ULTIMATE KCET

CRASH COURSE 2026

Mathematics | Lecture : 01

Probability, Permutation & Combination

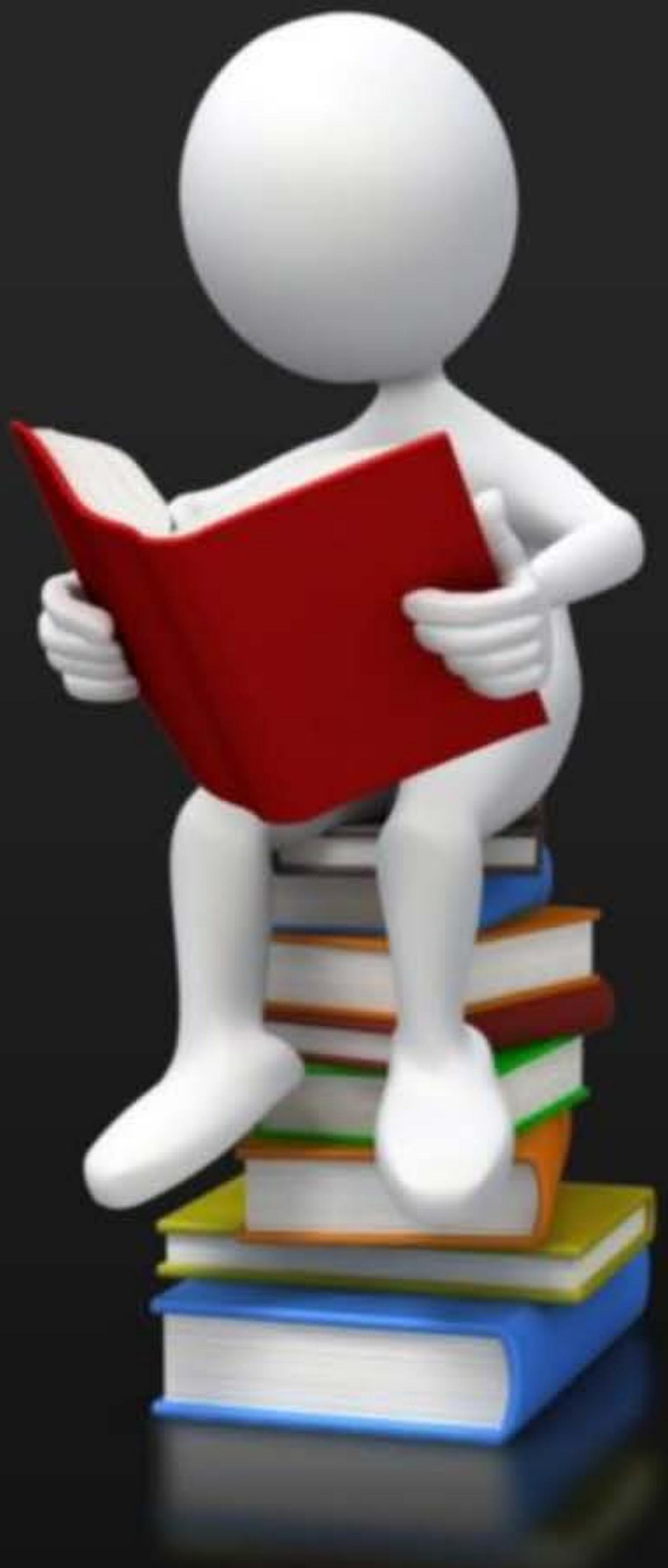
By – Guru sir

Recap *of previous lecture*

1. Probability
2.
3.
4.

Topics *to be covered*

1. Probability — Continue
2. P & C
3.
4.



QUESTION

#Q. Two cards are drawn at random from a pack of 52 cards. The probability of these two being "Aces" is

(A) 1/26

(B) 1/221

(C) 1/2

(D) 1/13

$\frac{\cancel{4}}{\cancel{52}_{13}} \cdot \frac{\cancel{3}}{\cancel{51}_{17}}$

$= \frac{1}{13 \times 17}$

$= \frac{1}{221}$

(or)

$\frac{{}^{4}C_{2}}{{}^{52}C_{2}} = \frac{\frac{4}{2} \times 3}{\frac{52}{2} \times 51} = \frac{1}{221}$

QUESTION

#Q. Two letters are chosen from the letters of the word 'EQUATIONS'. The probability that one is $\boxed{\text{vowel}}$ and the other is $\boxed{\text{consonant}}$ is

(A) 8/9

(B) 3/9

(C) 4/9

(D) ✓ 5/9

E	Q
U	T
A	N
I	S
O	
$\downarrow$	$\downarrow$
$^5C_1$	$^4C_1$

$$\frac{^5C_1 \times {}^4C_1}{^9C_2} = \frac{5\times \cancel{4}}{\frac{9}{\cancel{2}}\times \cancel{8}} = \frac{5}{9}$$

