

Question 1: As part of his statistics project, Henry approached the first 100 students he saw one day on Sproul Plaza and found out the school or college in which they were enrolled. There were 33 men in his sample.

1.1 Was Henry's sampling procedure like taking a random sample, or not?

1.2 Should we trust the 33% as an estimate of the proportion of men at Berkeley?

Question 2: Sam got a job as a data scientist at Monsanto corporation, working to develop new lines of rice that combine high yields with resistance to disease and insects. His technique involves crossing different lines to get a new line which has the most advantageous combination of genes. One project involved breeding new lines to resist the deadly purple plant hopper (an insect).

There are two plant traits that influence resistance, which Sam named Strong and Fierce. If a line has both, it is fully resistant; if it has one or the other but not both, it is partially resistant; if it has neither then it is non-resistant." 374 lines were raised, with the results shown below:

Category	Number of lines
Both Strong and Fierce	97
Either Strong or Fierce	184
Neither Strong nor Fierce	93

According to Monsanto's model, the traits are independent, and each line has a 50% chance of being Strong, and a 50% chance of being Fierce. Sam wants to test whether the facts are consistent with this model.

2.1 What is Sam's null hypothesis?

2.2 What is Sam's alternative hypothesis?

2.3 What is a good test statistic?

2.4 How will Sam determine his p-value, given this test statistic?

Question 3: Mariah is doing research on kangaroos. She believes that feeding them a vitamin supplement will help them learn to navigate a maze faster. To test whether this is true, she divides up 20 kangaroos into 10 pairs. In each pair, one kangaroo is selected at random to receive the vitamin supplement, the other is fed a normal diet. The kangaroos are then timed as they run the maze. In 7 of the 10 pairs, the treated kangaroo runs the maze more quickly than its untreated partner.

Mariah wishes to determine whether the vitamin supplement helped, or whether this was just chance variation.

3.1 What is Mariah's null hypothesis?

3.2 What is Mariah's alternative hypothesis?

3.3 What is a good test statistic?

3.4 How will Mariah determine her p-value, given this test statistic?

Question 4: One of Mendel's pea breeding trials came out as follows. As in all his models, the category of a particular plant is random and unaffected by other plants.

Type of pea	Observed Number	Expected Number
Smooth yellow	315	313
Wrinkled yellow	101	104
Smooth green	108	104
Wrinkled green	32	35

Do you think the data were fudged to look more like the expected distribution?

4.1 What is your null hypothesis?

4.2 What is your alternative hypothesis?

4.3 What is a good test statistic?

4.4 How will you determine your p-value, given this test statistic?