Cambridge International University

Sample of Mathematics Entrance Examination 2022

All questions on this paper must be answered.

Working must be shown for all stages of the questions.

Each correct response to the questions receives 2 marks.

1. Evaluate the expressions:

$$15 - \frac{(-11) * 5 + 8 - (-11)}{4} - ((-7) - 10)$$

2. Find the HCF and LCM of each pair:
   a) 72 and 48
   b) 12 and 24
   c) 36 and 24
   d) 150 and 220
3. Evaluate the expressions:

$$\left(2\frac{1}{2} + 3\frac{1}{3}\right) * 6$$

4. Evaluate the expressions:

$$\left(12\frac{2}{9} + 24\frac{2}{3} - 16\frac{2}{15}\right) : \frac{467}{45}$$

5. Evaluate each expressions:
   a)$(-3)^5$
   b) $\left(\frac{1}{2}\right)^3$
   c) $(-0{,}4)^2$
   d) $\left(-\frac{1}{5}\right)^4$

6. Evaluate:
   a) $\frac{X^5 * X^8}{X^3}$
   b) $\frac{Y^7 * Y^9}{Y^5}$

c) $\frac{C^{12} * C^{10}}{C^{21}}$

d) $\frac{D^{18} * D^{12}}{D^{15}}$

7. Evaluate the expressions:

a) $(x^3)^2$

b) $(x^5)^6$

c) $(x^7)^{12}$

d) $(x^{10})^{13}$

8. Rewrite the polynomials:

$5x^2-3x^2-x^2$

9. Simplify:

$$14a * \frac{a+2}{7} - 25a^2 * \frac{4-3a}{5}$$

10. Solve the equation:

$5x + 3(3x+7) = 35$

11. Solve the system:

$$\begin{cases} -5x + 2y = 10 \\ -7x + 2y = 18 \end{cases}$$

12. $$\begin{cases} -4x - y - 4z = -14 \\ x + 5y + 4z = 23 \\ -3x + 4y + 9 \end{cases}$$

13. Solve the equations:

a) $4x^2 + 10x - 6=0$

b) $25x^2+10x+1=0$

c) $3x^2 - 8x +5 =0$

d) $4x^2 - x +67 =0$

14. Find the roots of the equations:

$$18 - (x - 5)(x - 4) = -x^2$$

15. Factorize:

$$3(x+y)(x-y)-(x+y)^2$$

16. Factor by grouping:

$$2kn - 6k + 14n - 12$$

17. Factor grouping the expressions:

$$7c^2 - c - c^3 + 7$$

18. Factorize the algebraic expressions:

$$16ab^2 + 5b^2c + 10c^3 + 32ac^2$$

19. Factorize:

$$A^3 + 8$$

20. Factorize:

$$X^2 + 4x - 5$$

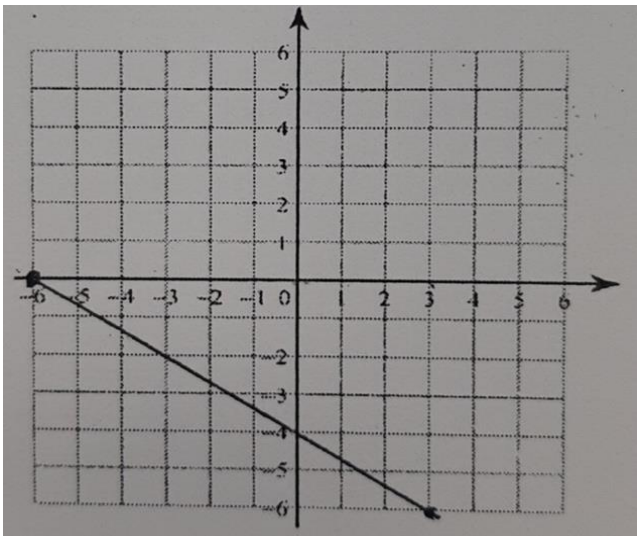
21. Raise to power:

$$(a+b)^2$$

22. Solve the equations:

$$3x + \frac{4}{x} = 7$$

23. Sketch the graph of the line: $Y = -\frac{2}{3}x - 4$



x		
y		

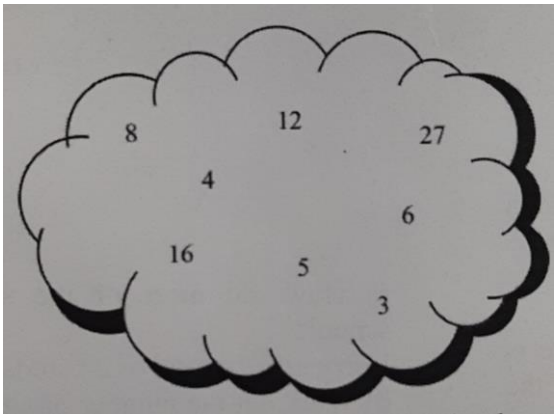
24. Calculate:

$$\sqrt{4 * 9}$$

25. Evaluate:

$$4^{1/3} * 4^{1/6}$$

26. There are some oranges and apples in a box. The total number of oranges and apples in box is 54. The ratio of the number of oranges to the number of apples is 1:5. Work out the number of apples in the box.
27. Grace and Jack share $140 in the ratio 3:4. Work out the amount of money that Jack gets.
28. What is 7% in decimal fraction?
29. What is 20%of 96?
30. Erin has completed 70% of her work. If she has been doing homework for 42 minutes, how many more minutes does she have left to work?
31. Using only the numbers in the cloud, write down;



a) all the multiples of 6

b) all the square numbers

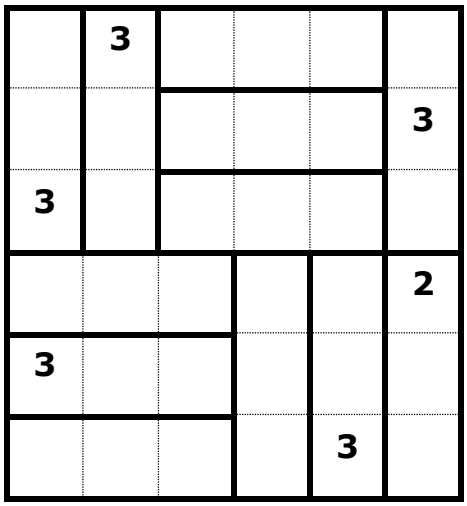
c) all the factors of 12

d) all the cube numbers

32. In a sale, normal prices are reduced by 20%. Andrew bought a saddle for his horse in the sale. The sale price of the saddle was $220. Calculate the normal price of the saddle.

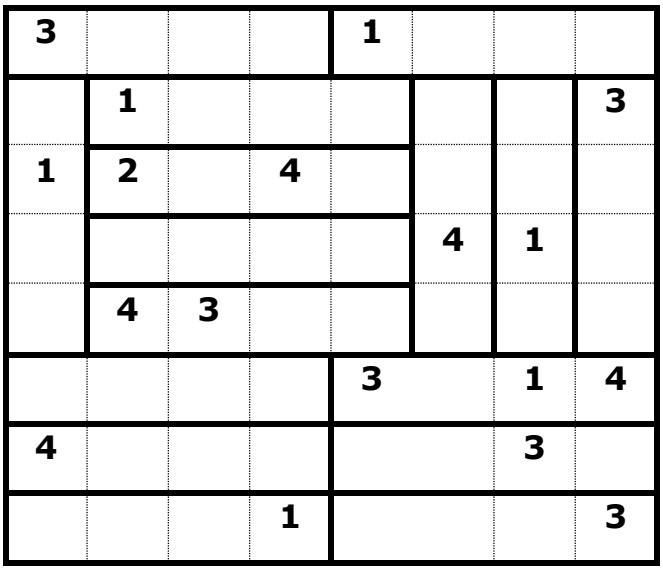
33. Tatami

Each small parallelogram contains the digits 1, 2 and 3. Each digit appears twice in each row and in each column of the big square. The same digit cannot appear horizontally or vertically next to itself, but it can appear diagonally next to itself. Fill in the figure.



