OPEN STUDENT FOUNDATION
Std 12 : MATHS
PRACTICE SHEET DAY 13

Section A

- **Write the answer of the following questions. [Each carries 2 Marks]** **[14]**

1. Evaluate $P(A \cup B)$, if $2P(A) = P(B) = \frac{5}{13}$ and $P(A|B) = \frac{2}{5}$

2. Compute $P(A|B)$, if $P(B) = 0.5$ and $P(A \cap B) = 0.32$

3. Determine $P(E|F)$: A coin is tossed three times, where
(i) E : head on third toss,
F : heads on first two tosses
(ii) E : at least two heads,
F : at most two heads
(iii) E : at most two tails,
F : at least one tail

4. Two cards are drawn at random without replacement from the pack of 52 playing cards. Find the probability that both the cards are black.

5. Probability of solving specific problem independently by A and B are $\frac{1}{2}$ and $\frac{1}{3}$ respectively. If both try to solve the problem independently, find the probability that exactly one of them solves the problem.

6. Given two independent events A and B such that $P(A) = 0.3$, $P(B) = 0.6$. Find
(i) P(A and B)
(ii) P(A and not B)
(iii) P(A or B)
(iv) P (neither A nor B)

7. Events A and B are such that $P(A) = \frac{1}{2}$, $P(B) = \frac{7}{12}$ and P(not A or not B) $= \frac{1}{4}$. State whether A and B are independent ?

Section B

- **Write the answer of the following questions. [Each carries 3 Marks]** **[24]**

8. A fair coin and an unbiased dice are tossed. Let A be the event 'head appears on the coin' and B be the event '3 on the dice'. Check whether A and B are independent events or not.

9. An urn contains 5 red and 5 black balls. A ball is drawn at random, its colour is noted and is returned to the urn. Moreover, 2 additional balls of the colour drawn are put in the urn and then a ball is drawn at random. What is the probability that the second ball is red ?

10. Of the students in a college, it is known that 60% reside in hostel and 40% are day scholars (not residing in hostel). Previous year results report that 30% of all students who reside in hostel attain A grade and 20% of day scholars attain A grade in their annual examination. At the end of the year, one student is chosen at random from the college and he has an A grade, what is the probability that the student is a hostlier ?

11. A factory has two machines A and B. Past record shows that machine A produced 60% of the items of output and machine B produced 40% of the items. Further, 2% of the items produced by machine

A and 1% produced by machine B were defective. All the items are put into one stockpile and then one item is chosen at random from this and is found to be defective. What is the probability that it was produced by machine B ?

12. A manufacturer has three machine operators A, B and C. The first operator A produces 1% defective items, where as the other two operators B and C produce 5% and 7% defective items respectively. A is on the job for 50% of the time, B is on the job for 30% of the time and C is on the job for 20% of the time. A defective item is produced, what is the probability that it was produced by A ?

13. Suppose a girl throws a dice. If she gets a 5 or 6, she tosses a coin three times and notes the number of heads. If she gets 1, 2, 3 or 4, she tosses a coin once and notes whether a head or tail is obtained. If she obtained exactly one head, what is the probability that she threw 1, 2, 3 or 4 with the dice ?

14. Suppose that 5% of men and 0.25% of women have grey hair. A grey haired person is selected at random. What is the probability of this person being male ? Assume that there are equal number of males and females.

15. Bag I contains 3 red and 4 black balls and Bag II contains 4 red and 5 black balls. One ball is transferred from Bag I to Bag II and then a ball is drawn from Bag II. The ball so drawn is found to be red in colour. Find the probability that the transferred ball is black.

Section C

- **Write the answer of the following questions.** [Each carries 4 Marks] **[8]**

16. Probability of solving specific problem independently by A and B are $\frac{1}{2}$ and $\frac{1}{3}$ respectively. If both try to solve the problem independently, find the probability that

(i) the problem is solved

(ii) exactly one of them solves the problem.

