

**MARKS**

5

- Suppose that you are investigating the relationship between political attitudes and length of hair among male university students. You will measure political attitudes with a standard questionnaire; indicate briefly how you will measure hair length. Give clear instructions *in point form* that your assistant can follow, including a statement of the *units* of measurement and the *measuring instrument*.

Use a light rigid ruler (so it can be manipulated with *one* hand) long enough (e.g., 60 cm) to cover male hair lengths and calibrated in millimetres.

**Comments**

- On centre line of the scalp, select a group of about 10 hairs at the *front* hair line.
- Place zero of ruler on scalp at hair roots and perpendicular to scalp surface; stretch group of hairs to reasonable tension and record its 'average' length, if possible to the nearest millimetre.
- Repeat steps 1 and 2 in *centre* of top of scalp.
- Repeat steps 1 and 2 at *rear* hair line.
- Repeat steps 1-4 a second time.
- Record data as it is gathered in a standard table already set up with proper headings and labels which identify the different measurements on each person.
- Ask for date of last haircut and record today's date.
- Ask for name and phone number in case there are follow-up questions about the data for a particular person.

Don't rely on the length of a *single* hair.  
 Try to *standardize* measuring system to reduce measurement error.  
 Use *more than one defined* location on scalp.  
 Take *repeated* measurements.  
*Systematic, planned* data recording.  
 Possible allowance for cutting.  
 Allow for possibility of *follow-up*.

\_\_\_\_\_ mm  
 Units

\_\_\_\_\_ 60 cm light rigid ruler  
 Measuring instrument

**MARKS**

4

(2, 2)

- All the members of a physical education class are asked to measure their pulse rate as they sit in a classroom. The students use several methods, among which are:

**Method 1:** count heart beats for 6 seconds and multiply by 10 to get beats per minute;  
**Method 2:** count heart beats for 30 seconds and multiply by 2 to get beats per minute.

- Which method is likely to yield a more accurate measurement? Explain briefly.
- One student proposes **Method 3:** starting exactly on a heart beat, measure the time for the next 50 beats and then convert this time into beats per minute. Is Method 3 likely to yield a more or less accurate measurement than 1 and 2? Explain briefly.

- Method 2 is preferred.

Inaccuracies involving *fractions* of a beat in the time interval will have *less* influence on the result for 30 seconds multiplied by 2 than for 6 seconds multiplied by the much larger 10; the result from the longer interval will also be less sensitive to irregularities in pulse rate.

2

 (a)  
 Method preferred

- Method 3 is likely to yield a *more* accurate measurement than Methods 1 and 2.

Method 3 overcomes the difficulty of fractions of a *beat* in a specified time interval and uses instead a whole number of beats; the fraction of a *second* at the end of the interval can be measured quite accurately with a suitable stopwatch.

Also, 50 beats is closer to the resting pulse rate of around 70 beats per minute, with the advantages associated with a smaller multiplier being required to scale the result up to 60 seconds.

More

 (b)  
 More or Less