GRADE XII

Question Bank (MATHEMATICS)

Chapter – 13 Probability

1 Marks:

1. Let E be an event of a sample space S of an experiment then $P(S|E)$ is **[BOARD 2024]**

   a) $P(S \cap E)$ b) $P(E)$ c) 1 d) 0

2. A fair die is rolled. Events E and F are $E = \{1, 3, 5\}, F = \{2, 3\}$ respectively. Value of $P(E|F)$ is **[BOARD 2023]**

   a) $\frac{2}{3}$ b) $\frac{1}{3}$ c) $\frac{1}{6}$ d) $\frac{1}{2}$

3. If E and F are two independent events such that $P(E) = \frac{2}{3}, P(F) = \frac{3}{7}$ then $P(E|\bar{F})$ is equal to **[BOARD 2025]**

   a) $\frac{1}{6}$ b) $\frac{1}{2}$ c) $\frac{2}{3}$ d) $\frac{7}{9}$

4. X and Y are independent events such that $P(X \cap \bar{Y}) = \frac{2}{5}$ and $P(X) = \frac{3}{5}$ then $P(Y)$ is equal to **[BOARD 2023]**

   a) $\frac{2}{3}$ b) $\frac{2}{5}$ c) $\frac{1}{3}$ d) $\frac{1}{5}$

5. If $P(A) = \frac{1}{7}, P(B) = \frac{5}{7}$ and $P(A \cap B) = \frac{4}{7}$ then $P(\bar{A}|B)$ is **[BOARD 2025]**

   a) $\frac{6}{7}$ b) $\frac{3}{4}$ c) $\frac{4}{5}$ d) $\frac{1}{5}$

6. If $P(A \cap B) = \frac{1}{8}$ and $P(\bar{A}) = \frac{3}{4}$ then $P(B|A)$ is equal to **[BOARD 2023]**

   a) $\frac{1}{2}$ b) $\frac{1}{3}$ c) $\frac{1}{6}$ d) $\frac{2}{3}$

7. For any two events A and B, if $P(\bar{A}) = \frac{1}{2}, P(\bar{B}) = \frac{2}{3}$ and $P(A \cap B) = \frac{1}{4}$ then $P(\bar{A}|\bar{B})$ equals **[BOARD 2023]**

   a) $\frac{3}{8}$ b) $\frac{8}{9}$ c) $\frac{1}{8}$ d) $\frac{1}{4}$

8. If $P(A) = \frac{1}{5}, P(B) = \frac{3}{5}$ and $\mathrm{P}\left(\frac{\mathrm{A}}{\mathrm{B}}\right) = \frac{2}{5}$ then $P(A' \cap B')$ is **[BOARD 2025]**

   a) $\frac{11}{25}$ b) $\frac{19}{25}$ c) $\frac{8}{25}$ d) $\frac{6}{25}$

9. If $P(A|B) = 0.3, P(A) = 0.4$ and $\mathrm{P(B)} = 0.8$ then $P(B|A)$ is **[BOARD 2023]**

   a) 0.6 b) 0.3 c) 0.06 d) 0.4

Prepared by: H.Sabareesh (PGT Mathematics)

10. If A and B are two events such that $P(B) = \frac{1}{5}, P(A|B) = \frac{2}{3}$ and $P(A \cup B) = \frac{3}{5}$, then $P(A)$ is **[BOARD 2025]**

a) $\frac{10}{15}$ b) $\frac{2}{15}$ c) $\frac{1}{5}$ d) $\frac{8}{15}$

11. Let E and F are two events such that $P(E) = 0.1, P(F) = 0.3$ and $P(E \cup F) = 0.4$ then $P(F|E)$ is **[BOARD 2024]**

a) 0.6 b) 0.4 c) 0.5 d) 0

12. Let M and N be two events such that $P(M) = 0.6, P(N) = 0.2$ and $P(M \cap N) = 0.5$, then $P(M'|N')$ is **[BOARD 2025]**

a) $\frac{7}{8}$ b) $\frac{2}{5}$ c) $\frac{1}{2}$ d) $\frac{2}{3}$

13. If E and F are two events such that $P(E) > 0$ and $P(F) \neq 1$ then $P(\bar{E}|\bar{F})$ is **[BOARD 2025]**

a) $\frac{P(\bar{E})}{P(\bar{F})}$ b) $1 - P(\bar{E}|F)$ c) $1 - P(E|F)$ d) $\frac{1-P(E \cup F)}{P(\bar{F})}$

