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Choosing a biscuit

What is mathematical about choosing a biscuit? We asked parents during one of our workshops. Here is a summary of what they told us...

Children may choose a biscuit according to size, surface area, shape, colour, volume, weight, and density of biscuits. There are opportunities to talk about the differences and relationships between these concepts. Sometimes a choice is made based on how rare a biscuit is - the rarer the biscuit, the more valuable or desirable it may be, which in turn introduces concepts of supply and demand (How many biscuits are in a pack? How many biscuits have been eaten so far? How many people want to eat the biscuits? Who do I have to share the biscuits with?). This also relates to probability (What is the likelihood of the biscuit being there later if I don't eat it now?). If children have to share biscuits they may be thinking about subtraction, division, multiplication and fractions, particularly if there are not enough biscuits to go around, or if the amount of biscuits they can have is limited. The ratio of a chocolate layer to a non-chocolate layer may be an issue too. Children may prefer the flavour of smaller biscuits, but may take a larger biscuit if they are hungry, which again introduces proportion or ratio. Some children may estimate the number of biscuits in a packet (e.g. by feeling them in the shop) and compare the weight and size of the packets. Parents may be interested in the biscuits' nutritional information and the amount it costs to buy a packet (and if children know the price of biscuits they may prefer the more expensive ones).

Going for a walk

What is so mathematical about going for a walk and finding a rope swing? This is what parents told us...

One parent went for a walk with their child and found a rope swing hanging from a tree. There were opportunities to talk about what makes the rope swing from side to side (e.g. by introducing forces, vectors, weight, etc.). There were also opportunities to talk about the difference between precise mathematical models taught in the classroom and the differences people experienced in the real world. For example, the rope swing could be thought of as a pendulum. When you swing a pendulum you expect the pendulum to swing to the same height each time. However, the reality of the ropes' swing was such that it did not swing to the same height. Estimation could be introduced (e.g. the gap between the floor and rope, etc.) and potential talk about how kinetic energy is converted during the movement of a swing. Parents and children can make use of concepts and measurements to come to an understanding of the world even if they do not do the sums. For example, parents and children can talk about the relationship between different forms of measurement in relation to rolling down a hill (how the speed of a roll is related to the gradient and size of the hill). The time it took to walk home became a topic of discussion. Surveying the land and identifying landmarks (trees etc.) helped people gauge how far they had come, and how much further they had to walk. Because the route was downhill the child estimated that it would be quicker to get back. This introduced basic arithmetic around time and distance and the relationship between different natural objects in the environment. There was also talk about perspective and relative height (How tall is the tower? How much taller is the tower than the tree? How much taller is the tree in relation to me?).

Swimming

Parents shared ideas of how they could use mathematical thinking when swimming.

It is possible to estimate and measure the depth and length of the pool (in both feet and metres), the amount of water in the pool, how much energy is needed to heat the pool up, and how hard a swimmer has to work to keep warm. Swimmers can find out how tall they are in relation to the depth of the pool, and find the point where they can no longer touch the bottom. The size and shape of floats can be explored (how much water each float absorbs, how heavy they become, how fast they shoot out of the water when they are emerged etc.) and conversations can be had about why things float (e.g. relating shape to density). Swimmers can explore how many lengths they can swim in a certain time frame, or until they run out of energy. They may count the number of lifeguards, and estimate the lifeguard to swimmer ratio. Some may play games involving numbers, such as the amount of times a width can be swam without the swimmer needing to hold onto the rail, or how far somebody can travel whilst holding their breath. Swimmers in lanes need to take account of who is in front and behind them, and not swim too fast or too slow otherwise swimmers may get kicked. Swimmers may explore the patterns they make in the water when the swim different strokes.

Practical concerns include the size of the changing cubicle, how much it costs to swim and whether or not the person has the right change for the locker, how many lockers there are, and the proximity to the changing cubicle.

Cooking

Parents talked lots about the mathematics involved in cooking...

This included purchasing the ingredients (e.g. choosing the ingredients based on freshness, size, cost, and ensuring that they had enough money at the till), estimating how many ingredients were needed (e.g. based on the number of people eating), and how to divide (or cut up) ingredients such as mushrooms. The amount of time needed to cook was discussed, and so was calculating the number of knives and forks needed for the dinner table. Parents talked about portion sizes (especially if those parents were monitoring weight) but also how much food to give to each person depending on age (young children needed less food than adults). Children enjoyed mixing the ingredients and were taught to spot for things like consistency of sauces, lumps in gravy, and how runny a cake mix was. If children were baking cakes they needed the right amount of cake mixture in each tin otherwise the mixture might burn or be undercooked. Food portions – especially pizzas – were understood in terms of fractions (e.g. ¼ of a pizza for each person) but could also be talked about in terms of percentage.Children who didn't like vegetables sometimes negotiated to eat less of them, and children sometimes helped with the washing up and needed to know how much washing up liquid to use, and how to dry the knives and forks properly using a tea towel (e.g. they had to wipe the whole surface to dry it).

Even when children were not cooking/washing up, having dinner was sometimes framed in terms of time. For example, children were given a certain amount of time to play video games or do homework before dinner, and had to be sat on the table promptly when it was ready

Whittling wood

One parent described how her daughter was making a magic wand by whittling (carving) wood. Where is the maths in whittling wood?

The act of whittling can be thought of in terms of the force or pressure exerted to carve the bark from the wood. The angle with which you hold the knife and wood is also important – pointing the wood to the floor and whittling is easier than whittling upwards. Risk and probabilities are introduced as well – the whittler has to consider how much force is required before the wood breaks. This leads to consideration of density, size (thickness), age of the wood and how brittle the wood is. The size of the knife is also important and this relates to time – a small knife could take much longer than a long knife, particularly if the wood is thick. Balance was linked to wand aesthetics – a wand with a balanced weight had a better "feel" than a wand which was heavy at the end. Shape influenced weight, and the choice of wood depended on its size, bends, angles, curves, gradients and tapers. The balance and feel of the knife was also important consideration – a good knife is understood in terms of its handle-to-blade ratio, and consideration can be given to the weight of the handle vs. the weight of the blade.

The texture of the wood can also be understood mathematically. There can be a smooth or rough feel to the wand which is linked to the distribution of the grain of the wood (which can be made smooth by sanding). Wood (and the feeling of it) can be classified according to a rough-smooth continuum. The different angles and sizes of the grain make it feel rough, whereas sanding the grain makes it the same. Rubbing the grain with your hand results in friction, and the more force applied the greater the level of friction.

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