17. An insurance company insured 2000 scooter drivers, 4000 car drivers and 6000 truck drivers. The probability of an accidents are 0.01, 0.03 and 0.15 respectively. One of the insured persons meets with an accident. What is the probability that he is a scooter driver ?

Section A

- **Write the answer of the following questions.** [Each carries 2 Marks] **[14]**

1. Evaluate $P(A \cup B)$, if $2P(A) = P(B) = \frac{5}{13}$ and $P(A|B) = \frac{2}{5}$

➥ We have $2P(A) = P(B) = \frac{5}{13}$ Hence $P(A) = \frac{5}{26}$, and $P(B) = \frac{5}{13}$

$P(A \mid B) = \frac{2}{5}$

$\therefore \frac{P(A \cap B)}{P(B)} = \frac{2}{5}$

$\therefore P(A \cap B) = \frac{2}{5} P(B) = \frac{2}{5} \times \frac{5}{13} = \frac{2}{13}$

Now, $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$= \frac{5}{26} + \frac{5}{13} - \frac{2}{13}$

$= \frac{5}{26} + \frac{3}{13}$

$= \frac{11}{26}$

2. Compute $P(A|B)$, if $P(B) = 0.5$ and $P(A \cap B) = 0.32$

➥ Given that $P(B) = 0.5$ and $P(A \cap B) = 0.32$

$P(A|B) = \frac{P(A \cap B)}{P(B)}$

$= \frac{0.32}{0.5}$

$= \frac{32}{50} \times \frac{2}{2}$

$= \frac{64}{100} = 0.64$

3. Determine $P(E|F)$: A coin is tossed three times, where

(i) E : head on third toss,
F : heads on first two tosses

(ii) E : at least two heads,
F : at most two heads

(iii) E : at most two tails,
F : at least one tail

➥ Let S is the sample space of tossing a coin thrice

S = {TTT, HTT, THT, TTH, HHT, HTH, THH, HHH}

$\therefore n(S) = 8$

(i) Event E = In third toss head is obtained.

= {TTH, HTH, THH, HHH}

$\therefore\ n(\text{E}) = 4$

Event F = Head is obtained in first two tosses.

= {HHT, HHH}

$\therefore\ n(\text{F}) = 2$

$\text{E} \cap \text{F} = \{\text{HHH}\} \Rightarrow n\ (\text{E} \cap \text{F}) = 1$

Now $\text{P(E}|\text{F)} = \dfrac{\text{P(E} \cap \text{F)}}{\text{P(F)}}$

$$= \frac{\dfrac{n(\text{E} \cap \text{F})}{n(\text{S})}}{\dfrac{n(\text{F})}{n(\text{S})}} = \frac{n(\text{E} \cap \text{F})}{n(\text{F})} = \frac{1}{2}$$

(ii) Event E = At least two heads are obtained.

= {HHT, HTH, THH, HHH}

$\therefore\ n(\text{E}) = 4$

Event F = At most two heads are obtained

= {TTT, HTT, THT, TTH, HHT, HTH, THH}

$\therefore\ n(\text{F}) = 7$

$\text{E} \cap \text{F} = \{\text{HHT, HTH, THH}\}$

$\therefore\ n\ (\text{E} \cap \text{F}) = 3$

Now, $\text{P(E}|\text{F)} = \dfrac{\text{P(E} \cap \text{F)}}{\text{P(F)}}$

$$= \frac{\dfrac{n(\text{E} \cap \text{F})}{n(\text{S})}}{\dfrac{n(\text{F})}{n(\text{S})}} = \frac{n(\text{E} \cap \text{F})}{n(\text{F})} = \frac{3}{7}$$

