

# The Height Measure

Pretty clear what this is. Just a strip with markings on it which can be fastened up on the wall and used to measure people's heights. Well more or less. But of course, in an educational context it is quite a bit more than that!

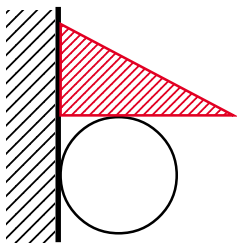
It is probably fairly obvious how the whole thing is assembled. The relevant 5 pages are printed out. The top of each one (except for the last with the heading) is trimmed off along the dotted line. Lay out the pages in order. Some glue is put on the back at the top of a page and it is glued to the bottom of the one above it, using the dotted line on that one as a guide to position. Obviously, since this is a 'measuring instrument', care is needed in getting this stage right. For the same reason measurements should be made to check that the printout (or subsequent photocopying) has not changed the intended sizes. As this will come in for a lot of contact in usage, it might be better to print (or photocopy) it onto card. Also, since it is subjected to regular contact in use, if possible, cover it with a transparent plastic.

When fixing it up on a wall it is clearly necessary to get it at the right height above the floor! To help in this, at the 150 cm level a small line will be found at both edges. It is suggested that a permanent (small) mark is made on the wall at that level. Not only will this help in the fixing, but it will also allow an 'at a glance' check to be made later, that no unauthorised adjustments have been made by those of a mischievous disposition.

If presented as printed here then it has some merit as a reinforcement of the relationship between metric and imperial measures - especially if placed near the front of the classroom where it is continually in view. This could be described as 'subliminal learning'. Those who wish to have only metric units around will have to resort to some 'whiting out' of the printout and then photocopying the end product. There is an alternative spelling for the heading (to be found on one of the later pages), for those that need it, which will have to be cut and pasted on the printout if required.

## What do you do with it?

Some suggestions are given here but, as always, it must all be decided by circumstances and the particular enthusiasms of the teacher.



The drawing on the left is a reminder of the need to get as reliable a measurement of height as possible.

- Shoes off
- Feet flat on the ground
- Back against the wall
- Look straight ahead
- Use a set-square resting lightly on the top of the head (not hair) to project that level onto the scale

Is that it then? Could be. Just let pupils measure themselves when they feel like it. Or . . .

What about putting up a sheet of graph paper close by, with suitably marked scales (height/age) and let them mark their positions on that. The involvement of several different age-groups should make an interesting scattergram which would have some meaning for all concerned.

What about putting a weighing machine nearby? Another scattergram - weight/height?

What about making a weight/height scattergram for a class at the beginning of the school year, and then again at the end? Present it on 2 ohp overlays, blue dots for the beginning, red dots for the end.

And then, what about . . .

## Warning

Not everyone may be as willing to publicise their personal measurements as you might think.

Remember and respect that.

Allow for it in your planning

**Be sensitive!**

## Getting serious

The preceding notes dealt with an informal or introductory use of the resulting data but, where appropriate, there is much more that can be done. Perhaps one of the more important ideas that could be ‘pushed’ is that of the ‘average’. Normal school mathematics consists of reducing a (small) mass of data (numbers) to a single figure which is known as the ‘average’. A distinction is usually made as to ‘mean’ ‘median’ and ‘mode’ but the idea of it being a single value persists. This is a gross over-simplification and it needs to be made clear that the ‘average’ should refer to a range or else, in real terms, the ‘average’ may not exist! (Remember how the ‘average’ family used to be ‘father, mother and 2.4 children?’) The scattergram offers a good opportunity to make this point. It is not difficult to see how the ‘average’ is a group in the ‘middle’.

Clearly many ideas of ‘traditional’ statistics can also be covered (correlation, deviation etc.) but here are a few notes on what may be less obvious ideas.

### Body Mass Index (BMI)

This is an indicator which has become more widely known in recent times, with the increasing interest in matters of health and diet.

$$\text{It is defined as: } \text{BMI} = \frac{m}{h^2}$$

where  $m$  is the mass in kilograms and  $h$  is the height in metres. It is an easy formula to apply.

Popular articles dealing with this are usually accompanied by a table or chart showing ‘desirable’ values of BMI and associated health risks for given values. But be careful, these over-simplified tables usually take no account of age and thus are **NOT** suited to pupils.