14. If $P(A \cup B) = 0.9$ and $P(A \cap B) = 0.4$ then $P(\bar{A}) + P(\bar{B})$ is **[BOARD 2025]**

a) 0.3 b) 1 c) 1.3 d) 0.7

15. If $P(A|B) = P(A'|B)$ then which of the following is true? **[BOARD 2024]**

a) $P(A) = P(A')$ c) $P(A \cap B) = \frac{1}{2}P(B)$

b) $P(A) = 2P(B)$ d) $P(A \cap B) = 2P(B)$

16. If A and B are events such that $P(A|B) = P(B|A) \neq 0$ then **[BOARD 2024]**

a) $A \subset B$, but $A \neq B$ c) $A \cap B = \phi$

b) $A = B$ d) $P(A) = P(B)$

17. Ashima can hit a target 2 out of 3 times. She tried to hit the target twice. The probability that she missed the target exactly once is **[BOARD 2023]**

a) $\frac{2}{3}$ b) $\frac{1}{3}$ c) $\frac{4}{9}$ d) $\frac{1}{9}$

18. A coin tossed and a card is selected at random from a well shuffled pack of 52 cards. The probability of getting head on the coin and a face card from the pack is **[BOARD 2025]**

a) $\frac{2}{13}$ b) $\frac{2}{26}$ c) $\frac{19}{26}$ d) $\frac{3}{13}$

19. Five fair coins are tossed simultaneously. The probability of the events that at least one head comes up is **[BOARD 2023]**

a) $\frac{27}{32}$ b) $\frac{5}{32}$ c) $\frac{31}{32}$ d) $\frac{1}{32}$

20. A box has 4 green, 8 blue and 3 red pens. A student picks up a pen at random, checks its color and replaces it in the box. He repeats this process 3 times. The probability that at lest one pen picked was red is **[BOARD 2025]**

a) $\frac{124}{125}$ b) $\frac{1}{125}$ c) $\frac{61}{125}$ d) $\frac{64}{125}$

21. The meeting will be held only if all three members A, B and C are present. The probability that member A does not turn up is 0.10, member B does not turn up is 0.20 and member C does not turn up is 0.05. The probability of the meeting being cancelled is **[BOARD 2025]**

a) 0.35 b) 0.316 c) 0.001 d) 0.65

22. A family has 2 children and the elder child is girl. The probability that both children are girls is **[BOARD 2023]**

a) $\frac{1}{4}$ b) $\frac{1}{8}$ c) $\frac{1}{2}$ d) $\frac{3}{4}$

23. The probability that A speaks truth is $\frac{4}{5}$ and that of B speaking the truth is $\frac{3}{4}$. The probability that they contradict each other in stating the same fact is **[BOARD 2023]**

a) $\frac{7}{20}$ b) $\frac{1}{5}$ c) $\frac{3}{20}$ d) $\frac{4}{5}$

24. Chances that three persons A, B and C go to the market are 30%, 60% and 50% respectively. The probability that at least one will go to the market is **[BOARD 2025]**

a) $\frac{14}{10}$ b) $\frac{43}{50}$ c) $\frac{9}{100}$ d) $\frac{7}{50}$

Options for Assertion and Reasoning Questions:

a) Both assertion(A) and reason(R) are true and reason(R) is the correct explanation of assertion(A)

b) Both assertion(A) and reason(R) are true but reason(R) is not the correct explanation of assertion(A)

c) Assertion (A) is true but reason (R) is false.

d) Assertion (A) is false but reason (R) is true.

