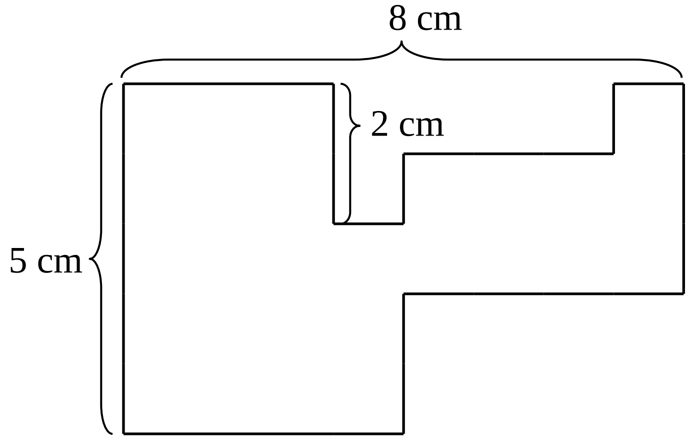
SHORT ANSWER PROBLEMS

1. What is the perimeter, in cm, of the figure below, given that all the angles are right angles?



2. A merchant sold 80% of all his flower vases at a profit of 30%. Then, upon checking, he saw that 17 of his vases were broken and could not be sold. He sold all the remaining vases at a loss of 10%. In the end, the merchant made a total profit of 5%. What was the number of vases that he had at the beginning?

3. In a competition, there were five competitors: Ali, Benny, Chin, Din and Eddy. Before the competition began, four spectators had made the following predictions:

Spectator 1: "Benny will get the 4^{th} place and Eddy will get the 2^{nd} place."
Spectator 2: "Din will get the 1^{st} place and Chin will get the 3^{rd} place."
Spectator 3: "Eddy will get the 3^{rd} place and Ali will get the 4^{th} place."
Spectator 4: "Ali will get the 3^{rd} place and Benny will get the 1^{st} place."

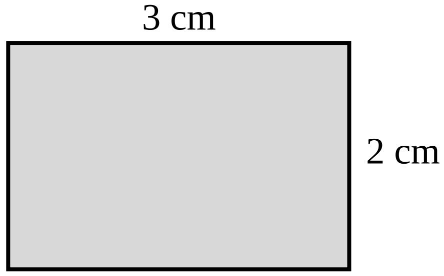
It turned out that each spectator had one prediction correct and one prediction incorrect. Who got the 3^{rd} place in the competition?

