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ULTIMATE MATHEMATICS : BY AJAY MITTAL.

PROBABILITY : CLASS NO: 2
(11th class)

Q No: 1 ✦ In a class of 60 students, 30 opted for NCC, 32 opted for NSS and 24 opted for both NCC and NSS. If one of the students is selected at random find the probability that

(a) The student opted for NCC or NSS
(b) the student has opted neither NCC nor NSS
(c) The student has opted NSS but not NCC.

Sol: Let A → student opted for NCC
B → student opted for NSS

Given $P(A) = \frac{30}{60}$; $P(B) = \frac{32}{60}$ & $P(A \cap B) = \frac{24}{60}$

(i) By Prob: $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$= \frac{30}{60} + \frac{32}{60} - \frac{24}{60} = \frac{38}{60} = \frac{19}{30}$ Ans

(2) By Prob $P(A' \cap B') = 1 - P(A \cup B)$

$= 1 - \frac{19}{30} = \frac{11}{30}$

(3) By Prob $P(B \cap A') = P(B) - P(A \cap B) = \frac{32}{60} - \frac{24}{60} = \frac{8}{60}$

$= \frac{2}{15}$ Ans

Qn. 2 → A basket contains 20 apples and 10 oranges out of which 5 Apples and 3 oranges are defective.

If a person takes out 2 at random what is the probability that either both are Apples or both are good?

Sol: Let A → both items are apples

B → both items is good

$P(A) = \frac{20C_2}{30C_2}$; $P(B) = \frac{22C_2}{30C_2}$; $P(A \cap B) = \frac{15C_2}{30C_2}$

Req: $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$= \frac{20C_2}{30C_2} + \frac{22C_2}{30C_2} - \frac{15C_2}{30C_2}$

$\frac{15}{30} \times \frac{14}{29}$

$\frac{22}{30} \times \frac{21}{29}$

$\frac{15}{30} \times \frac{14}{29}$

$= \frac{20C_2 + 22C_2 - 15C_2}{30C_2} = \frac{190 + 231 - 105}{435}$

$= \square$ Ans

Qn 3 → An Integer is chosen at random from the numbers from 1 to 50. What is the probability that the integer chosen is a multiply of 2 or 3 or 10?

Sol Let A → Integer chosen is multiply of 2

B → " " " " " 3

C → " " " " " 10

$A = \{2, 4, 6, \ldots 50\}$ $B = \{3, 6, 9 \ldots 48\}$ $C = \{10, 20, 30, 40, 50\}$

$A \cap B = \{6, 12, 18, \ldots 48\}$ $B \cap C = \{30\}$

$A \cap C = \{10, 20, 30, 40, 52\}$

$A \cap B \cap C = \{30\}$

$P(A) = \frac{25}{50}$; $P(B) = \frac{16}{50}$; $P(C) = \frac{5}{10}$; $P(A \cap B) = \frac{8}{50}$

$P(B \cap C) = \frac{1}{50}$; $P(C \cap A) = \frac{5}{50}$; $P(A \cap B \cap C) = \frac{1}{50}$

$P(A \cup B \cup C) = \frac{25}{50} + \frac{16}{50} + \frac{5}{10} - \frac{8}{50} - \frac{1}{50} - \frac{5}{50} + \frac{1}{50} =$ ☐ Ans

Q No 4 → For a post of three persons A, B & C appear in the interview. The probability of A being selected is twice that of B and the probability of B being selected is thrice that of C. What are the Individual probabilities of A, B, C being selected?

Sol: Let A → person A will be selected

B → " B " " "

C → " C " " "

Given $P(A) = 2P(B)$

$P(B) = 3P(C)$

A, B, C are Mutually exclusive & exhaustive events

$\therefore P(A) + P(B) + P(C) = 1$

$2P(B) + P(B) + \frac{P(B)}{3} = 1$

$\frac{10P(B)}{3} = 1$

$P(B) = \frac{3}{10}$

$P(A) = \frac{6}{10}$

$P(C) = \frac{1}{10}$ Ans

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$= \frac{20C_2}{30C_2} + \frac{22C_2}{30C_2} - \frac{15C_2}{30C_2}$

$= \frac{20C_2 + 22C_2 - 15C_2}{30C_2} = \frac{190 + 231 - 105}{435}$

$= \square$ Ans

15 × 29 = 435; 11 × 21 = 231; 22 × 21 / 2 = 231; 15 × 14 / 2 = 105

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$A = \{2, 4, 6, \ldots 50\}$ $B = \{3, 6, 9 \ldots 48\}$ $C = \{10, 20, 30, 40, 50\}$

$A \cap B = \{6, 12, 18, \ldots 48\}$ $B \cap C = \{30\}$

$A \cap C = \{10, 20, 30, 40, 52\}$

$A \cap B \cap C = \{30\}$

$P(A) = \frac{25}{50}$; $P(B) = \frac{16}{50}$; $P(C) = \frac{5}{10}$; $P(A \cap B) = \frac{8}{50}$

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$2P(B) + P(B) + \frac{P(B)}{3} = 1$

$\frac{10P(B)}{3} = 1$

$P(B) = \frac{3}{10}$

$P(A) = \frac{6}{10}$

$P(C) = \frac{1}{10}$ Ans

Ques 5 → A box contains 6 red, 4 white and 5 black balls.