(iii) Event E = At most two tails are obtained

= {HTT, THT, TTH, HHT, HTH, THH, HHH}

$\therefore\ n(\text{E}) = 7$

Event F = At least one tail is obtained

= {TTT, HTT, THT, TTH, HHT, HTH, THH}

$\therefore\ n(\text{F}) = 7$

$\text{E} \cap \text{F} = \{\text{HTT, THT, TTH, HHT, HTH, THH}\}$

$\therefore\ n(\text{E} \cap \text{F}) = 6$

Now $\text{P(E}|\text{F)} = \dfrac{\text{P(E} \cap \text{F)}}{\text{P(F)}}$

$n(\text{E} \cap \text{F})$

$$= \frac{n(S)}{\frac{n(F)}{n(S)}} = \frac{6}{7}$$

4. Two cards are drawn at random without replacement from the pack of 52 playing cards. Find the probability that both the cards are black.

➥ There are 26 black colour cards in pack of 52 playing cards.

Event A = First card is of black colour

Event B = Second card is of black colour

$\therefore$ $P(A) = \frac{26}{52} = \frac{1}{2}$

Here cards are selected without replacement means selected card will not be put back.

$\therefore$ For the selection of second card we take one card from 52 cards and black card from 26 black cards.

$\therefore$ $P(B) = \frac{25}{51}$

Here A and B are independent events.

$\therefore$ Probability of an event that both cards are of black colour. $= P(A \cap B)$

$= P(A)\,P(B)$

$= \frac{1}{2} \times \frac{25}{51}$

$= \frac{25}{102}$

5. Probability of solving specific problem independently by A and B are $\frac{1}{2}$ and $\frac{1}{3}$ respectively. If both try to solve the problem independently, find the probability that exactly one of them solves the problem.

➥ Event A = A solves problem independently

Event B = B solves problem independently

Here $P(A) = \frac{1}{2}$ and $P(B) = \frac{1}{3}$

A and B are independent events

P (Exactly any one of them solves problem)

$= P(A \cap B') + P(A' \cap B)$

$= P(A) \cdot P(B') + P(A')\,P(B)$ ($\because$ Independent events)

$= P(A)\,[1 - P(B)] + [1 - P(A)]\,P(B)$

$= \frac{1}{2}\left[1 - \frac{1}{3}\right] + \left[1 - \frac{1}{2}\right]\frac{1}{3}$

$= \frac{1}{2} \times \frac{2}{3} + \frac{1}{2} \times \frac{1}{3}$

$= \frac{2}{6} + \frac{1}{6}$

$= \frac{3}{6}$

$= \frac{1}{2}$

6. Given two independent events A and B such that P(A) = 0.3, P(B) = 0.6. Find

(i) P(A and B)

(ii) P(A and not B)

(iii) P(A or B)

(iv) P (neither A nor B)

➥ Given that P(A) = 0.3, P(B) = 0.6

A and B are independent events.

(i) P(A and B) $= P(A \cap B)$

$= P(A) \cdot P(B)$

$= 0.3 \times 0.6$

$= 0.18$

(ii) P(A and not B) $= P(A \cap B')$

$= P(A) - P(A \cap B)$

$= 0.3 - 0.18$ ($\because$ from 1)

$= 0.12$

(iii) P(A or B) $= P(A \cup B)$

$= P(A) + P(B) - P(A \cap B)$

$= 0.3 + 0.6 - 0.18$

$= 0.9 - 0.18$

$= 0.72$

(iv) P (Not A and Not B) $= P(A' \cap B')$

$= P[(A \cup B')]$ ($\because$ Using De-morgan's rule)

$= 1 - P(A \cup B)$

$= 1 - 0.72$

$= 0.28$

7. Events A and B are such that $P(A) = \frac{1}{2}$, $P(B) = \frac{7}{12}$ and P(not A or not B) $= \frac{1}{4}$. State whether A and B are independent ?

