

MARKS

3

1. Suppose you are writing an article for a consumer magazine based on a survey of the magazine’s readers on the reliability of their household appliances. Of 13,376 readers who reported owning Brand C dishwashers, 2,942 required a service call during the past year, whereas 192 service calls were reported over the same period by 480 readers who owned Brand D dishwashers. Describe an appropriate variate to measure the reliability of a brand of dishwasher, and use its values to assess Brands C and D on the basis of the survey information.

One measure of brand reliability is the *proportion of dishwashers needing a service call*.

For Brand C: proportion is $(2,942/13,376) \times 100 \approx 22\%$;

For Brand D: proportion is $(192/480) \times 100 \approx 40\%$.

With an appreciably *lower* proportion needing service calls in the past year, Brand C appears to be *more* reliable than Brand D.

However, the much *smaller* number of responses from Brand D owners makes 40% a *less precise* estimate of the corresponding population proportion than the 22% for Brand C.

A matter of concern in both cases is the *non-probability* method of selecting the sample.

C (maybe)

More reliable brand

MARKS

4

(2, 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.

- (a) Which method is likely to yield a more accurate measurement? Explain briefly.
 (b) 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.

- (a) 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)
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Method preferred

- (b) 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)
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More or Less