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B.COM. PART 1

CORE CONCEPT OF BUSINESS MATHMATICS & STATISTICS

Example-29: A bag contains 5 white and 7 black balls. Two draws are made without replacement. What is the probability that both the balls are- (i) white, (ii) black, (iii) different colour?

Solution-29: (i) Probability of white ball in first draw P (A) = 5/12

Probability of white ball in second draw after getting red ball in first draw = P (B/A) = 4/11

Probability that both the balls are white = P (A and B) = P (A) * P (B|A)

$$= \frac{5}{12} * \frac{4}{11} = \frac{20}{132} = \frac{5}{33}$$

(ii) Probability of black ball in first draw P (A) = 7/12

Probability of black ball in second draw after getting red ball in first draw = P (B/A) = 6/11

Probability that both the balls are black = P (A and B) = P (A) * P (B|A)

$$= \frac{7}{12} * \frac{6}{11} = \frac{42}{132} = \frac{7}{22}$$

(iii)) Both balls of different colour means that the first is white and second is black.

Probability that first ball is red and second is white = P (A and B) = P (A) * P (B|A)

$$= \frac{5}{12} * \frac{7}{11} = \frac{35}{132}$$

Probability that first ball is white and second is red = P (A and B) = P (A) * P (B|A)

$$= \frac{7}{12} * \frac{5}{11} = \frac{35}{132}$$

Both these events are mutually exclusive, so addition theorem will be applicable and probability that both balls are of different colours = $\frac{35}{132} + \frac{35}{132} = \frac{70}{132} = \frac{35}{66}$

<u>PERMUTATIONS AND COMBINATIONS</u>

PERMUTATIONS- Permutation mean the total number of different way in which items can be arranged by changing the order of component it is denoted that $^{n}P_{r}$.

Symbolically:

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

n = total no. of event, r = desired no. of event

Example-30: (i) calculate the value of the following:

$^{15}P_3$, $^8P_3$

(ii) In how many ways can 12 people be seated on a bench, if only 3 seats are available?

Solution-30: (i) $^nP_r = \frac{n!}{(n-r)!}$

$$^{15}P_3 = \frac{15!}{(15-3)!} = \frac{15!}{12!} = \frac{15*14*13*12*11*10*9*8*7*6*5*4*3*2*1}{12*11*10*9*8*7*6*5*4*3*2*1}$$

$$= 15 * 14 * 13$$

= 2730

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

$$^8P_3 = \frac{8!}{(8-3)!} = \frac{8!}{5!} = \frac{8*7*6*5*4*3*2*1}{5*4*3*2*1} = 8 * 7 * 6 = 336$$

(ii) n=12, r = 3

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

$$^{12}P_3 = \frac{12!}{(12-3)!} = \frac{12!}{9!} = \frac{12*11*10*9*8*7*6*5*4*3*2*1}{9*8*7*6*5*4*3*2*1} = 12*11*10 = 1320$$

COMBINATIONS- This concept is very useful in the theory of probability. The different selections or groups that can be made out of a given set of objects taking all or some of them at a time are called combinations. It is important that in combination no attention is given to the order of arrangement of objects.

Symbolically- $^nC_r = \frac{n!}{(n-r)!*r!}$

Example-31: Calculate the value of the following:

(i) $^{15}C_3$, (ii) $^8C_3$

Solution- 31: (i) $^{15}C_3$

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

$$^{15}C_3 = \frac{15!}{(15-3)!*3!} = \frac{15!}{12!*3!} = \frac{15*14*13*12*11*10*9*8*7*6*5*4*3*2*1}{12*11*10*9*8*7*6*5*4*3*2*1*3*2*1}$$

$$= \frac{15*14*13}{3*2*1} = = \frac{2730}{6} = 455$$

(ii) $^{8}C_{3}$

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

$$^{8}C_{3} = \frac{8!}{(8-3)!*3!} = \frac{8!}{5!*3!} = \frac{8*7*6*5*4*3*2*1}{5*4*3*2*1*3*2*1*3*2*1}$$

$$= \frac{8*7*6}{3*2*1} = \frac{336}{6} = 56$$