Q.1) Max Marks: 1

The number of ways in which five different letters can be put in their five addressed envelopes so that all the letters are in the wrong envelopes is

A 10

B 30

C 44 Correct Option

Solution: (C)

This is the number of derangements given by !5= 5!(1-(1/1!)+(1/2!)-(1/3!)+(1/4!)+(1/5!))= =60-20+5-1=44

D 17280

Q.2) Max Marks: 1

The number of words which can be formed with two different consonants and 1 vowel out of 7 different consonants and 3 different vowels, the vowel to lie between two consonants is

A 63

B 132

C 126 Correct Option

Solution: (C)

No of ways the 2 consonants can be selected = C(7,2)
No of ways 1 vowel can be selected= C(3,1)
The 3 character word the consonants can be arranged in 2! Ways whereas the vowel can be arranged only in 1 way

Total no of words = C(7,2) * C(3,1)*2=126.

D 378

Q.3) Max Marks: 1

The greatest binomial coefficient in the expansion of $(2x^{1/3} + 3x^{-7/2})^{31}$ is equal to the coefficient of x^k in the expansion of $(1+x)^{31}$. Then k=

A 13, 14

B 14, 15

C 15, 16 Correct Option

Solution: (C)

The greatest binomial coefficient in the expansion of $(2x^{1/3} + 3x^{-7/2})^{31}$ is C(31,15) or C(31,16) and the greatest coefficient in the expansion of $(1+x)^{31}$ is C(31,k).
Which is k=15 or 16

D 16, 17

Q.4) Max Marks: 1

The sum of coefficients in the expansion of $(1-3x+10x^2)^n$ is a if the sum of coefficients in the expansion of $(1+x^2)^n$ is b then

A a=3b

B $a=b^3$ Correct Option

Solution: (B)

To get the sum of coeff the best way is to substitute 1 for all the variables
$a=(1-3x+10x^2)^n=(1-3+10)^n=8^n$
$b=(1+x^2)^n=(1+1)^n=2^n$
Clearly $a=b^3$.

C $b=a^3$

D **None of the above.**

Q.5) Max Marks: 1

The total no of ways of selecting 5 letters of the word INDEPENDENT is

A **12**

B **24**

C **48**

D **72** Correct Option

Solution: (D)

Total no of letters=11
I-1
N-3
D-2
E-3
P-1
T-1

All the possibilities are
1. All 5 distinct in 6C5 ways=6 ways
2. 3 distinct and 2 alike C(3,1)*C(5,3)=30
3. 2 distinct and 3 alike C(2,1)*C(5,2)=20
4. 2 alike, 2 alike and 1 distinct in C(3,2)*C(4,1)=12
5. 3 alike, 2 alike in 2C1*2C1=4 ways

Total=6+30+20+12+4=72 ways.

Q.6) Max Marks: 1

In how many ways can an examiner assigned 30 marks to 8 questions, giving not less than two marks to any question?

A **116280** Correct Option

Solution: (A)

The no of ways we can do this is
Coefficient of x^{30} in $(x^2+x^3+....x^{16})^8=x^{16}(1-x^{15})^8=C(21,14)=C(21,7)=116280$

B **670**

C **32**

D **None of these**

Q.7) Max Marks: 1

In chess championship, 153 games have been played. If a player plays with every other player only once, then the number of players is

A **17**

B **51**

C **18** Correct Option

Solution: (C)

If the number of players is n then ${}^nC_2=153$
$n(n-1)=306$.
$n=18$

D **35**

Q.8) Max Marks: 1

There are 38 different time periods during which the classes can be scheduled at an educational institute. If there are 677 different classes how many different

rooms will be sufficient

A 82 — Correct Option

Solution: (A)
Solution A
Applying the pigeon hole principle,
The minimum no of rooms required are floor(677/38)+1=18, but the question asked here is about sufficiency out of all the options we have 82 which is greater than 18, 82 rooms will be sufficient for this requirement. Therefore 82 is the correct option.

B 16

C 17

D None of the above.

Q.9) Max Marks: 1

Consider the recurrence relation

$a_n=-3a_{n-1}-3a_{n-2}-a_{n-3}$. With initial conditions
a0=1, a1=-2 and a2=-1.

Then the absolute value of a_{100}=____

Correct Answer

Solution: (19699)

Solution 19699

The characteristic Equation can be given by

$r^3+3r^2+3r+1=0$
$(r+1)^3=0$ it has a single root r=-1 with multiplicity of 3

$a_n=c_1(-1)^n+c_2n(-1)^n+c_3n^2(-1)^n$

On substituting the initial conditions in the above equation a0 , a2, a2 we get

c1=1
c2=3 and c3=-2.

$a_n=(1+3n-2n^2)(-1)^n$.

Substituting n=T100
We get a_{100}=-19699.
Absolute value=19699.

