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MATHEMATICS

MATERIAL FOR GRADE 12

Probability

QUESTIONS

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QUESTION 1

1.1 A three-digit code is made up of the numbers 4,7 or 9. How many different codes are possible if

1.1.1 The codes are repeated (1)

1.1.1 Each digit is used only once. (1)

1.2 Six different Mathematics books and five different Physical Sciences books have to be arranged on a shelf. How many arrangements can be made if all the Mathematics books are put together and all the Physical Sciences are put together? (3)

1.3 Survey shows that most people are carriers of a deadly disease. 100 people are tested and the findings are that 3 out of 45 females and 7 males tested positive.

Determine:

1.3.1 The probability that a male from those tested is positive (1)

1.3.2 The number of males in SA, with a population estimated at 50 million who are likely to be positive (2)

1.3.3 The probability that the person randomly tested is positive, given that the person is a female. (2)

1.3.4 The probability that the person randomly tested is a male given that he is positive. (3)

[13]

QUESTION 2

The events A and B are independent. P(A) = 0, 4 and P (B) = 0, 5

Determine:

2.1 P (A and *B*) (2)

2.2 P (A or *B*) (2)

2.3 P (not A and not B) (3)

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QUESTION 3

Three boys and four girls go to the cinema. They are seated together in one row as a group.

3.1 Calculate the total number of possible ways of arranging the whole group. (2)

3.2 Determine the total number of ways of arranging the group if the girls want to be seated together. (3)

3.3 Calculate the probability that the girls are seated together. (1)

3.4 Determine the probability that they will all be seated girl, boy, girl, boy etc. until all seven are seated. (3)

[9]

QUESTION 4

The table below represents the favourite sport for 120 learners.

	Boys	**Girls**	**Total**
Golf	32	12	44
Tennis	18	23	41
Squash	20	15	35
Total	**70**	**50**	**120**

4.1 Determine the probability that (if a learner is selected at random):

4.1.1 the learner who is selected, is a boy who plays tennis or squash. (2)

4.1.2 a learner who plays tennis is selected. (1)

4.1.3 a learner who is a girl is selected. (1)

4.2 Are the events of choosing golf as a favourite sport and being a boy, independent? Show ALL calculations to support your answer. (4)

[8]

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QUESTION 5

5.1 Five South Africans, three British citizens, four Germans and two Americans arrive for a congress.

5.1.1 In how many ways can they be arranged if they sit next to each other in a row? (1)

5.1.2 In how many ways can they be arranged so that those of the same nationality sit together in a row? (2)

5.2 Consider the letters of the word: PROBABILITY

5.2.1 How many unique word arrangements can be made from this word if the repeated letters are treated as identical? (3)

5.2.2 How many unique word arrangements can be made if the word ends with the letter R? (2)

[8]

QUESTION 6

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

6.1.1 $P(A \text{ or } B)$ if A and B are mutually exclusive events. (1)

6.1.2 $P(A \text{ or } B)$ if A and B are independent events. (3)

6.2 A car park has 14 VOLKSWAGEN cars and 18 BMW's. There are no other cars. During the afternoon two cars are stolen – one early afternoon, the other later. Determine the probability that:

6.2.1 Both cars were BMW's. (4)

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

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

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

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

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QUESTION 7

7.1 Consider the letters of the word **MERAFONG**

7.1.1 How many unique word arrangements can be made using all the letters? The letters may repeat. (2)

7.1.2 Calculate the probability that the word arrangement will start with a letter R and end with a letter N. (2)

7.1.3 Calculate the probability that the vowels (a, e, o) will be placed next to each other in any of the word arrangements. (3)

7.2 The probability that during a given weekend a PSL team player will play in an international game (S) is $0{,}7$. The probability that the player will play in a charity golf tournament (G) during that weekend is $0{,}4$ and the probability that the player will participate in both activities is 0,3.

