September task in discrete math:

s is your student number. k = s mod 10000. T = s mod 100. m = s mod 35.

a = s mod 25.

L = s mod 10. 𝑑2=(𝑇−𝐿)/10. e = s mod 8. m7 = s mod 7. m6 = s mod 6. m4 = s mod 4. m3 = s mod 3.

Introduction:

1. What do you want from this course?

2. What is discrete math?

en.wikipedia.org/wiki/Discrete\_mathematics

3. Why do you need discrete math?

Practical:

4. How can we reduce the pollution and its impact on people and nature?

General:

5. Analyse discrete math news.

6. Study actions of operator or drone.

7. How can we help Indonesia using discrete math?

8. Study this:

discrete4math.weebly.com

discrete7math.weebly.com

9. Study Zimmermann contests.

azspcs.com

10. Solve number puzzle for 3 + m8 digits.

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/codesums0-9.txt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/code1-9sums.txt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/1-8code1-8sums.txt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/0-6codesums.txt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/1dx4de5dnumberpuzzle.txt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/2dx3de5dnumberpuzzle.txt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/code1-9numberpuzzles.txt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/code0-8numberpuzzles.txt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/code1-8numberpuzzles.txt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/code0-6numberpuzzles.txt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/code1-6numberpuzzles.txt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/code1-5numberpuzzles.txt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/code1-4numberpuzzles.txt

11. Hack password.

https://calculus1only.weebly.com/

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

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

12. Use Chat GPT and/or other such methods.

13. Analyse wars in Ukraine, Africa, Yemen, etc.

14. Predict results of Indonesian elections of 2024.

15. Try to apply for all grants, scholarships, fellowships, etc. in embassies of USA, Canada, Europe, Australia, Japan, etc.

Sets:

16. How many subsets are there in a set of m elements?

17. Find all number of subsets for the set with cardinality = m.

Logic:

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

19. Give arithmetic equivalence of logical operations OR, AND, NOT.

20. Explain syllogism.

21. Use existential quantifier and universal quantifier for negation.

Relations:

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

23. Binary relation R on the set {1 to e+2} 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?

24. Binary relation R on the set {1 to e+2} 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?

Sequences:

25. Find

26. Prove .

27. Prove the Triangular Number expression .

28. Prove the expression for

Number theory:

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.

32. Give prime factorization of s.

Combinatorics:

33. Calculate C(9,e) and P(7,e). Give all the options for C(e+3,e).

34. In how many ways can you answer an exam with m+1 questions

 each of which has e+1 options for the answer?

Probability:

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

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

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

**Graph Theory and Trees Theory:**

38. How many edges are there in KT, K(a+1),(m+1)?

39. Find adjacency and incidence matrixes for the graphs:

m6 = 0: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/student16number16graph16.docx

m6 = 1: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/trees16graphs2solve16.docx

m6 = 2: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/student4number4graph.docx

m6 = 3: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/student3number3graph.docx

m6 = 4: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/trees24graphs2solve.docx

m6 = 5: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/trees4graphs2solve.docx

40. Find the number of faces for your graph.

41. Do graceful labeling of your graph.

http://azspcs.com/Contest/GracefulGraphs

42. Give Euler’s, Hamiltonian’s cycles, and paths in the graphs:

m4 = 0: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/student16number16graph16.docx

m4 = 1: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/trees16graphs2solve16.docx

m4 = 2: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/euler6cycle.ppt

m4 = 3: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/question2euler.ppt

43. Apply Dijkstra’s, Prim's and Kruskal’s algorithms to the graphs. Traverse the trees.

m6 = 0: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/student16number16graph16.docx

m6 = 1: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/trees16graphs2solve16.docx

m6 = 2: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/student4number4graph.docx

m6 = 3: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/student3number3graph.docx

m6 = 4: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/trees24graphs2solve.docx

m6 = 5: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/trees4graphs2solve.docx

44. Is the graph planar? Why?

m7 = 0: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/graph22jun16.docx

m7 = 1: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/graph7am22jun16.docx

m7 = 2: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/graph8am22jun16.docx

m7 = 3: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/graph1pm22june16.docx

m7 = 4: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/student16number16graph16.docx

m7 = 5: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/trees16graphs2solve16.docx

m7 = 6: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/planar4graphs.ppt

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

http://azspcs.com/Contest/GracefulGraphs

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

http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/8code.txt

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

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

46. What is the number of faces for your graceful graph?

47. Is your graceful graph planar? Why?

https://en.wikipedia.org/wiki/Kuratowski%27s\_theorem

48. Find the graceful labeling of

ii = FreeFile

Open "D:\bipartate33k.txt" For Output As #ii

Dim e(9)

e(1) = 9

Max = 8

For v1 = 1 To Max - 3

For v2 = v1 + 1 To Max - 2

For v3 = v2 + 1 To Max - 1

For v4 = v3 + 1 To Max

e(2) = v4

e(3) = v3

e(4) = Abs(9 - v1)

e(5) = Abs(v4 - v1)

e(6) = Abs(v3 - v1)

e(7) = Abs(9 - v2)

e(8) = Abs(v4 - v2)

e(9) = Abs(v3 - v2)

