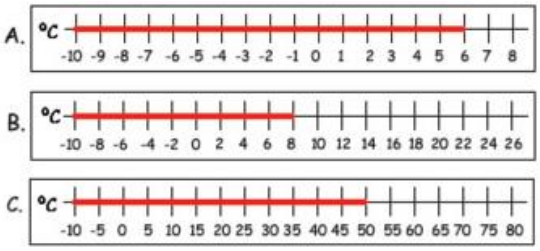

In this scale, the difference between 50 and 60 is 10.
The space has been divided into 5, so each mark represents
10 ÷ 5 = 2.
The arrow is pointing to 50 + 2 + 2 = 54.

## Example 4




In this scale, the difference between 5 and 6 is 1.
The space has been divided into 4, so each mark represents
1 ÷ 4 = 0.25.
The arrow is pointing to 5 + 0.25 + 0.25 + 0.25 = 5.75.

## Example 4




The first thing to do when reading a thermometer is to check the scale.
The three thermometers shown above use different scales.

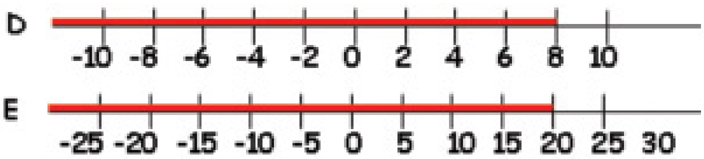
- Each division on A represents 1 degree. It is showing $6^{\circ}$C.
- Each division on B represents 2 degrees. It is showing $8^{\circ}$C.
- Each division on C represents 5 degrees. It is showing $50^{\circ}$C.

If you only look at the red line, rather than reading the scale, it's easy to get a wrong reading.

Example $8^{\circ}$C on scale B looks lower than $6^{\circ}$C on scale A.

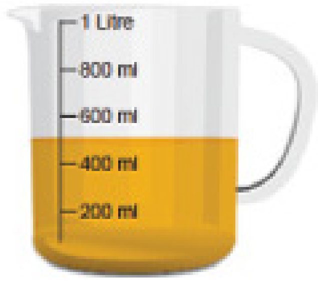
Example $-3^{\circ}$C on scale A looks higher than $10^{\circ}$C on scale C.

## Example 5




Although the zero on each of these two thermometers is in the same position, and the divisions are the same distance apart, they show very different temperatures. The scale on D is marked in 2s and E in 5s, so although the red lines seem to be the same length, the temperature shown on E ($20^{\circ}$C) is much higher than that shown on D ($8^{\circ}$C).

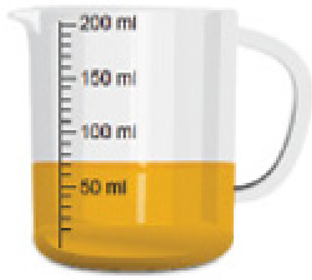
## Common mistakes 1




**Mistake The liquid in the jug measures 450ml.**

**They haven't looked at the upper value. The liquid in this jug measures 500ml.**

## Common mistakes 2




**Mistake The liquid in the jug measures 52ml.**

**They assumed that each mark was worth 1ml. The liquid in this jug measures 70ml.**