Q_1 : Let $A = \{1, 2, 3, 4, 5, 6, 7, 8\}$
$B = \{2, 5, 9\}$
$C = \{a, b\}$ find each of the following:-

i. $A - B$:

$\{1, 2, 3, 4, 5, 6, 7, 8\} - \{2, 5, 9\}$
$= \{1, 3, 4, 6, 7, 8\}$

ii. $(A \cap B) \cup C = \{2, 5\} \cup \{a, b\}$
$= \{2, 5, a, b\}$

iii. $A \cap B \cap C = \{2, 5\} \cap \{a, b\}$
$= \phi$, empety set

iv. $B \times C = \{2, 5, 9\} \times \{a, b\}$
$= \{(2,a), (2,b), (5,a), (5,b), (9,a), (9,b)\}$

v. $P(C)$ = power set of C
= set of all subset of C
$= \{\phi, \{a\}, \{b\}, \{a, b\}\}$

Q1 b) $(P \cap ((P' \cup Q')')) \cup (P \cap Q)$

$= (P \cap ((P')' \cap Q')) \cup (P \cap Q)$, By De morgans Law.

$= P \cap (P \cap Q') \cup (P \cap Q)$

$= ((P \cap P) \cap Q') \cup (P \cap Q)$

$= (P \cap Q') \cup (P \cap Q)$

$= P \cap (Q' \cup Q)$

$= \emptyset$

c)

p	q	$\neg p$	$\neg p \wedge q$	$q \leftrightarrow p$	A
T	T	F	F	T	T
T	F	F	F	F	T
F	T	T	T	F	F
F	F	T	F	T	T

Q1) d) $X = 3 \rightarrow (X+2)^2$

$P(X) = X$ is an odd $(3+2)^2 = 25$ (both odd)

$Q(X) = X^2$ is an odd integer

$\forall x \, (P(X) \rightarrow Q(X))$

Let a is odd integer

$a = 2n + 1$

$\cancel{a^2 = (2n+1)^2}$

$(a+2)^2 = ((2n+1)+2)^2$

$(a+2)^2 = (2n+3)^2$

$\cancel{(a+2)^2}$ $\cancel{a^2+4a^2+4}$ $= 4n^2 + 12n + 9$

$(a+2)^2 = 4(n^2 + 3n) + 9$

$(a+2)^2 = 4m + 9$

$a + 2^2 =$ is an odd integer

~~#~~ Q7)

e) i)

- Consider the positive integers $x = 5, y = 3$

$5 \geq 3 \Rightarrow x \geq y \Rightarrow P(x, y)$ is true.

$\exists$ is the existential quantifier. Hence it is true that $\exists x \exists y P(x, y)$.

ii) Consider the positive integers $x = 2, y = 3$

$2 \ngeq 3 \Rightarrow x \ngeq y \Rightarrow P(x, y)$ is not true

$\forall$ is the universal quantifier.

Hence, it is FALSE that $\forall x \forall y P(x, y)$.

Q2) a)

i) Therefore elements of relation R will be:

$R = (4,5), (6,4), (6,5) \}$

Domain of ~~R = {(4,6)}~~ $R = \{4, 6\}$

Range of $R = \{4, 5\}$

ii) $R = \{(4,5), (6,4), (6,5)\}$

we notice that $(4,4) \notin R$, $(5,5) \notin R$

$(6,6) \notin R$

Therefore R is irreflexive relation

Therefore R is antisymmetric relation

Therefore Relation is irreflexive and antisymmetric.

Q2) b)

i) elements of set S

as $4+5 \geq 9$ & $5+5 \geq 9$

so the elements of the set S are $\{4, 5\}$

~~the elements of the set~~

ii) $S = \{4, 5\}$

- as $4+4 < 9$ so S is not reflexive
- $4+5 \geq 9$ & $5+4 \geq 9$ so set S is symmetric
- $4+5 \geq 9$ & $5+5 \geq 9$ so $5+5 \geq 9$ so set S is transitive.

as S is not reflexive it does not contains any equivalence realation.

