Permutations And Combinations

If an event can occur in m different ways, following which another event can occur in n different ways, then the total number of occurrence of the events in the given order is $m \times n$.

Permutations → A permutation is an arrangement in a definite order of a number of objects taken some or all at a time.

Ex-6.1

Que 1) How many 3-digit numbers can be formed from the digits 1, 2, 3, 4 and 5 assuming that

(i) repetition of the digits is allowed?

(Ans-i)

Repetition of digits is allowed.

Here,

the unit place can be filled in by any of the given five digits. Similarly, tens and hundreds digit can be filled in by any of the given five digits.

$5 \times 5 \times 5$

125 Ans

(ii) repetition of the digit is not allowed?

(Ans-ii) Repetition of digit is not allowed.

The number of ways of filling the units place of the three-digit number is 5. Then, the tens place can be filled with any of the remaining four digits and the hundreds place can be filled with any of the remaining three digits.

$5 \times 4 \times 3$

$\Rightarrow$ 60 Ans

(Que 2) How many 3-digit even numbers can be formed from the digits 1,2,3,4,5,6 if the digits can be repeated?

(Ans-2) Here, the repetition is allowed.
~~The unit~~ In this case, the units place can be filled by 2 or 4 or 6 only because the units place can be filled in 3 ways.
The tens place can be filled by any of the 6 digits in 6 different and also the hundreds place can be filled by any of digits in 6 different ways.

$$3 \times 6 \times 6$$
$$\Rightarrow 108 \text{ Ans}$$

(Que 3) How many 4-letter code can be formed using the first 10 letters of the English alphabet, if no letter can be repeated?

(Ans-3) Repetition of letters is not allowed.

The first place can be filled in 10 different ways by any of the first 10 letters.
The second place can be filled in by any of the remaining letters in 9 different ways.
Similarly, 3^{rd} and 4^{th} can be filled in 8 and 7 different ways respectly.

(Que 6)

$10 \times 9 \times 8 \times 7$

$\Rightarrow$ 5040 Ans

(Ans-6)

Que 4) How many 5-digit telephone numbers can be constructed using the digit 0 to 9 if each number starts with 67 and no digit appears more than once?

(Ans-4) Repetition is not allowed.
Here, 2 out of 5 digit space is fixed with stating place, So there are 3 digit space is empty and ~~filled~~ it has to filled with remaining 8 digits in different ways.

$8 \times 7 \times 6$

$\Rightarrow$ 336 Ans

(Que 5) A coin is tossed 3 times and the outcomes are recorded. How many possible outcomes are there?

(Ans-5) Here, a coin is tossed 3 times and each time 2 possibility come (Head and tail).

Therefore, Number of possible outcomes are

$\rightarrow 2 \times 2 \times 2$

$\Rightarrow 8$

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(Que 6) Given 5 flags of different colours, how many different signals can be generated if each signal requires the use of 2 flags, one below the other?

(Ans-6) There are 5 flags and we put 2 flags at a time to generate different types of signal.

Repetition is not allowed.

And if put 1 flag in 1^{st} place then are only 4 flags to put in second place in different ways.

5×4

$\Rightarrow 20$ Ans

Exercise - 6.2

Que 1) Evaluate

(i) $8!$ (ii) $4!-3!$

(Ans-i) ~~1×2×3×4×5×6×~~

$8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$

$56 \times 6 \times 20 \times 6$

$4 \times 3 \times 2 \times 1 - 3 \times 2 \times 1$

$24 - 6$

18

Que 2) Is $3! + 4! = 7!$?