### Body Surface Area (BSA)

This is a measure which is needed in some treatments to determine the size of the dosage of medicine which is to be given (say mL/m<sup>2</sup>)

It can be found using various formulas.

$$\text{One of the simplest is: } \text{BSA} = \sqrt{\frac{hm}{3600}}$$

where  $m$  is the mass in kilograms and  $h$  is the height in centimetres

#### The BSA problem

*(a homework?)*

Make as good an approximation as you can of the surface area of your body.

Make a table of all the measurements you make.

Show your separate calculations and give some indication of what the error might be.

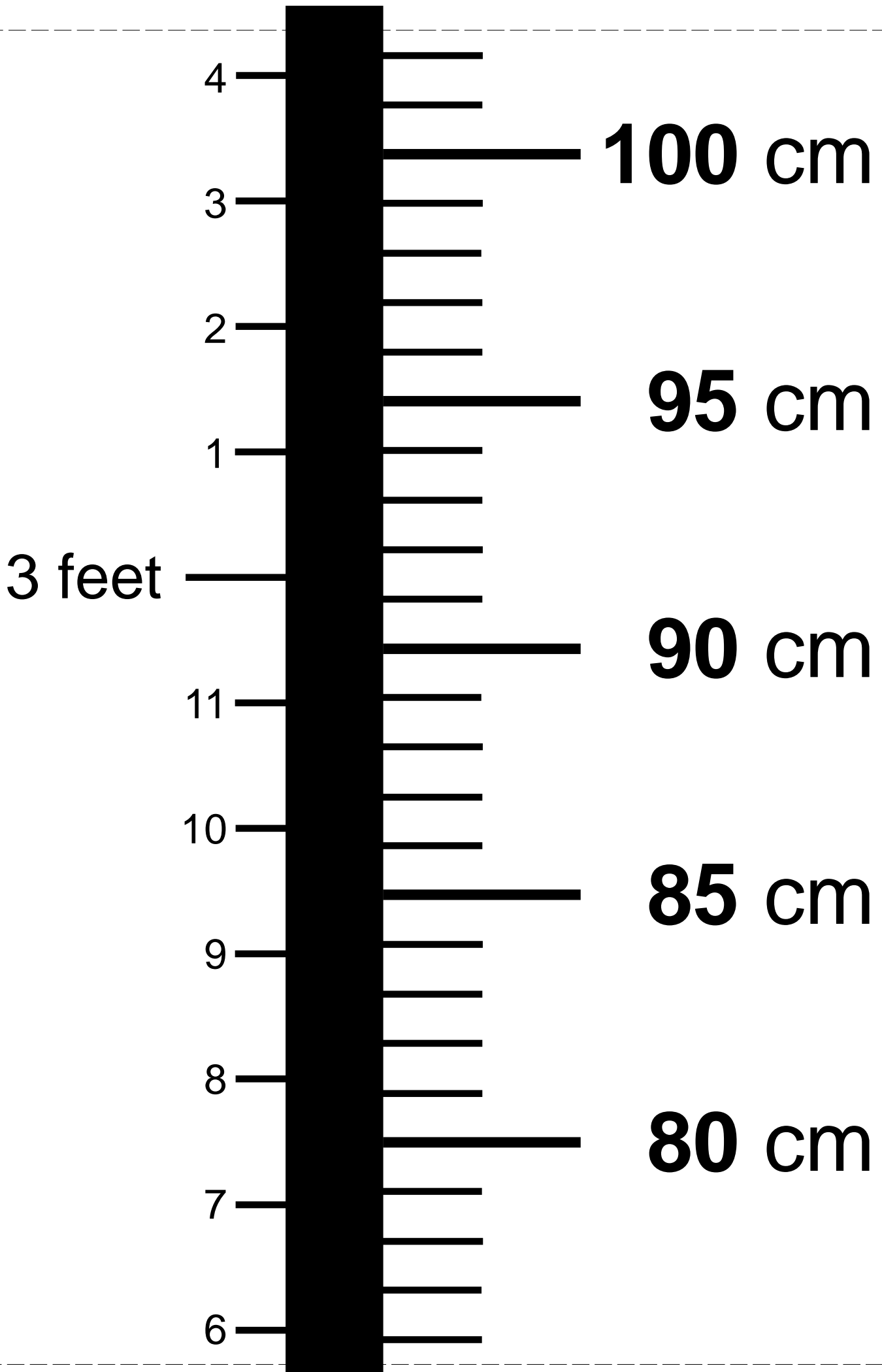
*(modified as necessary)*

### Percentiles

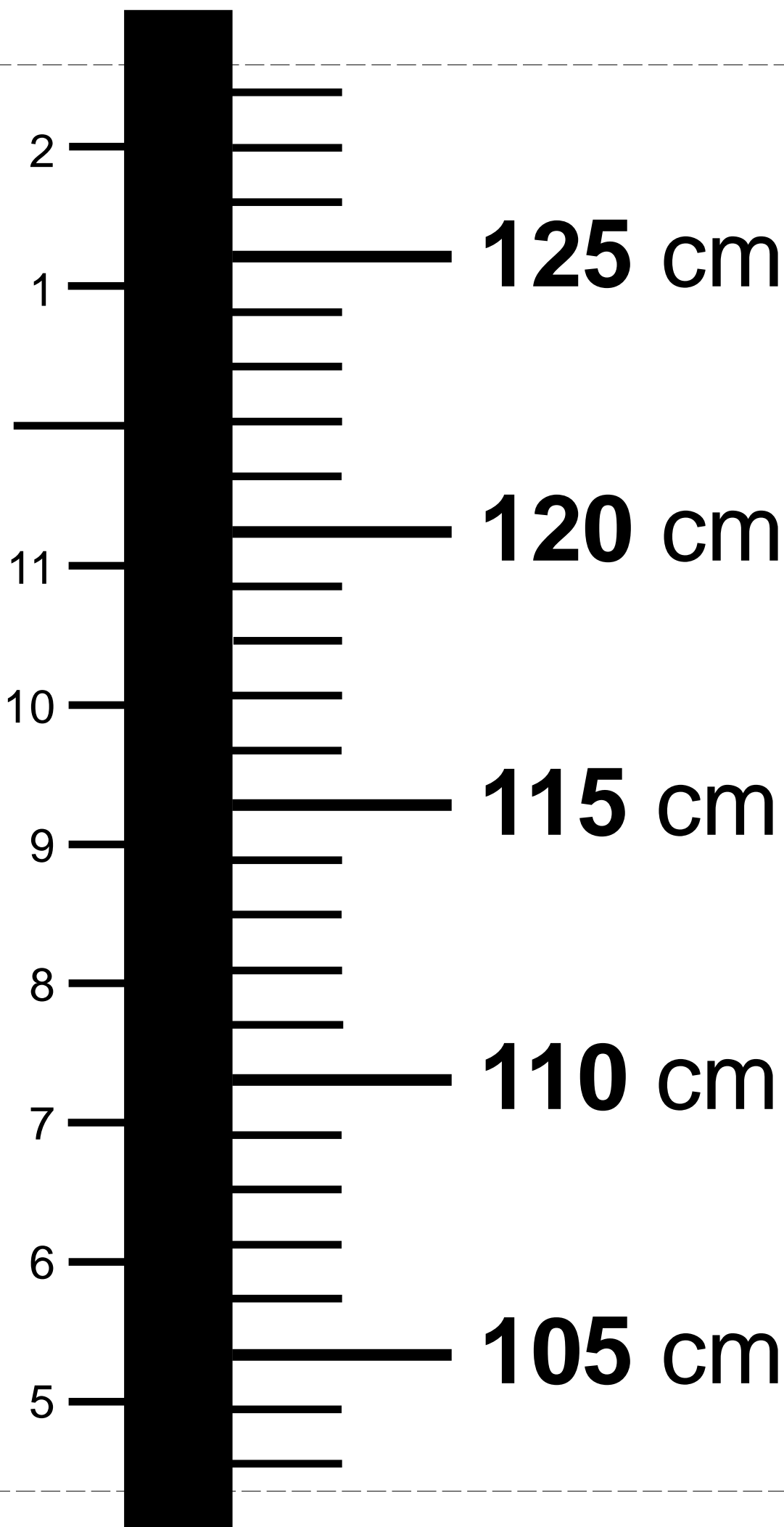
A general understanding of percentiles is of increasing importance in a world which becomes ever more reliant upon statistics, and the presentation of data. Parents, with small children who are subjected to various tests, can now be given results in the form “X registered 37 in the test for (hearing) which is between the 30th and 40th percentiles.” Eh? Good? Bad? Serious? No just about average! Oh!

