Probability

LET Mathematics & Statistics

1. A small company of 20 people runs a weekly raffle where there are always 2 prizes. Each employee gets 1 raffle entry for every year they have worked there, so during your first year you don't have a ticket in the draw. Before the draw today the combined total years people have worked there is 80 years.

   A ticket is drawn, the winner picks their prize, the winning ticket is returned to the draw and a second winner is drawn.

   (a) In a weekly draw, what is the probability of winning the first prize:

      i. for an employee that's been there for 2 years?

      ii. for an employee that's been there for 9 months?

   (b) A particular employee has been working there for 8 years. What is the probability that in a weekly draw that

      i. they win the first prize

      ii. given they win the first prize they then win the second prize?

      iii. they win both the first and second prizes?

   (c) The company decides to change the nature of the draw, and the first prize winning ticket is no longer returned to the draw. Work out the probability, for the individuals given, of winning.

      i. Employee has worked there for 4 years, probability of them winning first prize.

      ii. Given an employee of 4 years has just won first prize, the probability of them also winning second prize.

      iii. An employee of 8 years, probability of them winning both first and second prizes.

iv. An employee of 1 year, probability of them winning the second prize.

v. An employee of 5 years, probability of them winning one of the prizes but not both.

(d) The number of employees based on the number of complete years they've worked there is shown in the table.

Years	0	1	2	3	4	5	6	7	8
Employees	4	1	1	1	4	3	2	1	3

What is the probability that in a weekly draw there are no prizes to employees who have been there more than 5 years?

2. Below is an incomplete two-way table showing the preferences of 500 people to two operating systems (Pear and Robot) and their self-declared interest in technology (low, medium, high).

Operating System	**Tech Interest**			**Total**
	Low	Medium	High	
Pear	95			350
Robot		90	40	
Total		300		

(a) Complete the two-way table

(b) What is the probability that a randomly selected person:

i. uses the Pear operating system?

ii. has a medium interest in technology?

iii. has a medium interest and uses the Robot operating system?

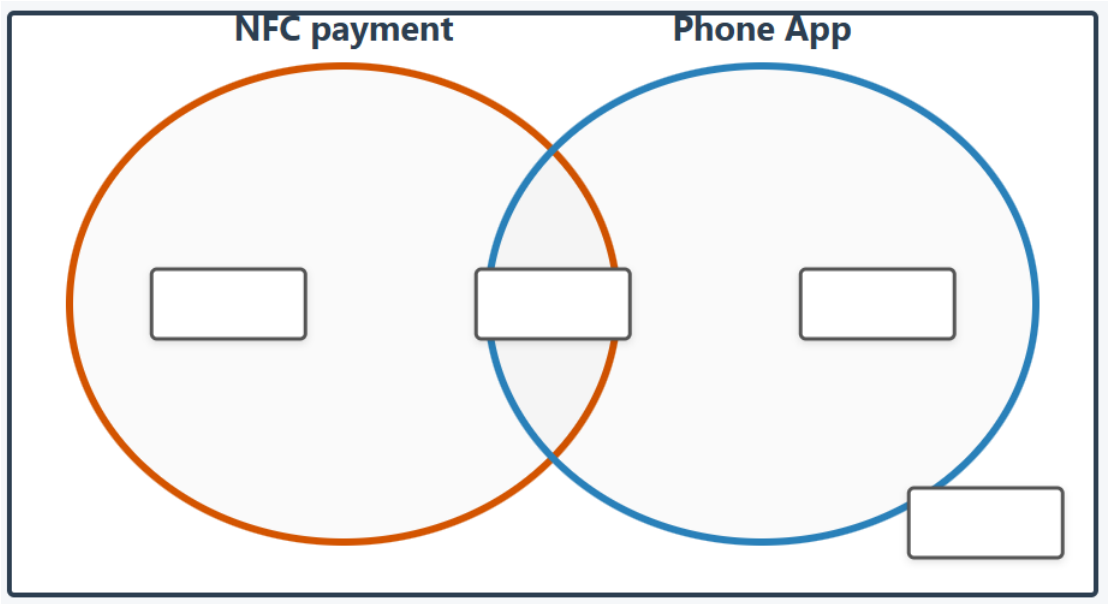
iv. has a low or medium interest and uses the Pear operating system?

v. has a high technology interest, given that they use the Robot operating system?

vi. uses the Robot operating system, given they have a low technology interest?