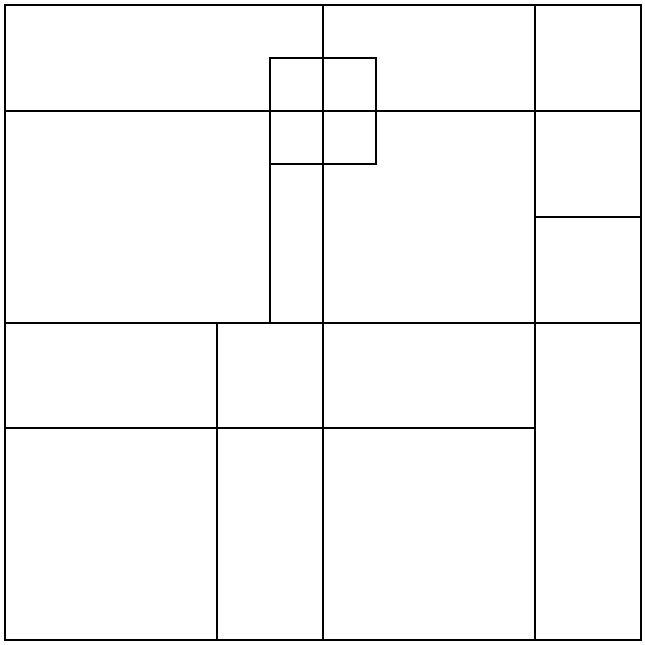
34. Tatami 8x8

Each small parallelogram contains the digits 1, 2, 3 and 4. Each digit appears twice in each row and in each column of the big square. The same digit cannot appear horizontally or vertically next to itself, but it can appear diagonally next to itself. Fill in the figure.