$^9C_2 \downarrow$

Out of 9 objects
You are picking 2

QUESTION

without Replacement

#Q. $\boxed{\text{Two letters}}$ are chosen from the letters of the word 'EQUATIONS'. The probability that $\boxed{\text{one is vowel}}$ and the $\boxed{\text{other is consonant}}$ is

order of Picking the letter is not given

⇓

P(vowel) · P(consonant) or P(consonant) P(vowel)

$$= \frac{5}{9}\frac{4}{8} + \frac{4}{9}\frac{5}{8}$$

$$= \cancel{2}\left(\frac{5}{9}\frac{\cancel{4}}{\cancel{8}}\right) = \frac{5}{9}$$

(A) 8/9

(B) 3/9

(C) 4/9

(D) 5/9

Permutations:-

① If we are provided n distinct objects

$\Downarrow$

$${}^nP_r = \frac{n!}{(n-r)!}$$

② If we are provided with repeated objects (same objects)

Then

$${}^nP_r = \frac{n!}{p_1!\, p_2!\, p_3! \ldots p_k!}$$

$p_i \to$ object repeated p_i times

MISSISSIPPI $\Rightarrow$ Total objects = 11

$\Downarrow$

M	I	S	P
	I	S	P
	I	S	
	I	S	
1 time	4 times	4 times	2 times
$r_1 = 1$	$r_2 = 4$	$r_3 = 4$	$r_4 = 2$

No. of Permutations

$$= \frac{11!}{1!\,4!\,4!\,2!}$$

given the word BENCH Find the permutations of

① No of ways in which the word BENCH can be arranged = $^5P_5 = 5!$
$= 120$

② No of ways in which —" —" —" —
such that E & C stays at first & last of the word.

③ No of ways in which —" —" —" —
such that N & C always stays together

(2) $\underline{E}\ \underbrace{\_\ \_\ \_}_{{}^3P_3 = 3! = 6}\ \underline{C}$

(or)

$\underline{C}\ \underbrace{\_\ \_\ \_}_{{}^3P_3 = 3! = 6}\ \underline{E}$

$6+6$

$= \underline{12}$

(3) BEHNC

NC → Packed as 1 object

⇒ Together 4 objects $= {}^4P_4 = 4! = 24$

Now C & N can be arranged in 2 ways among themselves

$24 \times 2 = 48$

BEHCN	BECNH
BEHNC	BENCH

1. Find the permutations of the word FEMALE in which FMA are always together

Soln:

FMA
FAM
MAF
MFA
AMF
AFM

FMA LEE

Packed as 1 object

$\Rightarrow$ Total 4 objects $= \frac{4!}{2!} = 12$ (Since E is repeated twice)

Here FMA can be arranged in $3! = 6$ ways among themselves

12×6

$= \underline{72}$

FMA
FAM
AMF
AFM
MAF
MFA

FMA LEE	L EE	LE E	LEE
ELE	E LE	EL E	EL E
EEL	E EL	EE L	EEL

(2) Find the Permutations of the word FEMALE in which FMA never come together.

Soln:

FEMAL

E

↓

2

Total Permutations − No of Permutations in which PMA are always together

$$= \frac{6!}{2!} - \frac{4!}{2!}(3!)$$

$$= \frac{720}{2} - (12 \times 6) = 360 - 72 = \underline{288}$$

QUESTION

#Q. The probability that in a random arrangement of the letters of the word "FAVOURABLE", the two 'A' do not come together is

(A) 1/5

(B) 1/10

(C) 9/10

(D) 4/5

F A V O U R B L E
A

Total Permutation $= \frac{10!}{2!}$

A's always come together $= 9!$

$$P(\bar{A}) = \frac{\frac{10!}{2!} - 9!}{\frac{10!}{2!}} = 1 - \frac{9!}{\frac{10!}{2!}}$$

$$= 1 - \frac{\cancel{9!} \times 2}{10 \times \cancel{9!}}$$

$$= 1 - \frac{2}{10} = 1 - \frac{1}{5} = \frac{4}{5}$$

QUESTION

#Q. The letters of the word 'UNIVERSITY' are randomly arranged, then the probability of the arrangement that no two 'I' come together is

Same a Previous one

A. 4/5

B. 1/5

C. 1/10

D. 7/10

QUESTION

Total $= {}^6P_6 = 6!$

→ All objects are distinct

N E

EN

#Q. If letters of the word 'PENCIL' are arranged in random order, then the probability that N is always next to E is

N & E stays together

(A) 1/6

(B) 1/2

(C) 4/3

(D) 2/6

PICL EN

⇓

Packed as one object

⇒ 5 objects in total $= 5!$

E & N can be arranged in 2 ways among themselves

$120 \times 2 = 240$

$P(A) = \frac{240}{720}$

$= \frac{24}{72}$

$= \frac{1}{3} = \frac{2}{6}$

QUESTION

#Q. Words with or without meaning are to be formed using all the letters of the word EXAMINATION. The probability that the letter M appears at the fourth position in any such word is

