Mathematics Winter School worksheet

PROBABILITY

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

jT
Junior Tukkie

QUESTION 1 : **ASHTON INTERNATIONAL COLLEGE 2019 TRIALS**

Alex is training for a triathlon. Some days she chooses to go surfing after training. The table below shows various probabilities for the different training events on any given day.

Event	Probability
Running (R)	0,65
Cycling (C)	0,3
Swimming (S)	0,05

After running, the probability that she will go surfing is 0,4. The probability that she will go surfing after a swim is 0,5 and after cycling, the probability of not surfing is 0,8. The tree diagram is shown.
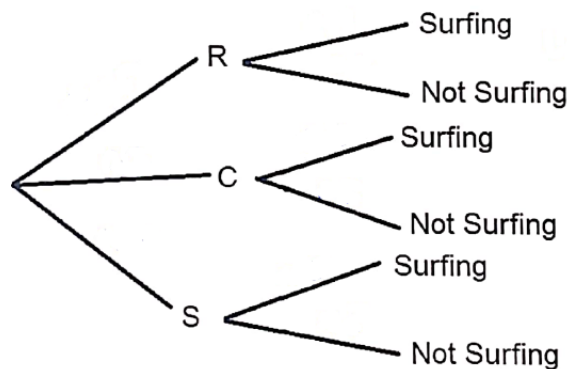
1.1 Complete the tree diagram above and determine the probability that she goes surfing on any particular day. *(correct to 3 decimal places)* (3)

1.2 Determine the probability that she goes surfing on any particular day. *(correct to 3 decimal places)* (2)

QUESTION 2

The survey conducted about the use of nuclear energy amongst 34 girls and 666 boys in one of the high schools in the Karoo District shows some of the results, as illustrated in the table below:

	Girls(G)	Boys (B)	Total
Nuclear energy (N)	a	270	300
Not nuclear energy (not N)	4	b	c
Total	34	666	d

2.1 Write down the values of a, b and c. (2)

2.2 Is a person's choice of the use of nuclear energy independent of a person's gender? Support your answer with appropriate calculations. (4)

2.3 If there are 25 000 high schools in the Karoo District, how many learner's will be against the use of nuclear energy if the information in the table is used to make a prediction. (3)

2.4 Is the prediction valid? Give a reason for your answer. (2)

QUESTION 3 PREP 2015 WC

3.1   If $P(A) = \frac{3}{8}$ and $P(B) = \frac{1}{4}$, find:

3.1.1 $P(A\ or\ B)$ if A and B are mutually exclusive events.   (1)

3.1.2 $P(A\ or\ B)$ if A and B are independent events.   (3)

3.2   A car park has 14 VW cars and 18 BMW's. There are no other cars. During the
        afternoon two cars are stolen one early afternoon, the other later. Determine,
        using a tree diagram, the probability that:

3.2.1   Both cars were BMW's.   (4)

3.2.2   The first car stolen was a BMW and the second one a Volkswagen.   (2)

3.3   Eight boys and seven girls are to be seated randomly in a row. What is the
        probability that:

3.3.1   The row has a girl at each end?   (3)

3.3.2   The row has girls and boys sitting in alternate positions?   (3)

QUESTION 4

4.1   The Eastern Cape requires new codes for number plates. The new codes consist of
        four letters followed by four digits, as shown below. All codes ends with EC.

        ADBC 1829 EC

        The vowels **(A, E, I, O, U)** and **Q** may be used and digits **1** to **9** are used. Letters and
        digits may be repeated.

4.1.1   Determine how many number plates with different codes can be made.   (3)

4.1.2   Determine the probability that a number plate that is randomly selected will
        consist of even digits which are not the same.   (2)

4.2   How many different ways are there of predicting the results of 5 rugby matches
        where each match can either end with a win, lose or draw?   (2)

QUESTION 5   REDHILL 2019

5.1   In a sample space S, the number of elements in the sample is $n(S) = 60$. There
        are 2 events A and B . Event A has $n(A) = 30$ and event B has $n(B) = 40$ and
        $n(A\ and\ B) = 12$.

5.1.1   Draw a venn diagram to represent the information above.   (3)

5.1.2   Write down the value of n(A or B)   (1)

5.1.3   An element is selected at random, write down the probability that the element is
        in both events, P(A and B).   (1)

5.1.4   Show all working to determine whether events A and B are independent.   (3)

5.2   Eight house captains need to be chosen for 2021. Matheson, Arcadia, Town and
        Rissik can each have a captain and a deputy. There are 4 boys and 4 girls chosen.