(Ans-2) $3 \times 2 \times 1 + 4 \times 3 \times 2 \times 1 = 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$

$6 + 24 = 7 \times 720$

$30 \neq 5040$

Que 3) Compute $\frac{8!}{6! \times 2!}$

(Ans-3) $\frac{\overset{4}{\cancel{8}} \times 7 \times \cancel{6!}}{\cancel{6!} \times \underset{1}{\cancel{2}} \times 1} \Rightarrow 8 \times 7 \Rightarrow 28$ Ans

Que 4) If $\frac{1}{6!} + \frac{1}{7!} = \frac{x}{8!}$, find x

(Ans-4) $\frac{1}{6!} + \frac{1}{7 \times 6!} = \frac{x}{8 \times 7 \times 6!}$

$\frac{7+1}{\cancel{7 \times 6!}} = \frac{x}{8 \times \cancel{7 \times 6!}}$

$8 \times 8 = x$

$64 = x$ Ans

Que5) Evaluate $\frac{n!}{(n-r)!}$, when

(i) $n=6, r=2$

Ans-i) $\frac{6!}{(6-2)!} \Rightarrow \frac{6 \times 5 \times \cancel{4!}}{\cancel{4!}} \Rightarrow 6 \times 5 \Rightarrow 30$ Ans

(ii) $n=9, r=5$

Ans-ii) $\frac{9!}{(9-5)!} \Rightarrow \frac{9 \times 8 \times 7 \times 6 \times 5 \times \cancel{4!}}{\cancel{4!}} \Rightarrow 9 \times 8 \times 7 \times 6 \times 5 \Rightarrow 15120$ Ans

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Ex-6.3

(Que 1) How many 3-digit numbers can be formed by using the digit 1 to 9 if no digit is repeated?

(Ans-1) 3-digit number have to be formed using the digit 1 to 9.
So, we have to made 3-digit numbers ~~abt~~ with the help of 9 digit.
Repetition is not allowed.

$$^{9}P_{3} = \frac{9!}{(9-3)!}$$

$$= \frac{9 \times 8 \times 7 \times \cancel{6!}}{\cancel{6!}}$$

$$= 72 \times 7 \Rightarrow 504 \text{ Ans}$$

(Que2) How many 4-digit numbers are there with no digit repeated?

(Ans 2) Repetition is not allowed.
There are 10 digit from 0 to 9. So ~~we~~ ~~can~~ 4-digits can be selected out of 10 digits in $^{10}P_{4}$ different ways.

But if we start with zero then it become a 3-digit number, so we subtract it. ~~So~~ So remaining 3-digit space can be selected out of 9 digit in different ways.

$$^{10}P_{4} - {}^{9}P_{3}$$

$$\Rightarrow \frac{10!}{(10-4)!} - \frac{9!}{(9-3)!}$$

$$\Rightarrow \frac{10 \times 9 \times 8 \times 7 \times \cancel{6!}}{\cancel{6!}} - \frac{9 \times 8 \times 7 \times \cancel{6!}}{\cancel{6!}}$$

$$\Rightarrow 5040 - 504 \Rightarrow 4536 \text{ Ans}$$

(Que 3) How many 3-digit even number can be made using the digits 1, 2, 3, 4, 6, 7, if no digit is repeated?

(Ans-3) Repetition is not allowed.
There 6 digit 1, 2, 3, 4, 6, 7 and we have ~~to~~ made 3-digit even number. So in even number ones place is always even.
Therefore, ones place can be filled in 3 different ways. And other two digit can be filled out of 5 ~~~~ ~~di~~ number ~~in~~ different ways.

$$^5P_2 \Rightarrow \frac{5!}{(5-2)!} \Rightarrow \frac{5\times4\times\cancel{3!}}{\cancel{3!}} \Rightarrow 5\times4 \Rightarrow 20$$

Then multiply with ones place

$$\Rightarrow 20\times3 \Rightarrow 60 \text{ Ans}$$

(Que 4) Find the number of 4-digit numbers that can be formed using the digit 1, 2, 3, 4, 5 if no digit is repeated. How many of these will be even?

