

**15** Bottles of Fizzipop nominally contain 330 ml of drink. A consumer affairs researcher collects a random sample of 55 bottles of Fizzipop and records the volume of drink in each bottle.

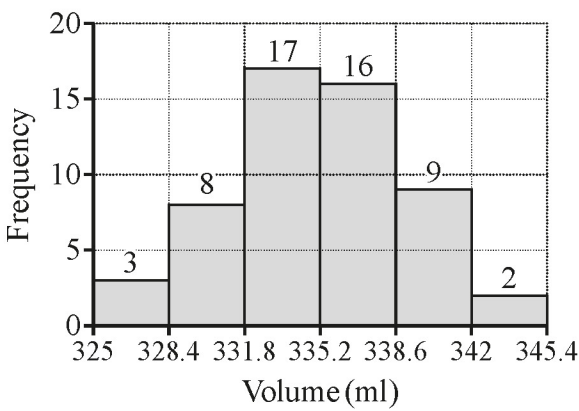
Summary statistics for the researcher’s sample are shown in the table.

$n$	55
$\sum x$	18 535
$\sum x^2$	6 247 066.6

- (a) (i)** Calculate the mean volume of drink in a bottle of Fizzipop. **[1]**

**(ii)** Show that the standard deviation of the volume of drink in a bottle of Fizzipop is 3.78 ml. **[1]**

The researcher uses software to produce a histogram with equal class intervals, which is shown below.



- (b)** Explain why the researcher decides that the Normal distribution is a suitable model for the volume of drink in a bottle of Fizzipop. **[2]**

**(c)** Use your answers to parts **(a)** and **(b)** to determine the expected number of bottles which contain less than 330 ml in a random sample of 100 bottles. **[3]**

In order to comply with new regulations, no more than 1% of bottles of Fizzipop should contain less than 330 ml.

The manufacturer decides to meet the new regulations by adjusting the manufacturing process so that the mean volume of drink in a bottle of Fizzipop is increased.

The standard deviation is unaltered.

- (d)** Determine the minimum mean volume of drink in a bottle of Fizzipop which should ensure that the new regulations are met. Give your answer to **3** significant figures. **[3]**

The mean volume of drink in a bottle of Fizzipop is set to 340 ml. After several weeks the quality control manager suspects the mean volume may have reduced. She collects a random sample of 100 bottles of Fizzipop.

The mean volume of drink in a bottle in the sample is found to be 339.37 ml.

- (e) Assuming the standard deviation is unaltered, conduct a hypothesis test at the 5% level to determine whether there is any evidence to suggest that the mean volume of drink in a bottle of Fizzipop is less than 340 ml. [7]