Permutation and Combination for SNAP

Instructions

For the following questions answer them individually

Question 1

A committee of 3 members is to be formed out of 3 men and 4 women. In how many different ways can it be done so that at least one member is a woman?

A 34

B 12

C 30

D 36

E None of these

Answer: A

Explanation:

Number of ways of selecting any 3 members = $^7C_3 = 35$

Number of ways of selecting only men = $^3C_3 = 1$

Number of ways of selecting such that at least one member is a woman = 35 - 1 = 34

Question 2

A bag contains 5 red balls, 7 yellow balls and 3 pink balls. If two balls are drawn at random from the bag, one after another, what is the probability that the first ball is red and the second ball is yellow ?

A $\frac{5}{12}$

B $\frac{3}{8}$

C $\frac{1}{4}$

D $\frac{1}{8}$

E $\frac{1}{6}$

Answer: E

Explanation:

Required probability = $\frac{5}{15} \times \frac{7}{14} = \frac{1}{6}$

Question 3

In how many different ways can the letters of word 'REMAKE' be arranged ?

A 720

B 130

C 360

D 180

E None of these

Answer: C

Explanation:

The total number of alphabets in the word REMAKE is 6.

So the word can be rearranged in 6! ways.

But the alphabet "E" appears twice in the word.

Hence the word can be rearranged only in $\frac{6!}{2!}$ ways.

$\frac{6!}{2!} = \frac{720}{2}$

=360.

Hence Option C is the correct answer.

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Question 4

In a bag there are 4 white, 4 red and 2 green balls. Two balls are drawn at random. What is the probability that at least one ball is of green colour ?

A $\frac{4}{5}$

B $\frac{3}{5}$

C $\frac{1}{5}$

D $\frac{2}{5}$

E None of these

Answer: D

Explanation:
There are 4 white, 4 red and 2 green balls and two balls are drawn at random.

Total possible outcomes = Selection of 2 balls out of 10 balls

$= C_2^{10} = \frac{10*9}{1*2} = 45$

Favourable outcomes = 1 green ball and 1 ball of other colour + 2 green balls

$= C_1^2 \times C_1^8 + C_2^2$

= 2*8 + 2 = 18

$\therefore$ Required probability = $\frac{18}{45} = \frac{2}{5}$

Question 5

If all letters of the word "CHCJL" be arranged in an English dictionary, what will be the 50^{th} word?

A HCCLJ

B LCCHJ

C LCCJH

D JHCLC

E None of the above

Answer: C

Explanation:
The alphabetical order = CCHJL

Number of words starting with C = $4! = 24$

Number of words starting with H = $\frac{4!}{2} = 12$

Number of words starting with J = $\frac{4!}{2} = 12$

Total words till now = 24 + 12 + 12 = 48

First word starting with L (49th in dictionary) = LCCHJ

Therefore, the 50th word = LCCJH

Question 6

In how many ways can 7 identical erasers be distributed among 4 kids in such a way that each kid gets at least one eraser but nobody gets more than 3 erasers?

A 16

B 20

C 14

D 15

Answer: A

Explanation:
We have been given that a + b + c + d = 7
Total ways of distributing 7 things among 4 people so that each one gets at least one = ${}^{n-1}C_{r-1}$ = 6C3 = 20
Now we need to subtract the cases where any one person got more than 3 erasers. Any person cannot get more than 4 erasers since each child has to get at least 1. Any of the 4 childs can get 4 erasers. Thus, there are 4 cases. On subtracting these cases from the total cases we get the required answer. Hence, the required value is 20 - 4 = 16

Instructions

Directions for the next two questions: Answer the questions based on the following information.

Each of the 11 letters A, H, I, M, O, T, U, V, W, X and Z appears same when looked at in a mirror. They are called symmetric letters. Other letters in the alphabet are asymmetric letters.

Question 7

How many four-letter computer passwords can be formed using only the symmetric letters (no repetition allowed)?

A 7,920

B 330

C 14,640

D 4,19,430

Answer: A

Explanation:
The number of ways in which this can be done is 11*10*9*8 = 7920

Instructions
For the following questions answer them individually

Question 8

The coefficient of x^7 in the expansion of $(1 - x^2 + x^3)(1 + x)^{10}$ is:

A 75

B 78

C 85

D None of the above

Answer: B

Explanation:
We need to find the coefficient of x^7 in the expansion $(1-x^2+x^3)(1+x)^{10}$

Now, $(1+x)^{10}$ will have all the powers of x from 0 to 10. Multiplying these powers by 1, x^2 and x^3 will yield different results but we are interested in finding only the coefficient of x^7. When we multiply x^7 of $(1+x)^{10}$ by 1, x^5 of $(1+x)^{10}$ by x^2 and x^4 of $(1+x)^{10}$ by x^3 we will get x^7. coefficient of x^7 in $(1+x)^{10}$ is $10C_7$ = 120, coefficient of x^5 in $(1+x)^{10}$ is $10C_5$ = 252, coefficient of x^4 in $(1+x)^{10}$ is $10C_4$ = 210 adding 120 and 210 and subtracting(since x^2 has a negative sign) 252 we get coefficient of x^7 as 78

Therefore our answer is option 'B'

Question 9

Let AB, CD, EF, GH, and JK be five diameters of a circle with center at 0. In how many ways can three points be chosen out of A, B, C, D, E, F, G, H, J, K, and 0 so as to form a triangle?

Answer:160

Explanation:
The total number of given points are 11. (10 on circumference and 1 is the center)
So total possible triangles = 11C3 = 165.
However, AOB, COD, EOF, GOH, JOK lie on a straight line. Hence, these 5 triangles are not possible. Thus, the required number of triangles = 165 - 5 = 160

Question 10

How many numbers with two or more digits can be formed with the digits 1,2,3,4,5,6,7,8,9, so that in every such number, each digit is used at most once and the digits appear in the ascending order?

Answer:502

Explanation:
It has been given that the digits in the number should appear in the ascending order. Therefore, there is only 1 possible arrangement of the digits once they are selected to form a number.
There are 9 numbers (1,2,3,4,5,6,7,8,9) in total.
2 digit numbers can be formed in $9C_2$ ways.
3 digit numbers can be formed in $9C_3$ ways.
....
..9 digit number can be formed in 9C9 ways.

We know that $nC_0 + nC_1 + nC_2 + ... + nC_n = 2^n$
=> $9C_0 + 9C_1 + 9C_2 + ...9C_9 = 2^9$
$9C_0 + 9C_1 + ...9C_9 = 512$

We have to subtract $9C_0$ and $9C_1$ from both the sides of the equations since we cannot form single digit numbers.

$=> 9C_2 + 9C_3 + ... + 9C_9 = 512 - 1 - 9$
$9C_2 + 9C_3 + ... + 9C_9 = 502$

Therefore, 502 is the right answer.