If e(1) <> e(2) And e(1) <> e(3) And e(1) <> e(4) And e(1) <> e(5) Then GoTo 11

GoTo 10

11 If e(1) <> e(6) And e(1) <> e(7) And e(1) <> e(8) And e(1) <> e(9) Then GoTo 111

GoTo 10

111 If e(2) <> e(3) And e(2) <> e(4) And e(2) <> e(5) And e(2) <> e(6) And e(2) <> e(7) And e(2) <> e(8) Then GoTo 22

GoTo 10

22 If e(2) <> e(9) Then GoTo 222

GoTo 10

222 If e(3) <> e(4) And e(3) <> e(5) And e(3) <> e(6) And e(3) <> e(7) And e(3) <> e(8) And e(3) <> e(9) Then GoTo 33

GoTo 10

33 If e(4) <> e(5) And e(4) <> e(6) And e(4) <> e(7) And e(4) <> e(8) And e(4) <> e(9) Then GoTo 44

GoTo 10

44 If e(5) <> e(6) And e(5) <> e(7) And e(5) <> e(8) And e(5) <> e(9) Then GoTo 55

GoTo 10

55 If e(6) <> e(7) And e(6) <> e(8) And e(6) <> e(9) Then GoTo 66

GoTo 10

66 If e(7) <> e(8) And e(7) <> e(9) Then GoTo 77

GoTo 10

77 If e(8) <> e(9) Then GoTo 1

10 Next v4

Next v3

Next v2

Next v1

GoTo 2

1 Print #ii, v1, v2, v3, v4

2 End Sub

49. Color your graphs using as few colors as possible. Find the chromatic numbers of the graphs.

50. Color the map of the country number T using as few colors as possible.

http://www.worldometers.info/geography/alphabetical-list-of-countries/

51. Solve the trade graph.

Graph Indonesian international trade.

Weights are the percentages.

Optimize the trade.

USA 13

China 12

Japan 11

European Union 10

Singapore 9

India 8

Korea 7

Middle East 6

Malaysia 5

Thailand 4

Philippines 3

Australia 2

Russia 1

https://atlas.media.mit.edu/en/profile/country/idn/

Bad relations are between:

USA and China,

USA and Russia,

USA and Middle East,

Malaysia and Russia,

Australia and Russia.

Take e + 6 countries.

52. Do graceful labeling of your trade graph.

http://azspcs.com/Contest/GracefulGraphs

53. Is your trade graph planar? Why?

54. Find the number of regions in your trade graph.

55. Find the number of regions for the graph with L+20 edges and e+10 vertices.

56. Petersen graph:

m6 = 0: Does Petersen graph satisfy the condition e < 2v – 4?

m6 = 1: Does Petersen graph satisfy the condition e < 3v – 6?

m6 = 2: Is this graph planar?

m6 = 3: Why?

m6 = 4: Which important graph is Petersen graph similar to?

m6 = 5: Do graceful labeling of Petersen graph.

http://azspcs.com/Contest/GracefulGraphs

https://en.wikipedia.org/wiki/Petersen\_graph

https://en.wikipedia.org/wiki/Planar\_graph

https://en.wikipedia.org/wiki/Kuratowski%27s\_theorem

**Boolean algebra:**

57. Simplify the expression for your *e*.

e = 0: A´BC + BC + AB´ + ABC + AC´ + BC´

e = 1: AB´C + B´C + A´B´ + ABC´ + AC´ + BC´

e = 2: B´C + B´C + A´B´C´ + ABC´ + AB´C´ + BC´

e = 3: BC´ + B´C + A´B´C´ + ABC´ + AB´C´ + B´C´

e = 4: A´BC + BC + AB´ + ABC + AC´ + BC´ + A´B´C

e = 5: A´BC + AB´ + ABC + AC´ + BC´ + A´B´C

e = 6: BC + AB´ + ABC + AC´ + BC´ + A´B´C

e = 7: A´BC´ + BC + AB´ + AC´ + BC´ + A´B´C

Use Karnaugh Map.

https://en.wikipedia.org/wiki/Karnaugh\_map

58. 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

Project:

59. Do your project.

Additional questions:

Practical:

60. How dangerous it is to live near high voltage electric wires?

61. How can we avoid ingrowing nails?

62. Analyse jokes.

Philosophical:

63. Can I prove anything?

64. What are the best countries?