University of Asia Pacific

Department of CSE

Mid-Semester Examination, Fall 2020

Name: Rashik Rahman

Reg ID: 17201012

Year: 4th

Semester: 1st

Course Code: CSE 401

Course Title: Math

Date: 27.02.2021

"During Examination and upload time I will not take any help from anyone. I will give my exam all by myself."

University of Asia Pacific

Admit Card

Mid-Term Examination of Fall, 2020

Financial Clearance	PAID

Registration No : 17201012

Student Name : Rashik Rahman

Program : Bachelor of Science in Computer Science and Engineering

Sl.NO.	COURSE CODE	COURSE TITLE	CR.HR.	EXAM. SCHEDULE
1	CSE 400	Project / Thesis	3.00	
2	CSE 330	Industrial Training	1.50	
3	CSE 401	Mathematics for computer Science	3.00	
4	CSE 403	Artificial Intelligence and Expert Systems	3.00	
5	CSE 404	Artificial Intelligence and Expert Systems Lab	1.50	
6	CSE 405	Operating Systems	3.00	
7	CSE 406	Operating Systems Lab	1.50	
8	CSE 407	ICTLaw, Policy and Ethics	2.00	
9	CSE 410	Software Development	1.50	
10	CSE 427	Topics of Current Interest	3.00	

Total Credit: 23.00

1. Examinees are not allowed to enter the examination hall after 30 minutes of commencement of examination for mid semester examinations and 60 minutes for semester final examinations.

2. No examinees shall be allowed to submit their answer scripts before 50% of the allocated time of examination has elapsed.

3. No examinees would be allowed to go to washroom within the first 60 minutes of final examinations.

4. No student will be allowed to carry any books, bags, extra paper or cellular phone or objectionable items/incriminating paper in the examination hall.
Violators will be subjects to disciplinary action.

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Admit Card Generation Time: 21-Feb-2021 10:23 PM

Answer to the Q.No. 1(a)

$N = (012+2) \% 10 + 20 = 4 + 20 = 24$

Using ceil function we can get a general equation. The algorithm is the following

$D := 1$

while $D \leq (q-1)N$:

$$D := \left\lceil \frac{q}{q-1} D \right\rceil$$

$J_q(n) := qn + 1 - D$

Here,

$q = 3$; As every third person is eliminated.

$\therefore$ while $D \leq 2N$:

$D = \lceil 3/2 \times 1 \rceil = 2$

$D = \lceil 3/2 \times 2 \rceil = 3$

$D = \lceil 3/2 \times 3 \rceil = 5$

$D = \lceil 3/2 \times 5 \rceil = 8$

$D = \lceil 3/2 \times 8 \rceil = 12$

$D = \lceil 3/2 \times 12 \rceil = 18$

$D = \lceil 3/2 \times 18 \rceil = 27$

$D = \lceil 3/2 \times 27 \rceil = 41$

$D = \lceil 3/2 \times 41 \rceil = 62$

$J_3(24) = 3 \times 24 + 1 - 62 = 11^{th}$ ~~posit~~

$\therefore$ If a person stands in 11^{th} position then he/she will be the last person alive.

Answer to the Q. No. 1(b)

$N_1 = (012+5)\% 30+30 = 17+30 = 47$

$N_2 = (012+10)\% 40+50 = 22+50 = 72$

Euclid's algorithm for gcd calculation:

~~gcd(m, n) =~~

$gcd(0, n) = n$

$gcd(m, n) = gcd(n \bmod m, m)$

$gcd(72, 47) = gcd(72\%47, 47)$

$= gcd(25, 47)$

$= gcd(47, 25)$

$= gcd(47\%25, 25)$

$= gcd(22, 25)$

$= gcd(25, 22)$

$= gcd(25\%22, 22)$

$= gcd(3, 22)$

$= gcd(22, 3)$

$= gcd(22\%3, 3)$

$= gcd(1, 3) = gcd(3, 1) = gcd(3\%1, 1)$

$= gcd(0, 1) = 1$

$\therefore gcd(72, 47) = 1$

Answer to the Q. No. 2(a)

$N = \cancel{012+} \, (012 \% 100] + 1050 = 12 + 1050 = 1062$

If we consider "W" as the number of winner then we know the general equation to find w that is

$$W = \lfloor N/k \rfloor + \frac{1}{2}k^2 + \frac{5}{2}k - 3$$

where,

$$k = \lfloor \sqrt[3]{N} \rfloor = \lfloor \sqrt[3]{1062} \rfloor = \lfloor 10.2 \rfloor = 10$$

$$\therefore W = \left\lfloor \frac{1062}{10} \right\rfloor + \frac{1}{2}(10)^2 + \frac{5}{2} \times 10 - 3$$

