

Senior 2021

[Question 1]

13 June 2021 is the competition date of the first round of 2021 Asia Mathematical Olympiad. Fill in one digit number in the blanks so that the correct multiplication sum shown below is achieved.[8 marks]

$$\begin{array}{r}
 \boxed{\text{(A)}} \\
 \times \boxed{\text{(B)}} \boxed{\text{(C)}} \boxed{\text{(D)}} \\
 \hline
 \boxed{\text{(E)}} \boxed{\text{(F)}} \boxed{\text{(G)}} \\
 \boxed{\text{(H)}} 0 \boxed{\text{(I)}} \\
 \boxed{\text{(J)}} \boxed{\text{(K)}} 2 \\
 \hline
 \boxed{\text{(L)}} \boxed{\text{(M)}} 613
 \end{array}$$

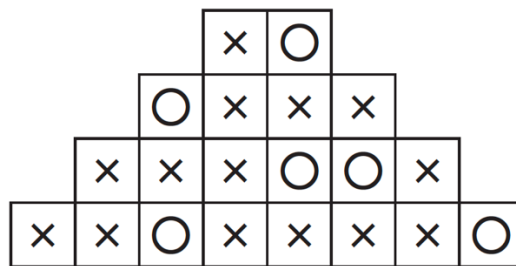
Please type in your answer in the blank below start from A) X, B) X, C) X.... where "X" denotes a single digit

[Question 2]

The boxes containing O or Í are stacked in following conditions
 “When putting a new box on top, if there is O directly below or next to underneath box either on the left or the right, the new box to the stack must be Í. If neither of three boxes below are O, the new box to the stack must be O.”

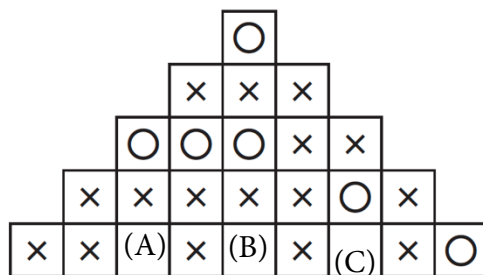
According to above conditions, fill in all blanks in (1) and (2) with O or Í .

Please key in your answers below start with i.e A) X B) X C) O ... [9 marks]

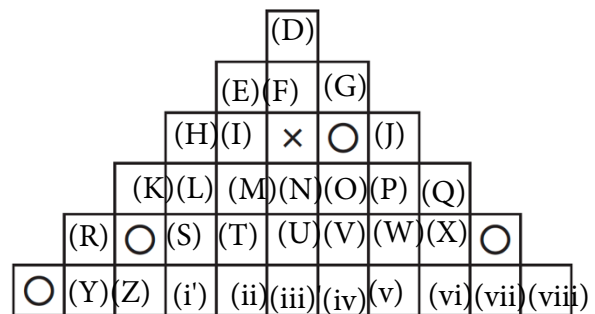


Example : the correct stack

(1)

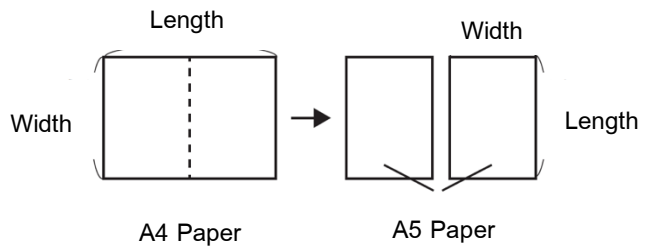


(2)

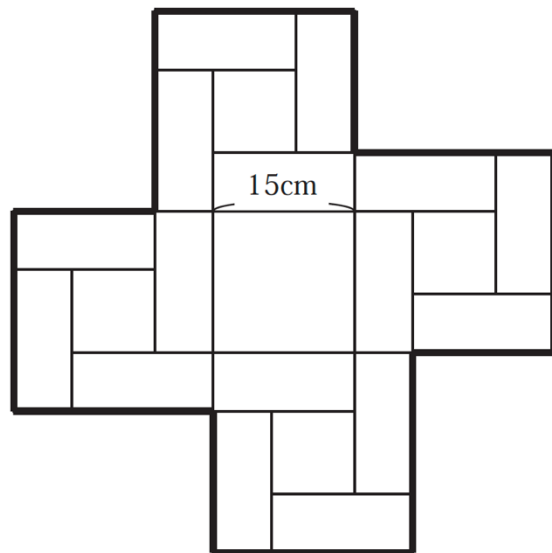
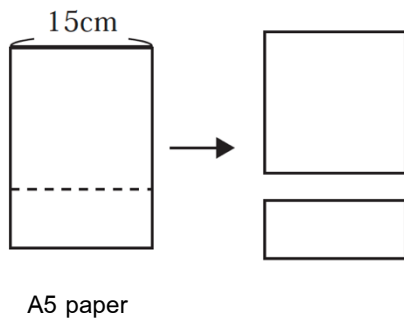


[Question 3]

When dividing standard paper sizes A4 or B5 in two equal halves as shown in the right figure, the ratio of length and width of paper is as same as the ratio of the paper before dividing.



Each A5 paper whose width is 15 cm, is cut to make one large square and remaining part is a rectangle. Then, arrange the remaining rectangle papers together to make a shape as shown in below right figure. What is the area of the shape that covered by the thick line perimeter in cm. [10 marks]



[Question 4]

The calculation result of the term $6 \times 12 + 93$ is 165.