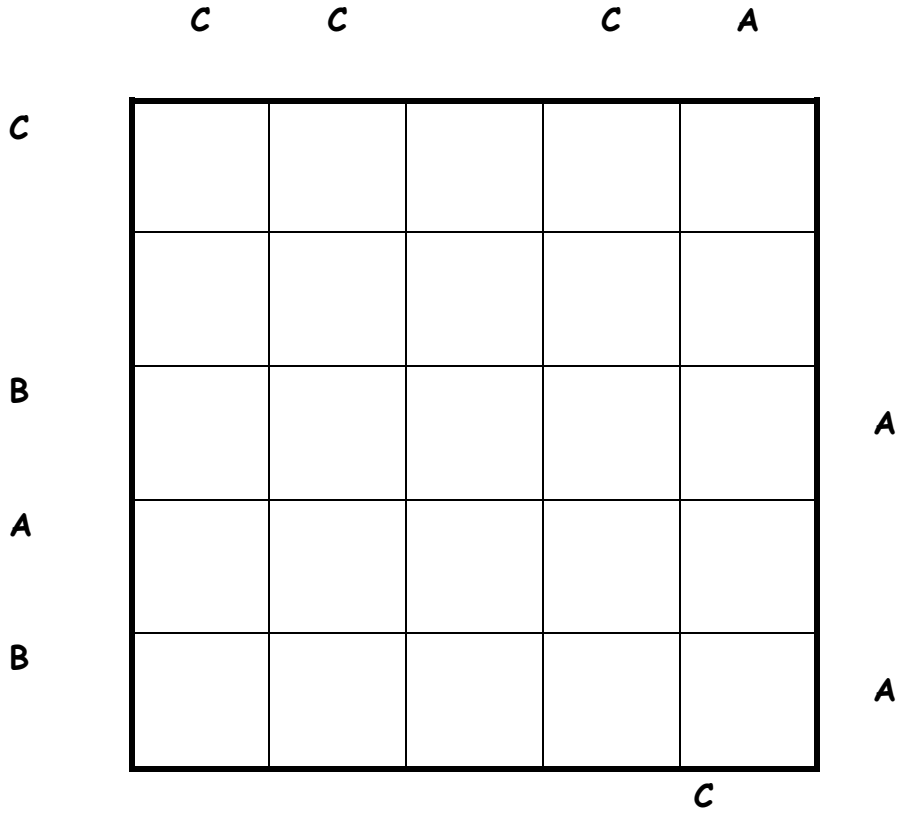
35. Shape count

How many squares (of any size) are in this figure?



36. ABC

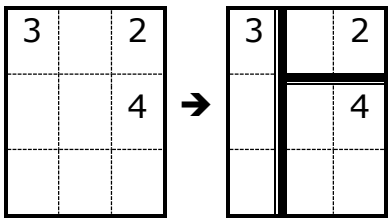
Fill in the table below so that each row and column contains the letters A, B and C and two black squares. The letter that appears at the side of a row or a column indicates that that letter is the first to appear in that row or column.



37. Shikaku

Divide the grid below into rectangles so that a) each rectangle contains one of the given numbers and b) each rectangle contains as many cells as the number it encloses.

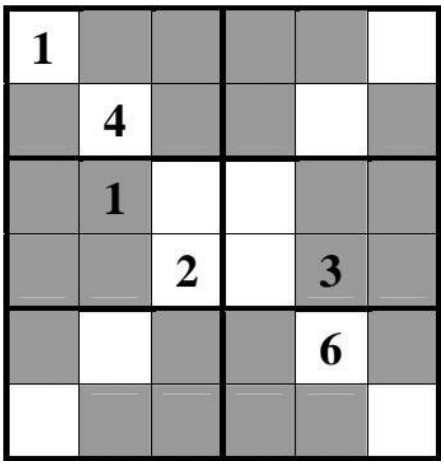
Remember: a square is also a rectangle



3				6		
		3				3
	4			4		
			5		2	
		6				6
4						
						3

38. Sudoku X

Place the numbers 1-6 once in every row, column, diagonal AND 3x2 block. [The diagonals form an X and are highlighted. The 3x2 blocks are clearly marked]



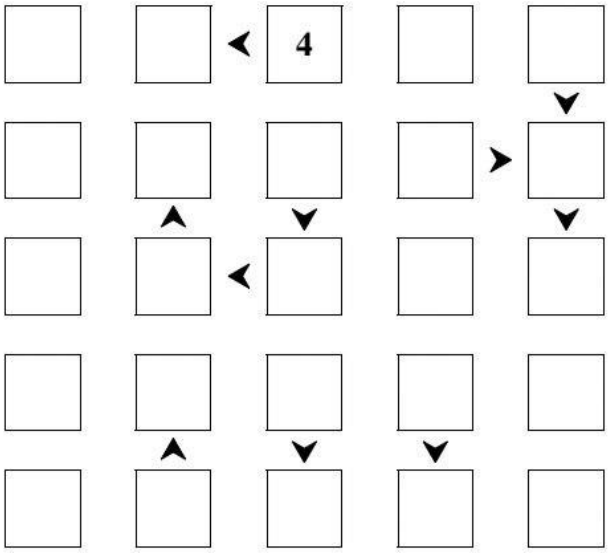
39. Hitori

Black out numbers in the grid below so that:
a) There is one, and only one occurrence of a number in each row and each column;
b) All the numbers that remain should be connected and accessible through up and down, but not diagonal, moves;
c) Black squares cannot touch vertically or horizontally

5	4	3	7	6	1	8	8
1	6	5	4	8	7	4	2
2	2	2	1	6	3	6	7
6	1	8	5	2	7	1	1
5	7	3	4	3	8	5	6
8	3	6	2	5	2	7	4
3	8	1	6	3	4	6	5
4	5	4	8	1	7	2	3