(Ans-4) Repetition is not allowed.
4-digit numbers ~~have~~ ~~to~~ ~~sed~~ can be selected out of 5-digit in $^5P_4$ different ways.

$$^5P_4 \Rightarrow \frac{5!}{(5-4)!} \Rightarrow 5\times4\times3\times2\times1 \Rightarrow 20\times6 \Rightarrow 120 \text{ Ans}$$

If we have to find even number then it ones place have only two ways 2 and 4. And for remaining other 3-digit number it can be selected out of 4 digit is $^4P_3$ ways.

multiply by ones place

$$^4P_3 \Rightarrow \frac{4!}{(4-3)!} \Rightarrow 4\times3\times2\times1 \Rightarrow 24 \times 2 \Rightarrow 48 \text{ Ans}$$

(Que 5) From a committee of 8 persons, in how many ways can we choose a chairman and a vice chairman assuming one person can not hold more than one position?

(Ans-5) Here, we have 8 persons and two positions and repetition is not allowed.
Therefore, 2 position can be filled out of 8 persons in ${}^{8}P_2$ ways.

$$^8P_2 \Rightarrow \frac{8!}{(8-2)!} \Rightarrow \frac{8 \times 7 \times \cancel{6!}}{\cancel{6!}}$$

$$\Rightarrow 8 \times 7$$

$$\Rightarrow 56 \text{ Ans}$$

(Que 6) Find n if ${}^{n-1}P_3 : {}^{n}P_4 = 1:9$

(Ans-6)
$$^{n-1}P_3 : {}^{n}P_4 = 1:9$$

$$\Rightarrow \frac{^{n-1}P_3}{^{n}P_4} = \frac{1}{9}$$

$$\Rightarrow \frac{\frac{(n-1)!}{\cancel{(n-1-3)!}}}{\frac{n!}{\cancel{(n-4)!}}} = \frac{1}{9}$$

$$\Rightarrow \frac{(n-1)!}{n!} = \frac{1}{9}$$

$$\Rightarrow \frac{\cancel{(n-1)!}}{n \times \cancel{(n-1)!}} = \frac{1}{9}$$

$$\Rightarrow \frac{1}{n} = \frac{1}{9}$$

$$\Rightarrow \boxed{n = 9} \text{ Ans}$$

Que7) Find r if

(i) ${}^5P_r = 2\,{}^6P_{r-1}$

(Ans-i) $\frac{5!}{(5-r)!} = 2\times\frac{6!}{(6-(r-1))!}$

$\Rightarrow \frac{\cancel{5!}}{(5-r)!} = 2\times\frac{6\times\cancel{5!}}{(7-r)!}$

$\Rightarrow \frac{1}{\cancel{(5-r)!}} = \frac{12}{(7-r)(6-r)\cancel{(5-r)!}}$

$\Rightarrow (7-r)(6-r) = 12$

$\Rightarrow 42-7r-6r+r^2-12=0$

$\Rightarrow r^2-13r+30=0$

$\Rightarrow r^2-3r-10r+30$

$\Rightarrow r(r-3)-10(r-3)$

$\Rightarrow (r-3)\ (r-10)$

$\Rightarrow r-3=0 \quad r-10=0$

$\boxed{r=3} \quad \boxed{r=10}$

r is never greater than n

Therefore $\boxed{r=3}$ Ans

(ii) ${}^5P_r = {}^6P_{r-1}$

(Ans-ii) $\frac{5!}{(5-r)!} = \frac{6!}{(6-(r-1))!}$

$\Rightarrow \frac{\cancel{5!}}{(5-r)!} = \frac{6\times\cancel{5!}}{(7-r)!}$

$\Rightarrow \frac{1}{\cancel{(5-r)!}} = \frac{6}{(7-r)(6-r)\cancel{(5-r)!}}$

$\Rightarrow (7-6)(6-r) = 6$

$\Rightarrow 42-7r-6r+r^2-6=0$

$\Rightarrow r^2-13r+36$

$\Rightarrow r^2-4r-9r+36$

$\Rightarrow r(r-4)-9(r-4)$

$\Rightarrow (r-4)(r-9)$

$\Rightarrow r-4=0 \quad r-9=0$

$\boxed{r=4} \quad \boxed{r=9}$

r is never greater than n

Therefore $\boxed{r=4}$ Ans.