4. The word *IMSOHANOI* is repeated 2019 times:

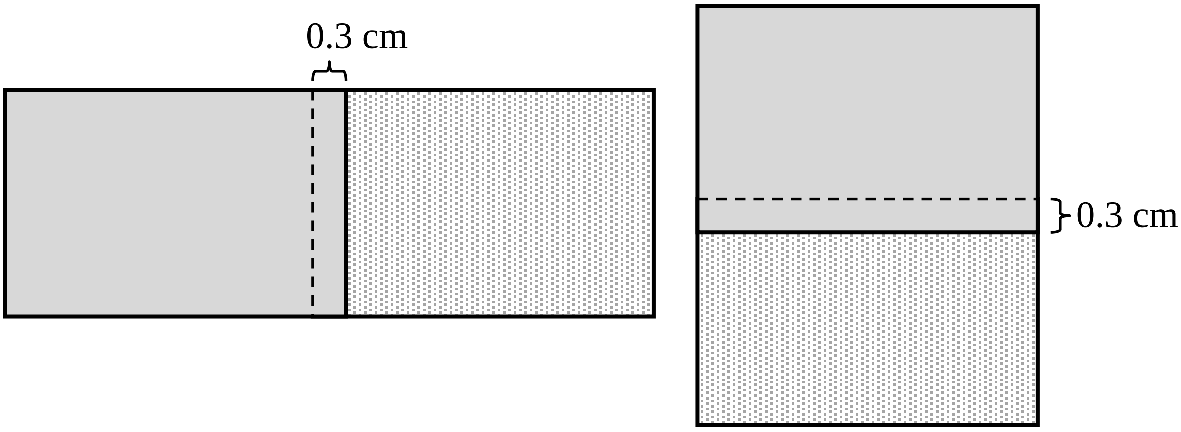
IMSOHANOIIMSOHANOIIMSOHANOI…

Then, the letters are coloured, starting from the left, each letter in one colour, in a repeating pattern: red, blue, yellow, green, red, blue, yellow, green, ...
What is the colour of the 2019^{th} *"I"* (counting from the left)?

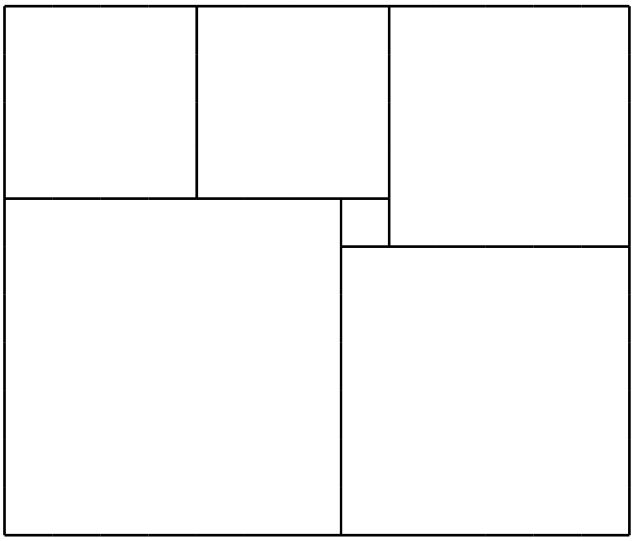
5. Ms. Liên combines ten rectangular cards of size $2\,\text{cm} \times 3\,\text{cm}$ to make a larger rectangle.



If the width of the overlapping part between any two adjacent cards is 0.3 cm (see the figure below), what is the area, in cm^2, of the largest rectangle that she can make?



6. A rectangle is divided into some small squares, as shown in the figure below. Given that the side length of the smallest square is 1 cm, what is the perimeter, in cm, of the rectangle?

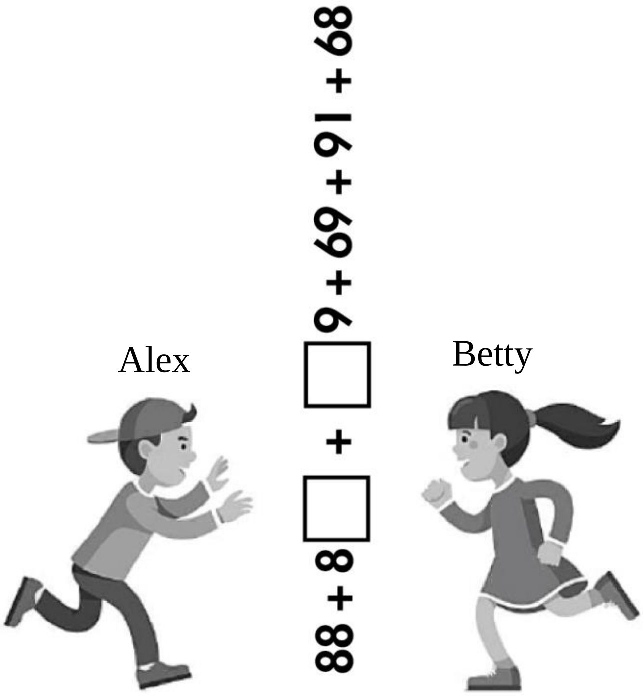


7. In one afternoon, a ferry travelled from Island A to Island B and another ferry travelled from Island B to Island A at a different speed. They started at the same time and met for the first time at 3:50 pm. The two ferries continued to their destinations, stopped for 15 minutes before returning. They met again at 4:41 pm. If the two ferries travelled at uniform speeds throughout the whole journey, then at what time did they start their journey?

