 Conducting a binomial experiment

Part A – a binomial experiment

Students are to conduct a binomial experiment with the class, investigating a known statistic and determining whether this is represented in the class population. This is an opportunity to informally explore the characteristics of binomial random variables.

Potential population proportions/statistics

Technology use: Source: [Australian Bureau of Statistics, Household Use of Information Technology, Australia, 2016-17](https://www.abs.gov.au/ausstats/abs@.nsf/mf/8146.0?OpenDocument)

See downloads, Persons use of the internet, for use of internet by age. E.g. 15-17 year olds.

* Internet connection at home: 0.86 (include through a phone)
* 15-17 year olds who have used the internet in the last 3 months: 0.98
* 15-17 year olds who have used the internet in the last 3 months for social networking: 0.932
* 15-17 year olds who have used the internet in the last 3 months for a purchase: 0.605
* 15-17 year olds who have used the internet in the last 3 months for health services: 0.186

Population demographics NSW 2016: Source: Australian Bureau of Statistics, [2016 Census](https://quickstats.censusdata.abs.gov.au/census_services/getproduct/census/2016/quickstat/1?opendocument).

* Proportion of males: 0.493
* Proportion of Aboriginal and/or Torres Strait Islander people: 0.029
* Married: 0.487
* Born in Australia: 0.655
* Both parents born overseas: 0.37
* Both parents born in Australia: 0.454
* English only spoken at home: 0.685
* Less than 5 hours of unpaid domestic work per week: 0.223
* Live in an apartment: 0.199
* 3 bedroom residence: 0.372
* Rented residence: 0.318
* 2 cars registered to the residence: 0.341

1. Collect corresponding class statistics.
2. Compare and contrast the class statistics verse the population.

Part B – modelling binomial probability

Using the binomial data collected Part A: A binomial experiment, students create a series of probability questions. The datasets and questions will be distributed to the class and students will solve the problems constructed by their peers.

1. Students choose or are distributed a binomial statistics for the wider population.
2. Students construct probability questions based upon the binomial statistic for the wider population. Questions should include:
   * A simple problem concerning a single outcome.
   * A problem concerning a range of outcomes.
   * A problem involving a complementary relationship.

Sample questions for social media internet access in the last 3 months: 30 people are chosen from the population of 15-17 year olds, what is the probability that:

* + Exactly 28 accessed the internet for social media.
  + More than 28 accessed the internet for social media.
  + At least 3 accessed the internet for social media.

1. Students to construct worked solutions for their questions.
2. In groups, students solve the problems constructed by their peers.
3. In groups, students compare answers and discuss any difference to form their best solution.

Part C – mean and variance of a binomial distribution.

Using the binomial data collected Part A: A binomial experiment, students create a series of probability questions regarding expected value and variance. The datasets and questions will be distributed to the class and students will solve the problems constructed by their peers.

1. Students choose or are distributed a binomial statistics for the wider population.
2. Students construct a probability questions based upon the expected value and variance for their binomial statistic.

Sample questions for social media internet access in the last 3 months: 30 people are chosen from the population of 15-17 year olds, what is:

* + Expected number of people who accessed the internet for social media?
  + The variance in the number of people who accessed the internet for social media?

1. Students to construct worked solutions for their questions.
2. In groups, students solve the problems constructed by their peers.
3. In groups, students compare answers and discuss any difference to form their best solution.