(Que 8) How many words, with or without meaning, can be formed using all the letters of the word EQUATION, using each letter exactly once?

(Ans-8) There 8 letters in word EQUATION and repetition is not allowed. All letters have to use.

So, 8 letters word can be formed out of 8 letters in ${}^8P_8$ ways.

$${}^8P_8 = \frac{8!}{(8-8)!} \Rightarrow \frac{8\times7\times6\times5\times4\times3\times2\times1}{0!} \Rightarrow \frac{56\times30\times24}{1} \Rightarrow 40320$$

Ans

(Que 9) How many words, with or without meaning can be made from ~~from~~ the letters of the word MONDAY, assuming that no letter is repeated, if.

(i) 4 letters are used at a time,

(Ans-i) Repetition is not allowed and the word MONDAY has 6 letters.

So, 4 letters word can be selected ~~of~~ from 6 letters in $^6P_4$ ways.

$$^6P_4 = \frac{6!}{(6-4)!} \Rightarrow \frac{6\times5\times4\times3\times\cancel{2!}}{\cancel{2!}} \Rightarrow 30\times12 \Rightarrow 360 \text{ Ans}$$

(ii) all letters are used at a time,

(Ans-ii) Repetition is not allowed and the word MONDAY has 6 letters.

So, ~~all~~ 6 letters word can be selected from 6 letters in $^6P_6$ ways.

$$^6P_6 \Rightarrow \frac{6!}{(6-6)!} \Rightarrow \frac{6\times5\times4\times3\times2\times1}{0!} \Rightarrow \frac{30\times24}{1} \Rightarrow 720 \text{ Ans}$$

(iii) all letters ~~are~~ are used but first letters is a vowel?

(Ans-iii) First letter ~~can~~ has to vowel. So first letter can be selected in 2 ways.

And other 5 letters can be selected out of 5 letters in $^5P_5$ ways.

$$^5P_5\times2 \Rightarrow \frac{5!}{(5-5)!}\times2 \Rightarrow \frac{5\times4\times3\times2\times1\times2}{1}$$

$$\Rightarrow 120\times2 \Rightarrow 240 \text{ Ans}$$

(Que 10) In how many of the distinct permutation of the letters in MISSISSIPPI do the four I's not come together?

(Ans 10) There are 11 letters in MISSISSIPPI and we have find number of ways in four 'I' not come together So, we find all way in which MISSISSIPPI can be formed and then substract it with the number of ways four I come together from remaining words And we assume four I as one.

$$\frac{11!}{4! \times 4! \times 2!} - \frac{8!}{4! \times 2!}$$

$$\frac{11 \times 10 \times 9 \times 8 \times 7 \times 6 \times 5 \times 4!}{4! \times 4 \times 3 \times 2 \times 1 \times 2 \times 1} - \frac{8 \times 7 \times 6 \times 5 \times 4!}{4! \times 2 \times 1}$$

$$110 \times 9 \times 7 \times 5 - 28 \times 30$$

$$\Rightarrow 34650 - 840$$

$$\Rightarrow 33810 \text{ Ans}$$

(Que 11) In how many ways can the letters of the word PERMUTATIONS be arranged if the

(i) words start with P and end with S,

(Ans-i) There are 10 letters between P and S and in those letters there are 2 'T'.

So, 10 letters can be arranged in $\rightarrow$

$$\frac{10!}{2!} \Rightarrow \frac{10 \times 9 \times 8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1}{2 \times 1}$$

$$\Rightarrow 1814400 \text{ Ans}$$

(ii) vowels are all togethers.