(A) 2/11

(B) 1/11

(C) 1/9

(D) 1/66

E X A M I N T O
A I N

$n(S) = \frac{11!}{2!2!2!}$

$n(A) = \frac{10!}{2!2!2!}$ (Since the position of M is fixed, we need to arrange remaining 10 letters)

$P(A) = \frac{10!}{11!} = \frac{10!}{11 \times 10!} = \frac{1}{11}$

19^{th} of April (Sunday) $\rightarrow$ morning 6 to 10

$\Downarrow$

3 to 4 hrs

$\Downarrow$

1. Bayes
2. P & C

QUESTION

#Q. Two dice of different colours are thrown at a time. The probability that the sum is either 7 or 11 is

7 → 6, 11 → 2

(A) 7/36

(B) 2/9

(C) 2/3

(D) 5/9

$$\frac{6+2}{36} = \frac{8}{36} = \frac{2}{9}$$

Sum	No of outcomes
2	→ 1
3	→ 2
4	→ 3
5	→ 4
6	→ 5
7	→ 6
8	→ 5
9	→ 4
10	→ 3
11	→ 2
12	→ 1

QUESTION

#Q. A coin is tossed and a die is rolled. The probability that the coin shows head and the die shows 3 is

(A) 1/6

(B) 1/12

(C) 1/9

(D) 11/12

$S = \{(H,1), \dots (H,6)$
$(T,1), \dots (T,6)\}$

$A = \{(H,3)\}$

$P(A) = \frac{1}{12}$

QUESTION

Total = 4 + 2 + 4 = 10

Red white Black

$n(S) = {}^{10}C_4 = \frac{10}{4} \times \frac{9}{2} \times \frac{8}{2} \times 7 = 30 \times 7 = 210$

#Q. From 4 red balls, 2 white balls and 4 black balls, four balls are selected. The probability of getting 2 red balls is

(A) 7/21

(B) 8/21

(C) 9/21

(D) 10/21

$n(A) = {}^4C_2 \times {}^6C_2$

2 from 4 Red

2 from Remaining

$= 6 \times 15$

$P(A) = \frac{n(A)}{n(S)} = \frac{6 \times 15}{10 \times 3 \times 7} = \frac{3}{7}$

$= \frac{3}{7} \times \frac{3}{3} = \frac{9}{21}$

QUESTION

$n(S) = {}^{15}C_{11} = {}^{15}C_4 = \frac{15}{4} \times \frac{14}{2} \times \frac{13}{2} \times 12$ 5B | 10G

#Q. In a class of 15 students, 5 of them are boys and 10 students are girls. A team of 11 members has to be formed at random. The probability that the team has at least 4 boys is

(A) 37/91

(B) 54/95

(C) 54/91

(D) 51/91

$n(A) = {}^5C_4 \times {}^{10}C_7 + {}^5C_5 \times {}^{10}C_6 = ({}^5C_1 \times {}^{10}C_3) + (1 \times {}^{10}C_4)$

$= \left(5 \times \frac{10}{3} \frac{9}{2} 8\right) + \left(\frac{10}{4} \times \frac{9}{3} \times \frac{8}{2} \times 7\right)$

$= (25 \times 24) + (30 \times 7)$

$= 600 + 210$

$= 810$

$P(A) = \frac{810}{15 \times 7 \times 13}$

$= \frac{54}{91}$

QUESTION

Total objects = 7 objects = 7!

$B_1 B_2 B_3 B_4 B_5 B_6 \; G_1 G_2 G_3 G_4 G_5 G_6 \to 6!$

Packed as one object

#Q. 6 boys and 6 girls sit in a row at random. The probability that all the girls sit together is

$n(S) = {}^{12}P_{12} = 12!$

$n(A) = 7!\,6!$

(A) 1/432

(B) 12/431

(C) 1/132

(D) None of these

$$P(A) = \frac{7! \times 6!}{12!}$$

$$= \frac{7! \times 6!}{12 \times 11 \times 10 \times 9 \times 8 \times 7!} = \frac{720}{12 \times 11 \times 10 \times 9 \times 8}$$

$$= \frac{6}{11 \times 9 \times 8} = \frac{1}{11 \times 3 \times 4} = \frac{1}{11 \times 12}$$

$$= \frac{1}{132}$$

$\underline{\quad}$ girls $B_1 B_2 B_3 B_4 B_5 B_6$

ABC

B_1 $\underline{\quad}$ girls $B_2 B_3 B_4 B_5 B_6$

$B_1 B_2$ $\underline{\quad}$ $B_3 \dots B_6$

$B_1 B_2 B_3$ $\underline{\quad}$ $B_4 B_5 B_6$

B_4 $\underline{\quad}$ $B_5 B_6$

B_5 $\underline{\quad}$ B_6

$B_5 B_6$ $\underline{\quad}$

QUESTION

Total Permutations $= {}^8P_8 = 8! = n(S)$

#Q. The letters of the word "QUESTION" are arranged in a row at random. The probability that there are exactly two letters between Q and S is

