Task 1 in discrete math:

Study materials:

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/i1dm2023.docx

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/2dm2023.docx

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/3dm2023.docx

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/4dm2023.docx

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/1sets.ppt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/2propositions.ppt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/3proofs.ppt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/4sequences.ppt

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

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

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

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

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

Instructions:

Write all your answers in this Word Document and email the Word Document with your answers to me.

Try to write only text. Try to avoid pictures, videos and other things, which make files big.

Write your name(s)

Write your student number(s)

s is your student number.

k = s mod 10000 = m10000

T = s mod 100 = m100

m = s mod 35 = m35

a = s mod 25 = m25

L = s mod 10 = m10

m9 = s mod 9

e = s mod 8 = m8

m7 = s mod 7

m6 = s mod 6

m5 = s mod 5

m4 = s mod 4.

m3 = s mod 3

m2 = s mod 2

1. What do you want from this course of discrete math?

2. Describe your project.

3. How many subsets are there in a set of T elements?

4. Give truth table for

m4 = 0: NOT

m4 = 1: AND

m4 = 2: OR

m4 = 3: implication

5. Order the logical operations OR, AND, NOT.

6. Explain NOT, AND, OR gates, using transistors.

**7. Give a direct proof of the theorem:**

**“IF n is an odd integer, THEN n2 is odd”**

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/3proofs.ppt

**8. Give a direct proof of the theorem:**

**“IF m is an odd integer and n is even integer, THEN m + n is odd”**

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/3proofs.ppt

**9. Give a direct proof that:**

**“IF m and n are both perfect squares, THEN nm is also a perfect square”**

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/3proofs.ppt

**10. Prove that:**

**“IF n is an integer and 3n + 2 is odd, THEN n is odd”**

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**11. Prove that:**

**“IF n = ab, where a and b are positive integers,**

**THEN a ≤ √n or b ≤ √n ”**

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/3proofs.ppt

**12. Prove that:**

**“IF 3n + 2 is odd, then n is odd”**

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/3proofs.ppt

**13. Prove that:**

**“IF n2 is even, then n is even”**

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/3proofs.ppt

14. Prove that

**1 + 2 + … + n = n(n+1)/2**

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15. Prove that

**1 + 3 + 5 + … + (2n -1) = n2**

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16. Prove that

**1 + 4 + 7 + … + (3n -2) = n2**

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17. Prove that

**1 + 2 + 22 + … + 2n = 2n+1 -1**

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18. Prove that

**1 + 22 + … +n2 = n(n+1)(2n+1)/6**

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19. Prove that

**n < 2n**

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20. Prove by induction.

.

21. Find

22. Prove the Triangular Number expression .

23. Prove the expression for

https://calculus12s.weebly.com/uploads/2/5/3/9/25393482/p2integration2vs2summation.docx

24. Is this function (0, 0), (1, 1), (4, 2), (9, 3), (4, -2)? Why?

25. Compare truth tables of implication, conversion, inversion, contraposition.

26. Calculate number of permutations L out of T: P(T,L).

27. In how many ways you can write the digits of your k?

28. 10 fair coins were tossed. How many options? (use multiplication rule)

How many options contain 5 heads?

How many options contain at least 5 heads?

29. Find Highest Common Divisor and Lowest Common Multiple of e+4 and L+4.

30. Convert T to e+2 and L+2 counting systems.

31. Calculate the largest prime number you can using your own computer code.

n = 13

For i = 2 To Int(Sqr(n))

If n Mod i = 0 Then GoTo 1

Next i

MsgBox "prime"

GoTo 2

1 MsgBox "not prime"

2 Label2 = 2

32. Give prime factorization of s.

33. Draw the histogram of tossing L+2 fair coins. Draw the histogram of the first e+3 digits of π.

34. Draw the histogram of adding random between e+2 times.

35. Give the histogram of Benford of the first digit of e+2 the most populated countries.

worldometers.info/world-population/population-by-country/

36. Use the rule:

to publicly pass secret information.

Use p and q as your private keys, these are secret numbers for you and your partner.

b, n, r, m are public numbers, everybody can know these numbers.

planetcalc.com/8326/

37. Find the equation for the sequence: 1, 4, 9, 16, 25, 36, 49, …

38. Hack password.

https://calculus1only.weebly.com/uploads/5/9/8/5/59854633/password-hacking-game-rules.docx

https://calculus12s.weebly.com/uploads/2/5/3/9/25393482/code4password\_cracki4game.txt

https://calculus1only.weebly.com/uploads/5/9/8/5/59854633/guessinput.txt

39. Use conjunctive normal form and disjunctive normal form to express f(x,y,z) through x,y,z.

|  |  |  |  |
| --- | --- | --- | --- |
| X | y | Z | f(x,y,z) |
| 0 | 0 | 0 | 1 |
| 0 | 0 | 1 | 0 |
| 0 | 1 | 0 | 0 |
| 0 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 |
| 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 0 |

40. Find the function for your truth table for your *e*.

e = 0: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/e0\_truth\_table.docx

e = 1: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/e1\_truth\_table.docx

e = 2: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/e2\_truth\_table.docx

e = 3: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/e3\_truth\_table.docx

e = 4: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/e4\_truth\_table.docx

e = 5: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/e5\_truth\_table.docx

e = 6: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/e6\_truth\_table.docx

e = 7: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/e7\_truth\_table.docx

41. Solve the Graceful Graph Problem for *(e+3)* vertices.

http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/code5better.txt

http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/code6.txt

http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/7code7.txt

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http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/10code10.txt

http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/11code11.txt

http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/12code12.txt

http://azspcs.com/Contest/GracefulGraphs