A person draws 4 balls from the box at random.

Find the probability that among the balls drawn there is "atleast one ball of each colour!"

Sol:

(6)	(4)	(5)
R	W	B
1	1	2
1	2	1
2	1	1

Req:4

A → gets 1 R, 1 W & 2 B

B → gets 1 R, 2 W & 1 B

C → gets 2 R, 1 W, 1 B ball

$$P(A) = \frac{{}^6C_1 \times {}^4C_1 \times {}^5C_2}{{}^{15}C_4}$$

$$P(B) = \frac{{}^6C_1 \times {}^4C_2 \times {}^5C_1}{{}^{15}C_4}$$

$$P(C) = \frac{{}^6C_2 \times {}^4C_1 \times {}^5C_1}{{}^{15}C_4}$$

Req Prob $P(A) + P(B) + P(C)$

$$= \frac{(6 \times 4 \times 10) + (6 \times 6 \times 5) + (15 \times 4 \times 5)}{{}^{15}C_4}$$

$$= \frac{240 + 180 + 300}{15 \times 7 \times 13} = \square \text{ Ans}$$

Req 4

$$\frac{15 \times 14 \times 13 \times 12}{24}$$

Qm. 6 If 4-digit numbers greater than 5000 are randomly formed from the digits 0, 1, 3, 5 & 7 what is the probability of forming a number divisible by 5 when

(i) the digits are repeated ?

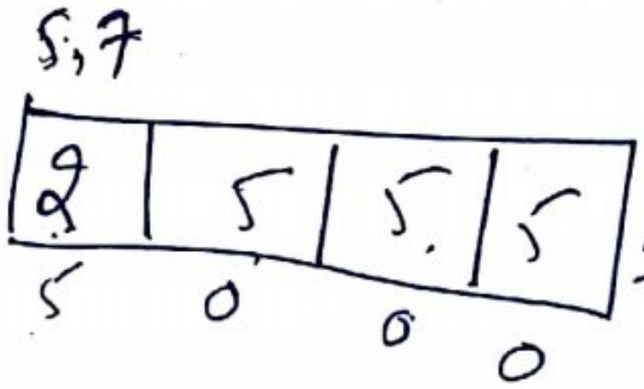
(ii) the repetition of digits is not allowed ?

Sol:

0, 1, 3, 5, 7

(i) Rep of digits allowed

total no of ways



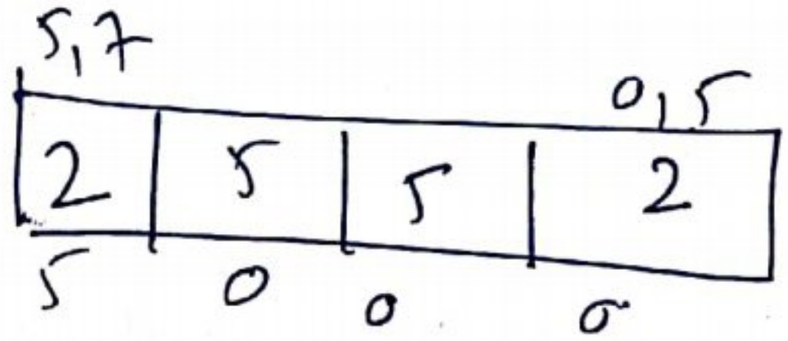
$= 2 \times 5 \times 5 \times 5$

$= 250$

$= 250 - 1$ { 1 for 5000 only

$= 249$

fav. no of ways



$= 2 \times 5 \times 5 \times 2$

$= 100$

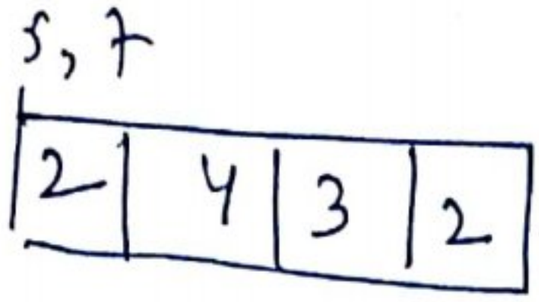
$= 100 - 1$ { 1 for 5000 only

$= 99$

Req. Prob $= \frac{99}{249} = \frac{33}{83}$ Ans

(2) Rep. not allowed

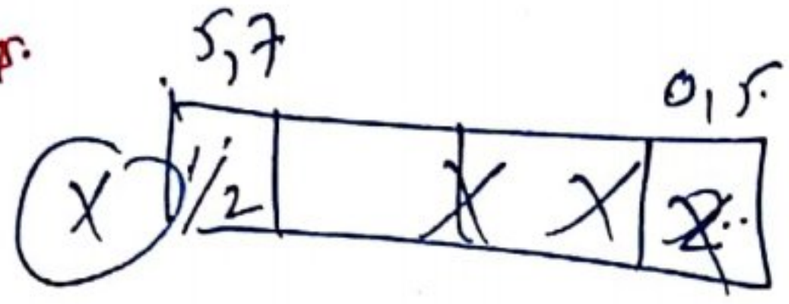
total no of ways :-



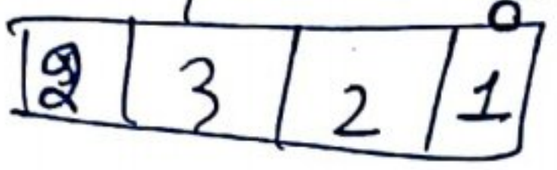
$= 2 \times 4 \times 3 \times 2$

$= 48$

fav. no of arrays.

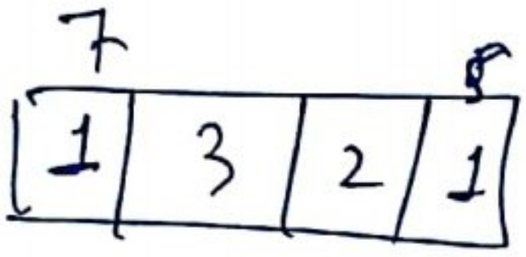


case I nos ends with 0



$= 12$

Case II nos end with 5



$= 6$

$\underline{18}$

Req prob. $\frac{18}{48}$ Ans

WORKSHEET No: 2 PROBABILITY

Q.No 1 In an entrance test, that is graded on the basis of two examination, the probability of a randomly chosen Student passing the first examination is 0.8 and the probability of passing the second examination is 0.7. The probability of passing atleast one of them is 0.95 what is the probability of passing both? Ans 0.55

Q.No 2 → The probability that a student will pass the final examination in both English and Hindi is 0.5 and the probability of passing neither is 0.1. If the probability of passing the English examination is 0.75, what is the probability of passing the Hindi examination? Ans 0.65

Q.No 3 → (a) Given $P(A) = 3/5$ and $P(B) = 1/5$
Find $P(A \text{ or } B)$, if A and B are mutually exclusive

(b) given $P(\text{not } E \text{ or not } F) = 0.25$. State whether E & F are mutually exclusive events?

Ans (a) $\frac{4}{5}$ (b) No

Q.No 4 → given $P(A) = 0.54$; $P(B) = 0.69$; $P(A \cap B) = 0.35$
find (i) $P(A' \cap B')$ (2) $P(B \cap A')$ Ans (i) 0.12 (ii) 0.34

Qn. 5 → Find the probability that when a hand of 7 cards is drawn from a pack of 52 cards it contains

(1) all kings

(2) 3 kings

(3) atleast 3 king

Ans (1) $\frac{1}{7735}$ (2) $\frac{9}{1547}$ (3) $\frac{46}{7735}$

Qn. 6 → In a town of 6000 people, 1200 are over 50 years old and 2000 are female. It is known that 30% of the females are are 50 years. What is the probability that a random chosen individual from the town either female or over 50 years?

Ans = $\frac{13}{30}$

Qn. 7 → Find the probability of almost two tails or atleast two heads in a toss of three coins

Ans = $\frac{7}{8}$

Qn. 8 → Two cards are drawn from a pack of 52 cards. What is the probability that either both are red or both are kings?

Ans = $\frac{55}{221}$

Qn. 9 → Two dice are thrown together. What is the probability that the sum of the numbers on the two faces is neither divisible by 3 nor by 4

Ans = 4/9

Qn 10 → A drawer contains 30 bolts and 40 nuts. Half of the bolts and half of the nuts are rusted. If two items are drawn at random, what is the probability that either both are rusted or both are bolts

Ans $\frac{185}{483}$

Qn 11 → If A, B, C are mutually exclusive & exhaustive events such that $P(B) = \frac{3}{2} P(A)$; $P(C) = \frac{1}{2} P(B)$ find $P(A)$

Ans = $\frac{4}{13}$

Qn 12 → A card is drawn from a pack of 52 cards. Find the prob of getting a king or a heart or a red card

Ans = $\frac{7}{13}$

Qn 13 → The probability that atleast one of the events A and B occur is 0.6 . If A and B occur simultaneously with probability 0.2 Find $P(A') + P(B')$

Ans = 1.2

—x—