3.3 Lesson 3 Mutually exclusive and exhaustive outcomes

Mutually exclusive outcomes cannot happen at the same time.

A **list of exhaustive outcomes** includes all possible outcomes.

If a set of outcomes are all mutually exclusive and the list is exhaustive, then the probabilities of these events add up to 1, because it is **certain** that exactly one of them will happen.

If $P(A)$ is the probability of event A happening, then the probability if A **not** happening is :

$$P(\overline{A}) = 1 - P(A)$$

■ **Exemple 3.1** A spinner used in a game shows the numbers $1-5$. The table shows the probability of it landing on each number. The chance of it landing on the number 4 is double the chance of it landing on 1. Complete the table:

ω	1	2	3	4	5	Total
$P(\omega)$		0.2		0.3	0.1	

$P(1) = P(4) \div 2 = 0.3 \div 2 = 0.15$

$P(3) = 1 - 0.15 - 0.2 - 0.3 - 0.1 = 0.25$

Exercise 8 Answer the questions. Write a sentence and show your workings

1. In a game, you can either win or lose. The probability of wining is $\frac{3}{7}$. Work out the probability of losing.

   .....

2. In a game, you can either win, lose or draw. The probaility of losing is 35% and the probaility of drawing is 20%. Work out the probability of winning.

   .....

3. The probability of a token in a bag being particular color is shown in the table. It is equally likely that a counter will be blue or black. Complete the table.

ω	Red	Blue	Black	Other
$P(\omega)$	$\frac{3}{10}$			0.45

4. The probability that a train will be running late is 3%. Work out the probability that the train will be running on time.

   .....

5. The probability that Jackie will win the first prize in a raffle is 0.05. Work out the probability that Jackie will **not** win the first prize in the raffle.

   .....

6. Each table shows the probabilities of winning, drawing and losing in a particular game.
   Work out the missing values.

Win	Draw	Lose
	0.05	$\frac{6}{10}$

Win	Draw	Lose
	$\frac{2}{5}$	$\frac{1}{2}$

Win	Draw	Lose
22%		78%

Win	Draw	Lose
0.12		$\frac{1}{2}$

7. The table shows the probability of picking a red, blue, green or yellow token from a bag.
   Are there any other colored token in the bag ?
   Explain your answer.

Color	Red	Blue	Green	Yellow
Probability	0.2	0.18	0.02	0.5

8. The list below shows a set of events that can occur when a normal six sided fair die is rolled.
   Which pair of events are mutually exclusive.

   .....

   Which pair of events are exhaustive.

   .....

A = Rolling an even number
B = Rolling a prime number
C = Rolling a square number
D = Rolling a number greater than 4
E = Rolling an odd number

9. The table shows the probabbilities of some countries winning an Olympic event.
   USA are twice as likely to win as Japan.
   Complete the table.

Country	UK	USA	Japan	Other
Probability	$\frac{1}{2}$			$\frac{1}{6}$

10. Here are some events that can happen when a card i picked from a normal pack of 52 playing cards.

Event A	Event B	Event C	Event D	Event E
The card is red	The card is a club	The card is an even number	The card is black	The card is a diamond

Decide whether these statements are true or false :

	True	False
1/ Events A and B are mutually exclusive.	☐	☐
2/ Events A and D are mutually exclusive.	☐	☐
3/ Events B and E are exhaustive.	☐	☐
4/ Events C and D are exhaustive.	☐	☐
5/ Events A and B are exhaustive.	☐	☐