25. **Assertion (A):** Two coins are tossed simultaneously. The probability of getting two heads, if it is known that at least one head comes up, is $\frac{1}{3}$.

    Reason (R): Let E and F be two events with a random experiment then $P(F|E) = \frac{P(E \cap F)}{P(E)}$. **[BOARD 2023]**

26. **Assertion (A):** If A and B are two events such that $P(A \cap B) = 0$ then A and B are independent events. **[BOARD 2025]**

    Reason (R): Two events are independent if the occurrence of one does not affect the occurrence of the other.

27. **Assertion (A):** If R and S are two events such that $P(R|S) = 1$ and $P(S) > 0$, then $S \subset R$. **[BOARD 2024]**

    Reason (R): If two events A and B are such that $P(A \cap B) = P(B)$ then $A \subset B$.

2 Marks:

1. In a village of 8000 people, 3000 go out of the village to work and 4000 are women. It is noted that 30% of women go out of the village to work. What is the probability that a randomly chosen individual is either a woman or a person working outside the village?

   [BOARD 2025]

3 Marks:

1. E and F are two independent events such that $P(\bar{E}) = 0.6$ and $P(E \cup F) = 0.6$. Find $P(F)$ and $P(\bar{E} \cup \bar{F})$. **[BOARD 2024]**
2. A and B are independent events such that $P(A \cap \bar{B}) = \frac{1}{4}$ and $P(\bar{A} \cap B) = \frac{1}{6}$. Find $P(A)$and P(B). **[BOARD 2023]**
3. A card from a well shuffled pack of 52 cards is lost. From the remaining cards of the pack, a card is drawn at random and is found to be a King. Find the probability of the lost card being a King.

   [BOARD 2024]

4. A and B throw die alternatively till one of them gets a '6' and wins the game. Find their respective probabilities of winning, if A starts the game first. **[BOARD 2023]**
5. There are two coins. One of them is a biased coin such that $P(\text{head}):P(\text{tail}) = 1:3$ and other coin is a fair coin. A coin is selected at random and tossed once. If the coin showed head, then find the probability that it is a biased coin. **[BOARD 2023]**
6. A fair coin and an unbiased die are tossed. Let A be the event, "Head appears on the coin" and B be the event, "3 comes on the die". Find whether A and B are independent events or not. **[BOARD 2023]**
7. It is known that 20% of the students in a school have above 90% attendance and 80% of the students are irregular. Past year results show that 80% of students who have above 90% attendance and 20% of irregular students get 'A' grade in their annual examination. At the end of a year, a student is chosen at random from the school and is found to have an 'A' grade. What is the probability that the student is irregular? **[BOARD 2024]**
8. For the vacancy advertised in the newspaper, 3000 candidates submitted their applications. From the data it was revealed that two third of the total applicants were females and other were males. The selection for the job was done through a written test. The performance of the applicants indicates that the probability of a male getting a distinction in written test is 0.4 and that a female getting a distinction is 0.35. find the probability that the candidate chosen at random will have a distinction in the written test. **[BOARD 2025]**
9. Two dice are thrown, Defined are the following two events A and B: $A = \{(x,y): x + y = 9\}$, $B = \{(x,y): x \neq 3\}$, where (x, y) denote a point in the sample space. Check if events A and B are independent or mutually exclusive. **[BOARD 2025]**
10. In a city, a survey was conducted among residents about their preferred mode of commuting. It was found that 50% people preferred using public transport, 35% preferred using a bicycle and 20% use

both public transport and a bicycle. If a person is selected at random, find the probability that, **[BOARD 2025]**

(i) The person uses only public transport. **1**

(ii) The person used bicycle given that they also use the public transport. **1**

(iii) The person uses neither public transport nor a bicycle. **1**

11. A person is Head of two independent selection committee I and II. If the probability of making a wrong selection in committee I is 0.03 and that in committee II is 0.01, then find the probability that the person makes the correct decision of selection, **[BOARD 2025]**

(i) In both committees

(ii) In only one committee.

