

Section 1: Introducing hypothesis testing

Exercise level 2

1. A school estimates the probability that a student gets an A or B pass in a Statistics exam to be 0.4. The school appoints a new teacher, who has never taught statistics before. The Head of Maths is concerned that the A and B pass-rate may decrease. Although all students passed in the following year, out of a group of 19 students only 2 got an A or B grade. Comment on the Head of Department's concerns, by using a hypothesis test with a 5% significance level.
2. A coin is tossed 8 times and 6 heads come up. Test at the 5% significance level the hypothesis whether the coin is biased towards heads.
3. Repeat question 2 when the results give 12 heads from 16 throws of the coin.
4. The probability that a certain type of seed germinates is estimated to be 0.75. A new batch of seeds is produced which appear to have a lower probability. To check this, a sample of 16 seeds is tested and 8 germinate. Is this evidence, at a 5% significance level of a reduction in the probability?
5. Using recent data provided by the low-cost airline Brianair, it is estimated that the probability that a passenger loses his suitcase on a flight is 0.05. From newspaper reports I think the figure is higher. On 25 different occasions I take a flight with Brianair. My luggage does not arrive on 3 occasions. Using a hypothesis test, with a significance level of 5%, does this data confirm my suspicions?
6. Over a long period of time, it is found that a particular bus service is on time in 80% of journeys. The bus company claims that it has made improvements to the service and that the bus is now on time more often. I decide to test this at the 5% significance level.
 - (i) Write down the null and alternative hypotheses that I should use. In my next 10 journeys, the bus is on time every time.
 - (ii) Find the p -value for this hypothesis test.
 - (iii) What is my conclusion?
 - (iv) Explain why this hypothesis test is unfair on the bus company, and state how many journeys I need to make so that it is possible that the null hypothesis could be rejected using the same significance level.