$$= 106 + 50 + 25 - 3$$

$$= \cancel{133} \, 178$$

So the possible number of winners if game is played N times are ~~133.~~ 178

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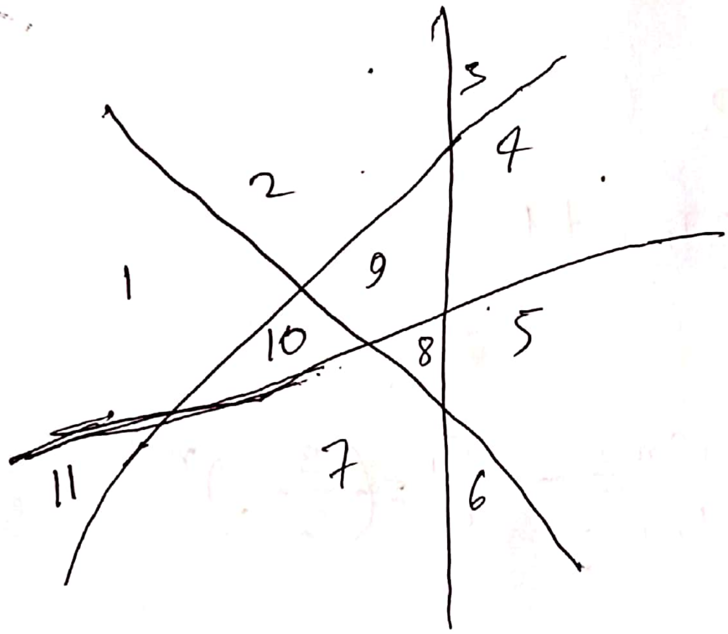
Answer to the Q. No. 2(b)

To find the total number of non-overlapping equation is

$L_n = 1 + \frac{n(n+1)}{2}$; where n is the number of lines.

For $n = 4$,

$L_4 = 1 + \frac{4(4+1)}{2} = \frac{20}{2} + 1 = 11$ ~~regions~~



∴ Total 11 non-overlapping regions

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Answer to the Q.No.3(a)

$T_0 = d_n$

$a_n T_n = b_n T_{n-1} + c_n$

here

$a_n = 012 \% 5 + 1 = 2 + 1 = 3$ n°

$b_n = (012 + 1) \% 6 + 1 = 1 + 1 = 2$ n°

$c_n = \cancel{012 \% 2 = 0}\ (012 + 2) \% 7 + 1 = 2$ n°

$d_n = 012 \% 2 = 0$

$\therefore T_0 = 0$

$3T_n = 2T_{n-1} + 1$

~~Sn =~~

$$S_n = \frac{a_{n-1} a_{n-2} \cdots a_1}{b_n \cdot b_{n-1} \cdots b_2} = \left(\frac{3}{2}\right)^{n-1}$$

We know,

$$T_n = \frac{1}{S_n a_n} \left(S_1 b_1 T_0 + \sum_{k=1}^{n} S_k C_k \right)$$

$$= \frac{1}{\left(\frac{3}{2}\right)^{n-1} \cdot 3} \left(\left(\frac{3}{2}\right)^{1-1} \cdot 2 \cdot 0 + \sum_{k=1}^{n} \left(\frac{3}{2}\right)^{k-1} \cdot 1 \right)$$

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$$= \frac{1}{\frac{3^{n-1+1}}{2^{n-1}}} \times \sum_{k=1}^{n} \left(\frac{3}{2}\right)^{k-1}$$

$$= \frac{2^{n-1}}{3^{n}} \times \sum_{k=1}^{n} \left(\frac{3}{2}\right)^{k-1}$$

$$= \frac{2^{n-1}}{3^{n}} \times 2\left(\frac{3}{2}\right)^{n} - 1$$

Ans.

$$\left(\frac{3}{2}\right)^0 + \left(\frac{3}{2}\right)^1 + \left(\frac{3}{2}\right)^2 + \dots + \left(\frac{3}{2}\right)^{n-1}$$

$$\frac{a(r^n - 1)}{r-1}$$

$$a = \left(\frac{3}{2}\right)^1$$

$$r = \frac{3/2}{1} = 3/2$$

$$= \frac{\left(\frac{3}{2}\right)^{n} - 1}{3/2 - 1}$$

$$= \frac{\left(\frac{3}{2}\right)^{n} - 1}{1/2}$$

$$= 2\left(\frac{3}{2}\right)^{n} - 1$$

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~~$N_1 = 17201012 \% 100 + 150$~~

Answer to the Q. No. 3(b)

$N_1 = 17201012 \% 100 + 150 = 12 + 150$
$= 162$

$N_2 = 162 + 1000 = \cancel{262}\ 1162$

. Square prime of all number between N_1, N_2

~~Sigma~~

Sigma notation:

$$\sum_{\substack{162 \le p \le 1162 \\ p \text{ prime}}} p^2$$

Delimited form:

$$\sum_{k=162}^{\pi(1162)} (p_k)^2$$

where p_k denotes the k^{th} prime and $\pi(N_2)$ is the number of primes $\le N_2$

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Answer to the Q.No. 1(b)

~~N~~ =

$m = (012 * 5) \% 30 + 30 = 47$

$n = (012 + 10) \% 40 + 50 = 72$

$gcd(n, m) = (m, n \% m)$

$gcd(n, 0) = n$

$\therefore gcd(72, 47) = gcd(47, 72 \% 47)$

$= gcd(47, 25)$

$= gcd(25, 47 \% 25)$

$= gcd(25, 22)$

$= gcd(22, 25 \% 22)$

$= gcd(22, 3)$

$= gcd(3, 22 \% 3)$

$= gcd(3, 1)$

$= gcd(1, 3 \% 1)$

$= gcd(1, 0)$

$= 1$

$\therefore gcd(72, 47) = 1$