(Ans-ii) There are 12 letter ~~is~~ in PERMUTATION and if we put all vowel together then it will become 8 letters and there are 2 T's in it. Therefore,

$$\frac{8!}{2!} \Rightarrow \frac{8\times7\times6\times5\times4\times3\times\cancel{2}\times1}{\cancel{2}\times1} \Rightarrow 20160$$

And there 5 vowel that are placed in one place but we can arrange it in ${}^5P_5$ ways.

$${}^5P_5 \Rightarrow \frac{5!}{(5-5)!} \Rightarrow \frac{5\times4\times3\times2\times1}{0!} \Rightarrow \frac{120}{1} \Rightarrow 120$$

Therefore,

$$20160 \times 120 \Rightarrow 2419200 \text{ Ans}$$

(iii) there are always 4 letters between P and S

(Ans-iii) As given in the question there are only 4 letters between P and S and if we check it there are 14 ways when 4 letters are between P and S. So, there 10 letters left ~~and~~ which are arrange in different ways.

$$\frac{10!}{2!} \times 14$$

$$\Rightarrow \frac{10\times9\times8\times7\times6\times5\times4\times3\times\cancel{2!}}{\cancel{2!}} \times 14$$

$$\Rightarrow 10\times9\times8\times7\times6\times5\times4\times3\times14$$

$$\Rightarrow 25401600 \text{ Ans}$$

Ex-6.4

(Que 1) If ${}^nC_8 = {}^nC_2$, find ${}^nC_2$

(Ans-1) ${}^nC_8 = {}^nC_2$

It is known that ${}^nC_a = {}^nC_b \Rightarrow a=b$ or $n = a+b$

${}^nC_8 = {}^nC_2$ $\{ {}^nC_a = {}^nC_b \Rightarrow n = a+b \}$

$n = 8+2$

$\boxed{n=10}$

Therefore

${}^nC_2 \Rightarrow {}^{10}C_2 = \dfrac{10!}{2!(10-2)!}$

$= \dfrac{\cancel{10}^{5} \times 9 \times \cancel{8!}}{\cancel{2} \times 1 \times \cancel{8!}} \Rightarrow 45$ Ans

(Que 2) Determine n if

(i) ${}^{2n}C_3 : {}^nC_3 = 12:1$

(Ans-i) $\dfrac{{}^{2n}C_3}{{}^nC_3} = \dfrac{12}{1}$

$\Rightarrow {}^{2n}C_3 = 12 \times {}^nC_3$

$\Rightarrow \dfrac{(2n)!}{3!(2n-3)!} = 12 \times \dfrac{n!}{3!(n-3)!}$

$\Rightarrow \dfrac{2n \times (2n-1) \times (2n-2) \times \cancel{(2n-3)!}}{\cancel{(2n-3)!}} = 12 \times \dfrac{n \times (n-1) \times (n-2) \times \cancel{(n-3)!}}{\cancel{(n-3)!}}$

$\Rightarrow \cancel{2} \times \cancel{2} \times \cancel{(n-1)} \times (2n-1) = \cancel{12}^{3} \times (n-2) \times \cancel{(n-1)}$

$\Rightarrow 2n-1 = 3(n-2)$

$\Rightarrow 2n-1 = 3n-6$

$\Rightarrow 3n-2n = 6-1$

$\Rightarrow \boxed{n = 5}$ Ans

(ii) $^{2n}C_3 : {}^{n}C_3 = 11:1$

(Ans-ii) $\dfrac{^{2n}C_3}{^{n}C_3} = \dfrac{11}{1}$

$^{2n}C_3 = 11 \times {}^{n}C_3$

$\Rightarrow \dfrac{(2n)!}{3!(2n-3)!} = 11 \times \dfrac{(n)!}{3!(n-3)!}$

$\Rightarrow \dfrac{2\cancel{n} \times (2n-1) \times (2n-2) \times \cancel{(2n-3)!}}{\cancel{(2n-3)!}} = 11 \times \dfrac{\cancel{n} \times (n-1) \times (n-2) \times \cancel{(n-3)!}}{\cancel{(n-3)!}}$

