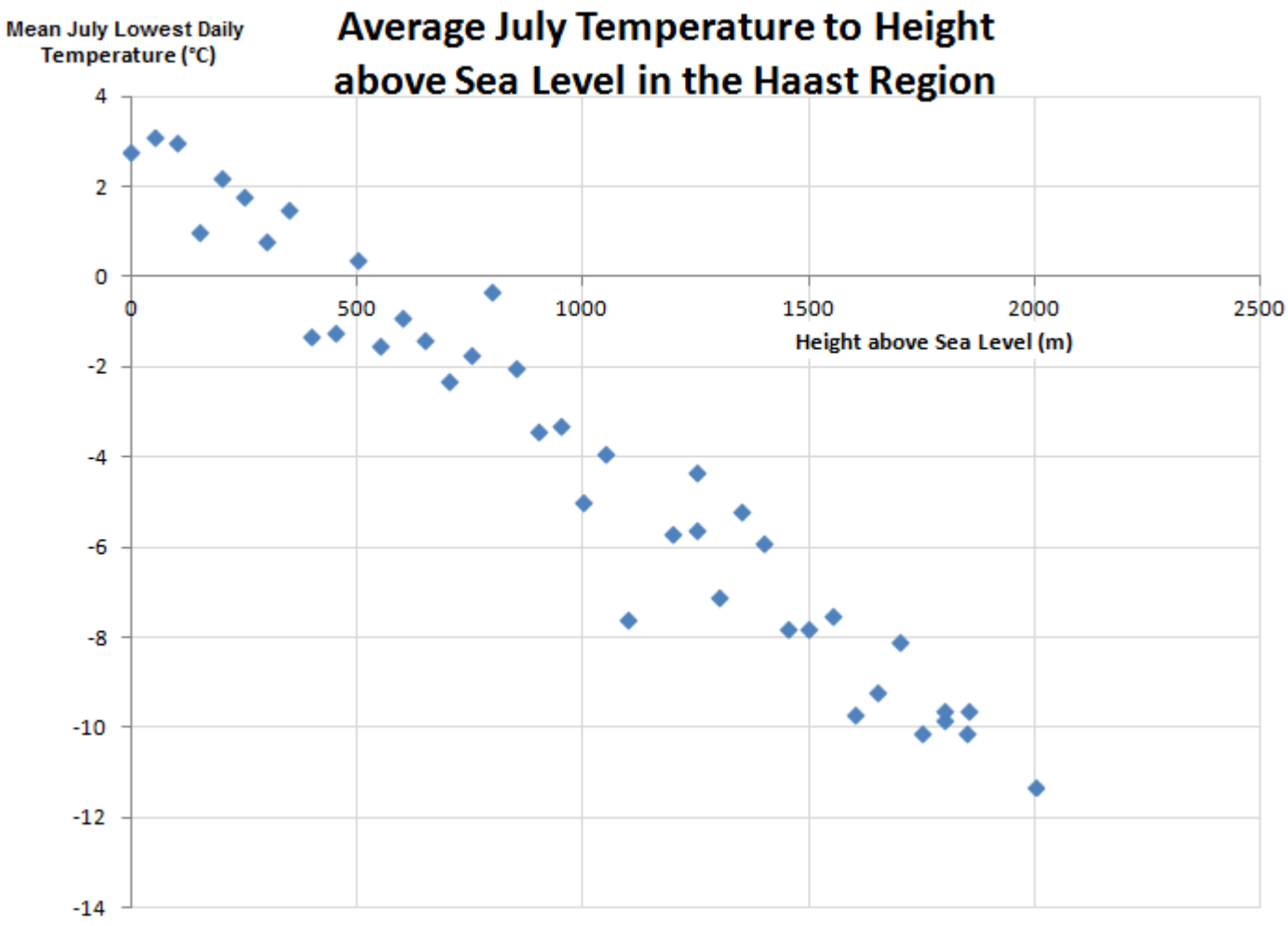
Level 1 Data Practice #2

The Haast Region, on the West Coast of the South Island, extends from the sea to some high mountains. July is the coldest month in the area.

Scientists studying plants in cold weather have gathered some data for places at varying heights in the Haast Region, to investigate the point at which plants can no longer grow.

The temperature recorded is the mean of the daily lowest value over the whole month of July.



1. Describe the relationship in the Haast Region between height above sea level and average temperature.

2. Circle the point on the graph which is much warmer than you would expect for its height above sea level.

   Put a square around the point on the graph that is much colder than one would expect for its height above sea level.