➥ Given that $P(A) = \frac{1}{2}, P(B) = \frac{7}{12}$

P(Not A or Not B) $= \frac{1}{4}$

$P(A' \cup B') = \frac{1}{4}$

$\therefore P[(A \cap B)'] = \frac{1}{4}$ ($\because$ De-Morgan's theorem)

$\therefore\ 1 - P(A \cap B) = \frac{1}{4}$

$\therefore\ P(A \cap B) = 1 - \frac{1}{4} = \frac{3}{4}$ ... (i)

Now $P(A) \cdot P(B) = \frac{1}{2} \times \frac{7}{12} = \frac{7}{24}$ ... (ii)

From result (i) and (ii)

$P(A \cap B) \neq P(A) \cdot P(B)$

$\therefore$ A and B are not independent events.

Section B

- **Write the answer of the following questions.** [Each carries 3 Marks] **[24]**

8. A fair coin and an unbiased dice are tossed. Let A be the event 'head appears on the coin' and B be the event '3 on the dice'. Check whether A and B are independent events or not.

➥ One balanced coin and dice are tossed.

Sample space S = {H1, H2, H3, H4, H5, H6, T1, T2, T3, T4, T5, T6}

$\therefore\ n(S) = 12$

Event A = Head is obtained.

= {H1, H2, H3, H4, H5, H6}

$\therefore\ n(A) = 6$

$\therefore\ P(A) = \frac{n(A)}{n(S)} = \frac{6}{12} = \frac{1}{2}$ ...(1)

Event B = Number 3 is obtained.

= {H3, T3}

$\therefore\ n(B) = 2$

$\therefore\ P(B) = \frac{n(B)}{n(S)} = \frac{2}{12} = \frac{1}{6}$ ...(2)

Now $A \cap B$ = Head is obtained on coin and number 3 is obtained on dice.

= {H3}

$\therefore\ P(A \cap B) = \frac{1}{12} = \frac{1}{2} \times \frac{1}{6} = P(A) \cdot P(B)$ ($\because$ From results (1) and (2))

$\therefore\ P(A \cap B) = P(A) \cdot P(B)$

$\therefore$ A and B are independent events.

9. An urn contains 5 red and 5 black balls. A ball is drawn at random, its colour is noted and is returned to the urn. Moreover, 2 additional balls of the colour drawn are put in the urn and then a ball is drawn at random. What is the probability that the second ball is red ?

➥

Number of balls	After event A	After event B
Red colour balls = 5	7	5
Black colour balls = 5	5	7
Total = 10	12	12

Let event A = Ball selected at random is of red colour.

Event B = Ball selected at random is of black colour.

$\therefore$ $P(A) = \frac{5}{10} = \frac{1}{2}$, $P(B) = \frac{5}{10} = \frac{1}{2}$

Event C = Selected second ball is of red colour.

$\therefore$ $P(C|A) = \frac{7}{12}$ ($\because$ After the event A balls in box are 5 + 2 = 7 and total balls are 12)

$\therefore$ $P(C|B) = \frac{5}{12}$ ($\because$ After event B total numbers of ball in box are 5 + 2 = 7 and total balls are 12)

Now $P(C) = P(A)\ P(C|A) + P(B)\ P(C|B)$

$$= \frac{1}{2} \times \frac{7}{12} + \frac{1}{2} \times \frac{5}{12}$$

$$= \frac{7}{24} + \frac{5}{24}$$

$$= \frac{12}{24}$$

$$= \frac{1}{2}$$

$\therefore$ Probability that second ball is red is $\frac{1}{2}$.

10. Of the students in a college, it is known that 60% reside in hostel and 40% are day scholars (not residing in hostel). Previous year results report that 30% of all students who reside in hostel attain A grade and 20% of day scholars attain A grade in their annual examination. At the end of the year, one student is chosen at random from the college and he has an A grade, what is the probability that the student is a hostlier ?

➥ Let Event E_1 = Student stays in hostel.