7.2.1 Draw a Venn diagram to represent the given information. (4)

7.2.2 Calculate:

a) $P(S')$ (1)

b) $P(S \text{ and } G)'$ (1)

c) $P(S \text{ or } G)$ (1)

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QUESTION 8

8.1 A study on eating chocolate and gender yielded the following results.

	Eating Chocolate	**Not Eating Chocolate**	**TOTAL**
Male	45	25	70
Female	35	45	80
TOTAL	80	70	150

8.1.1 How many people participated in this study? (1)

8.1.2 Calculate the following probabilities:

(a) P (male) (1)
(b) P (Eating Chocolate) (1)

8.1.3 Are the events being a male and eating chocolate independent? Justify your answer with relevant calculations. (3)

8.2 Four - digit codes (not beginning with 0), are to be constructed from the set of digits {1 ; 3 ; 4 ; 6 ; 7 ; 8 ; 0 }.

8.2.1 How many four - digit codes can be constructed, if repetition of digits is allowed? (2)

8.2.2 How many four - digit codes can be constructed, if repetition of digits is not allowed? (2)

8.2.3 Calculate the probability of randomly constructing a four - digit code which is divisible by 5 if repetition of digits is allowed. (3)

[13]

QUESTION 9

9.1 M and K are two events. If P(K) = 0, 5; P (K and M) = 0, 2 and P (not K and not M) = 0, 3

9.1.1 Draw a Venn diagram to represent the above events. (4)

9.1.2 Are events M and K independent or not. Explain. (3)

9.2 Koketso and Marvin are to sit with five other friends in a church in one row. There are seven empty chairs in that row.

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9.2.1 In how many different ways can they all sit together? (2)

9.2.2 In how many different ways can they sit if Koketso and Marvin should not sit next to each other? (4)

9.2.3 Koketso first sat on a chair at one end of the row. He now decides to change his initial position. What is the probability that he will sit on a chair at the other end of the row. (2)

[15]

QUESTION 10

At a certain technical school all Grade 9 learners have to choose subjects by the end of the year. All Grade 9 learners have to choose between Mathematics and Technical Mathematics. Thereafter they have to choose between Electrical Technology, Mechanical Technology and Civil Technology. The probability that a learner from this school will choose Mathematics is $\frac{4}{7}$. If a learner chooses Mathematics as a subject, the probability that he will choose Electrical Technology as a subject is $\frac{5}{10}$ and the probability that he will choose Mechanical Technology is $\frac{3}{10}$. If a learner chooses Technical Mathematics, the probability that he will choose Electrical Technology as a subject is $\frac{4}{10}$ and the probability that he will choose Mechanical Technology is $\frac{5}{10}$.

10.1 Draw a tree diagram to represent the above information. Indicate on your diagram the probabilities associated with each branch as well as all the outcomes. (4)

10.2 If a learner is selected randomly, what is the probability that the learner:

10.2.1 will choose Technical Mathematics and Mechanical Technology. (2)

10.2.2 will choose Electrical Technology as a subject. (3)

[9]

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QUESTION 11

11.1 The digits 0 to 9 are used to form codes.

11.1.1 Determine the number of different 6-digit codes that can be formed if repetition of digits is allowed. (1)

11.1.2 Determine the number of 6-digit codes that can be formed that starts with a 9 and ends with a 2 if repetition of digits is not allowed. (2)

11.2 The digits 0 to 9 are used to form 10-digit codes. Determine the number of 10-digit codes that can be formed if the 2 and the 3 may not appear next to each other and if repetition of digits is not allowed. (3)

[6]

QUESTION 12

12.1 A group of 540 people with green or blue eyes were randomly selected in order to determine whether or not green or blue eyes are dependent on gender. The results are tabulated below:

	Male	**Female**	**Total**
Green eyes	183	147	**330**
Blue eyes	117	93	**210**
Total	**300**	**240**	**540**

12.1.1 If a person is selected at random, determine the probability that it will be a female with green eyes. (2)

12.1.2 After analysing the results, a grade 11 learner concludes that the probability of having green eyes is independent of gender. Is he correct? Substantiate your answer with relevant calculations. Give all answers correct to 2 decimal places. (5)

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12.2 The letters in the word CURRICULUM are rearranged to form other words. Assume that all words have meaning.

12.2.1 How many different letter arrangements (words) are possible? (3)

12.2.2 What is the probability that a word will start and end with the letter U? (4)

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