Probability

LLE – Mathematics and Statistics Skills

Single Event

1. On a fair six-sided die, what is the probability of rolling a four?

   ○ 6 ○ $\frac{1}{6}$ ○ $\frac{1}{2}$ ○ $\frac{1}{4}$

2. On a standard fair six-sided die, what is the probability of rolling a prime number?

   ○ $\frac{1}{6}$ ○ $\frac{2}{3}$ ○ $\frac{1}{2}$ ○ 0

3. A card set has cards that contain: 2 red squares, 3 blue rectangles, 5 red triangles, 1 blue pentagon, and 1 green pentagon. What is the probability of picking, at random, a red card?

   ○ $\frac{1}{6}$ ○ $\frac{5}{12}$ ○ $\frac{1}{2}$ ○ $\frac{7}{12}$

4. A card set has cards that contain: 2 red squares, 3 blue rectangles, 5 red triangles, 1 blue pentagon, and 1 green pentagon. What is the probability of picking, at random, a card with a shape of less than 5 sides?

   ○ $\frac{5}{6}$ ○ $\frac{1}{6}$ ○ 1 ○ 0

5. A bag contains 20 red counters and 30 blue counters. A counter is selected, recorded, then returned to the bag. If 15 draws are made, what is the expected number of blue counters?

   Answer: _____

6. A bus is late to my stop with a probability of 0.28. In a 14-day period, how many times would I expect the bus to be on time? Give answer correct to 2 decimal places.

Answer: _____

Contingency or Two-way Tables

1. Use the information given in the table to complete the remaining frequencies of a company's profile of division and level of employment.

Division/Level	Junior	Senior	Manager	TOTAL
Manufacturing	15	8		30
Marketing	20		4	32
Sales				28
TOTAL	50	25	15	90

2. Using the table above; what is the probability that a randomly selected person works in manufacturing?

   ○ $\frac{1}{5}$ ○ $\frac{1}{3}$ ○ $\frac{1}{2}$ ○ 1

3. Using the table above; what is the probability that a randomly selected person is senior and in sales?

   ○ $\frac{1}{10}$ ○ $\frac{14}{45}$ ○ $\frac{5}{18}$ ○ $\frac{4}{45}$

4. Using the table above; what is the probability that a randomly selected person is not a manager?

   ○ $\frac{3}{18}$ ○ $\frac{5}{18}$ ○ $\frac{1}{2}$ ○ $\frac{15}{18}$

5. Using the table above; given that a person is a junior member, what is the probability that they work in marketing?

   ○ $\frac{16}{45}$ ○ $\frac{5}{9}$ ○ $\frac{3}{18}$ ○ $\frac{2}{5}$

6. Using the table above; given a person is a senior member, what is the probability that they work in sales? Give your answer as a decimal number between 0 and 1.

   Answer: _____

7. The company 'The Pecs Bar & Gym' has different levels of membership, called Basic, Standard, Premium. There are 522 members on a Basic membership and 828 members on the Standard membership. There is also a swimming pool, and members can either book the pool through reception (known as Normal) or can pay to have a VIP membership (which means they don't need to book). There are 1260 customers who have Normal pool access. The company has a total of 1800 customers.

   (a) Given the information above, and in the table below, complete the two-way table.

Membership/Pool	**Basic**	**Standard**	**Premium**	**TOTAL**
Normal pool	450			
VIP pool			180	
TOTAL				

   (b) A member is selected at random, from the information given above. Find the probability, as a decimal between 0 and 1 rounded to 3 decimal places if needed, that this member:

      i. has a Premium membership

         Answer: _____

      ii. has a Standard or Premium membership

         Answer: _____

      iii. has a Standard membership and Normal Pool booking

Answer: _____

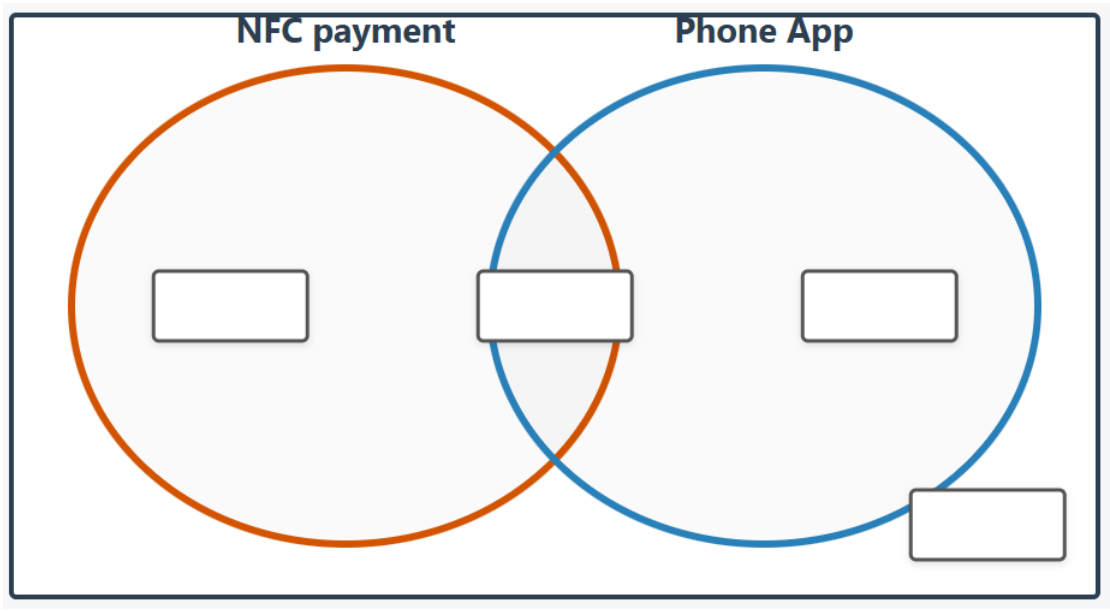
iv. has a VIP Pool booking given that they have Basic membership

