

Mathematics

Part B

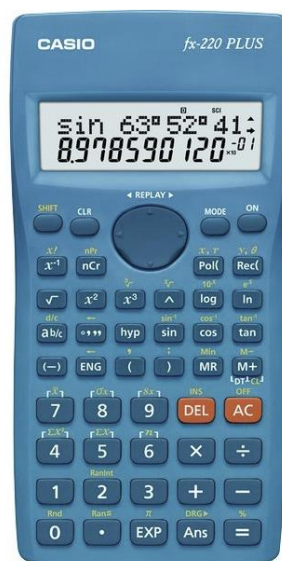
DATE: 24 May 2022

Duration of the exam:

90 minutes

Total: 65 points

- Exam with calculator
- Formula sheet is allowed



Part B

Question 1

16 Points

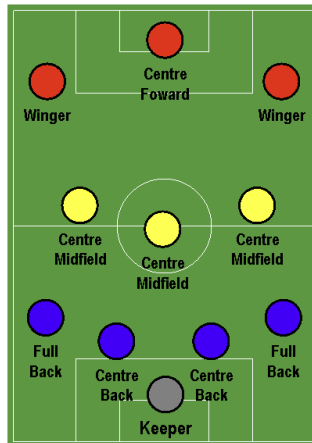
The coach of a football team selected 24 players for a tournament. He picked 8 defenders, 7 midfielders, 5 strikers and 4 goalkeepers.

a) How many different teams can the coach put together if he chooses a line-up consisting of 1 goalkeeper, 4 defenders, 3 midfielders and 3 strikers?

4 points

b) The coach has chosen 4 defenders in his line-up: Virgil, Sergio, Ruben and Trent. The trainer can line up these defenders in the places indicated by the blue dots. How many lineups are possible with these 4 defenders?

3 points



c) For a press conference, a group of 4 players is randomly chosen from all 24 players. Calculate the probability that this group consists of 1 defender, 1 midfielder, 1 striker and 1 goalkeeper.

3 points

d) The probability that Cristiano scores a penalty is 85%. Cristiano kicks 5 penalties.

- I. Calculate the probability that Cristiano scores 5 times.
- II. Calculate the probability that Cristiano scores 3 out of 5 attempts.
- III. Calculate the probability that Cristiano scores 4 times at most.

2 points

2 points

2 points

Question 2	14 points
<p>In a basket are 5 white and 3 red socks. You take two random socks out of the basket.</p> <p>A. Draw a tree diagram for this experiment and write down the probabilities for each branch of your tree diagram.</p> <p>B. The stochastic variable X is "the number of red socks". Give the probability distribution of X in a table.</p> <p>C. Calculate the expected value of X. Write down all steps in your calculation.</p>	<p>4 points</p> <p>6 points</p> <p>4 points</p>

Question 3**10 points**

The students of a class are represented in the set U .

Set A is the set of pupils who wear glasses.

Set B is the set of students who have blue eyes.

- A. Calculate $P(B)$
- B. Calculate $P(A \cup B)$
- C. Calculate $P(A|B)$
- D. Calculate $P(B|\bar{A})$
- E. A student with blue eyes leaves the classroom. Calculate the probability that this student is wearing glasses.

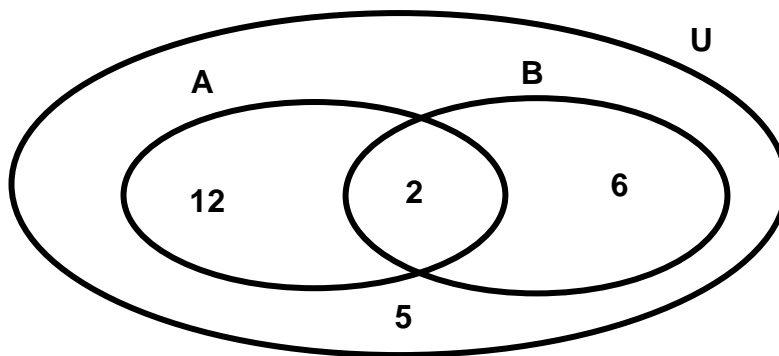
2 points


2 points

2 points

2 points

2 points



Question 4	8 points
<p>A box contains letter blocks (see figure). This box contains the letter blocks C, A, T, M and S. Els takes 3 random blocks out of the box.</p> <p>a) Calculate the probability that she can form the word MAT with these three blocks.</p> <p>Peter takes 3 random cubes out of the box.</p> <p>b) The first block he takes is the letter M. Then he takes 2 more letter blocks. Calculate the probability that Peter can form the word MAT knowing that his first letter block is the letter M.</p>	<p style="text-align: center;"></p> <p style="text-align: right;">4 points</p> <p style="text-align: right;">4 points</p>
Question 5	12 points
<p>The <i>sensitivity</i> of a Covid test is the probability that someone who is infected with Covid tests positive. The <i>specificity</i> of a Covid test is the probability that someone who is not infected with Covid tests negative.</p> <p>Els and Peter use a Covid self-test with a sensitivity of 97% of a specificity of 99%. In the city where Els and Peter live, 1% of the population has Covid.</p> <p><i>Use a Venn diagram, a table, or a tree scheme for the following calculations. Write your answers to the following questions in percent and round to 2 decimal places.</i></p> <p>a) Calculate the probability that Els tests positive for Covid.</p> <p>b) Calculate the chance that Els tests positive but does not have Covid.</p> <p>c) Peter tests positive. What is the probability that Peter has Covid?</p> <p>d) The city where Els and Peter live has 100 000 inhabitants. If all residents of this city take a self-test, how many people have a 'false positive' test result?</p>	<p style="text-align: right;">3 points</p> <p style="text-align: right;">3 points</p> <p style="text-align: right;">3 points</p> <p style="text-align: right;">3 points</p>

Question 6	5 points
<p>At a concert there are 135 seats. The organizers of the concert know from experience that only 96% of the people who have bought a ticket will come to the concert. They therefore decide to sell more tickets than there are seats.</p> <p>a) Explain why the number of people coming to the concert is a Bernoulli process (binomial experiment).</p> <p>a) The organizers of the concert sell 137 tickets. Calculate the probability of "overbooking". In other words, calculate the probability that more than 135 people will come to the concert.</p>	<p>2 points</p> <p>3 points</p>