Q _ _ S _ _ _ _
1 2 3 4 5 6

U, E, T, I, O, N $\rightarrow {}^6P_6 = 6!$

(A) 1/14

(B) 5/7

(C) 1/7

(D) 5/28

→ Q & S can be arranged in 2 ways among themselves = 2

→ The positions of Q & S can be shifted = 5 ways

_ Q _ _ S _ _ _
_ _ Q _ _ S _ _
_ _ _ Q _ _ S _
_ _ _ _ Q _ _ S

$$n(A) = 6! \times 2 \times 5$$

$$\therefore P(A) = \frac{6! \times 2 \times 5}{8!}$$

$$= \frac{\cancel{6!} \times \overset{1}{\cancel{2}} \times 5}{{}_{4}\cancel{8} \times 7 \times \cancel{6!}}$$

$$= \frac{5}{28}$$

QUESTION

$X = |\text{No of head} - \text{No of Tails}|$

#Q. A coin is tossed three times. If X denotes the absolute difference between the number of heads and the number of tails, then $P(X = 1) =$

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

$|3-0| = 3$, $|2-1| = 1$, $|2-1| = 1$, $|2-1| = 1$, $|0-3| = 3$, $|1-2| = 1$, $|1-2| = 1$, $|1-2| = 1$

(A) 1/2

(B) 2/3

(C) 1/6

(D) 3/4

$(X=1) = \{HHT, HTH, THH, TTH, THT, HTT\}$

$P(X=1) = \frac{6}{8} = \frac{3}{4}$

QUESTION

Diamond cards are Red in colour.

#Q. From a deck of cards, all the diamonds are removed. From remaining cards, a card is chosen randomly. What is the probability that it will be a black card?

$n(S) = \text{Total} - \text{Diamond}$
$= 52 - 13$
$= 39$

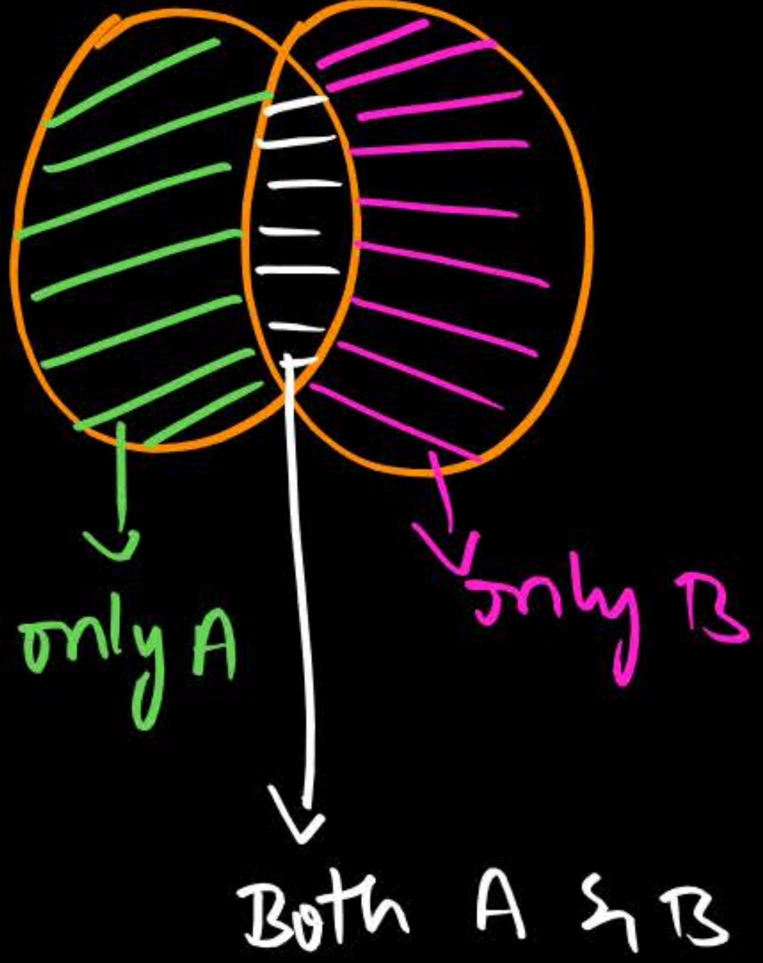
$P(A) = \frac{26}{39} = \frac{2}{3}$

(A) 1/2

(B) 2/3

(C) 1/3

(D) 3/4



$A \cup B$

$\downarrow$

either A या B | Atleast one of A & B

QUESTION

$P(A) = 0.4$ | $P(B) = 0.3$ | $P(C) = 0.2$ | $P(A') = 0.6$

P(A hit)