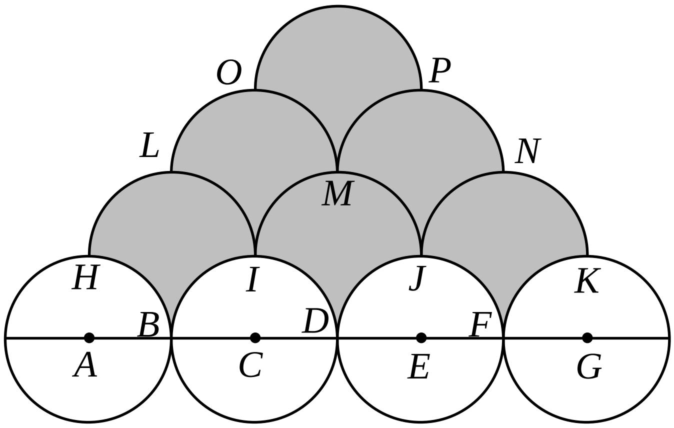
8. There are 120 scouts standing in a circle, equally spaced, around a campfire. They start calling out 1, 2, 3, ... in the clockwise direction, and Keith calls out 55. If the calling starts with the same person but continues in the anticlockwise direction instead, what number will the scout opposite to Keith call out?

9. Mrs. Santos went to the market to buy apples. She bought 100 apples and put them in 6 bags. The number of apples in each bag contained at least a digit 6. What are the numbers of apples in each bag?

10. Alex and Betty are facing each other. Between them, written on the ground, is a sequence of digits and plus signs, as shown in the figure below. From their points of view, Alex and Betty see two different expressions. Two digits can be filled in the two squares so that their expressions have the same value. What is that value?

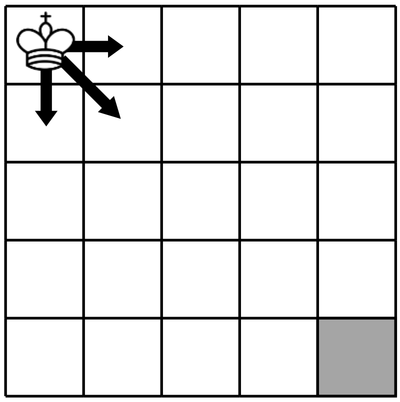


11. Ten circular cards of radius 2 cm each are arranged as shown in the figure.

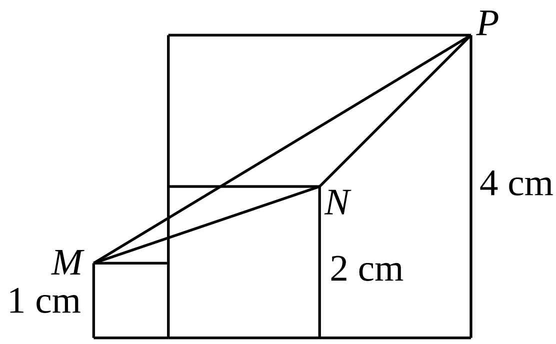


Given that the four collinear points A, C, E, G are the centres of the white cards, and $AHIC$, $CIJE$, $EJKG$, $COPE$ are rectangles and $BLMD$, $DMNF$ are squares, what is the area, in cm^2, of the shaded region?

12. In each step, the chess piece in the board shown in the figure can move 1 square in one of the three directions: right, down, or right-down. In how many ways can it move from the top-left corner to the bottom-right corner in exactly 6 steps?