3. At the bar of the company 'The Pecs Bar & Gym', customers can pay for items via different means. 30% of customers now use NFC on their smartphone to pay at the bar. The company also has an app that gives news, information and offers to customers, 70% of customers have installed this app. 20% of customers use their smartphones to pay and have the company app.

   (a) Complete the Venn diagram, showing the probabilities as decimal numbers between 0 and 1.



   (b) Using the Venn diagram, or otherwise, calculate the following probability (as a decimal number to no more than 3 decimal places) that a customer:

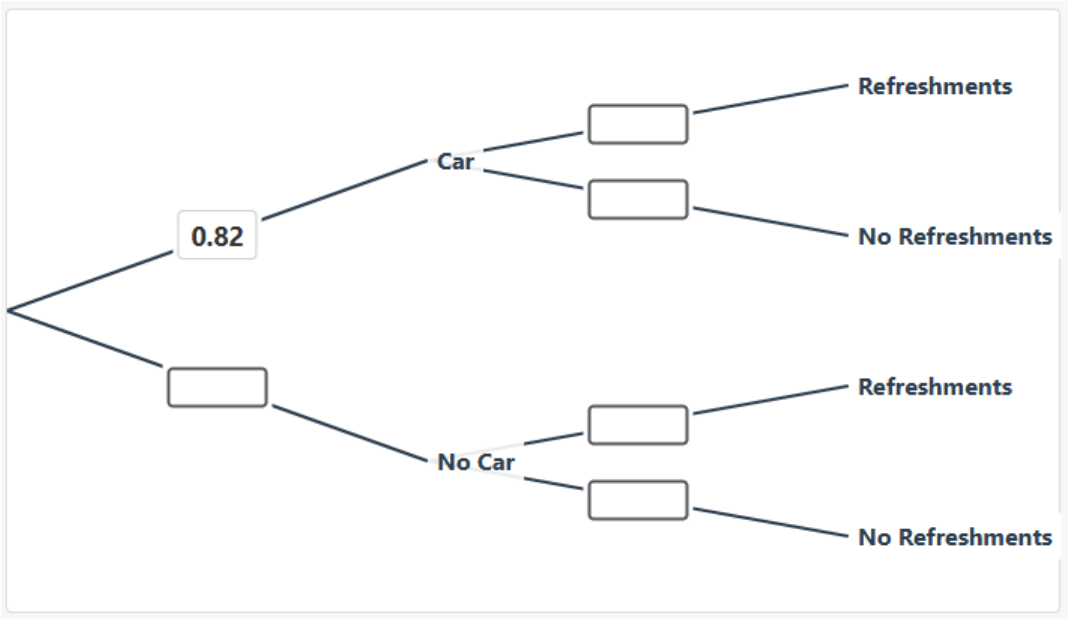
      i. does not use the NFC function and does not use the app
      ii. uses their phone for at least one of the NFC or app means
      iii. uses their NFC but does not have the app
      iv. uses their NFC given that they have the app installed
      v. uses the app given that they use NFC to pay

   (c) Are the events using NFC and using the phone app independent of one another?

4. A company records and finds that 82% of its members make use of the car park when they visit. Of these 82%, 23% regularly use

the café for refreshments during the visit. For those who do not use the car park 64% obtain refreshments.

(a) Fill in the missing probabilities as decimals between 0 and 1.



(b) Find the probability that a randomly selected customer drives by car and has refreshments from the café. Give your answer as a decimal correct to 4 decimal places.

(c) Find the probability that a randomly selected customer has refreshments from the café. Give your answer as a decimal correct to 4 decimal places.

(d) Given that a customer has had refreshments from the café, what is the probability that they did not use the car?