P(A Missed the target)

#Q. Three persons A, B and C, fire at a target in turn, starting with A. Their probability of hitting the target are $0.4, 0.3$ and 0.2, respectively. The probability of $\boxed{\text{two hits}}$ is → exactly 2

(A) 0.024

(B) 0.188

(C) 0.336

(D) 0.452

$P(A)P(B)P(C')$ or $P(A)P(B')P(C)$ or $P(A')P(B)P(C)$

$= \frac{4}{10}\frac{3}{10}\frac{8}{10} + \frac{4}{10}\frac{7}{10}\frac{2}{10} + \frac{6}{10}\frac{3}{10}\frac{2}{10}$

$= \frac{96+56+36}{(10)(10)(10)} = \frac{188}{1000}$

$= 0.188$

A, B & C are independent

QUESTION

$P(A)=0.4$ | $P(B)=0.3$ | $P(C)=0.2$ | $P(A')=0.6$

P(A hit)

P(A Missed the target)

#Q. Three persons A, B and C, fire at a target in turn, starting with A. Their probability of hitting the target are $0.4, 0.3$ and 0.2, respectively. The probability of atleast 2 hits the target

(A) 0.024

(B) 0.188

(C) 0.336

(D) None of these

$P(A)P(B)P(C')$ or $P(A)P(B')P(C)$ or $P(A')P(B)P(C)$

or $P(A)P(B)P(C)$

$$= \frac{4}{10}\frac{3}{10}\frac{8}{10} + \frac{4}{10}\frac{7}{10}\frac{2}{10} + \frac{6}{10}\frac{3}{10}\frac{2}{10} + \frac{4}{10}\frac{3}{10}\frac{2}{10}$$

$$= \frac{96+56+36+24}{1000} = \frac{212}{1000} = 0.212$$

QUESTION

$P(A)=0.4$ | $P(B)=0.3$ | $P(C)=0.2$ | $P(A')=0.6$

P(A hit) | P(A Missed the target)

#Q. Three persons A, B and C, fire at a target in turn, starting with A. Their probability of hitting the target are $0.4, 0.3$ and 0.2, respectively. The probability of atleast one hits the target

(A) 0.024

(B) 0.188

(C) 0.336

(D) None of them

P(Atleast one of A, B & C hits target)

$= P(A \cup B \cup C) = 1 - P(A')\,P(B')\,P(C')$

$= 1 - \frac{6}{10}\,\frac{7}{10}\,\frac{8}{10}$

$= 1 - \frac{42 \times 8}{1000}$

$= 1 - \frac{336}{1000}$

$1 - 0.336$

$= \underline{0.664}$

QUESTION

#Q. The probability that a certain person will buy a shirt is 0.2 , the probability that he will buy a trouser is 0.3 and the probability that he will buy a shirt given that he buys a trouser is 0.4 . Find the probability that he will buy both a shirt and a trouser.

(A) 0.2

(B) 0.12

(C) 0.3

(D) 0.06

$P(\text{shirt}) = P(A) = 0.2$

$P(\text{Pant}) = P(B) = 0.3$

$P(A|B) = 0.4$

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

$= (0.3)(0.4)$

$= \underline{0.12}$

QUESTION

conditional Probability

#Q. For the married couple living in Jammu, the probability that a husband will vote in an election is 0.5 and the probability that his wife will vote is 0.4 . The probability that the husband votes, $\boxed{\text{given that}}$ his wife also votes is 0.7 . Then the probability that husband and wife both will vote is

(A) 0.28

(B) 0.20

(C) 0.35

(D) 0.15

$P(\text{Husband vote}) = P(A) = 0.5$

$P(\text{wife vote}) = P(B) = 0.4$

$P(A/B) = 0.7$

$P(A \cap B) = ?$

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

$= (0.4)(0.7)$

$= \underline{0.28}$

QUESTION

Let $P(A) = p$

$P(B) = q$

#Q. A and B are two $\boxed{\text{independent}}$ events. The probability that both A and B occur is $\frac{1}{6}$ and the probability that neither of them occurs is $\frac{1}{3}$. Find the probability of the occurrence of A.