Q2 C. i. f is clearly one to one but it's not onto and it doesn't take the value 4.

ii. g is onto and it takes both values 1, 2
It's not one to one, $g(1) \neq g(2)$.

iii. h isn't one to one as $h(1) = h(2)$
, isn't onto, cause it doesn't take the value 2.

d. i. $x = 4y + 3$, $4y = x - 3$

$y = \frac{x-3}{4}$

ii. $n \circ m$ - $n(m(x)) = 2(4x+3) - 4$
$= 8x + 6 - 4 = 8x + 2$

Q3 a) i. $a_1 = 1$
$a_2 = a_1 + 4 = 1 + 4 = 5$
$a_3 = a_{3-1} + 2(3) = a_2 + 6 = 5 + 6 = 11$
first 3 items = 1, 5, 11

ii. $\begin{cases} a = 1 \\ a_k = a_{k-1} + 2k, & k \geq 2 \end{cases}$

b) $r_1 = 7$, $r_2 = 2r_1$, $r_3 = 2^2 r_2$

$r_k = 2^x r_{k-1}$ = final recurrence relation.

c) Input = n
output = S(n)
S(n) {
if (n=1)
return 5
return 5 * S(n-1)
}

Trace S(4)

$S(4) = 5 \cdot 5 \cdot 5 \cdot 5 = 625$

$S(4) = 625$

Q4

(a)

$3 \rightarrow B = \{3,4,5,6,7,8,9,A,B\} = 9$ possibilites

$5 \rightarrow F = \{5,6,7,8,9,A,B,C,D,E,F\} = 11$ posibilites

$\square$ $\square$ $\square$ $\square$ Four digites

9 16 16 11

$9 \times 16 \times 16 \times 11 =$ Hexadecimal number

(b)

~~digit~~ letters digite

$\boxed{A}$ $\square$ $\square$ $\square$ $\square$ $\square$ $\boxed{0}$

26 26 26 10 10

$26 \times 26 \times 26 \times 10 \times 10 =$ lincese plates

(c) COMPUTEP

1 2 3 4 5 6 7 8 $\rightarrow$ For on letter

First letter $\rightarrow$ 8 ways $\rightarrow$

Second letter $\rightarrow$ 7ways

$N(A2) = 8 \times 7 = 56$

third letter $\rightarrow$ 6ways

$N(A3) = 8 \times 7 \times 6 = 336$

total(A) $= 8 + 56 + 336 = 400$ arrangement

Q 4

(d)

total → 13

wome → 7

men → 6

Group

4 women

3 men

women for group $\binom{7}{4}$ =

men for group $\binom{6}{3}$ =

total number for groups = $\binom{7}{4} \times \binom{6}{3}$

(e)

PROBABILITY

number of letters = 11

$\boxed{B}$ Repatering times = 2

$\boxed{I}$ Repeating times = 2

word PROBABILITY can be arranget = $\frac{11!}{2!2!}$ =

(f)

$n = 6$

$r = 10$

$C\binom{6+10-1}{10} = \binom{15}{10} = \frac{15!}{10!} =$

Q5

ⓐ

The person's first and last name are

$3 \times 2 = 6 \Rightarrow$ pegionholes $\Rightarrow$ probabilities of the name

$18 \Rightarrow$ pegion $\Rightarrow$ person's

□	□	□	□	□	□
1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18

So by pegionholele princible some of pegionholes have at least three pegions.

ⓑ

even numbers = {2, 4, 6, 8, 10, 12, 14, 16, 18, 20} = 10 numbers

odd numbers = {1, 3, 5, 7, 9, 11, 13, 15, 17, 19} = 10 numbers

$10 + 1 = 11$ integer numbers

ⓒ

$a = 5$
$d = 5$
$n = ?$
$a_n = 100$

$a_n = 10$

$a + (n-1)d = 100$

$5 (n-1)\cancel{d} = 100$

$(n-1)5 = 100 - 5$

$\frac{(n-1)\cancel{5}}{\cancel{5}} = \frac{95}{5}$

$n - 1 = 19$

$n = 20$ integers

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