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SUBJECT: DISCRETE STRUCTURE

FINAL : SUMMER EXAM

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Question No 1

Find the 36th term of the arithmetic Sequence whose 3rd term is 7 and 8th term is 17.

Sol:

Let a be the first term and d be the common difference of the arithmetic Sequence. Then

$a_n = a + (n-1)d$

$a_3 = a + (3-1)d$ and

$a_8 = a + (8-1)d$

Given that $a_3 = 7$ and $a_8 = 17$. Therefore

$7 = a + 2d$ ...... (1) and

$17 = a + 7d$ .... (2)

Subtracting (1) from (2) we get

$\Rightarrow d = 2$

Substituting $d = 2$ in (1) we have

$7 = a + 2(2)$

which gives $a = 3$

Thus $a_n = a + (n-1)d$

$a_n = 3 + (n-1)2$ (using values of a and d)

Hence the value of 36th term is

$a_{36} = 3 + (36-1)2$

$= 3 + 70$

$= 73$

Question No 2

Find $f \circ g(x)$ and $g \circ f(x)$ of the Function $f(x) = 2x + 3$ and $g(x) = -x^2 + 5$

Sol:

$$f \circ g(x) = f(g(x))$$
$$= f(-x^2+5)$$
$$= 2(\ ) + 3$$
$$= 2(-x^2+5) + 3$$
$$= -2x^2 + 10 + 3$$
$$= -2x^2 + 13$$

$$\Rightarrow g \circ f(x) = g(f(x))$$
$$= g(2x+3)$$
$$= -(2x+3)^2 + 5$$
$$= -(4x^2 + 12x + 9) + 5$$
$$= -4x^2 - 12x - 9 + 5$$
$$= -4x^2 - 12x - 4$$

Ans

Question No 3

Answer:- Let the given number be

$P(n)$

$\Rightarrow P(n)\cdot\ 1^2 + 2^2 + 3^2 + \dots\dots + n^2 = \frac{n(n+1)(2n+1)}{6}$

For $n = 1$

$P(1)\cdot\quad 1 = \frac{1(1+1)(2*(1)+1)}{6}$

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

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

it is true

let assume that $P(k)$ is true for Positive integers k which is

$1^2 + 2^2 + 3^2 + \dots + k^2 = \frac{k(k+1)(2k+1)}{6}$ — (1)

Now we have to Prove that $(P(k+1)$ is also true

$(1^2 + 2^2 + 3^2 + \dots\ k^2) + (k+1)^2$

$= \frac{k(k+1)(2k+1)}{6} + (k+1)^2$ | using eq (1) |

$= \frac{k(k+1)(2k+1) + 6(k+1)^2}{6}$

$$= \frac{(k+1)(2k^2+7k+6)}{6}$$

$$= \frac{k+1)(k+1+1)(2(k+1)+1)}{6}$$

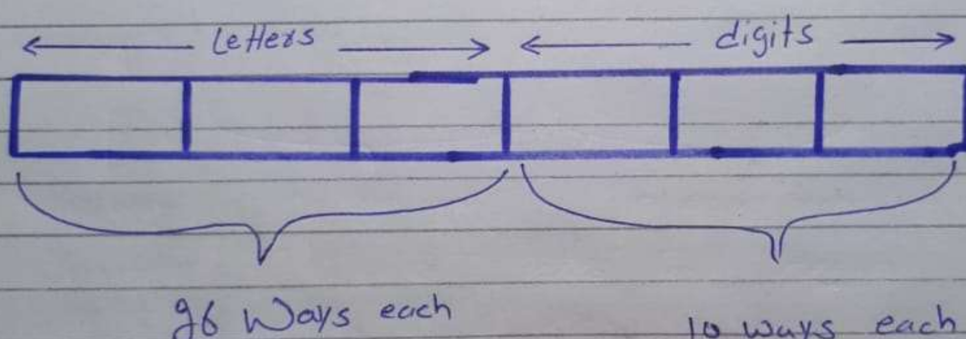
Thus $P(k+1)$ is true whenever $P(k)$ is true

Hence from the Principale of mathematical induction the statement $P(n)$ is true for all natural numbers n.

Question No 5

Answer:.

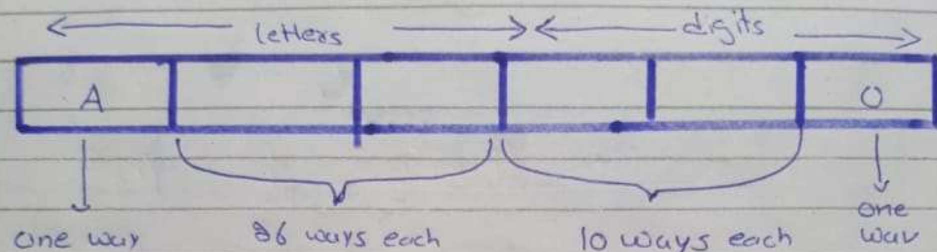
(a) Each of the three letters can be writen in 26 different ~~ways~~ ways and each of the three digits can be writen in 10 different ways.



