Notes for parents (1).

The purpose of the activity is to help your child to:

- Investigate a situation that involves chance
- Find the chance of something happening by a trial or by making a model

Here is what to do:

It will be wise to have a calculator handy for tricky calculations. However, expect your child to estimate the cost of a piece of cheese before using the calculator.

Read the problem statement together and discuss what is required.

How much do you have to spend on the cheeses?
Your child should notice that $30.00 – $5.00 = $25.00 is available.

How much weight of cheese in total will you be able to buy?
The prices of the cheeses vary but $20.00 is a reasonable average. Expect your child to estimate that they can buy a bit over 1 kilogram, unless they opt for cheaper or dearer cheeses than the average.

How many grams are in 1 kilogram?
They should know that 1000 grams equals 1 kilogram ('kilo' means one thousand).

About how many grams can you buy?
1200 grams is a good amount. Expect your child to allocate this weight among different cheeses. For example, they may decide that 200 grams of each cheese will work. You might ask how much cheese that is and visit the refrigerator to check. 200 grams is a good-sized piece for people to cut from.

However, encourage them to go for different weights to make the problem more challenging. After all Blue Vein is not everyone's cheese of choice.

How will you work the cost of each piece of cheese?

How will you keep track of the total cost?

Calculating the cost of each piece requires multiplication of the weight, as a decimal of 1 kilogram, and the cost per kilogram. For example, a 250 gram slice of Gouda costs 0.25 x $25.6. Ask your child to estimate the cost before using a calculator.

Notes for parents (2).

For example, 250 grams is one quarter of a kilogram, so the cost should be about one quarter of $26.00 which is $4.50. Establish some benchmarks to estimates, such as 200 grams is one fifth of a kilogram, 500 grams is one half, etc. Even after using the calculator ask if the cost looks reasonable. It is easy to make entry errors on a calculator and not notice.

It is unlikely that the total cost of the cheese will be exactly $25.00. If the total is too high then your child will need to adjust what they are buying.

What can you do to be within the budget?

They could reduce the weight of one or more cheeses or swap an expensive cheese for a cheaper one. Before totalling the cost of the various cheeses ask your child it they think they are within the budget. Look for:

Do they 'give and take' among the costs to see if the balance is below the average?
Do they round amounts up and down appropriately to estimate the total cost?

First card	Second Card	Third Card	Free Burger?
M	L	M	No
R	R	M	No
M	R	L	Yes
R	L	L	No
L	M	L	No
L	M	R	Yes
R	L	R	No
M	R	M	No
L	L	M	No
M	M	M	No
R	M	R	No
L	R	M	Yes

Ask questions like:

How often do we get a free burger? (As a fraction, about three in twelve tries).

How many trials should we do to get a good idea of the chances of a free burger? (The more trials you do the more confidence you can have in the result).

Write down the winning outcomes; MRL, LMR, LRM.

Are there other ways to win? (There are six orders LMR, LRM, MLR, MRL, RLM, RML though the combination of cards is the same).

Notes for parents (3).

After you think there is enough data from the trial ask your child to create a model of all the possible outcomes, that is the way that three cards can be drawn. A tree diagram is a good way to organise the outcomes:

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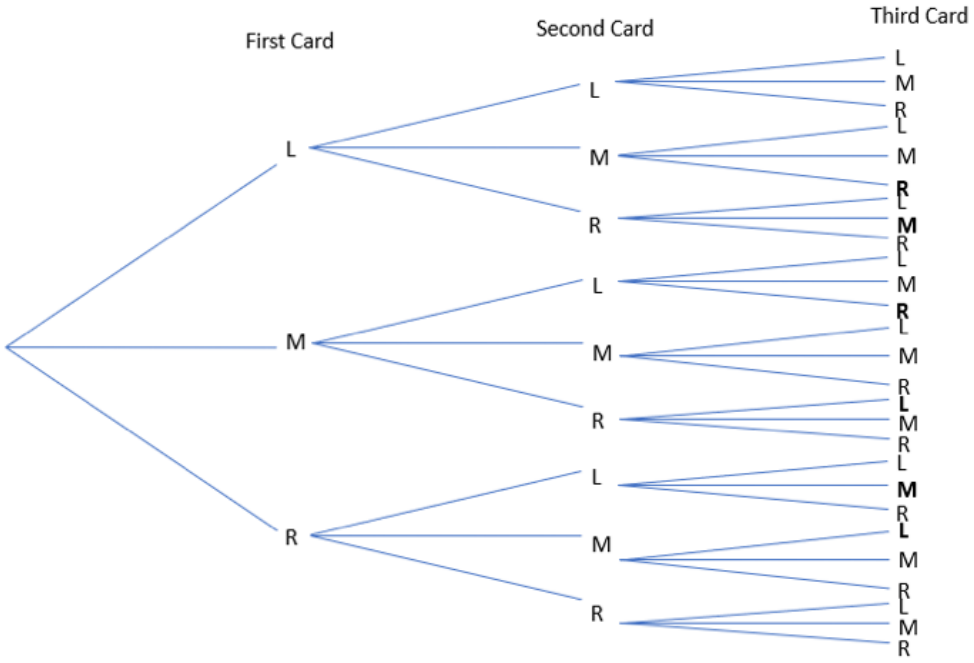
Write down the winning outcomes; MRL, LMR, LRM.