Event E_2 = Student does not say in hostel

Event A = Student gets A grade

From given data we have

$P(E_1) = \frac{60}{100} = \frac{6}{10}$, $P(E_2) = \frac{40}{100} = \frac{4}{10}$

$P(A|E_1) = \frac{30}{100} = \frac{3}{10}$, $P(A|E_2) = \frac{20}{100} = \frac{2}{10}$

Probability of an event that if student gets A grade and student is from hostel = $P(E_1|A)$

$$P(E_1|A) = \frac{P(E_1)\ P(A|E_1)}{P(A)}$$

$$= \frac{P(E_1)\ P(A|E_1)}{P(E_1)\ P(A|E_1) + P(E_2) \cdot P(A|E_2)}$$

$$= \frac{\frac{6}{10} \times \frac{3}{10}}{\frac{6}{10} \times \frac{3}{10} + \frac{4}{10} \times \frac{2}{10}}$$

$$= \frac{18}{18+8}$$

$$= \frac{18}{26}$$

$$= \frac{9}{13}$$

$\therefore$ Required probability $= \frac{9}{13}$

11. A factory has two machines A and B. Past record shows that machine A produced 60% of the items of output and machine B produced 40% of the items. Further, 2% of the items produced by machine A and 1% produced by machine B were defective. All the items are put into one stockpile and then one item is chosen at random from this and is found to be defective. What is the probability that it was produced by machine B ?

➥ Suppose that,

Event A = Item is produced by machine A

Event B = Item is produced by machine B

Event D = Produced item is defective

It is given that

$P(A) = \frac{60}{100} = \frac{6}{10}$, $\quad P(B) = \frac{40}{100} = \frac{4}{10}$

$P(D \mid A) = \frac{2}{100}$, $\quad P(D \mid B) = \frac{1}{100}$

Probability of an event that produced item is defective if it is produced by machine B = P (B | D)

$$\therefore\ P(B \mid D) = \frac{P(B) \cdot P(D \mid B)}{P(A)\ P(D \mid A) + P(B)\ P(D \mid B)}$$

$$= \frac{\frac{4}{10} \times \frac{1}{100}}{\frac{6}{10} \times \frac{2}{100} + \frac{4}{10} \times \frac{1}{100}}$$

$$= \frac{4}{12+4}$$

$$= \frac{4}{16} = \frac{1}{4}$$

$\therefore$ Required probability $= \frac{1}{4}$

12. A manufacturer has three machine operators A, B and C. The first operator A produces 1% defective items, where as the other two operators B and C produce 5% and 7% defective items respectively. A is on the job for 50% of the time, B is on the job for 30% of the time and C is on the job for 20% of the time. A defective item is produced, what is the probability that it was produced by A ?

➥ Suppose that Event E_1 = work is done by operator A.

Event E_2 = work is done by operator B

Event E_3 = work is done by operator C

And Event A = Product is defective

Here it is given that,

$$P(E_1) = \frac{50}{100} = \frac{5}{10}, \quad P(E_2) = \frac{30}{100} = \frac{3}{10}$$

$$P(E_3) = \frac{20}{100} = \frac{2}{10}$$

Also $P(A|E_1) = \frac{1}{100}$, $P(A|E_2) = \frac{5}{100}$

$$P(A|E_3) = \frac{7}{100}$$

Probability of event that defective item is produce by operator A.

$$P(E_1|A) = \frac{P(E_1)\,P(A|E_1)}{P(E_1)\,P(A|E_1) + P(E_2)\,P(A|E_2) + P(E_3)\,P(A|E_3)}$$

$$= \frac{\frac{5}{10} \times \frac{1}{100}}{\frac{5}{10} \times \frac{1}{100} + \frac{3}{10} \times \frac{5}{100} + \frac{2}{10} \times \frac{7}{100}}$$

$$= \frac{5}{5 + 15 + 14}$$

$$= \frac{5}{34}$$

$\therefore$ Required probability $= \frac{5}{34}$

13. Suppose a girl throws a dice. If she gets a 5 or 6, she tosses a coin three times and notes the number of heads. If she gets 1, 2, 3 or 4, she tosses a coin once and notes whether a head or tail is obtained. If she obtained exactly one head, what is the probability that she threw 1, 2, 3 or 4 with the dice ?