12. The probability that a student buys a coloring book is 0.7 and that she buys a box of colors is 0.2. The probability that she buys a coloring book, given that she buys a box of colors, is 0.3. Find the probability that the student, **[BOARD 2025]**

(i) Buys both coloring books and the box of colors.

(ii) Buys a box of colors given that she buys the coloring book.

13. Out of two bags, bag A contains 2 white and 3 red balls and bag B contains 4 white and 5 red balls. One ball is drawn at random from one of the bags and is found to be red. Find the probability that it was drawn from bag B. **[BOARD 2023]**

14. Bag I contains 4 white and 5 black balls. Bag II contains 6 white and 7 black balls. A ball is drawn randomly by from Bag I is transferred to Bag II and then a ball is drawn randomly from Bag II. Find the probability that the ball drawn is white. **[BOARD 2025]**

15. Bag I contains 3 red balls and 4 black balls. Bag II contains 5 red balls and 2 back balls. Two balls are transferred at random from Bag I to Bag II and then a ball is drawn at random from Bag II. Find the probability that the drawn ball is red in color. **[BOARD 2024]**

16. The chances of P, Q and R getting selected as CEO of a company are in the ratio $4:1:2$ respectively. The probabilities for the company to increase its profits from the previous year under the new CEO, P, Q or

R are 0.3, 0.8 and 0.5 respectively. If the company increased the profits from the previous year, find the probability that it is due to the appointment of R as CEO. **[BOARD 2024]**

5 Marks:

1. In answering a question on a multiple choice test, a student either knows the answer or guesses. Let $\frac{3}{5}$ be the probability that he knows the answer and $\frac{2}{5}$ be the probability that he guesses. Assuming that a student who guesses at the answer will be correct with probability $\frac{1}{3}$. What is the probability that the student knows the answer, given that he answered it correctly? **[BOARD 2023]**

Case Based Problems:

1. A building contractor undertakes a job to construct 4 flats on a plot along with parking area. Due to strike the probability of many construction workers not being present for the job is 0·65. The probability that many are not present and still the work gets completed on time is 0·35. The probability that work will be completed on time when all workers are present is 0·80. **[BOARD 2023]**

   Let : E1 : represent the event when many workers were not present for the job;

   E2 : represent the event when all workers were present; and

   E : represent completing the construction work on time.

   Based on the above information answer the following:

   (i) What is the probability that all the workers are present for the job? **1**

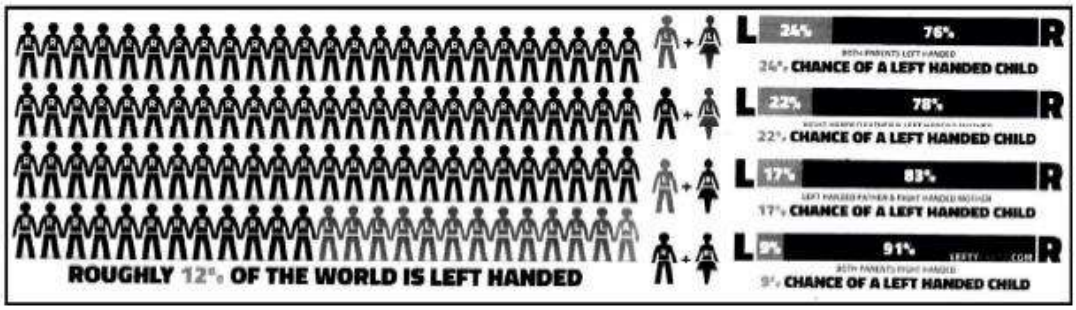
   (ii) What is the probability that construction will be completed on time? **1**

   (iii) (a) What is the probability that many workers are not present given that the construction work is completed on time? **2**

   (OR)

(b) What is the probability that all workers were present given that the construction job was completed on time? **2**

2. Recent studies suggest that roughly 12% of the world population is left handed.



Depending upon the parents, the chances of having a left handed child are as follows:

A : When both father and mother are left handed:
Chances of left handed child is 24%.

B : When father is right handed and mother is left handed:
Chances of left handed child is 22%.