Hence by the Product rule there is a total of $26 \times 26 \times 26 \times 10 \times 10 \times 10$ $= 17.576000$ different license Plates Possible.

(b)

The first and last Place can be filled is one way only while each of Second and third place can be filled in 26 ways and each of fourth and fifth Place can be filled in10ways.



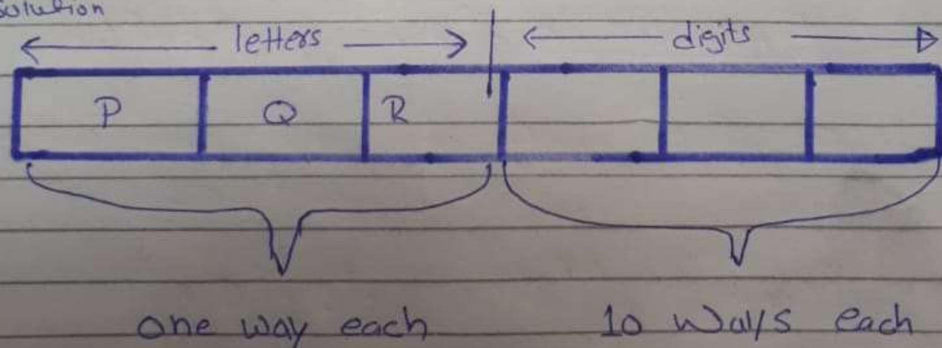
Number of license Plates that begin with A and end in O are

$1 \times 26 \times 26 \times 10 \times 10 \times 1 = 67600$

(c)

Number of license Plates that begin with PQR are $1 \times 1 \times 1 \times 10 \times 10 = 1000$

Solution



Question NO 4

Relations Definition

A relation in arithmetic defines the link between 2 completely different sets of knowledge. If 2 sets ar thought-about, the relation between them are going to be established if there's a association between the weather of 2 or additional non-empty sets.In the morning assembly at colleges, students ar imagined to interchange a queue in ascending order of the heights of all the scholars. This defines an ordered relation between the scholars and their heights.
Therefore, we can say,
'A set of ordered pairs is outlined as a relation.'

This mapping depicts a relation from set A into set B. A relation from A to B could be a set of A x B. The ordered pairs ar (1,c),(2,n),(5,a),(7,n). for outlining a relation, we have a tendency to use the notation wherever,
set represents the domain.
set represents the vary.
Sets and Relations
Sets and relation ar interconnected with one another. The relation defines the relation between 2 given sets.
If there ar 2 sets out there, then to ascertain if there's any association between the 2 sets, we have a tendency to use relations.
For example, an empty relation denotes none of the weather within the 2 sets is same.
Let us discuss the opposite varieties of relations here.
Relations in arithmetic
In Maths, the relation is that the relationship between 2 or additional set of values.
Suppose, x and y ar 2 sets of ordered pairs. And set x has relation with set y, then the values of set x ar known as domain whereas the values of set y ar known as vary.
Example: For ordered pairs=
The domain is =
And vary is =

Types of Relations
There are eight main varieties of relations that include:

- Empty Relation
- Universal Relation
- Identity Relation
- Inverse Relation
- Reflexive Relation
- Symmetric Relation
- Transitive Relation
- Equivalence Relation

Empty Relation
An empty relation (or void relation) is one during which there's no relation between any parts of a collection. as an example, if set A = then, one amongst the void relations will be R = where, |x – y| = eight. For empty relation,

$$R = \phi \subset A \times A$$

Universal Relation
A universal (or full relation) could be a form of relation during which each component of a collection is expounded to every different. take into account set A = . currently one amongst the universal relations are going to be R = where, |x – y| ≥ zero. For universal relation,

$$R = A \times A$$

Identity Relation
In an identity relation, each component of a collection is expounded to itself solely. as an example, in a very set A = , the identity relation are going to be I = , , . For identity relation,

I =

Inverse Relation
Inverse relation is seen once a collection has parts that ar inverse pairs of another set. as an example if set A = , then inverse relation are going to be R-1 = . So, for an inverse relation,

R-1 =

Reflexive Relation

In a reflexive relation, each component maps to itself. as an example, take into account a collection A = . currently an example of reflexive relation are going to be R = . The reflexive relation is given by-

$$(a, a) \in R$$

Symmetric Relation

In a symmetrical relation, if a=b is true then b=a is additionally true. In different words, a relation R is symmetrical on condition that (b, a) ∈ R is true once (a,b) ∈ R. associate degree example of symmetrical relation are going to be R = for a collection A = . So, for a symmetrical relation,

$$aRb \Rightarrow bRa, \forall\ a, b \in A$$

Transitive Relation

For transitive relation, if (x, y) ∈ R, (y, z) ∈ R, then (x, z) ∈ R. For a transitive relation,

$$aRb \text{ and } bRc \Rightarrow aRc\ \forall\ a, b, c \in A$$

Equivalence Relation

If a relation is reflexive, symmetrical and transitive at an equivalent time it's referred to as an equivalence relation