3. Sam is investigating the weather throughout the year in Hurn.
He uses the large data set to investigate the daily mean wind direction.

Sam believes that each cardinal wind direction is equally likely in Hurn.

(a) Assuming that Sam is correct,

(i) state the probability that the cardinal wind direction in Hurn on a randomly selected day is NNE,

(1)

(ii) state the distribution that Sam should use to model the probability of each cardinal wind direction in Hurn on a randomly selected day.

(1)

Sam decides to investigate the daily mean wind direction throughout the year.

(b) State a limitation of using the data for Hurn from the large data set as a sampling frame.

(1)

(c) Explain how to use simple random sampling to select 36 days from a year.

(2)

Sam defines the random variable X as the number of days out of 36 on which the daily mean wind direction in Hurn is between the bearings 135° and 225°

Sam collects data from 36 randomly selected days and finds that $x = 15$

Sam carries out a hypothesis test at the 10% level of significance.

(d) Given that $H_0 : p = 0.25$ and that the critical region is $\{X \leqslant 4 \cup X \geqslant 14\}$

(i) state the alternative hypothesis, H_1

(ii) giving a reason for your answer, explain what Sam should conclude about the daily mean wind direction in Hurn.

(3)