C : When father is left handed and mother is right handed:
Chances of left handed child is 17%

D : When both father and mother are right handed:
Chances of left handed child is 9%.

Assuming that $P(A) = P(B) = P(C) = P(D) = \frac{1}{4}$ and L denotes the event that child is left handed. **[BOARD 2023]**

Based on the above information answer the following:

(i) Find $P(L|C)$. **1**

(ii) Find $P(\bar{L}|A)$. **1**

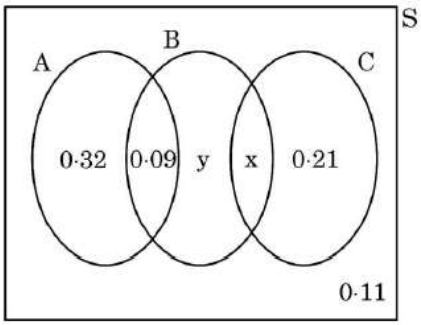
(iii) (a) Find $P(A|L)$. **2**

(OR)

(b) Find the probability that a randomly selected child is left handed given that exactly one of the parents is left handed. **2**

3. There are different types of Yoga which involve the usage of different poses of Yoga Asanas, Meditation and Pranayam as shown in the figure below:

The Venn diagram below represents the probabilities of three different types of Yoga, A, B and C performed by the people of a society. Further, it is given that probability of a member performing type C Yoga is 0·44. **[BOARD 2023]**



Based on the above information answer the following:

(i) Find the value of x. **1**

(ii) Find the value of y. **1**

(iii) (a) Find $P(C|B)$. **2**

(OR)

(b) Find the probability that a randomly selected person of the society does Yoga of type A or B but not C. **2**

4. In a group class activity, there are 10 students whose ages are 16, 17, 15, 14, 19, 17, 16, 19, 16 and 15 years. One student is selected at random such that each has equal chance of being chosen and age of the student is recorded. **[BOARD 2023]**

Based on the above information answer the following:

(i) Find the probability that the age of the selected student is a composite number. **1**

(ii) Let X be the age of the selected student. What can be the value of X? **1**

(iii) A student was selected at random and his age was found to be greater than 15 years. Find the probability that his age is a prime number. **2**

5. A departmental store sends bills to charge its customers once a month. Past experience shows that 70% of its customers pay their first month bill in time. The store also found that the customer who pays the bill in time has the probability of 0.8 of paying in time next month and the customer who does not pay in time has the probability off 0.4 of paying in time the next month. **[BOARD 2024]**

Based on the above information answer the following:

(i) Let E_1 and E_2 respectively denote the event of customer paying or not paying the first month bill in time. Find $P(E_1), P(E_2)$. **1**

(ii) Let A denotes the event of customer paying second month's bill in time, then find $P(A|E_1)$ and $\mathrm{P(A|E_2)}$. **1**

(iii) (a) Find the probability of customer paying second month's bill in time. **2**

(OR)

(b) Find the probability of customer paying first month's bill in time if it is found that customer has paid the second month's bill in time. **2**

6. Rohit , Jaspreet and Alia appeared for an interview for three vacancies in the same post. The probability of Rohit's selection is $\frac{1}{5}$, Jaspreeet's selection is $\frac{1}{3}$ and Alia's selection is $\frac{1}{4}$. The event of selection is independent of each other. **[BOARD 2024]**

Based on the above information answer the following:

(i) What is the probability that at least one of them is selected? **1**

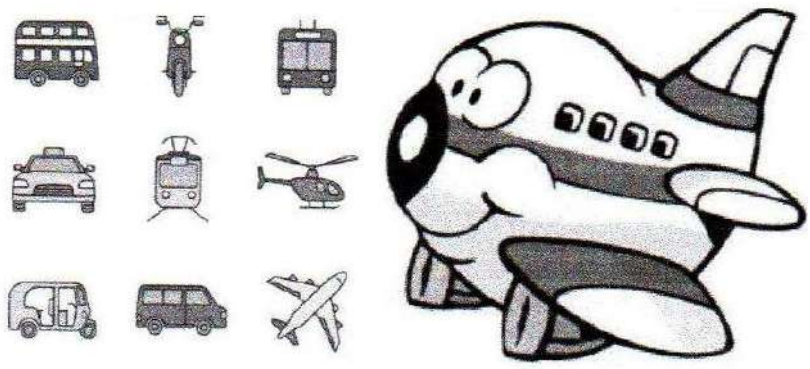
(ii) Find $P(G|\bar{H})$ where G is the event of Jaspreet's selection and $\bar{H}$ is the event that Rohit is not selected. **1**

(iii) (a) Find the probability that exactly one of them is selected. **2**

(OR)

(b) Find the probability that exactly two of them are selected. **2**

7. Airplanes are by far the safest mode of transportation when the number of transported passengers is measured against personal injuries and fatality totals.



Previous records state that the probability of an airplane crash is 0·00001%. Further, there are 95% chances that there will be survivors after a plane crash. Assume that in case of no crash, all travellers survive.

Let E1 be the event that there is a plane crash and E2 be the event that there is no crash. Let A be the event that passengers survive after the journey.

Based on the above information answer the following:

(i) Find the probability that the airplane will not crash. **1**

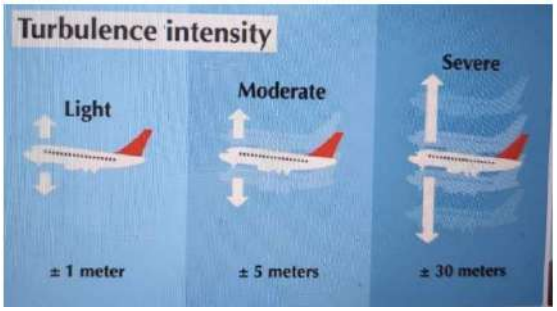
(ii) Find $P(A|E_1) + P(A|E_2)$. **1**

(iii) (a) Find $P(A)$. **2**

(OR)

(b) Find $P(E_2|A)$. **2**

8. According to recent research, air turbulence has increased in various regions around the world due to climate change. Turbulence makes flights bumpy and often delays the flights. Assume that, an airplane observes severe turbulence, moderate turbulence or light turbulence with equal probabilities. Further, the chance of an airplane reaching late to the destination are 55%, 37% and 17% due to severe, moderate and light turbulence respectively. **[BOARD 2024]**



Based on the above information answer the following:

(i) Find the probability that an airplane reached its destination late. **2**

(ii) If the airplane reached its destination late, find the probability that it was due to moderate turbulence. **2**

9. A bank offers loan to its customers on different types of interest namely, fixed rate, floating rate and variable rate. From the past data with the bank, it is known that a customer avails loan on fixed rate, floating rate or variable rate with probabilities 10%, 20% and 70% respectively. A customer after availing loan can pay the loan or default on loan repayment. The bank data suggests that the probability that a

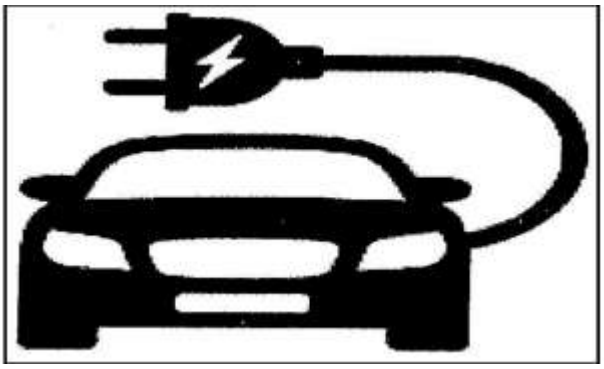
person defaults on loan after availing it at fixed rate, floating rate and variable rate is 5%, 3% and 1% respectively. **[BOARD 2025]**

Based on the above information answer the following:

(i) What is the probability that a customer after availing the loan will default on the loan repayment? **2**

