# Single Statistics – Discrete Hypothesis Testing

Remember to use calculate the probability of what you have seen and anything more extreme.

1. Find the critical values for the following tests.

   (a) $H_0 : p = \frac{1}{2}$,
   $H_1 : p < \frac{1}{2}$.
   $\alpha = 5\%$. $n = 30$. 10

   (b) $H_0 : \lambda = 3$,
   $H_1 : \lambda < 3$.
   $\alpha = 10\%$. 0

   (c) $H_0 : p = \frac{1}{4}$,
   $H_1 : p > \frac{1}{4}$.
   $\alpha = 1\%$. $n = 20$. □

   (d) $H_0 : \lambda = 5$,
   $H_1 : \lambda > 5$.
   $\alpha = 1\%$. □

   (e) $H_0 : p = 0.3$,
   $H_1 : p \neq 0.3$.
   $\alpha = 10\%$. $n = 10$. □

   (f) $H_0 : \lambda = 7$,
   $H_1 : \lambda \neq 7$.
   $\alpha = 8\%$. □

   (g) $H_0 : p = \frac{1}{3}$,
   $H_1 : p \neq \frac{1}{3}$.
   $\alpha = 10\%$. $n = 50$. □

   (h) $H_0 : \lambda = 10$,
   $H_1 : \lambda \neq 10$.
   $\alpha = 1\%$. □

   (i) $H_0 : p = 0.7$,
   $H_1 : p > 0.7$.
   $\alpha = 15\%$. $n = 10$. □

   (j) $H_0 : \lambda = 9$,
   $H_1 : \lambda > 9$.
   $\alpha = 5\%$. □

2. In Iceland 60% of the population are women. Simon claims that this is not the case.

   Out of a sample of 30 people, 22 are women. Carry out a test at the 10% significance level whether Simon's claim is correct.

   Find the critical values for the test.

3. In a game a dice is rolled. James claims that the dice is giving too many sixes.

   Set up a hypothesis test to test this claim at the 5% level.

   When the dice is rolled 14 times it gives 5 sixes. Is James' statement justified at the 5% level?

   Find the critical region.

4. Gareth claims he is psychic. When shown cards from a regular pack of cards he states he can pick the correct suit more often than expected.

   Set up a hypothesis test at the 10% level to test this claim.

   In an experiment of 20 cards he picks the correct suit 7 times. Find the critical value/values.

5. The number of misprints on the front page of a newspaper is found to have Poisson distribution with mean 6.5. A new proof reader is employed and shortly afterwards the front page is found to have 12 misprints. The editor says the number of misprints has increased. Test this claim at the 5% level.

6. The number of breakdowns in a computer follows a Poisson distribution with a mean of 4.5 per month. A new computer is installed and in the first month there are 2 breakdowns. Test, at the 5% level the claim that the mean has decreased.

7. The number of flaws per 100m of fabric is known to follow a Poisson distribution with mean 2. A 200m length is tested and 7 flaws are found. Test at the 5% level whether the mean has increased.

8. In a company, breakdowns occur on a particular machine at an average rate of 3 per month. Assuming that the number of breakdowns follows a Poisson distribution, find, to 3dp, the probability that:

   (a) exactly 2 occur in particular month

   (b) more than 12 occur in a 3-month period

   (c) exactly 2 occur in each of 3 successive months

   For this machine, the maintenance contract firm the supplier is such that if the number of breakdowns exceeds $n$ during a calendar year, the premium paid for the contract will be refunded.