

# The money in milk

---

## Annotation

Ben uses a probability experiment to explore a chance situation that is presented to the class. He links his experiment to a theoretical model and uses his findings to evaluate the reasonableness of another student's claims. Ben can explain whether an advertising claim is misleading and shows an appreciation of the reasons why probability might be used in a particular way.

## Problem: The money in milk

The local supermarket is conducting a new promotion. Some bottles of milk have instant prizes printed on the inside of their lids. The advertisement in the paper says "One in three bottles is an instant winner!"

The teacher asks the students: "How many bottles of milk do you think we'd have to buy to win a prize?" Marco says: "If you bought three bottles, you'd be sure to win a prize." The teacher challenges the rest of the class to explore the situation and see if they agree with Marco. The teacher asks the students to record their ideas and their reasoning and asks:

*Is the advertising for this promotion misleading?*

## Student Response

Ben's work sample is as follows:

## One in three bottles of milk problem by Ben

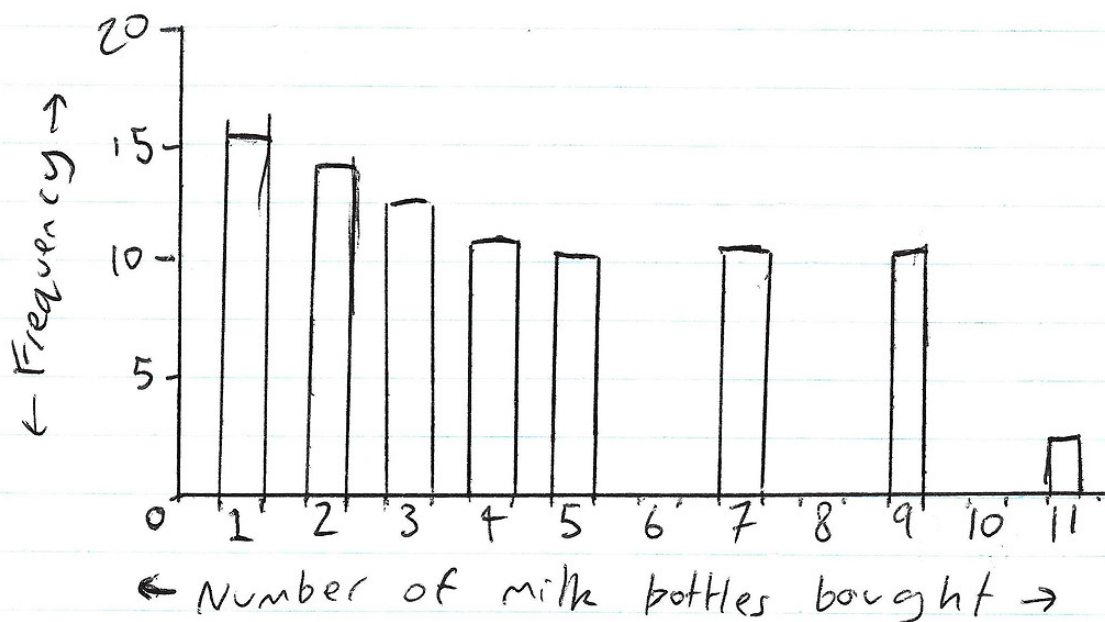
It seems like if you bought three bottles of milk one should have a prize in the lid, because one in every three bottles they are making has a prize lid.

But, if you think about them making hundreds of bottles and putting them in rows and putting the lids on then if you grabbed three from one row they might all have prizes in them or all not have prizes in them, so to be sure of a prize you'd have to grab more than three bottles.

It is hard to work out how many more with numbers so I decided to try doing it by pretending something was milk bottle lids. One in three is a third chance, so I chose a die: out of the six numbers on a die, two would be a third so I made one and two prize milk bottle lids and three, four, five and six not prize bottle lids. When I rolled the die I counted it as a milk bottle bought, and I kept rolling until I got a 'prize lid number' (one or two). Sometimes it came up on the first roll (so one bottle bought), but sometimes it took more than ten rolls for a one or a two to come up (so ten bottles bought).

My results are on this bar graph

Number of milk bottles bought to get a prize



From this graph it looks like there is a pattern. You might get a prize if you buy only three bottles like Marco said, but if you want to be sure, then buying six makes it much more likely. You still might not get a prize at all because theoretically you could buy 100 bottles and still not get a prize - when it's only a chance of a prize you can't be guaranteed one, but it is not very likely that out of 100 bottles there wouldn't be one prize, because a one in three chance is quite frequent and according to the numbers in 100 bottles there should be about 33 prizes.

The advertising is not exactly wrong, it just makes it sound like if you buy three bottles you will win a prize, when what they mean is that out of the thousands of bottles they make, one third has a prize on the lid. So the three particular bottles you buy might not have a prize. They are trying to get you to buy more milk, like getting an extra bottle that you don't need yet to see if it has a prize in it.