Answer: _____

Venn Diagrams

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.

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



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

   (a) does not use the NFC function and does not use the app

Answer: _____

(b) uses their phone for at least one of the NFC or app means

Answer: _____

(c) uses their NFC but does not have the app

Answer: _____

(d) uses their NFC given that they have the app installed

Answer: _____

(e) uses the app given that they use NFC to pay

Answer: _____

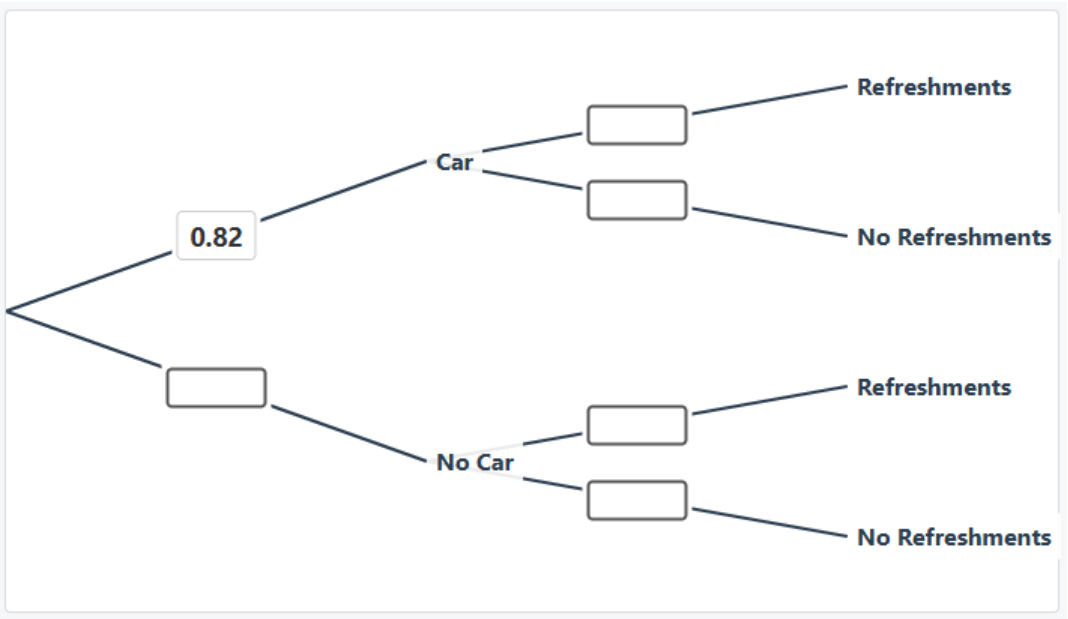
3. Are the events using NFC and using the phone app independent of one another?

Answer: _____

Tree Diagrams

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.

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



2. 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.

   Answer: _____

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

   Answer: _____

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

   Answer: _____

Probability Rules

1. Given the following information:

$$P(A) = \frac{2}{5} \qquad P(B) = \frac{1}{4} \qquad P(A \cap B) = \frac{1}{10}$$

(a) What is $P(A \cup B)$?

○ $\frac{13}{20}$ ○ $\frac{11}{20}$ ○ $\frac{3}{7}$ ○ $\frac{1}{10}$

(b) What is $P(A' \cap B')$

○ $\frac{11}{20}$ ○ $\frac{9}{10}$ ○ $\frac{9}{20}$ ○ $\frac{1}{2}$

(c) Are the events A and B independent?

Answer: _____

2. There are two events A and B such that:

$$P(M) = \frac{1}{2} \qquad P(N) = \frac{1}{3} \qquad P(M|N) = \frac{1}{4}$$

(a) Calculate $P(M$ AND $N)$

○ $\frac{1}{12}$ ○ $\frac{1}{6}$ ○ $\frac{1}{8}$ ○ $\frac{1}{4}$

(b) Calculate $P(M$ OR $N)$

○ $\frac{3}{4}$ ○ $\frac{2}{5}$ ○ $\frac{5}{6}$ ○ $\frac{1}{4}$

(c) You have another event R, such that M and R are independent. It is also given that:

$$P(M \text{ AND } R) = \frac{1}{12} \qquad P(N \text{ or } R) = \frac{1}{2}$$

Are the events N and R mutually exclusive?

Answer: _____