Are there other ways to win? (There are six orders LMR, LRM, MLR, MRL, RLM, RML though the combination of cards is the same)

After you think there is enough data from the trial ask your child to create a model of all the possible outcomes, that is the way that three cards can be drawn. A tree diagram is a good way to organise the outcomes:



The bold end letters show outcomes that are three different cards. Note that the combination of LMR is the same but the orders of selection are different, e.g. LMR is not the same outcome as RML. The theoretical chances of getting three different cards are only six out of 27 (3 x 3 x 3) possible outcomes. That is less than one quarter.

Notes for parents (4). Activity next page.

Points to note:

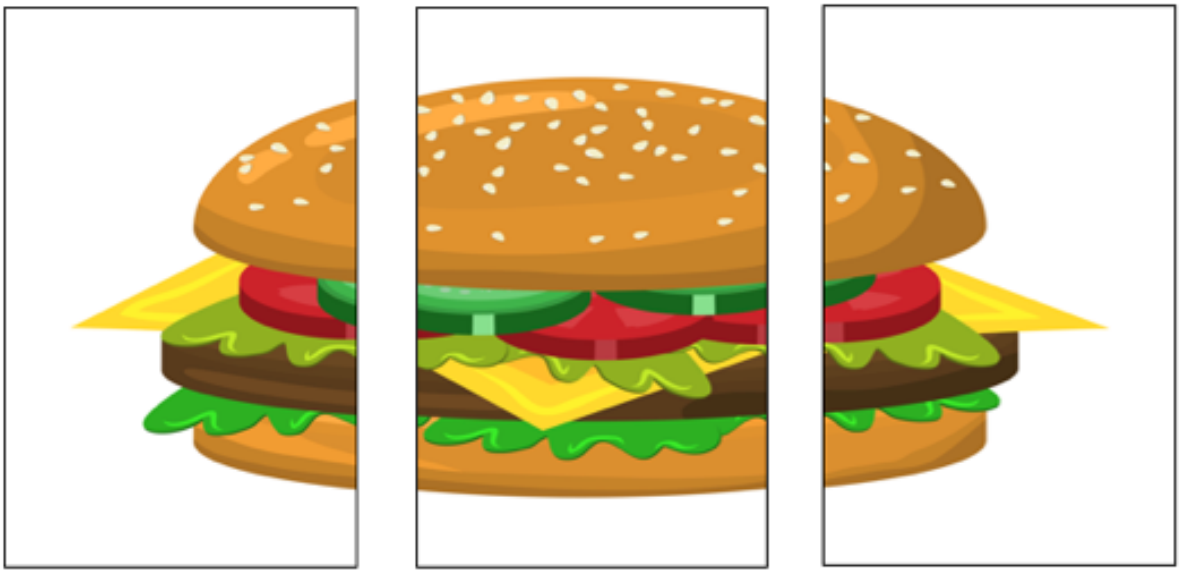
Probability is one of the most difficult topics in maths. Partly due to beliefs that influence people's perception of chance. For example, believing you are a lucky person influences your predictions for successfully getting three different cards.

Immediate success or failure is likely to influence perceptions. If the first three trials are 'no free hamburger' then children tend to expect to see fails after that. Conversely if the first three trials are 'free hamburger' this result is likely to colour further expectations.

Another reason that probability is hard is that it involves thinking in proportions not differences. If the trial results show three 'free hamburger' results to nine 'no' results then children need to represent the chances as fractions, decimals or percentages (3/12 = ¼ = 0.25 = 25%). This allows them to predict other results, such as if 36 trials were held about ¼ of 36 = 9 outcomes would be 'free hamburger'.

Finally, predictions based on a theoretical model of outcomes only loosely predict results. Trialling involves accepting variation due to randomness. In the trial of 36 three-card selections the probability of free hamburger might be 2/9. But the results are likely to vary from 2/9 of 36 = 8 'free burger' outcomes.

If you buy a burger at Billie's you get one of these cards.



You don't know which card you will get as Billie puts equal numbers of each card with her burgers.

If you get one of each card you get a free burger. Yum!

Imagine you buy three burgers.

What are the chances that the fourth burger will be free?