5.2.1   In how many ways can the 8 pupils selected be seated on the stage?   (2)

5.2.2   If girls need to sit next to each other and all the boys need to sit next to each
        other, In how many ways can they be seated on the stage?   (3)

QUESTION 6   MP 15

A group of 150 students decided to go shopping mall on a Saturday. They had to decide whether they are going to Eat out (E), go to the Movies (M) or just go Shopping (S). The information gathered is shown in the Venn diagram below.

S = 150

E
23
4
M
8 15 41
11
21
S
27
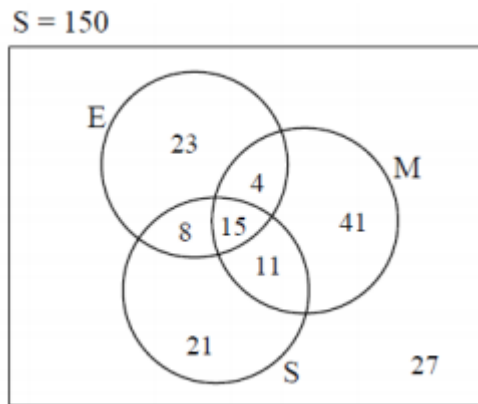
6.1.1   Calculate the probability that a student that is chosen randomly will not eat Eat out (E) nor go to the Movies (M).   (2)

6.1.2   Determine if the events, Eat out (E) and go to the Movies (M) are independent. Show all calculations to support your answer.   (4)

6.2   You have a combination lock with four single digit numbers on your lockers at school. If you forget your combination, what is the probability that you will open the lock with the correct combination on your first attempt?   (3)

6.3   An American tourist plans on visiting South Africa. He intends to visit the following cities: Durban, East London, Cape Town, Bloemfontein, Johannesburg and Polokwane.

How many different travelling plans can be made if:

6.3.1   there are no restrictions on the order in which he visits the cities.   (2)
6.3.2   he has to visit Johannesburg first and Durban last.   (2)
6.3.3   he has to visit the cities at beach, one after another.   (2)

QUESTION 7   VCAA 2014

7.1   Given that A and B are independent events such that:
$$P(B \; only) = 0,3$$
$$P(A \; and \; B) = 0,2$$
$$P(A \; only) = x$$
$$P(not \; A \; or \; B) = y$$

7.1.1   Draw a Venn diagram to represents the information.   (2)
7.1.2   Determine the values of x and y.   (4)

7.2   A race can be arranged from Port Shepstone via Shelley Beach. Contestants can run, cycle, row or swim from Margate to Shelley Beach and then swim, row or sail from Shelley Beach to Port Shepstone.

7.2.1   In how many different ways can they plan their race?   (2)
7.2.2   If an extra rule is introduced requiring contestants to swim at least one of the legs, (from Margate to Shelley Beach or from Shelley Beach to port Shepstone), determine the number of ways in which race can be completed.   (2)

7.3   Gary plays all nine holes on a golf course.
7.3.1   If there is no restriction on the order in which the holes can be played, determine in how many different ways Gary can play.
7.3.2   If Gary has to play hole number 1, 2 and 3 first, in any order, and if he has to play hole number 9 last, determine in how many ways he can complete all nine holes.   (2)

QUESTION 8

Six players of volleyball team stand at random positions in a row before the game begins. X and Y are two players in this team.

Determine the probability that:
8.1   X and Y will not stand next to each other.   (3)
8.2   Determine how many – 4 digit numbers can be formed from 10 digits 0 to 9 if:
8.2.1   Repetition is not allowed.   (2)
8.2.2   Repetition of digits is not allowed.   (3)
8.2.3   The last digit must be 0 and repetition of digits is allowed.   (2)

QUESTION 9   Mind Action Series

Consider the word NEEDED
9.1   How many word arrangements can be made with word if repeated letters are treated as different letters.   (2)
9.2   How many word arrangements can be made with word if repeated letters are treated as identical.   (2)
9.3   How many word arrangements can be made with word if the word starts and end with the same letter?   (4)
9.4   What is the probability that the word arrangement will start and end with the same letter. Repeated letters are identical.   (2)

QUESTION 10

In a company there are three vacancies. The company had identified candidates to fill each post.

POST	CANDIDATES
Floor worker	Carl, James and Sally
Sales Representative	Thandi, Sandy, Sizwe and David
Sales Manager	Mpho and Nicole

10.1.1	In how many ways can these three posts be filled?	(2)
10.1.2	If it is certain that James will get the job, as a clerk, in how many different ways can the posts be filled.	(2)

10.2   A card is chosen at random from a pack of cards. It is then replaced. This experiment is carried out 520 times. Determine the expected number of times for which the card is:

10.2.1	A club	(2)
10.2.2	An ace	(2)
10.2.3	Either an ace or club	(3)