3. Predict the average July temperature for a point 1,000 metres above sea level.

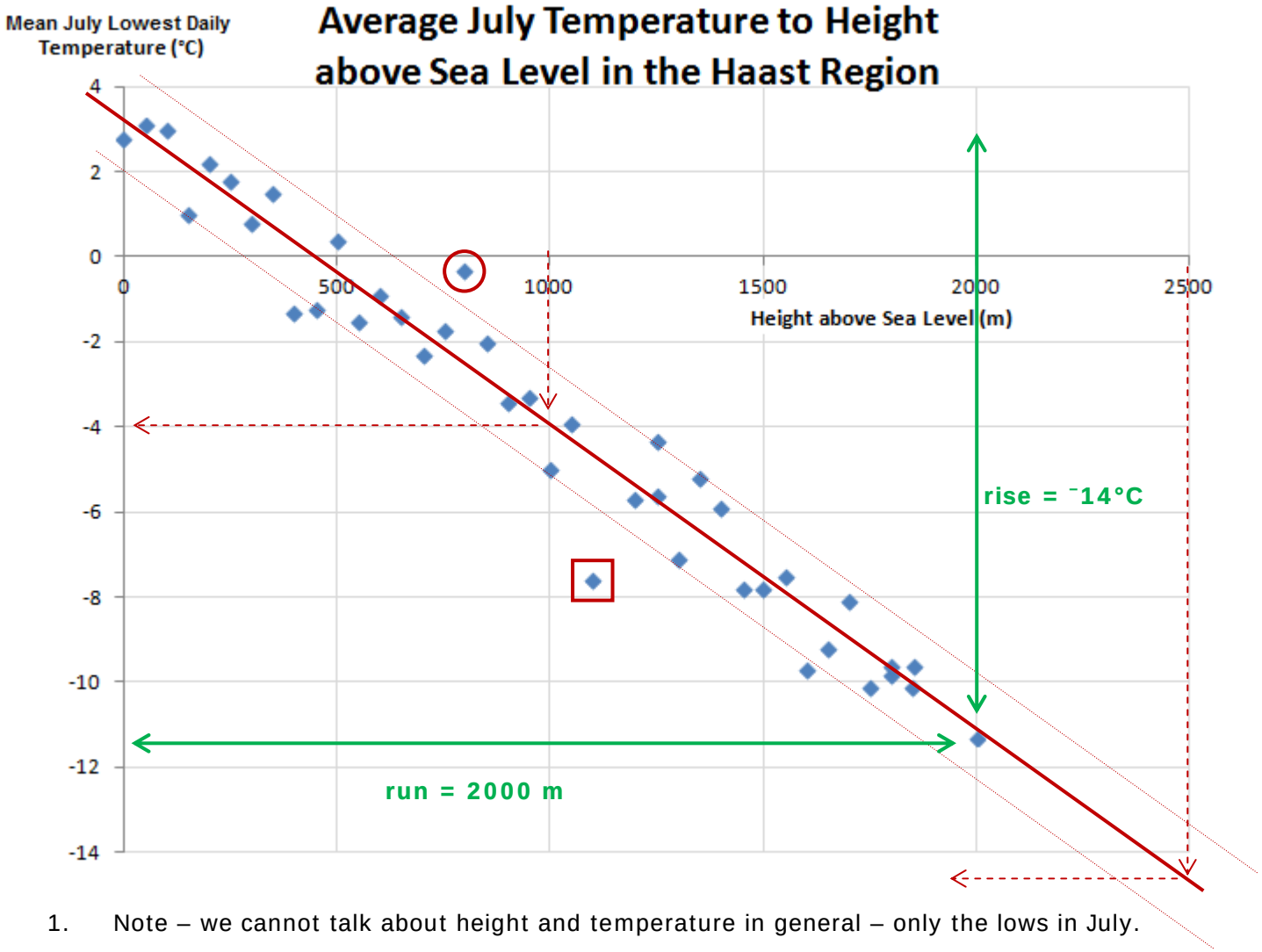
   How reliable do you believe your prediction is?

4. Predict the average July temperature for a point 2,500 metres above sea level.

   How reliable do you believe your prediction is?

5. Construct a model for the relationship between height above sea level and mean July Low temperature for the Haast Region.

Answers: Level 1 Data Practice #2



1. Note – we cannot talk about height and temperature in general – only the lows in July.

   As the height increases, July mean lows tend to decrease, in a fairly consistent manner. On average every 1000 metres of height gives a drop of 7°. Technically – there is a fairly strong negative linear correlation between height and July temperature.

   (Use all four key ideas 1) strength, 2) + or –, 3) linear, curved etc, 4) "correlation" when describing such a pattern. There is some scope for differences with strength, in this case "strong" is perfectly acceptable. "Moderate" is not quite so good as there is little spread.)

2. The circled and squared points are shown above. Note that they are not the warmest or coldest, but the points furthest above and below the general pattern shown by the line.

3. 1,000 metres should have a temperature of ¯4°C, shown by arrowed lines to line of best fit. You have some margin for error, but it is incorrect to say ¯5°C based on the actual point at 1,000 m. You must make predictions based on the pattern, not actual points.

   The prediction is probably within ±1°C, based on the spread of values, almost all of which are within that distance (see the thin dotted lines parallel to the best fit).

4. 2,500 metres gives a prediction of around ¯14.5 to ¯15 °C (it must be below ¯14°C).

   This is extrapolation (outside the data we have) so much more likely to have an error than the interpolation of question 3.

5. $T = \frac{-14}{2000} h + 3$ (with 90% within ±1 error) or close mathematical equivalents.
   where T = July mean Low in °C, and h = height above sea level