(A) 4/5

(B) 2/3

(C) 1/4

(D) 1/3

$P(A \cap B) = \frac{1}{6}$

$P(A)P(B) = \frac{1}{6}$

$pq = \frac{1}{6}$

$P(A' \cap B') = \frac{1}{3}$

$\Downarrow$

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

$(1-p)(1-q) = \frac{1}{3}$

$1 - p - q + pq = \frac{1}{3}$

$1 - (p+q) + \frac{1}{6} = \frac{1}{3}$

$p + q = 1 + \frac{1}{6} - \frac{1}{3} = \frac{6+1-2}{6} = \frac{5}{6}$

$q = \frac{5}{6} - p$

$pq = \frac{1}{6}$

$p\left(\frac{5}{6} - p\right) = \frac{1}{6}$

$\frac{5p}{6} - p^2 = \frac{1}{6}$

$$\frac{5p}{6} - p^2 = \frac{1}{6}$$

$$6p^2 - 5p + 1 = 0 \qquad \begin{array}{c} +6 \\ -3 \quad -2 \end{array}$$

$$6p^2 - 3p - 2p + 1 = 0$$

$$3p(2p-1) - 1(2p-1) = 0$$

$$p = \frac{1}{3} \quad \Big| \quad p = \frac{1}{2}$$

QUESTION

Fails if Atleast one of them Fails.

#Q. A machine operates if all of its three components function. The probability that the first component fails during the year is 0.14 , the second component fails is 0.10 and the third component fails is 0.05 . What is the probability that the machine will fail during the year?

(A) 0.1542

(B) 0.2647

(C) 0.3642

(D) 0.4231

$P(1^{st}\text{ Fail}) = P(A) = 0.14$

$P(B) = 0.10$

$P(C) = 0.05$

P(Machine Fails) = P(Atleast one of A, B & C Fails)

$= P(A \cup B \cup C)$

$= 1 - P(A')P(B')P(C')$

$= 1 - (0.86)(0.9)(0.95)$

$$1-(0.86)(0.9)(0.95)$$

$$= 1-(0.774)(0.95)$$

$$= 1-0.7353$$

$$= \underline{0.2647}$$

QUESTION

#Q. Given that, the events A and B are such that $P(A) = \frac{1}{2}$, $P(A \cup B) = \frac{3}{5}$ and $P(B) = p$. Then probabilities of B if A and B are mutually exclusive and independent respectively are

(A) 1/2, 1/3

(B) 1/5, 1/3

(C) 2/3, 1/3

(D) 1/10, 1/5

(1) A & B → mutually exclusive

$\Downarrow$

$P(A \cap B) = 0$

$P(A \cup B) = P(A) + P(B)$

$\frac{3}{5} = \frac{1}{2} + p$

$p = \frac{3}{5} - \frac{1}{2} = \frac{1}{10}$

(2) A & B are independent

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

$\frac{3}{5} = 1 - \frac{1}{2}(1 - p)$

$\frac{3}{5} = 1 - \frac{1}{2} + \frac{p}{2}$

$\frac{3}{5} - \frac{1}{2} = \frac{p}{2}$

$\frac{p}{2} = \frac{1}{10}$

$p = \frac{1}{5}$

QUESTION

let $P(F) = p$

#Q. Two events E and F are $\boxed{\text{independent}}$. If $P(E) = 0.3$ $P(E \cup F) = 0.5$, then $P(E \mid F) - P(F \mid E)$ equals to

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

$P(E \cup F) = 1 - P(E')\,P(F')$

$0.5 = 1 - (0.7)(1-p)$

$0.5 = 1 - 0.7 + 0.7p$

$0.5 - 0.3 = 0.7p$

$p = \frac{0.2}{0.7} = \frac{2}{7}$

$P(E) - P(F)$

$\frac{3}{10} - \frac{2}{7} = \frac{21-20}{70}$

$= \frac{1}{70}$

A 2/7

B 3/35

C 1/70

D 1/7

QUESTION

#Q. If A and B are two independent events with $P(A) = \frac{1}{3}$ and $P(B) = \frac{1}{4}$, then $P(B' \mid A)$ is equal to

$\Downarrow$

$1 - P(B|A)$

$1 - P(B)$

$1 - \frac{1}{4}$

$= \frac{3}{4}$

(A) 1/4

(B) 1/8

(C) 3/4

(D) 1

QUESTION

#Q. For two events $P(A \cup B) = \frac{5}{6}, P(A) = \frac{1}{6}, P(B) = \frac{2}{3}$, then A and B are

$$P(A \cap B) = \frac{1}{6} + \frac{2}{3} - \frac{5}{6}$$

$$= \frac{1+4-5}{6} = 0$$

A. mutually exclusive events

B. independent events

C. dependent events

D. none of these

QUESTION

#Q. If A and B are two $\boxed{\text{independent events}}$ with $P(A)=\frac{3}{5}$ and $P(B)=\frac{4}{9}$, then $P(A'\cap B')$ equals to

$\rightarrow P(A')\cdot P(B')$

$=\frac{2}{5}\,\frac{5}{9}$

$=\frac{2}{9}$

A 4/15

B 8/45

C 1/3

D ✓ 2/9

QUESTION

Let $P(B) = p$

#Q. Suppose A and B are such events that $P(A) = 0.3$ $P(A \cup B) = 0.8$. If A and B are $\boxed{\text{independent events}}$, then $P(B)$ is