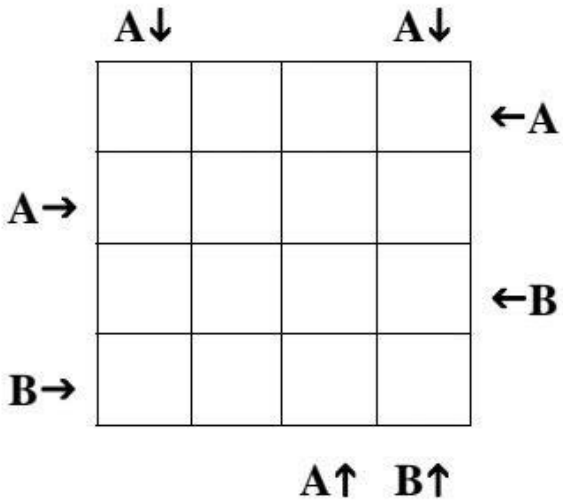
40. Hutosiki

Place the numbers 1 – 5 so that a) no number is repeated in any row or column and b) numbers in cells linked by“less than” or“greater than” must obey these signs



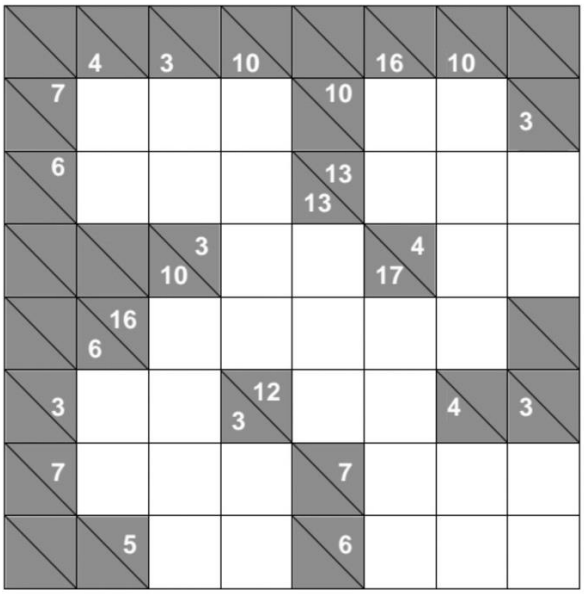
41. ABC

Each column and each row contains the letters A, B and C and one empty square. The letter outside the grid shows the first letter in the column or row in the direction indicated by the arrow. Fill in the grid.



42. Kakuro

Fill in the blank squares using the digits 1-9, without repeating any digit in any line of blank squares. Each line of blank squares should add up to the white total in the shaded area at the top or left of the line. [The white numbers at the bottom of a shaded box give a downward total; the white numbers at the top of a shaded box give a horizontal total]



43. One of the numbers below is the sum of two others. Find these three numbers.

44. During the summer, Mikhail earned money by working for four neighbours, doing a different job for each one. Find who lives in each house and what job Mikhail did for each one of them:

- Zach hired Mikhail to feed the sheep;
- Either Anna or Farukh lives at No 41;
- Sultana lives two houses east of the person who employed Mikhail as a babysitter;
- The person who employed Mikhail to do the gardening does not live in No 43;

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🏭 The person who lives in No 39 and the person who asked Mikhail to cut the hedges are a man and a woman.

	#37	#39	#41	#43
Person				
Job				

45. The teachers in a school are angry. Each teacher is angry with a different teacher for a different reason. Find each teacher's subject, the teacher they are angry with and the reason why.

- 🎭 The law teacher is angry with a male colleague;
- 🎭 One teacher is angry because another teacher told a joke about them;
- 🎭 Mr Green, who teaches business, is angry because another teacher said he was fat;
- 🎭 The mathematics teacher is angry with Mrs White;
- 🎭 A woman is angry with another teacher who said she was short;
- 🎭 Mr Green is angry at Mrs Orange, who teaches computing;
- 🎭 The teacher who is angry because another teacher took his or her pen does not teach law or mathematics;

- 🎭 Mr Brown does not teach law;
- 🎭 No pair of teachers is angry with each other.

