Example Context Elaboration: Independent Probabilities

Focus: Calculate probabilities

Achievement objective S8-4

In a range of meaningful contexts, students will be engaged in thinking mathematically and statistically. They will solve problems and model situations that require them to:

Investigate situations that involve elements of chance:

A calculating probabilities of independent, combined, and conditional events

B calculating and interpreting expected values and standard deviations of discrete random variables

C applying distributions such as the Poisson, binomial, and normal

Independent options

Graham and Samantha turn their attention to tossing two dice, one red, one blue, considering the two events

Event A: a five turns up on the blue die

Event B: a three turns up on the red die.

They consider whether these two events are independent, realising that we would not expect the outcome of tossing the red die to affect the outcome on the blue die.

They calculate the probability of event A occurring, event B occurring and both events occurring simultaneously P(A B), and notice that P(A). P(B) = P(A B).

They then consider Event T: the total on the two dice is eight, and whether events A and T are likely to be independent, that is, is the blue die is likely to affect the probability of the total score.

They calculate P(T) = 5/36, and P(A T) = 1/36 and note that P(A). P(T) ≠ P(A T).

The idea could be extended to

P(A|B) = P(A)	B has no effect on A
P(B|A) = P(B)	A has no effect on B

Further examples could be made using data found on Statistics NZ. http://www.stats.govt.nz/, for example, employment data.

Students could test ethnicity and whether they are employed or not. Find P(Employed/Ethnicity=X). Do employed and ethnicity seem to be independent?