

Mathematics in the New Zealand Curriculum Second Tier

Strand: Statistics

Thread: Probability

Level: One

Achievement Objective: Investigate situations that involve elements of chance, acknowledging and anticipating possible outcomes.

Exemplars of student performance:

Exemplar One: Terri predicts that either heads or tails might come up in a coin tossing experiment. She says that she cannot know which outcome will come up with one toss (i.e. T accepts randomness). Terri records the results of 20 coin tosses using a tally chart. She notes the absolute difference, e.g. "There are two more tails than heads," and believes that if two heads come up in a row that the next toss is likely to be heads as well or that the next throw must be heads to "fix the pattern." (i.e. Terri does not accept independence of each throw).

Exemplar Two: In an experiment rolling a standard dice, Kynan recognises that the numbers 1, 2,3,4,5, and 6 might come up, and that any of these numbers are possible with a given toss. He is unsure about which number would come up the most in many tosses but suggests that six may be "luckier" than the other numbers. After tossing the dice 30 times and recording his/her results Kynan revises his pre-conceptions in response to the results, e.g. "Three came up the most. It could be the lucky number on this dice."

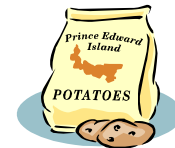
Exemplar Three: Leilani's teacher has asked her to predict what she might eat for dinner that night. She is given several pictures of food items such as carrots, bread, steak, weetbix. Leilani is able to place the items on a "likely, maybe, unlikely" continuum and justify why she thinks some foods are more likely than others, e.g. "We have potatoes nearly every night."



Unlikely



Maybe



Likely

Important teaching ideas

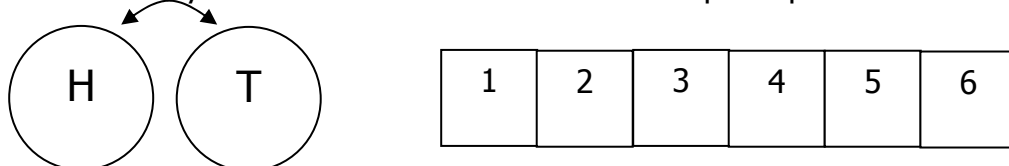
At Level One students learn to question their subjective predictions about outcomes by comparing these predictions to the actual outcomes of events. This may happen through predictions about daily events, e.g. "It will rain today because it is sports day," or contrived events, e.g. "If you want a six to come up the dice never shows six." Challenge students through comparing the actual outcomes of events with their predictions. For example, students who believe six is harder to get than other dice numbers are asked to explain why it comes up about the same frequency (number of times) as other numbers and that the frequencies vary. Note that trial can sometimes confirm the subjective judgments, e.g. six does come up fewer times than other numbers.

The focus at level one is to get students to consider the possible outcomes of situations involving elements of chance, especially those from their daily life. Examples might be getting what you want for your birthday, getting stopped at the traffic lights, how many lollies you get at the lolly scramble, winning at sport, and getting your favourite sandwiches for lunch. Students will have ideas about chance developed from their experiences, e.g. "Mum says we will never win Lotto."

Simple one-stage events such as tossing a coin or dice, and using a spinner are useful in helping students realize that in most situations a limited number of outcomes are possible. It is important that the experiments present strong visual cues for establishing all the outcomes and involve the students in "here and now" decisions that matter to them, e.g., "If a 1, 2, or 3 come up we go swimming early."

Challenge students' personal beliefs about likelihood. Use experiments that cannot be determined theoretically as well as those that can. For example, consider the chances of a plastic bottle top landing flat side up or tossing a coin to decide whether boys or girls go outside first. The bottle top experiment must be determined experimentally, by actually tossing the bottle top many times, while the results of many coin tosses can be predicted using a model of all the outcomes. There are two faces on the coin, just like there are six numbers on a dice and each face/number has the same chance of coming up, assuming the coin is fair.

Model visual ways to record all the outcomes for simple experiments:



Tally charts provide a useful recording strategy for recording the results of simple experiments. Students at this level need to develop ideas about equality and difference between displayed frequencies by counting, e.g. "There are more fives than fours."

	1	2	3	4	5	6	
		/		/		/	

Compare and contrast the results from the students. Highlight the variation between trials of the same experiment, e.g. A gets an ace, M gets a three, Z gets a three as well. Encourage students to recognize that variation occurs naturally. Increase the number of trials, each choose a card ten times, and consider the variation in both the number of each card selected and the order in which they are selected.

Develop the vocabulary of probability by discussing the outcomes. Use words such as “chance,” “might,” and “likely” to compare the outcomes of events and to predict outcomes. Apply these ideas to the everyday lives of your students such as the chance of the weather being windy on kite day, the chance of all twenty pieces of corn popping, or the chances losing a tooth this week. Encourage students to rank potential events in order of likelihood, such as being driven to school, walking or catching a bus. Certainty and impossibility are difficult concepts for students at this level. Applying words such as “never” and “always” to everyday events will help develop these ideas.

Useful resources

nzmaths units of work:

<http://www.nzmaths.co.nz/statistics/node/127> (Probability: No Way Jose)

<http://www.nzmaths.co.nz/statistics/node/128> (Probability: Lonely Pig)

Learning objects:

<http://www.tki.org.nz/r/digistore/protected/objects/?id=115&vers=1.0>

<http://www.tki.org.nz/r/digistore/protected/objects/?id=116&vers=1.0>

Refer also to the probability supplement in Topic Based Mathematics 1 (If available)