

# Growth of Dutch Children

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In addition to growth data of healthy Dutch children one has also collected in 1997 growth data of Dutch, Swedish, and Danish girls with Turner syndrome.\*

## Research Questions

- What difference in height and in height increase do there exist between healthy girls and girls with Turner syndrome? Formulate and underpin your conclusions.
- Does there exist a simple formula that fits well the average height of girls with Turner syndrome? If so, what is this formula and up to what age can it be applied?
- Does there exist a simple formula that fits well the mean height of healthy girls up to some age?

## Task B. Mathematical Model of Height Growth for Girls

1. Start Coach and select the project *Growth of Dutch Boys and Girls*.
2. Select activity B: *Mathematical Model of Height Growth for Girls*.
3. Carry out the tasks in this activity and answer the questions.

## Growth Data

Growth data have been placed in a text window inside the Coach activity. We write these data down below for those who want to put the text window in the background during their work. Age is in years; height is in centimetres (and is of course a mean value).

<i>Age</i>	<i>Height healthy girls</i>	<i>Height girls with Turner syndrome</i>
1	75.1	69.9
2	87.5	80.6
3	96.7	87.6
4	104.5	93.7
5	111.8	99.3
6	118.7	104.5
7	125.2	109.5
8	131.5	114.2
9	137.5	118.5
10	143.3	122.5
11	149.2	126.3
12	155.3	129.7
13	160.8	132.8
14	164.7	135.7
15	167.1	138.2
16	168.6	140.4
17	169.3	142.3
18	169.8	143.9
19	170.2	145.2
20	170.5	146.3

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\* Rongen-Westerlaken et al, Acta Paediatr. 1997, 86:937-942.

## Hints

Once you have a table with the growth data you can use several tools of Coach to answers the research questions. We give some hints:

- Make use of diagrams.
- Also study the increase diagram of height.
- The shape of the increase diagram of height for girls with Turner syndrome gives a clue to what kind of formula for height might be suitable.
- Once you have an idea about the kind of formula you are looking for, you can select in the diagram window the menu option 'Analyse' ▶ 'Function-fit'. A new window pops up in which you can match the graph of any desired quantity with the graph of a known mathematical function. For example, you can determine the straight line that fits best with the height increase of girls with Turner syndrome. This can be done manually or automatically (see the online help or the text in the paragraph below).
- Try to make (with 'Function-fit') a simple formula as meant in the second research question. If desired, restrict the data to an age interval for which a simple formula will work.
- A suggestion for the report: mention references to web pages and articles where the interested reader can learn more about Turner syndrome.

## Function-fit

The screen dump below shows manual fit in action. The formula of a straight line,  $y = ax + b$ , has been selected as function type; the selected column corresponds with the height increase for girls with Turner syndrome. The icon of the pin on the screen dump is such that the approximation has been fixed at that location. By dragging another point of the straight line with the mouse you can rotate the line. When you release the fixed pin by double clicking, then you can translate the line. When you press 'Auto-fit', then you let the software itself find the least-squares fit of all data.