➥ Suppose event E_1 = Number 5 or 6 obtained on dice.

Event E_2 = Number 1, 2, 3 or 4 is obtained on dice.

$$\therefore P(E_1) = \frac{2}{6} = \frac{1}{3}, \quad P(E_2) = \frac{4}{6} = \frac{2}{3}$$

Now we toss coin thrice.

Sample space = {HHH, HHT, HTH, HTT, THH, THT, TTH, TTT}

Event A = Only one head is obtained.

If number 5 or 6 is obtained toss the coin thrice. In this case $P(A|E_1) = \frac{3}{8}$

If number 1, 2, 3 or 4 is obtained on dice then toss coin. In this case $P(A|E_2) = \frac{1}{2}$

Probability of an event that if exactly one head is obtained if number 1, 2, 3 or 4 obtained on dice.

$$P(E_2|A) = \frac{P(E_2)\,P(A|E_2)}{P(E_1)\,P(A|E_1) + P(E_2)\,P(A|E_2)}$$

$$= \frac{\frac{2}{3} \times \frac{1}{2}}{\frac{1}{3} \times \frac{3}{8} + \frac{2}{3} \times \frac{1}{2}}$$

$$= \frac{\frac{1}{3}}{\frac{1}{8} + \frac{1}{3}}$$

$$= \frac{1}{3} \times \frac{24}{11}$$

$$= \frac{8}{11}$$

$\therefore$ Required Probability $= \frac{8}{11}$

14. Suppose that 5% of men and 0.25% of women have grey hair. A grey haired person is selected at random. What is the probability of this person being male ? Assume that there are equal number of males and females.

➥ Event E_1 = Person is man

Event E_2 = Person is woman

Event A = Person has gray hair

Numbers of man and woman and equal.

$\therefore P(E_1) = P(E_2) = \frac{1}{2}$

Now given that $P(A|E_1) = \frac{5}{100} = \frac{1}{20}$

and $P(A|E_2) = \frac{0.25}{100} = \frac{1}{400}$

Probability of an event that if person having gray hair if he is man = $P(E_1 | A)$

$$= \frac{P(E_1)\,P(A|E_1)}{P(E_1)\ P(A|E_1) + P(E_2)\,P(A|E_2)}$$

$$= \frac{\frac{1}{2} \times \frac{1}{20}}{\frac{1}{2} \times \frac{1}{20} + \frac{1}{2} \times \frac{1}{400}}$$

$$= \frac{1}{40} \times \frac{800}{21}$$

$$= \frac{20}{21}$$

$\therefore$ Required probability $= \frac{20}{21}$

15. Bag I contains 3 red and 4 black balls and Bag II contains 4 red and 5 black balls. One ball is transferred from Bag I to Bag II and then a ball is drawn from Bag II. The ball so drawn is found to be red in colour. Find the probability that the transferred ball is black.

➥

	Balls of red colours	Balls of black colours	Total
Bag I	3	4	7
Bag II	4	5	9

Event E_1 = Ball transferred from bag (I) to bag (II) is of red colour

E_2 = Ball transferred from bag (I) to bag (II) is of black colour

$\therefore P(E_1) = \frac{3}{7}, P(E_2) = \frac{4}{7}$

Event A = Selected ball from bag II is of red colour.

After event E_1 there are 5 red and 5 black colour ball in bag II.

$\therefore P(A | E_1) = \frac{5}{10}$

After event E_2 there are 4 red colour and 6 black colour balls.

