

Question 13**(12 marks)**

Brianna is considering buying an electric vehicle from Zaprer Motors. The manufacturer claims that, on average, a driver will be able to travel 350 km before needing to recharge the vehicle, and that the probability of travelling more than 400 km before needing to recharge is 0.2525.

Let X denote the distance, in kilometres, that a Zaprer Motors vehicle will travel before needing to recharge. Assume that X is a normally distributed random variable.

- (a) Determine the standard deviation of X . (2 marks)

Brianna will need to travel regularly to Albany, which is 420 km from her house.

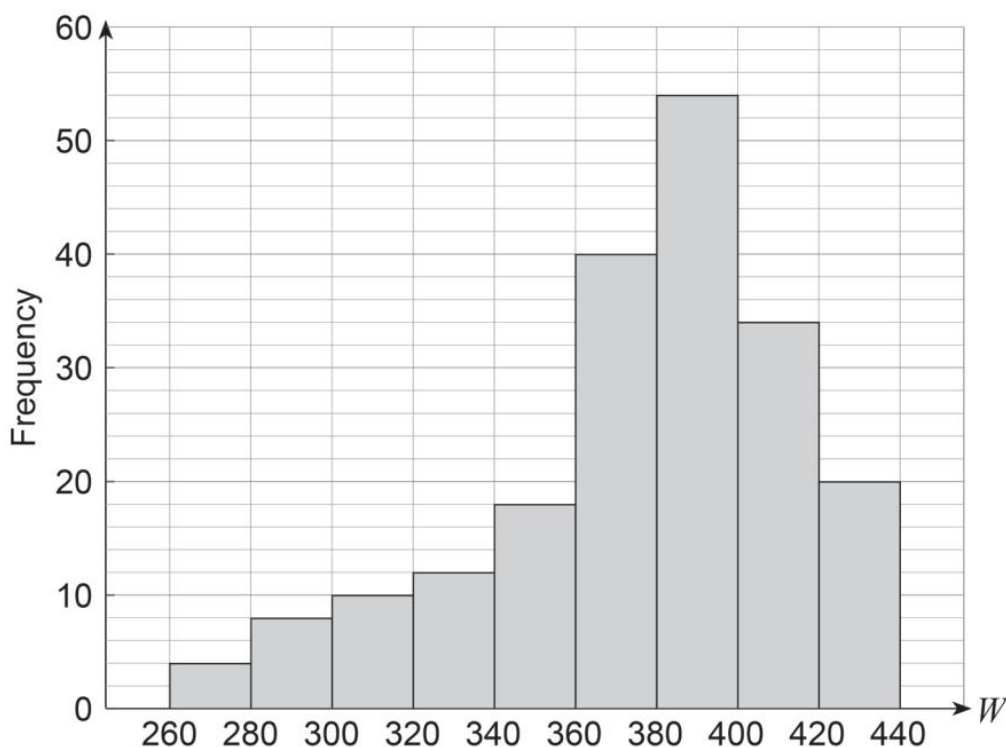
- (b) Calculate the probability that on any given day she will be able to drive to Albany without recharging the vehicle. (1 mark)

Matthew is interested in buying the same type of electric vehicle, but as he lives in England he would like to consider distances in miles (1 mile = 1.6 kilometres).

Let Y be a random variable that denotes the distance, in miles, that a Zaprer Motors vehicle will travel before needing to recharge.

- (c) Determine the expected value and variance of Y . (3 marks)

Brianna decides to consider an electric vehicle from a rival company, Spruky Cars, that show her the histogram below, based on 200 trials of its electric vehicle.



Let W be a random variable that denotes the distance, in kilometres, that a Spruky Cars vehicle will travel before needing to recharge.

- (d) On the basis of the histogram, is it appropriate to use a normal distribution to model the distance a Spruky Cars vehicle will travel between recharges? Justify your answer. (2 marks)
- (e) Assuming the distances are uniformly distributed within each interval, use the histogram to estimate the expected distance that a Spruky Cars vehicle will be able to travel before needing to recharge. (2 marks)

- (f) In which company's vehicle (Zaprer or Spruky) would Brianna be more likely to drive to Albany without recharging? Justify your answer. (2 marks)