(A) 5/7

(B) 5/4

(C) 1/3

(D) 1/2

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

$0.8 = 1 - (0.7)(1-p)$

$0.8 = 1 - 0.7 + 0.7p$

$0.8 - 0.3 = 0.7p$

$p = \frac{0.5}{0.7} = \frac{5}{7}$

QUESTION

#Q. The probability of A to be failed in an examination is 0.2 and that of B to be failed is 0.3 then the probability that either A or B to be failed is

$P(A \text{ Fail}) = P(A) = 0.2$

$P(B \text{ Fail}) = P(B) = 0.3$

(A) 0.3

(B) 0.44

(C) 0.8

(D) 0.25

$$P(A \cup B) = 1 - P(A')\,P(B')$$
$$= 1 - (0.8)(0.7)$$
$$= 1 - 0.56$$
$$= 0.44$$

QUESTION

#Q. A problem is given to three students whose probabilities of solving it are $\frac{1}{3}, \frac{1}{4}$ and $\frac{1}{6}$ respectively. If the events of solving the problem are independent, find the probability that at least one of them solves it.

(A) 5/12

(B) 7/12

(C) 1/2

(D) None of these

$P(A) = \frac{1}{3}$

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

$P(C) = \frac{1}{6}$

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

$$= 1 - \frac{\cancel{2}}{\cancel{3}} \cdot \frac{\cancel{3}}{\cancel{4}_{2}} \cdot \frac{5}{6}$$

$$= 1 - \frac{5}{12}$$

$$= \frac{7}{12}$$

QUESTION

#Q. A problem is given to three students whose probabilities of solving it are $\frac{1}{3}, \frac{1}{4}$ and $\frac{1}{6}$ respectively. If the events of solving the problem are independent, find the probability that at least Two of them solves it.

(A) 5/12

(B) 7/12

(C) 1/2

(D) None of these

$P(A) = \frac{1}{3}$

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

$P(C) = \frac{1}{6}$

P(Atleast 2 of A, B & C)

$= P(A)P(B)P(C') + P(A)P(B')P(C) + P(A')P(B)P(C) + P(A)P(B)P(C)$

$= \frac{1}{3}\frac{1}{4}\frac{5}{6} + \frac{1}{3}\frac{3}{4}\frac{1}{6} + \frac{2}{3}\frac{1}{4}\frac{1}{6} + \frac{1}{3}\frac{1}{4}\frac{1}{6}$

$= \left[\frac{5+3+2+1}{3(4)(6)}\right] = \frac{11}{72}$

QUESTION

PYQ of KCET

#Q. If A, B and C are three independent events such that $P(A) = P(B) = P(C) = p$, then P (atleast two of A, B and C occur) is equal to

$$\overset{A}{p}\,\overset{B}{p}\,\overset{C'}{(1-p)} + \overset{A}{p}\,\overset{B'}{(1-p)}\,\overset{C}{p} + \overset{A'}{(1-p)}\,\overset{B}{p}\,\overset{C}{p} + \overset{A}{p}\cdot\overset{B}{p}\cdot\overset{C}{p}$$

$$= 3p^2(1-p) + p^3$$

$$= 3p^2 - 3p^3 + p^3$$

$$= 3p^2 - 2p^3$$

(A) $p^2 - p$

(B) $2p^2 - 2$

(C) $3p^2 - 2p^3$

(D) $3p^3 - 2p^2$

QUESTION

$P(A) = \frac{3}{7}$ | $P(B) = \frac{5}{7}$

#Q. The probabilities of two students A and B coming to the school in time are $\frac{3}{7}$ and $\frac{5}{7}$ respectively. Assuming that the events, ' A coming in time' and ' B coming in time' are $\boxed{\text{independent,}}$ then find the probability of only one of them coming to the school in time.

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

$A \cap B'$ ↳ A but not B.

(A) 25/48

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

(B) 24/47

$= \frac{3}{7}\frac{2}{7} + \frac{4}{7}\frac{5}{7}$

(C) 26/49

$= \frac{26}{49}$

(D) 27/48

QUESTION

$P(A)=\frac{3}{7}$ | $P(B)=\frac{5}{7}$

#Q. The probabilities of two students A and B coming to the school in time are $\frac{3}{7}$ and $\frac{5}{7}$ respectively. Assuming that the events, ' A coming in time' and ' B coming in time' are independent, then find the probability of

(1) Both come on time

(2) Atleast one of them come on time

Soln:

(1) $P(A\cap B)=P(A)\,P(B)=\frac{15}{49}$

(2) $P(A\cup B)=1-P(A')\,P(B')=1-\frac{4}{7}\frac{2}{7}=1-\frac{8}{49}=\frac{41}{49}$

QUESTION

Equally likely means

$\Downarrow$

$P(A) = P(B)$

#Q. Let A and B be two events such that $P(\overline{A \cup B}) = \frac{1}{6}$, $P(A \cap B) = \frac{1}{4}$ and $P(\bar{A}) = \frac{1}{4}$. Then events A and B are