$\therefore P(A | E_2) = \frac{4}{10}$

Require probability of event that after event A Black ball is placed in bag I and II = $P(E_2 | A)$

$$P(E_2 | A) = \frac{P(E_2) P(A | E_2)}{P(E_1) P(A | E_1) + P(E_2) P(A | E_2)}$$

$$= \frac{\frac{4}{7} \times \frac{4}{10}}{\frac{3}{7} \times \frac{5}{10} + \frac{4}{7} \times \frac{4}{10}}$$

$$= \frac{16}{15 + 16} = \frac{16}{31}$$

$\therefore$ Required probability = $\frac{16}{31}$

Section C

● **Write the answer of the following questions. [Each carries 4 Marks]** **[8]**

16. Probability of solving specific problem independently by A and B are $\frac{1}{2}$ and $\frac{1}{3}$ respectively. If both try to solve the problem independently, find the probability that

(i) the problem is solved

(ii) exactly one of them solves the problem.

➥ Event A = A solves problem independently

Event B = B solves problem independently

Here $P(A) = \frac{1}{2}$ and $P(B) = \frac{1}{3}$

A and B are independent events

(i) The Problem is solved.

Any one of A and B gives solution of problem.

$\therefore$ P (Problem is solved)

$= P(A \cup B)$

$= P(A) + P(B) - P(A \cap B)$

$= P(A) + P(B) - P(A) \cdot P(B)$

$$= \frac{1}{2} + \frac{1}{3} - \frac{1}{2} \times \frac{1}{3}$$

$$= \frac{5}{6} - \frac{1}{6}$$

$$= \frac{4}{6} = \frac{2}{3}$$

(ii) P (Exactly any one of them solves problem)

$= P(A \cap B') + P(A' \cap B)$

$= P(A) \cdot P(B') + P(A')\ P(B)$ $(\because$ Independent events)

$= P(A)\ [1 - P(B)] + [1 - P(A)]\ P(B)$

$$= \frac{1}{2}\left[1 - \frac{1}{3}\right] + \left[1 - \frac{1}{2}\right]\frac{1}{3}$$

$$= \frac{1}{2} \times \frac{2}{3} + \frac{1}{2} \times \frac{1}{3}$$

$$= \frac{2}{6} + \frac{1}{6}$$

$$= \frac{3}{6}$$

$$= \frac{1}{2}$$

17. An insurance company insured 2000 scooter drivers, 4000 car drivers and 6000 truck drivers. The probability of an accidents are 0.01, 0.03 and 0.15 respectively. One of the insured persons meets with an accident. What is the probability that he is a scooter driver ?

➥ Let Event E_1 = Person is scooter driver.

Event E_2 = Person is car driver.

Event E_3 = Person is truck driver.

And event A = Person meets accident.

Total numbers of persons = 2000 scooter drivers

4000 car drivers

\+ 6000 Truck drivers

12000

$\therefore$ From the data we have

$$\therefore P(E_1) = \frac{2000}{12000} = \frac{1}{6}, \quad P(E_2) = \frac{4000}{12000} = \frac{1}{3}$$

$$P(E_3) = \frac{6000}{12000} = \frac{1}{2}$$

Also $P(A \mid E_1) = 0.01$, $P(A \mid E_2) = 0.03$

$P(A \mid E_3) = 0.15$

Probability of an event that person meets with accident if he is scooter driver = $P(E_1 \mid A)$

$$P(E_1 \mid A) = \frac{P(E_1) \cdot P(A \mid E_1)}{P(E_1)\ P(A \mid E_1) + P(E_2)\ P(A \mid E_2) + P(E_3)\ P(A \mid E_3)}$$

$$= \frac{\frac{1}{6} \times 0.01}{\frac{1}{6} \times 0.01 + \frac{1}{3} \times 0.03 + \frac{1}{2} \times 0.15}$$

$$= \frac{\frac{1}{6}}{\frac{1}{6} + 1 + \frac{15}{2}}$$

$$= \frac{1}{1 + 6 + 45}$$

$$= \frac{1}{52}$$

$\therefore$ Required probability $= \frac{1}{52}$