(ii) A customer after availing the loan, defaults on loan repayment. What is the probability that he availed the loan at a variable rate of interest? **2**

10. Three persons viz. Amber, Bonzi and Comet are manufacturing cars which run on petrol and on battery as well. Their production share in the market is 60%, 30% and 10% respectively. Of their respective production capacities, 20%, 10% and 5% cars respectively are electric (or battery operated). **[BOARD 2025]**



Based on the above information answer the following:

(i) (a) What is the probability that a randomly selected car is an electric car? **2**

(OR)

(b) What is the probability that a randomly selected car is a petrol car? **2**

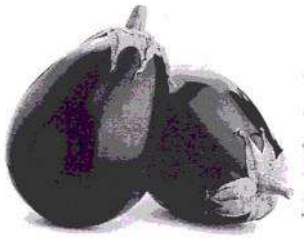
(ii) A car is selected at random and is found to be electric. What is the probability that it was manufactured by Comet? **1**

(iii) A car is selected at random and is found to be electric. What is the probability that it was manufactured by Amber or Bonzi? **1**

11. A gardener wanted to plant vegetables in his garden. Hence, he bought 10 seeds of brinjal plant, 12 seeds of cabbage plant and 8 seeds of radish plant. The shopkeeper assured him of germination probabilities of Brinjal, Cabbage and Radish to be 25%, 35% and 40% respectively. But before he could plant the seeds, they got mixed up in the bag and he had to sow them randomly. **[BOARD 2025]**

Radish

Cabbage



Brinjal

Based on the above information answer the following:

(i) Calculate the probability of a randomly chosen seed to germinate. **2**

(ii) What is the probability that it is a cabbage seed, given that the chosen seed germinated? **2**

12. A shop selling electronic items sells smart phones of only three reputed companies A, B and C because chances of their manufacturing a defective smart phones are only 5%, 4% and 2% respectively. In his inventory he has 25% smart phones from company A, 35% smart phones from company B and 40% smart phones from company C.

A person buys a smart phone from this shop. **[BOARD 2025]**

Based on the above information answer the following:

(i) Find the probability that it was defective. **2**

(ii) What is the probability that this defective smart phone was manufactured by company B? **2**

13. Based upon the results of regular medical check-ups in a hospital, it was found that out of 1000 people, 700 were very healthy, 200 maintained average health and 100 had a poor health record.

Let A_1: People with good health

A_2: People with average health and

A_3: People with poor health

During a pandemic, the data expressed that the chances of people contracting the disease from category A_1, A_2 and A_3 are 25%, 35% and 50% respectively. **[BOARD 2025]**

Based on the above information answer the following:

(i) A person was tested randomly. What is the probability that he/she has contracted the disease? **2**

(ii) Given that the person has not contracted the disease, what is the probability that the person is from category A_2? **2**

14. Some students are having misconception while comparing decimals. For example, a student may mention that $78.56 > 78.9$ as $7856 > 789$. In order to asses this concept, a decimal comparison test was administered to the students of class VI through the following questions: In the recently held sports day in the school, 5 students participated in a javelin throw competition. The distance to which they have thrown the javelin are shown below in the table: **[BOARD 2025]**

Name of student	Distance of javelin (in meters)
Ajay	47·7
Bijoy	47·07
Kartik	43·09
Dinesh	43·9
Devesh	45·2

The students were asked to identify who has thrown the javelin throw the farthest.

Based on the test attempted by the students, the teacher concludes that 40% of the students have the misconception in the concept of decimal comparison and the rest do not have the misconception. 80% of the students having, misconception answered Bijoy as the correct answer in the paper. 90% of the students who are identified with not having misconception, did not answer Bijoy as their answer.

Based on the above information answer the following:

(i) What is the probability of a student not having misconception but still answers Bijoy in the test? **1**

(ii) What is the probability that a randomly selected student answers Bijoy as his answer in the test? **1**

(iii) (a) What is the probability that a student who answered as Bijoy is having misconception? **2**

(OR)

(b) What is the probability that a student who answered as Bijoy is amongst students who do not have the misconception? **2**