C group task in discrete math:

Edited at 9am 3 April 2017.

**Logic:**

1. Find the truth tables.

a. A or not B and C

b. C and not B or not (A or D)

2. Give converse, inverse and contrapositive to “If I study hard, then I am rich.”

Series:

3. Prove the expressions for the sums of the terms of arithmetic and geometric progressions.

Relations:

http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/5relations.ppt

http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/9relations.ppt

4. Explain surjection, injection, bijection.

https://en.wikipedia.org/wiki/Bijection,\_injection\_and\_surjection

5. What is binary relation?

https://en.wikipedia.org/wiki/Binary\_relation

6. Explain relations.

7. Define relations. Give examples of the matrices.

8. A = {1, 2, 3, 4}

Which pairs are belong to R = {(a, b) | a ≤ b} ?

{(1, 1), (1, 2), (1, 3), (1, 4), (2, 3), (2, 4), (3, 4), (2,2), (3,3),(4,4)}

Is it reflexive, symmetric, anti-symmetric, transitive, composite?

9. Binary relation R on the set {1, 2, 3, 4} is defined so that *a*R*b* holds if and only if

*a* divides *b*, with remainder. Find the matrix and draw the graph.

Is it reflexive, symmetric, anti-symmetric, transitive, composite?

10. Binary relation R on the set {1, 2, 3, 4} is defined so that *a*R*b* holds if and only if

*a* divides *b*, with NO remainder. Find the matrix and draw the graph.

Is it reflexive, symmetric, anti-symmetric, transitive, composite?

11. Find f(f(f(f(f(2))))) if f(x) = x2.

12. Solve Fibonacci recurring relation. 1, 1, 2, 3, 5, 8, . . .

13. The deer population is 350 at time n = 0, and 400 at time n = 1. The increase from time n-1 to time n is four times larger than the increase from time n-2 to time n-1. Find the recurrence relation at time n.

14. There are 23 cats in a village this year. The growth of the population of the cats is 7% per year. How many cats will there be in the village in 9 years from now?

Number theory:

http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/6primes.ppt

15. Give the algorithms to find Highest Common Divisor and Lowest Common Multiple.

Include Euclidean algorithm.

http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/euclidean4algorithm.txt

16. Represent each of these decimal numbers in numeral systems with bases 2,5,7,9,16. a.67 b.94

http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/number2convert.txt

17. Give the best algorithm of finding the largest prime number.

http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/primes2find.txt

18. Why are prime number and factorization important?

19. Calculate big integers.

https://en.wikipedia.org/wiki/Arbitrary-precision\_arithmetic

Combinatorics:

http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/7combinatorics.ppt

20. What are the Multiplication, Addition, Pigeon-Hole, and Inclusion-Exclusion principles?

21. Find the number of grains for the Chess problem.

22. How many up to 6-symbols passwords can be made of 26 letters (a-z) and 10 digits (0-9)?

23. How many lines are needed to connect P points?

24. How many options are there for a password made of 5 digits, selected from 6 digits?

25. Prove these properties of combinations and permutations.

a.C(n,k)=C(n,n-k) b.P(n,k)=C(n, k)P(k, k) c.C(n,k)+C(n,k+1)=C(n+1,k+1) d.P(n,n)=P(n,n-1)=n!

26. Calculate a. $\sum\_{k=0}^{n}C(n,k)$ b.$ \sum\_{k=0}^{n}(-1)^{k}C(n,k)$

Probability:

http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/8probability.ppt

http://statistics4students.weebly.com/

http://statistics18.weebly.com/

27. How would you cheat in a multiple choice exam if you do not know the answers using your knowledge in discrete math?

28. Jane takes two buses to work. On a particular day, the probability of her catching the first bus is 0.7 and the probability of catching the second bus is 0.5. The probability of her catching neither is 0.1.

What are the probabilities of catching any of the buses and both buses? Find the conditional probabilities. Do the conditional probabilities agree with the Bayes Theorem, why?

29. How are the Multiplication, Addition, Pigeon-Hole, and Inclusion-Exclusion principles used in probability?

30. What are independent random variables and how the compound probability is given in this case?

31. What are dependent random variables and how the compound probability is given in this case?

32. Explain conditional probability and Bayes Theorem.

33. Calculate random between 1 and 5 using Excel 5 times. Draw the histogram.

34. Sum the calculated random between 1 and 5 using Excel 5 times. Draw the histogram of the sums.

35. Make histogram of first 9 digits of π.

36. Give the histogram of Behford of the first digit of 9 the most populated countries.

http://www.worldometers.info/world-population/population-by-country/

Creative questions:

Movies:

37. Analyze this movie.

https://en.wikipedia.org/wiki/Hidden\_Figures

Deadline: 8 April 2017 Saturday.