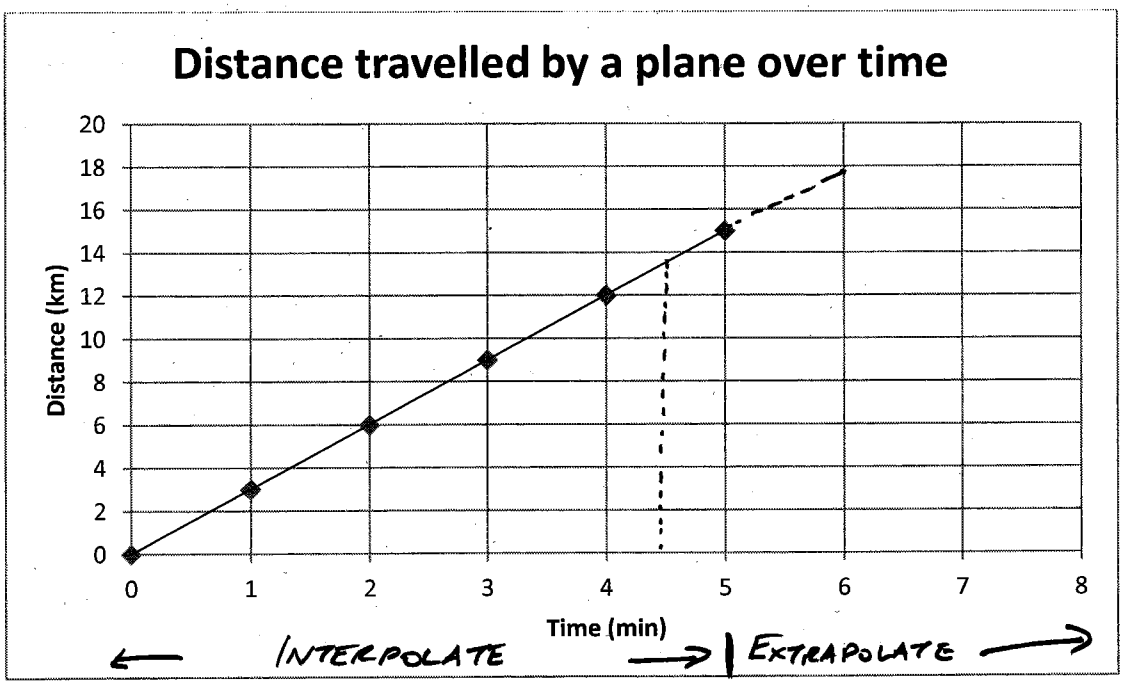
Interpolation & Extrapolation

Often when we collect data, we do not have the opportunity to sample every possible situation we can encounter. When a set of data is considered incomplete (quite often), we use Interpolation and Extrapolation to "FILL IN THE GAPS".

Interpolation - THE WORD 'INTER' MEANS WITHIN
- WHEN WE INTERPOLATE, WE LOOK 'WITHIN' THE GRAPH
- WE NEED TO LOOK BETWEEN THE GIVEN NUMBERS

Extrapolation - THE WORD 'EXTRA' MEANS TO ADD ON
- WHEN WE EXTRAPOLATE, WE LOOK 'OUTSIDE' THE GRAPH
- WE NEED TO LOOK BEYOND THE NUMBERS WE HAVE

Consider the following graph.

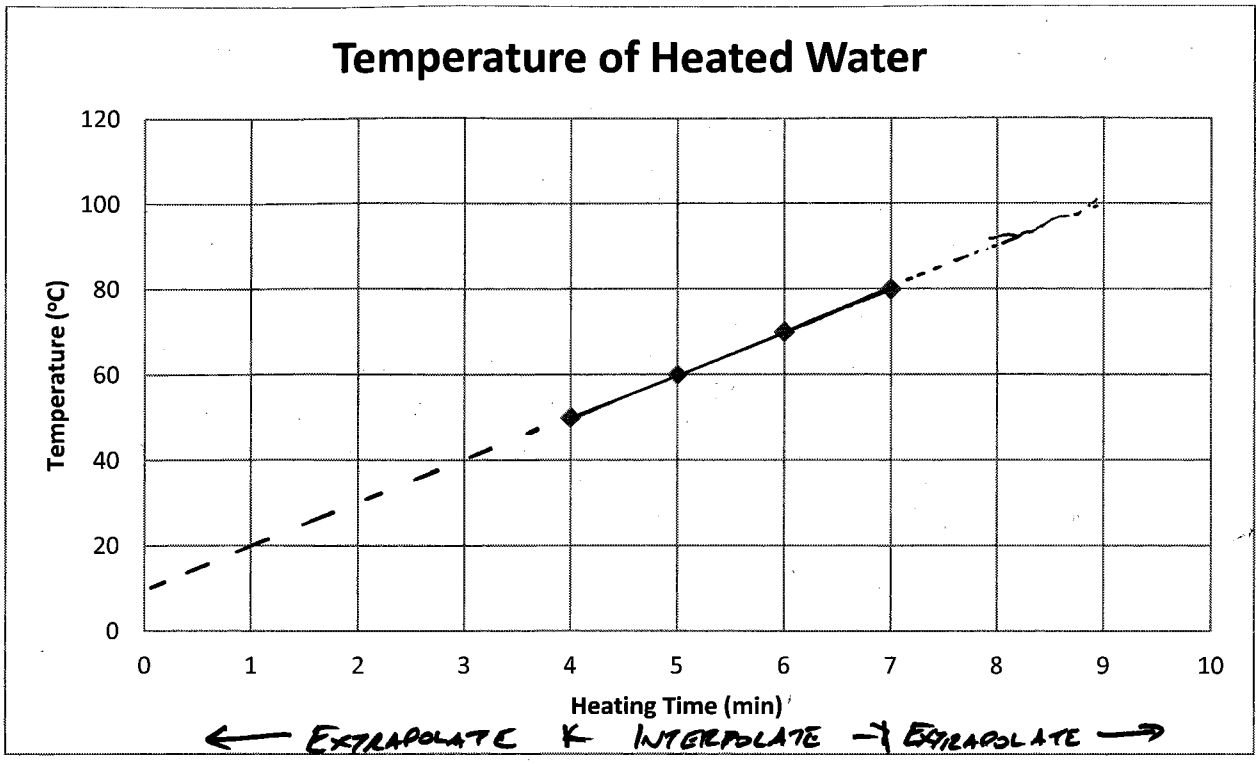


If you were asked how far the plane had travelled after 3 minutes, you would say 9 km.

However, if you were asked how far the plane had travelled after 4.5 min, you would have to INTERPOLATE the answer. You need to locate the time 4.5 min, trace up to the line, then over to the distance axis. You then ESTIMATE the answer as best you can → ~13.5 km

If you were asked how far the plane had travelled after 6 minutes, you would have to EXTRAPOLATE the answer. You need to EXTEND THE LINE to the appropriate time value, and ESTIMATE the answer off the distance axis → 18 km

Example:



For each question below, identify whether you had to interpolate or extrapolate to get your answer.

a) How long would it take the water to reach a boiling temperature (100°C)?

EXTRAPOLATE ~9 MIN

b) What was the temperature of the water after 5 min 30 sec?

~65°C; INTERPOLATE

c) How long was the water heated before it reached 30°C?

~2 MIN; EXTRAPOLATE

d) What was the starting temperature of the water?

~10°C; EXTRAPOLATE

p. 196-8 #4,5,7-15