Q.10) Max Marks: 1

On the occasion of Diwali festival, each student of a class sends greeting cards the others. If there are 20 students in the class, then the total number of greeting cards exchanged by the students is

A $^{20}C_2$

B $2*{}^{20}C_2$ — Correct Option

Solution: (B)
The total no of greeting cards=.$^{20}P_2$ =20*19=$2*{}^{20}C_2$.

C $2*{}^{20}P_2$

D None of these

Q.11) Max Marks: 2

A candidate is required to answer 7 questions out of 12 questions which are divided into two groups each containing 6 questions. He is not permitted to attempt more than 5 questions from either group. In how many different ways he can choose the 7 questions?

A 780 — Correct Option

Solution: (A)

Section 1 6 questions
Section 2 6 questions

Cannot attempt more than 5 in each section

Possible combinations are

Section 1	Section 2
2	5
3	4
4	3
5	2

No of ways are ${}^8C_2 * {}^6C_5 + {}^8C_3 * {}^6C_3 + {}^8C_3 * {}^5C_3 + {}^8C_2 * {}^5C_5 = 780$

B 720

C 120

D 5040

Q.12) Max Marks: 2

The number of ways a garland is made with 8 flowers such that two specified flowers should be side by side in the garland and another pair of flowers are never beside each other___

Correct Answer

Solution: (240)

We can consider this as 6+1 flowers the 2 flowers can be considered as 1 unit
Out of this 6 flowers, 1 is a single unit and remaining 6 flowers out of these we have a pair of flowers which are never together now we are left with 4 flowers which can be arranged in any way + 1 unit of 2 flowers and 2 flowers which cannot come beside each other,
First lets us arrange 4+1 unit of flowers in a circular way in 4! ways (the 1 unit can be arranged among themselves in 2! ways), now the remaining 2 flowers can be placed in between these 5 flowers in P(5,2) ways as we have 5 places as we need to place 2 flowers in 5 places.
Total no of ways of circular permutation = 4!*2!*P(5,2)
Because it is to be placed in a garland the total no of permutations=4!*2!*P(5,2)/2 ways= 240 ways.

Q.13) Max Marks: 2

A double-decked bus can accommodate 100 passengers 40 in the upper deck and 60 in the lower deck. In how many ways can a group of 100 passengers be accommodated if 15 refuse to sit in the lower deck and 20 refuse to sit in the upper deck?

A $\frac{100!}{60!40!}$

B $\frac{100!}{30!35!}$

C $\frac{65!}{25!40!}$ Correct Option

Solution: (C)

The 15 passengers who refuse to sit in the lower deck must be accommodated in the upper deck and the 20 passengers who refuse to sit in the upper deck must be accommodated in the lower deck. Therefore 25 passengers can be accommodated in the upper deck and 40 passengers can be accommodated in the lower deck from the remaining 65 passengers. It can be done in $\frac{65!}{25!40!}$ ways.

D $\frac{65!}{35!45!}$

Q.14) Max Marks: 2

If the letters of the word PRISON are permuted in all possible ways and the words thas formed are arranged in dictionary order, the rank of the word SIPRON is____

Correct Answer

Solution: (618)

Solution 618

Alphabetical order of the letters in the given is I, N, O, P, R, S
Number of words that are to begin with I 5I=120
Number of words that are to begin with N is S=120
Number of words that are to begin with O is=120
Number of words that are to begin with P is=120
Number of words that are to begin with R is=120
Number of words that are to begin with SIN is 3I= 6
Number of words that are to login with SIO is 3I=6
Number of words that are to begin with SIPNI 2I=2
Number of words that are to begin with SIP is 2I=2
Number of words that are to begin with SIPRN is 1I=1
The next word is SIPRON.

Rank=5(120)+2(6)+2(2)+1+1=618.

Q.15)

Max Marks: 2

There are 2504 computer science students at a school of these, 1876 have taken a course in C programming, 999 have taken a course in Java, and 345 have taken a course in Python. Further. 876 have taken courses in both C and Java, 231 have taken courses in both Java and python and 290 have taken courses in both C and Python. If 189 of these students have taken courses in C, Java, and Python, how many of these 2504 students have not taken a course in any of these three programming languages?

Correct Answer

Solution: (492)

Total Sample space 2504
N(C)=1876
N(J)=999
N(P)=345

N(C∩J)=876
N(J∩P)=231
N(C∩P)=290

N(C∩J∩P)=189

N((C∪J∪P)')=N(total set)-N((C∪J∪P))
N((C∪J∪P))=N(C)+N(J)+N(P)-N(C∩J)-N(J∩P)-N(C∩P)-N(C∩J∩P)
=1876+999+345-876-231-290+189
=2012

N((C∪J∪P)')=2504-2012=492

close