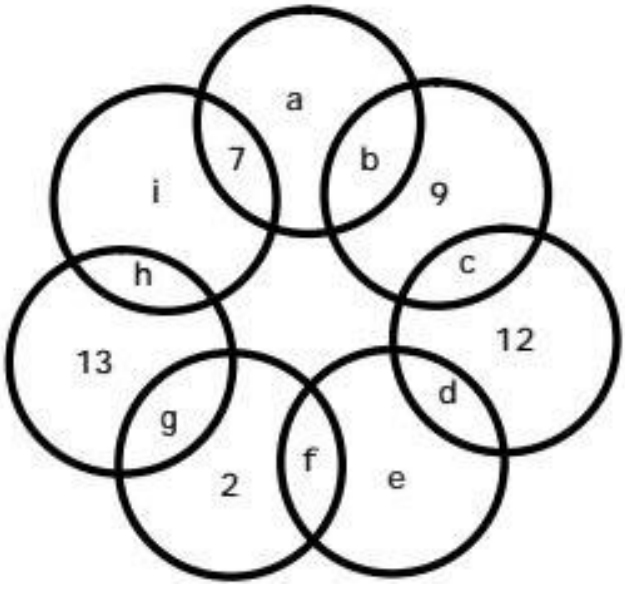
Work area:

Teacher	Subject	Angry with	Reason

46. Place the letters of the word UZBEK so that no row, column or diagonal line of ANY size contains the same letter more than once:

		U		
Z				
				E
B		K		

47. Replace the letters in the figure so that all the numbers from 1 to 14 appear and the total in each circle is 21

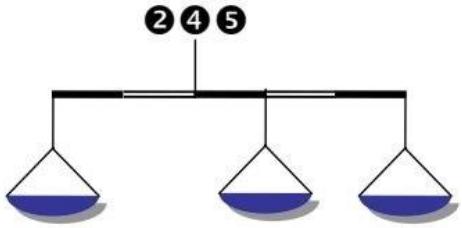


1 ~~2~~ 3 4 5 6 ~~7~~ 8 ~~9~~ 10 11 ~~12~~ ~~13~~ 14

a= ,b= ,c= ,d= ,e= ,f= ,g= ,h= and i=

48. Place the given weights in the pans – one weight per pan - so that the scales balance.

Note: The weight of the rods and pans can be ignored; the stripes on each rod are exactly the same length.