$\Rightarrow 2 \times (2n-1) \times 2 \times \cancel{(n-1)} = 11 \times \cancel{(n-1)} \times (n-2)$

$\Rightarrow 4(2n-1) = 11(n-2)$

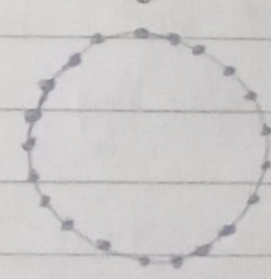
$\Rightarrow 8n - 4 = 11n - 22$

$\Rightarrow 22 - 4 = 11n - 8n$

$\Rightarrow 18 = 3n$

$\Rightarrow \boxed{6 = n}$ Ans

(Que 3) How many chords can be drawn through 21 points on a circle?



(Ans-3) For a chord only two point required, $r=2$

And there are 21 points of circle

$n=21$

$^{n}C_r = {}^{21}C_2 = \dfrac{21!}{2!(21-2)!}$

$= \dfrac{21 \times \overset{10}{\cancel{20}} \times \cancel{19!}}{\cancel{2} \times 1 \times \cancel{19!}}$

$\Rightarrow 21 \times 10$

$= 210$ Ans

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(Que 4) In how many ways can a team of 3 boys and 3 girls be selected from 5 boys and 4 girls?

(Ans-4) 3 boys can be selected from 5 boys in $^5C_3$ ways

3 girls can be selected from 4 girls in $^4C_3$ ways

$$^5C_3 \times {}^4C_3$$

$$\Rightarrow \frac{5!}{3!(5-3)!} \times \frac{4!}{3!(4-3)!}$$

$$\Rightarrow \frac{5 \times \cancel{4}^{2} \times \cancel{3!}}{\cancel{3!} \times \cancel{2} \times 1} \times \frac{4 \times \cancel{3!}}{\cancel{3!} \times 1}$$

$$\Rightarrow 10 \times 4$$

$$\Rightarrow 40 \text{ Ans}$$

(Que 5) Find the number of ways of selecting 9 balls from 6 red balls, 5 white balls and 5 blue balls if each ~~selecting~~ selection consists of 3 balls of each colour.

(Ans-5) We have to select 9 balls from 3 colour's balls and each colour consist of 3 balls.

3 balls can be selected from 6 red balls in $^6C_3$ ways.

3 balls can be selected from 5 white balls in $^5C_3$ ways

3 balls can be selected from 5 bule balls in $^5C_3$ ways

$${}^6C_3 \times {}^5C_3 \times {}^5C_3 \Rightarrow \frac{6!}{3!(6-3)!} \times \frac{5!}{3!(5-2)!} \times \frac{5!}{3!(5-2)!}$$

$$\Rightarrow \frac{6\times5\times4\times\cancel{3!}}{\cancel{3!}\times3!} \times \frac{5\times4\times\cancel{3!}}{\cancel{3!}\times2!} \times \frac{5\times4\times\cancel{3!}}{\cancel{3!}\times2!}$$

$$\Rightarrow \frac{\cancel{6}\times5\times4}{\cancel{3}\times\cancel{2}\times1} \times \frac{5\times\cancel{4}^{2}}{\cancel{2}\times1} \times \frac{5\times\cancel{4}^{2}}{\cancel{2}\times1}$$

$$\Rightarrow 20 \times 10 \times 10$$

$$\Rightarrow 2000 \text{ Ans}$$

(Que 6) Determine the number of 5 card combinations out of a deck of 52 cards if there is exactly one ace in each combination.

