Please stick the barcode label here.

TUTGATHER PRACTICE PAPER

HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION 2027

MATHEMATICS Extended Part Module M1
PAPER

Question-Answer Book

Candidate Number

TUTGATHER
PRACTICE PAPER · NOT AN OFFICIAL HKEAA PAPER

1 hour 5 minutes

This paper must be answered in English

Topic practice: Conditional Probability and Bayes' Theorem

INSTRUCTIONS

(1) This paper consists of THREE sections, A(1), A(2) and B.

(2) Attempt ALL questions in this paper. Write your answers in the spaces provided in this Question-Answer Book. Do not write in the margins.

(3) Unless otherwise specified, all working must be clearly shown.

(4) Unless otherwise specified, numerical answers should be either exact or correct to 3 significant figures.

(5) The diagrams in this paper are not necessarily drawn to scale.

(6) Calculators and mathematical drawing instruments may be used.

(7) The marks for each question are shown in brackets.

(8) No extra time will be given after the 'Time is up' announcement.

TUTGATHER

SECTION A(1) (16 marks)

1. Let A and B be events with $P(A) = 0.5$, $P(B) = 0.4$ and $P(A \cap B) = 0.2$. Find $P(A \mid B)$ and $P(B \mid A)$. **(3 marks)**

2. A disease affects 1% of a population. A diagnostic test gives a positive result for 95% of people with the disease and for 10% of people without the disease. A person is selected at random and tests positive. Find the probability that the person actually has the disease. **(3 marks)**

3. A bag contains 3 red balls and 2 blue balls. Two balls are drawn at random without replacement. Draw a tree diagram and find the probability that the two balls are of different colours. **(4 marks)**

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

TUTGATHER

4. Let A and B be two events such that $P(A) = 0.6$, $P(B) = 0.5$ and $P(A \cup B) = 0.8$. **(6 marks)**

(a) Find $P(A \cap B)$.

(b) Find $P(A \mid B)$ and $P(B \mid A)$.

(c) Determine whether A and B are independent. Justify your answer.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

TUTGATHER

SECTION A(2) (24 marks)

5. A factory has two machines, M_1 and M_2, producing respectively 60% and 40% of the total output. It is known that 2% of the items produced by M_1 are defective and 5% of the items produced by M_2 are defective. An item is selected at random from the total output. **(7 marks)**

(a) Find the probability that the item is defective.

(b) Given that the item is defective, find the probability that it was produced by M_2.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

TUTGATHER

6. A box contains 4 white balls and 6 black balls. A ball is drawn at random and then replaced together with 2 additional balls of the same colour. Then a second ball is drawn at random. **(8 marks)**

(a) Draw a tree diagram to represent the experiment.

(b) Find the probability that the second ball drawn is white.

(c) Given that the second ball drawn is white, find the probability that the first ball drawn was white.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

TUTGATHER

7. In a certain city, 60% of adults are classified as regular exercisers. Among regular exercisers, 20% have high blood pressure. Among non-regular exercisers, 30% have high blood pressure. An adult is selected at random. **(9 marks)**

(a) Find the probability that the adult has high blood pressure.

(b) Given that the adult has high blood pressure, find the probability that the adult is a regular exerciser.

(c) Given that the adult does not have high blood pressure, find the probability that the adult is a regular exerciser.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

TUTGATHER

SECTION B (10 marks)

8. A test for a rare disease is applied to a person selected at random from a population. The prevalence of the disease is p, where $0 < p < 1$. The test has sensitivity 0.9 (probability of a positive result given the person has the disease) and specificity 0.95 (probability of a negative result given the person does not have the disease). **(10 marks)**

(a) Show that the probability that a randomly selected person tests positive is $0.05 + 0.85p$.

(b) Find the probability that a person who tests positive actually has the disease, in terms of p.

(c) Find the value of p for which the probability in (b) is 0.5.

(d) The test is applied independently to two people selected at random from the population. Given that exactly one of the two tests is positive, find the probability that the first person has the disease, in terms of p.

END OF PAPER

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

TUTGATHER