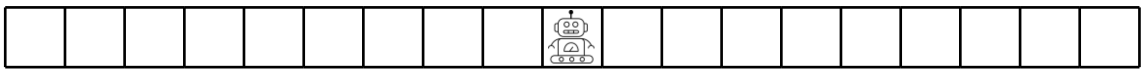


13. In the figure below, there are 3 squares whose side lengths are 1 cm, 2 cm and 4 cm, respectively. What is the area, in cm^2, of the triangle *MNP* ?



14. The entrance tickets of a music show were numbered consecutively, starting from 1. It is known that one ticket number was sold twice by mistake and all the other ticket numbers were sold exactly once. The sum of all the ticket numbers sold is 1316. What is the ticket number that was sold twice?

15. An IMSO robot stands on the middle cell of a 1×19 board, as shown in the figure below. It is programmed to make 5 moves. The directions of the moves alternate between left and right (the first move can be in either direction). For each move, the robot will move 1, 2, 3, 4 or 5 cells from its position; the robot should not move out of the board; moreover each number can be used exactly once. How many cells are there on this board on which the robot *cannot* end up after 5 moves?



16. What is the sum of the last two digits of the product of all the odd numbers from 1 to 2019?

17. Each of the 10 letters *A*, *B*, *C*, *D*, *E*, *F*, *G*, *H*, *I* and *J* in the addition below represents a different digit.

$$\begin{array}{rccc} & & A & B \\ & & C & D \\ & & E & F \\ + & & & G \\ \hline & H & I & J \end{array}$$

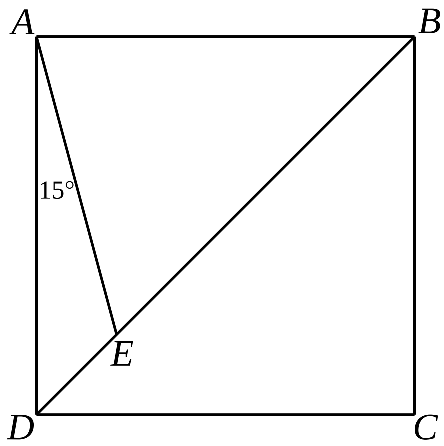
What is the largest possible value of the three-digit number $\overline{HIJ}$?

18. Jenny has a machine which can do one of the following two actions at each step: squaring the current number, or multiplying the current number by 2. Starting with the number 1, after at least how many steps can Jenny obtain 2^{2019} ?

19. Given fifty consecutive odd numbers: 1921, 1923, 1925, … , 2015, 2017, 2019. What is the least number of terms that one must select from those numbers to make sure that at least one pair of selected numbers adds up to 3930?

20. Each letter in the subtraction $HANOI - IMSO$ represents one digit, different letters represent different digits, and *H* and *I* are non-zero. How many possible values of *IMSO* are there such that the result of the subtraction is a three-digit number?

21. In the figure below, *ABCD* is a square, the point *E* is on *BD* such that $\angle EAD = 15°$. What is the value of $\dfrac{BD - AE}{DE}$?



22. Ms. Hà has a list of numbers in ascending order such that the difference between any two adjacent numbers is the same. If she removes the 25 greatest numbers and the 11 smallest numbers from the list, the average of the numbers in the list decreases by 2019. What is the difference between any two adjacent numbers of the original list?

23. How many three-digit numbers $\overline{xyz}$ are there such that x, y and z are all non-zero digits and $\overline{xy} > \overline{yz} > \overline{zx}$?

24. During a week, five university students A, B, C, D and E attended lectures from Monday to Friday. Given that:

- For each day from Monday to Friday, exactly three of them attended lectures while the other two were absent.
- No students were absent for 2 consecutive days, and no students attended lectures for 3 consecutive days.
- E was absent for 2 more days than B; there was only one day when A and C both attended lectures; C attended lecture on Monday.

Who were the 3 students that attended lectures on Friday?

25. Using the digits 1, 3, 5, 7 and 9 to form three-digit numbers (each digit can be used more than once), how many of them are multiples of 3?

END OF SHORT ANSWER PROBLEMS
