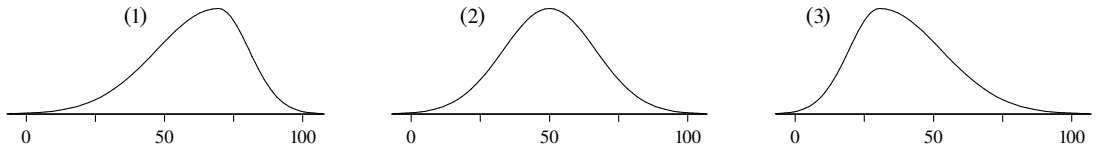
4. Below are sketches of the histograms for three data sets.

(a) In scrambled order, the averages are: 40, 50, 60; match the histograms with the averages.

(b) The standard deviation of histogram (3) is closest to: 5, 15, 50? Choose one option and explain briefly.

MARKS (c) The standard deviation of histogram (1) is *a lot* smaller than that of histogram (3): **True** or **False**? Explain briefly.

3
(1, 1, 1)



(a) (2) has average 50 by *symmetry*; (1) has average 60 and (3) has 40 because the average of (1) is *greater* than the average of (3).

(b) S.d. of (3) is closest to 15, because the 'average' deviation from the average is clearly more than 5 but less than 50.

(c) **False** – the two distributions are *mirror images* of each other and so have closely *similar* standard deviations.

5. Both the following small data sets have the same average of 50. Which one has the *smaller* standard deviation and why? Explain on the basis of an examination of the data **without computation**.

MARKS
2

(1) 50, 40, 60, 30, 70, 25, 75;

(2) 50, 40, 60, 30, 70, 25, 75, 50, 50, 50.

Standard deviation is $\sqrt{\text{'average' squared deviation from the average}}$.

2
Data set

Data set (2) has the smaller s.d. – the first 7 observations are *identical* and its three additional observations are all *at the average* (50); they therefore contribute *no further* deviation, but the *larger* number of observations (10 rather than 7) makes the 'average' deviation *smaller.*

6. For about 700 students in the course Statistics 2 at the University of California, Berkeley, in the Fall of 1975, the average number of university mathematics courses taken (other than Statistics 2) was about 1.1, with a standard deviation of about 1.5. Would the *distribution* of the number of mathematics courses (other than Statistics 2) taken by these students look more like (1) or (2) or (3)? Explain your reasoning briefly.

MARKS
2

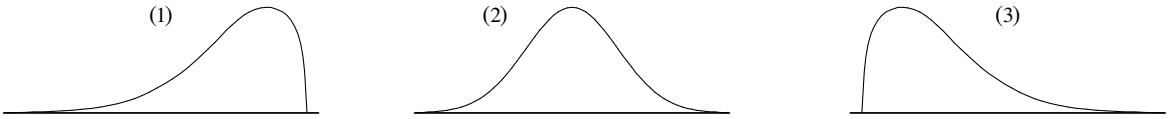


Diagram number (3): because the standard deviation (1.5) is *greater* than the average (1.1) and a student cannot take a *negative* number of mathematics courses, their long left tails rule out Diagrams (1) and (2). Also, Diagram (3) has the expected sharp *left* cut-off, presumably at zero mathematics courses.

3
Diagram number