To cover this aspect of statistics adequately requires first, some results such as we now have (height, weight, BMI) and then a chart made of a series of results based upon tests of very large groups of people. Obtaining the latter is not so easy. But some can be downloaded from the Web-site whose address is given below. It is an excellent site for this purpose and contains many more such charts offering different combinations of parameters, and a wealth of other related information also, all of it freely available. Their only drawback, for many, must be that since they originated in the USA their applicability and accuracy for other countries must be questioned. However, their differences are probably negligible at this level, and certainly they will serve the purpose very well. The chart giving the variation of BMI with age is particularly interesting as showing the danger of making generalisations about BMI without taking age into account. It may be worth noting that, as a generalisation, we could take as the ‘average’ all those readings which fall between the 25th and 75th percentiles; that is the middle 50% of the population.

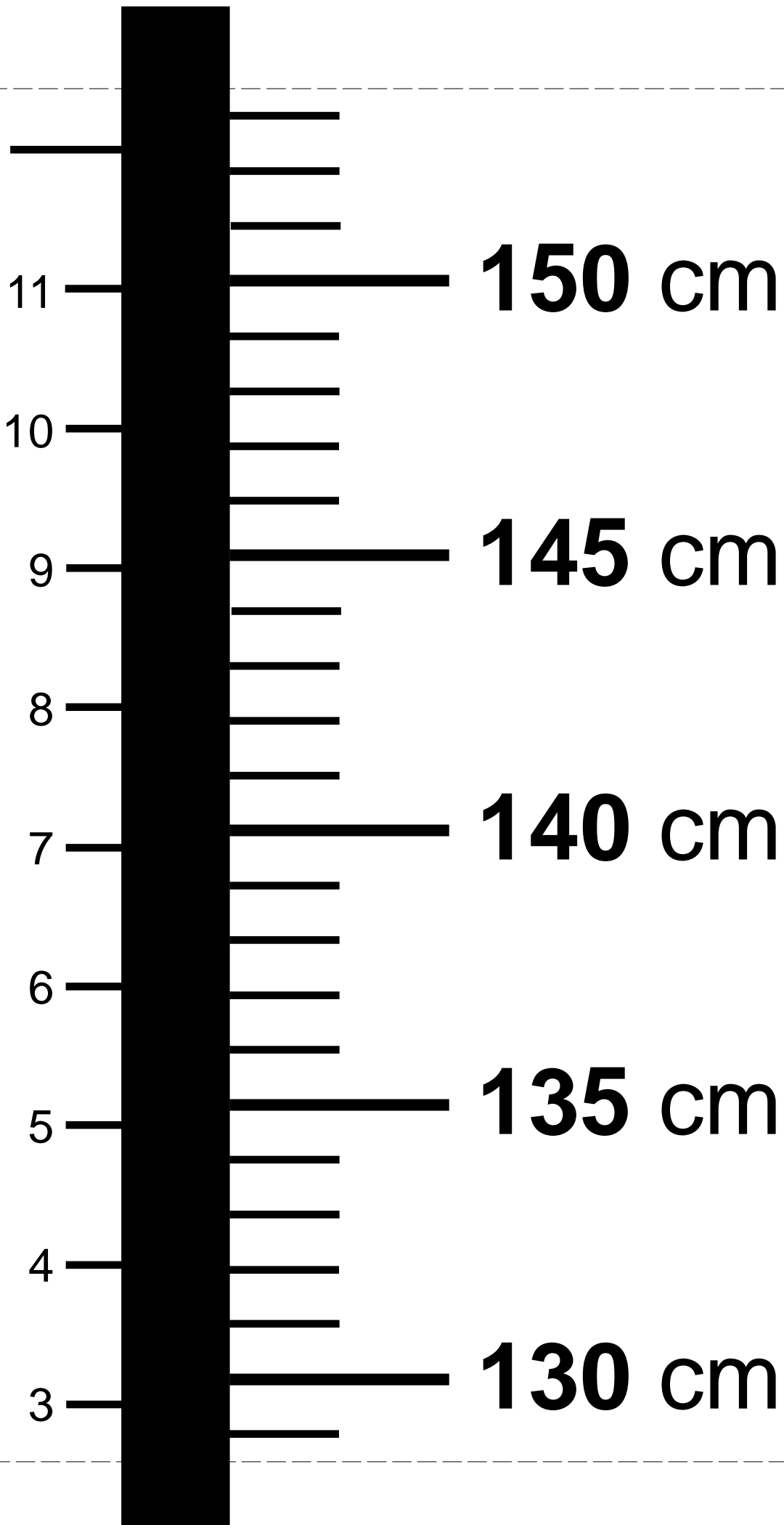
[www.cdc.gov/growthcharts](http://www.cdc.gov/growthcharts)