49. Place the given weights in the pans – one weight per pan - so that the scales balance.

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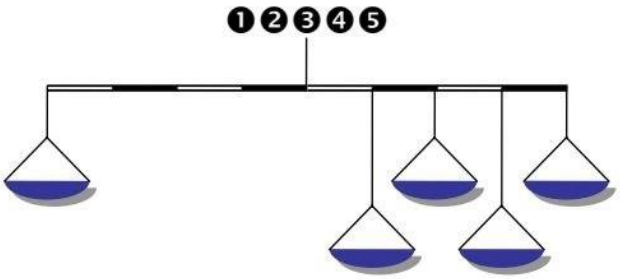
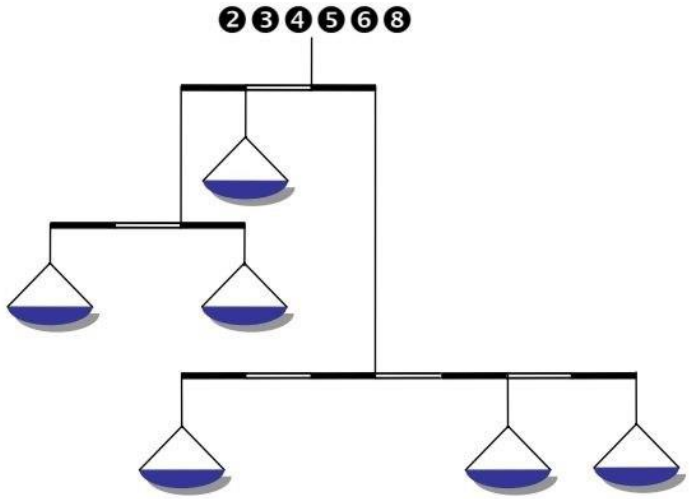
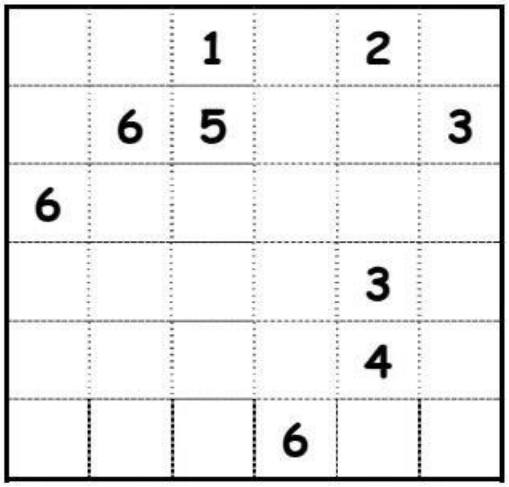
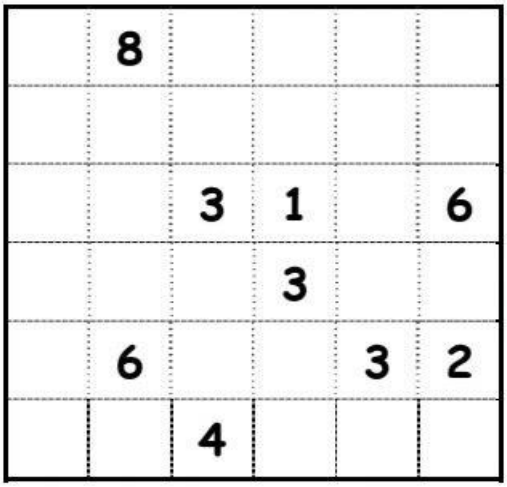
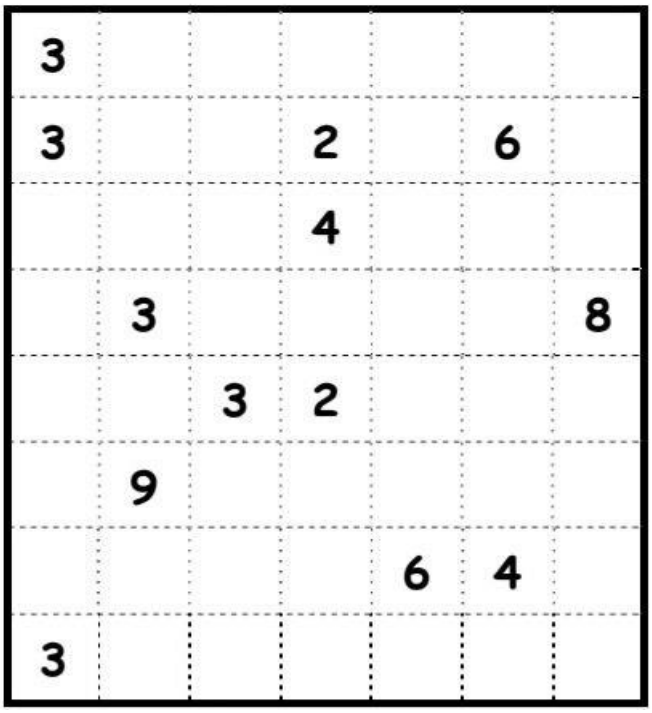




50. Divide the grid below into rectangles so that a) Each rectangle contains one of the given numbers and b) each rectangle contains as many cells as the number it encloses. Remember: a square is also a rectangle.







The end of questions!