When you read the expression in reverse order, the calculation of $39 + 21 \times 6$ is 165 as well.

The term that has its reversed calculation is the same as the result unreversed is called "Reversible term"

Answer the following questions below

Question 1 Fill in each blank below with the number from 1 to 5 to make "Reversible term". The number in each blank must be different.

$$2 \boxed{A} \times 4 + \boxed{B} \boxed{C}$$

Question 2 Fill in each blank $\square$ below with the number from 1 to 9 to make "Reversible term". The number in each blank must be different.

$$4 \ 8 \ 1 \times \boxed{D} \boxed{E} + \boxed{F} \ 0 \ \boxed{G} + \boxed{H} \boxed{I}$$

Type in your answers for A to I below [dmp`mrf Oscqrgml / \\$ 0Y11 marks](#)]

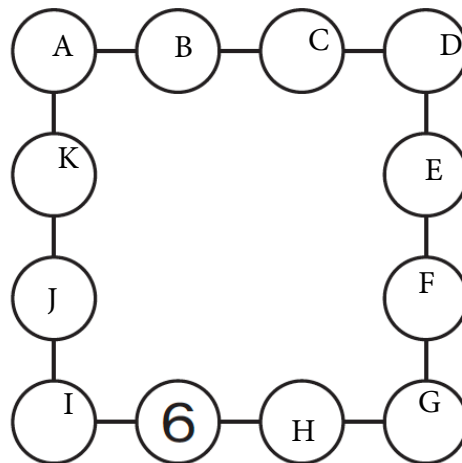
[Question 5]

12 circles are connected with lines as below. For every 3 consecutive circles which are arranged in straight line, the number in the middle circle is the average of the numbers in both adjacent circles.

As shown in below figure, 6 is already placed in one circle and the numbers filled in other circles are distinct positive integers.

Determine the minimum summation of all 12 numbers in circles and fill in the circles with the numbers to meet the minimum summation.

Label your answer for part 1 as i) and part ii) A=, B= ...[12 marks]



[Question 6]

Find the positive integer A and B satisfying these two equations below.

$$A \times B = 440134$$

$$A + 105 = B$$

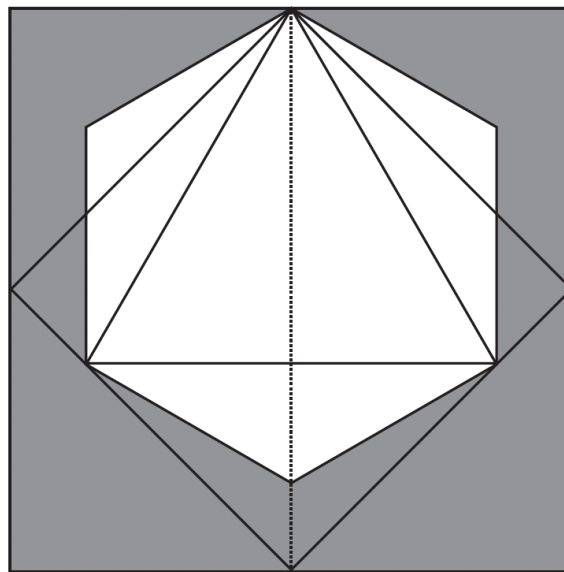
Please type your answer for A) and B) in the space below [8 marks]

[Question 7]

One equilateral triangle, two squares and one regular hexagon are placed together as shown in the figure. When folding along the dotted line, both halves would match exactly.

If the side length of equilateral triangle is 36, determine the shaded area in cm^2

Please type your answer in the blank below. [9 marks]



[Question 8]

There are 6 ways to arrange numbers 1, 2, 3 in row as below

(1, 2, 3)	(1, 3, 2)	(2, 1, 3)
(2, 3, 1)	(3, 1, 2)	(3, 2, 1)

Consider two numbers in each arrangement, if the left number is more than the right number, we call these two numbers “descending pair”.

For example, from the arrangement (2, 3, 1)

2 is located on the left side of 1

3 is located on the left side of 1

2 is located on the left side of 3

Therefore, for this arrangement, there are 2 “descending pairs”.

From all 6 arrangements of 1,2,3 the number of “descending pairs” is $0 + 1 + 1 + 2 + 2 + 3 = 9$ pairs.

How many “descending pairs” are there from all arrangements of 1, 2, 3, 4, 5, 6?

Please type your answer in the blanks below [10 marks]

[Question 9]

Write the whole numbers 20000, 19999, 19998, 19997, 19996, , 4, 3, 2 ,1 to form the new number “A” as below.

20000199991999819997.....987654321

In this number, there are many locations that 9 and 8 are adjacent, i.e. “98”. For example, at 14th and 15th digits from the left, “98” is formed in 19998, and at 9th and 8th digits from the right, “98” is formed in 98.

How many “2021” found in A ?

Please type your answer in the blank space provided. [11 marks]

[Question 10]

Triangle ABC and triangle ADE are isosceles right triangles where $\angle A = 90^\circ$. Let M be the midpoint of BC and suppose $AB = AC = DF = FM = EG = GM$ and $\angle FDE = \angle GED = 9^\circ$.

What is the measure of angle $\angle FMG$ in degree.

(the figure below is not -to- scale)

Please type in your answer in the blank space provided.[12 marks]