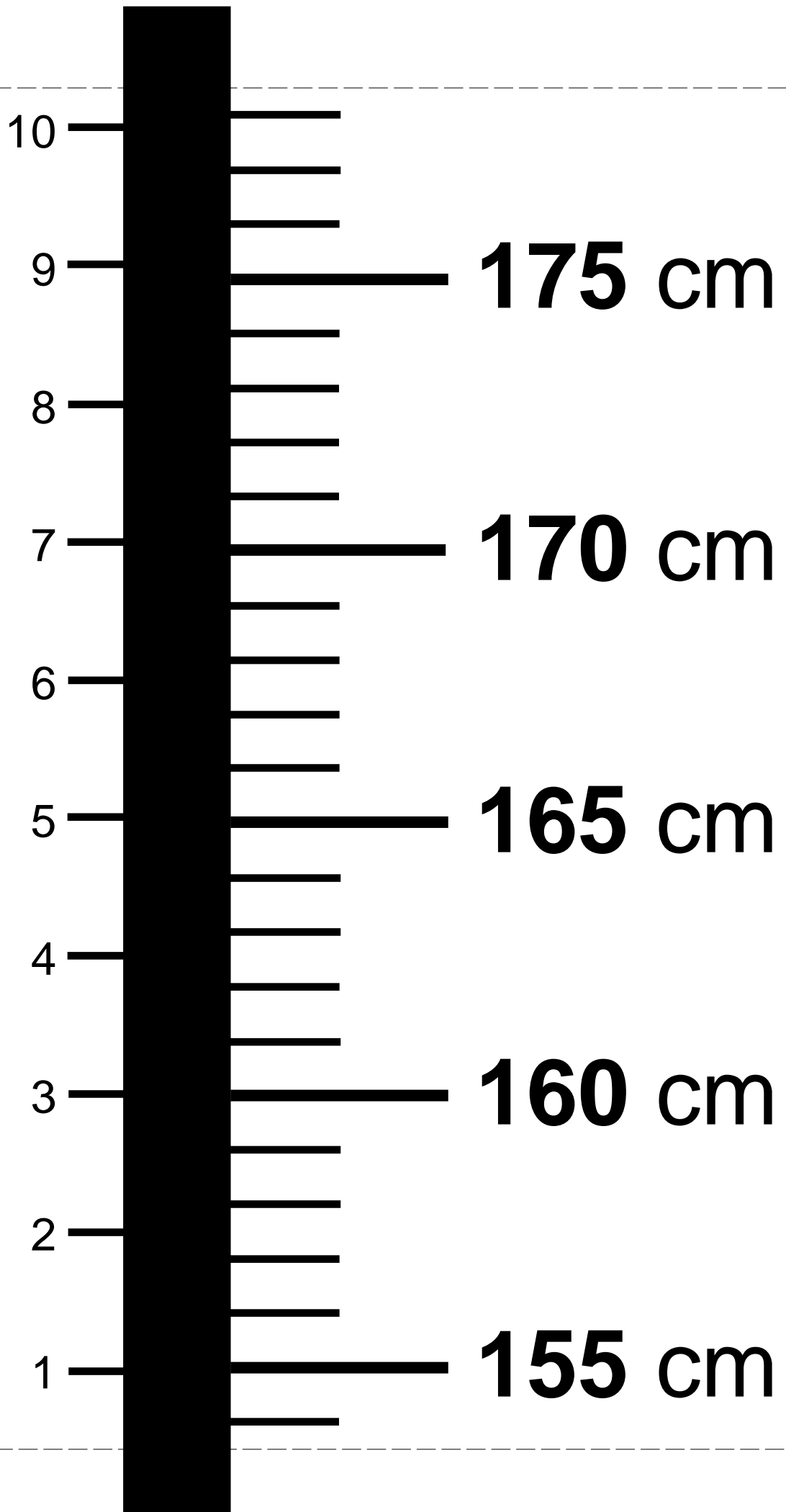


4 feet