$P(A \cup B) = \frac{5}{6}$

$P(A) = \frac{3}{4}$

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

(A) ✗ equally likely, but not independent

$P(B) = \frac{5}{6} + \frac{1}{4} - \frac{3}{4} = \frac{10+3-9}{12}$

$= \frac{4}{12} = \frac{1}{3}$

since $P(A \cap B) \neq 0$

(B) ✗ equally likely and mutually exclusive

(C) mutually exclusive and independent

$P(A)P(B) = \frac{3}{4} \cdot \frac{1}{3} = \frac{1}{4} = P(A \cap B)$

(D) ✓ independent but not equally likely

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

QUESTION

Let $P(B) = p$

#Q. Let A and B be independent events with $P(A) = 1/4$ and $P(A \cup B) = 2P(B) - P(A)$. Find $P(B)$.

(A) 1/4

(B) 3/5

(C) 2/3

(D) 2/5 ✓

$1 - P(A')P(B') = 2P(B) - \frac{1}{4}$

$1 - \frac{3}{4}(1-p) = 2p - \frac{1}{4}$

$1 - \frac{3}{4} + \frac{3}{4}p = 2p - \frac{1}{4}$

$\frac{1}{4} + \frac{1}{4} = 2p - \frac{3}{4}p$

$\frac{1}{\cancel{2}} = \frac{5p}{\cancel{4}\,2}$

$p = \frac{2}{5}$

QUESTION

#Q. Two events A and B will be independent, if

A) A and B are mutually exclusive

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

C) $P(A) = P(B)$

D) $P(A) + P(B) = 1$

QUESTION

#Q. If A and B are events such that $P(A)=\frac{1}{3}$, $P(B)=\frac{1}{4}$ and $P(A\cap B)=\frac{1}{12}$, then find $P(\text{not} A \text{ and not } B)$.

(A) $1/4$

(B) $1/2$

(C) $2/3$

(D) $1/3$

QUESTION

#Q. Fatima and John appear in an interview for two vacancies in the same post. The probability of Fatima's selection is $\frac{1}{7}$ and that of John's selection is $\frac{1}{5}$. What is the probability that $\boxed{\text{both of them will be selected?}}$

(A) 34/35

(B) 12/35

(C) 1/35

(D) None of these

$P(\text{Fatima}) = P(A) = \frac{1}{7}$

$P(\text{John}) = P(B) = \frac{1}{5}$

selection of Fatima doesn't effect that of John's & viceversa

$\therefore$ events A & B are independent

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

$= \frac{1}{35}$

QUESTION

#Q. A salesman has a 60% chance to sell a product to any customer. The behavior of two different customer is independent. If two customer A and B came into the shop, then what is the probability that salesman will sell the product to customer A or B ?

$P(A) = \frac{60}{100} = 0.6 = P(B)$

(A) 0.84

(B) 0.91

(C) 0.72

(D) 0.60

A & B are independent

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

$= 1 - (0.4)(0.4)$

$= 1 - 0.16 = 0.84$

QUESTION

Let $P(A) = p$ & $P(B) = q$

#Q. Two independent events A and B are such that $P(A \cup B) = \frac{2}{3}$ and $P(A \cap B) = \frac{1}{6}$. $\boxed{\text{If } P(B) < P(A)}$, then what is $P(B)$ equal to?

(A) 1/4

(B) 1/3

(C) 1/2

(D) 1/6

$P(A \cap B) = \frac{1}{6}$

$P(A)P(B) = \frac{1}{6}$

$pq = \frac{1}{6}$

$P(A \cup B) = \frac{2}{3}$

$1 - P(A')P(B') = \frac{2}{3}$

$1 - (1-p)(1-q) = \frac{2}{3}$

$\cancel{1} - \cancel{1} + q + p - pq = \frac{2}{3}$

$p + q = \frac{2}{3} + \frac{1}{6}$

$p + q = \frac{5}{6}$

→ option verification

$\boxed{p = \frac{5}{6} - q}$

$pq = \frac{1}{6}$

$\left(\frac{5}{6} - q\right)q = \frac{1}{6}$

$\frac{5q}{6} - q^2 = \frac{1}{6}$

$6q^2 - 5q + 1 = 0$

$6q^2-5q+1=0$ $\quad +6$

$6q^2-3q-2q+1=0$ $\quad -3 \quad -2$

$3q(2q-1)-1(2q-1)=0$

$q=\frac{1}{3}$ or $q=\frac{1}{2}$

$\Downarrow \qquad\qquad \Downarrow$

$p=\frac{5}{6}-q$

$p=\frac{5}{6}-\frac{2}{6}$

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

$p=\frac{1}{3}$

Here $P(B)<P(A)$

$\Downarrow$

Since

$\frac{1}{3}<\frac{1}{2}$

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

Thank You