

Activity sheet 4: Milk bottle wastage

This activity is an example of how a process can be modelled. The problem is about milk bottles and their journeys to and from the dairy.

If there are 1000 bottles and there is an 80% chance of any one bottle making it back to the dairy, how long does a bottle last?

Approach this problem by trying to work out the average number of trips a bottle makes. Load the spreadsheet file **M3j Milk bottles.xls**.

Model construction

- 1 The bottle has an 80% chance of survival on each trip, so it survives, on average, 8 trips in every 10. This can be represented on the model, using the `RANDBETWEEN(1,10)` function where 1 to 8 represent an unbroken bottle and 9 and 10 represent a broken bottle.
- 2 Using an IF statement, you can return a 1 for unbroken and a 0 for broken, depending on the random number generated. For example:
`=IF(RANDBETWEEN(1,10)>8,0,1)`.
- 3 By summing the returns along row 13 you can calculate an average in A15.
- 4 You can construct a graph of the results and use the <F9> to restart the simulation over and over again.

Using the model

- 1 *What hypotheses can you make before you start the simulation?
What do you expect the average number of trips to be?
What is the maximum time you could reasonably expect a bottle to last?
In theory, how long could this be?*
- 2 *What does it tell you about the average number of trips, the number of times 10 trips, 12 trips, 15 trips are achieved?*
- 3 *How successful is the model for modelling the process?*
- 4 *How much variation is there? What are the extreme values?*
- 5 *What does the graph show? Explain its shape/form.*
- 6 *What does the model tell you? What doesn't it tell you? How could it be improved?*

Note: It can be shown mathematically that the average number of trips is four.