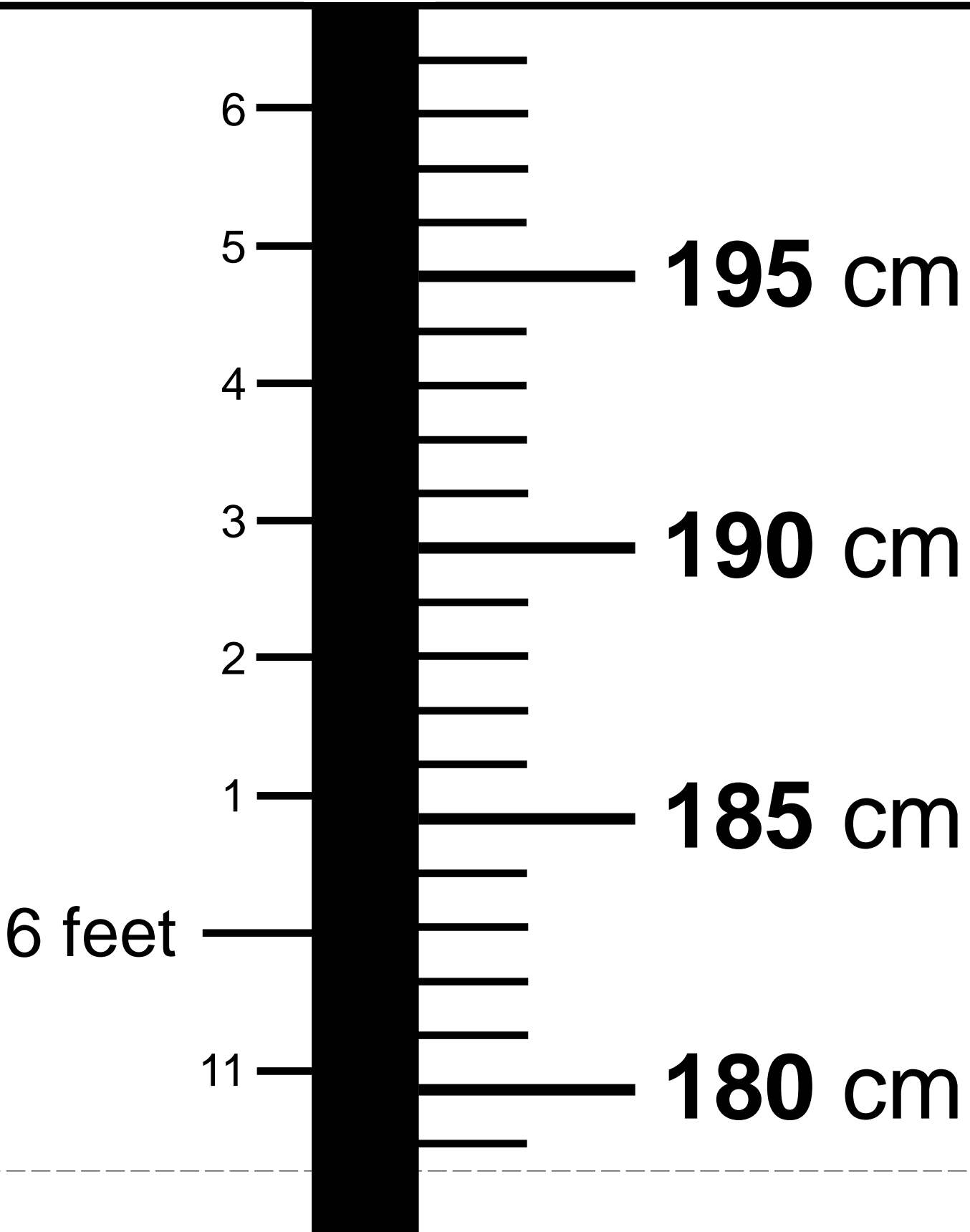


5 feet





# 2 metres



**2 meters**