(Ans-6) In a deck of 52 cards, there are 4 aces. A combination of 5 cards have to be made in which there is exactly one ace.
Then, one ace can be selected in ${}^4C_1$ ways and the remaining 4 cards can be selected out of the 48 cards in ${}^{48}C_4$ ways.

$${}^{48}C_4 \times {}^4C_1$$

$$\Rightarrow \frac{48!}{4!(48-4)!} \times \frac{4!}{1!(4-1)!}$$

$$\Rightarrow \frac{48\times47\times46\times45\times\cancel{44!}}{4!\times\cancel{44!}} \times \frac{4\times\cancel{3!}}{1!\times\cancel{3!}}$$

$$\Rightarrow \frac{\cancel{48}^{2}\times47\times46\times45\times4}{\cancel{4}\times\cancel{3}\times\cancel{2}\times1}$$

$$\Rightarrow 2\times47\times46\times45\times4$$

$$\Rightarrow 778320 \text{ Ans}$$

(Que 7) In how many ways can one select a cricket team of eleven from 17 players in which only 5 players can bowl if each cricket team of 11 must include exactly 4 bowlers?

(Ans-7) Out of 17 players, 5 players are bowlers.

A cricket team of 11 players is to be selected in such a way that there are exactly 4 bowlers.

4 bowlers can be selected in $^5C_4$ ways and the 7 players can be selected out of the 12 players in $^{12}C_7$ ways.

$$^5C_4 \times {^{12}C_7} \Rightarrow \frac{5!}{4!(5-4)!} \times \frac{12!}{7!(12-7)!}$$

$$\Rightarrow \frac{5 \times \cancel{4!}}{\cancel{4!} \times 1!} \times \frac{12 \times 11 \times 10 \times 9 \times 8 \times \cancel{7!}}{\cancel{7!} \times 5!}$$

$$\Rightarrow 5 \times \frac{\cancel{12} \times 11 \times \cancel{10} \times 9 \times 8}{\cancel{5} \times \cancel{4} \times \cancel{3} \times \cancel{2}}$$

$$\Rightarrow 5 \times 11 \times 9 \times 8$$

$$\Rightarrow 3960 \text{ Ans}$$

(Que 8) A bag contains 5 black and 6 red balls. Determine the number of ways in which 2 black and 3 red ~~blas~~ balls can be selected.

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(Ans-8) There are 5 black and 6 red balls in the bag.
2 black balls can be selected out of 5 black balls in $^5C_2$ ways and 3 red balls can be selected out of 6 red balls in $^6C_3$ ways.

$$^5C_2 \times {}^6C_3 \Rightarrow \frac{5!}{2!(5-2)!} \times \frac{6!}{3!(6-3)!}$$

$$\Rightarrow \frac{5\times4\times\cancel{3!}}{2!\times\cancel{3!}} \times \frac{6\times5\times4\times\cancel{3!}}{3!\times\cancel{3!}}$$

$$\Rightarrow \frac{5\times\cancel{4}^{2}}{\cancel{2}\times1} \times \frac{\cancel{6}\times5\times4}{\cancel{3}\times\cancel{2}}$$

$$\Rightarrow 10 \times 20$$

$$\Rightarrow 200 \text{ Ans}$$

(Que 9) In how many ways can a student choose a programme of 5 courses ~~a~~ if 9 courses are available and 2 specific courses are compulsory for every student?

(Ans-9) There are 9 courses available out of which, 2 specific courses are compulsory for every student.

Therefore, every student has to choose 3 courses out of the remaining 7 courses. This can be chosen in $^7C_3$ ways.

$$^7C_3 = \frac{7!}{3!(7-3)!}$$

$$= \frac{7\times6\times5\times\cancel{4!}}{3!\times\cancel{4!}}$$

$$\Rightarrow \frac{7\times\cancel{6}\times5}{\cancel{3}\times\cancel{2}\times1} \Rightarrow 7\times5 \Rightarrow 35 \text{ Ans}$$

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