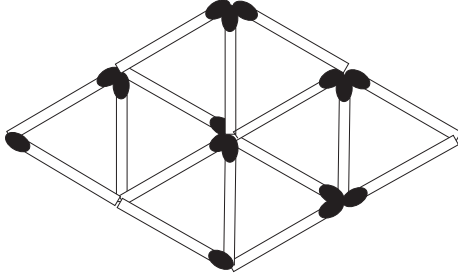


START for ALL PARTICIPANTS

1. Matches (coefficient 1)

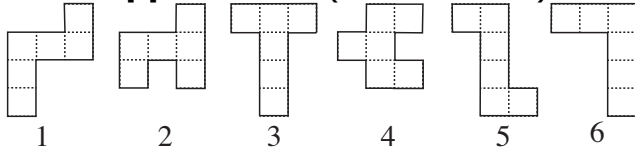


In the figure, Matilda counts eight small and two large triangles. The circumference of each triangle is fully drawn with matches.

Then, Matthew removes some matches, so that no fully drawn triangles are left.

How many matches did he remove, at least?

2. Wrapped Cube (coefficient 2)



Matilda found these six paper shapes. By folding them along the dotted lines, without cutting, only two of these shapes can cover all the faces of a cube.

Multiply the numbers of these two shapes together and write the result.

3. At the Restaurant (coefficient 3)

At the restaurant, there are only five desserts left: one strawberry ice cream, one lemon ice cream, one strawberry mousse, one lemon mousse and one lemon pie.

Cleo: "I would like a strawberry dessert".

Dennis: "I would like a mousse or an ice cream".

Billy: "I would like a lemon dessert".

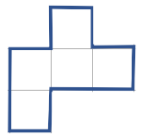
Alex: "Cleo and I only like mousses".

Elias: "I don't want ice cream".

Connect the first names to the desserts with arrows so that everyone is happy.

4. Collage (coefficient 4)

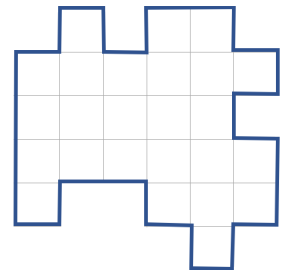
Lina cuts out five identical pieces that have this shape:



She glues them in such a way as to completely cover this larger figure.

Draw how she places the pieces in the collage.

Attention: You can turn the pieces but not flip them over.



5. A Magic Number (coefficient 5)

Kim observes that taking 2023 and adding all the digits together yields 7, her favourite number: $2 + 0 + 2 + 3 = 7$.

In the next hundred years, how many years will also produce 7?

We will not count 2023.

END for CE PARTICIPANTS

6. Multiplication (coefficient 6)

2	2		
×			
1			1

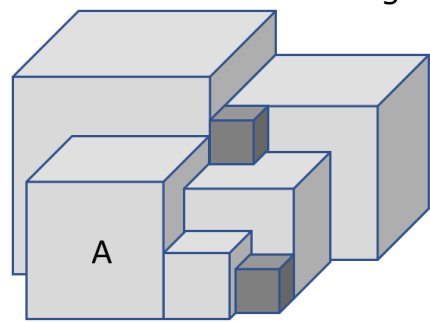
Place the numbers from 3 to 8, each in a box, so that the multiplication is correct.

7. Keychains (coefficient 7)

Louis makes keychains. Every day he becomes more skilled and he makes three more keychains than on the day before. He started making the keychains on a Monday and that day he made four keychains.

On which day of the week will he make his 200th keychain?

8. Those cubes! (coefficient 8)
 Zac has glued seven cubes, face to face.
 He obtained the following construction:



The largest cube has an edge of 9 cm.

The two dark grey cubes are identical and have an edge of 2 cm.
How many cm is the edge of cube A?

END for CM PARTICIPANTS

Problems 9 to 18: beware! For a problem to be completely solved, you must give both the number of solutions, and give the solution if there is only one, or give any two correct solutions if there are more than one. For all problems that may have more than one solution, there is space for two answers on the answer sheet (but there may still be just one solution).

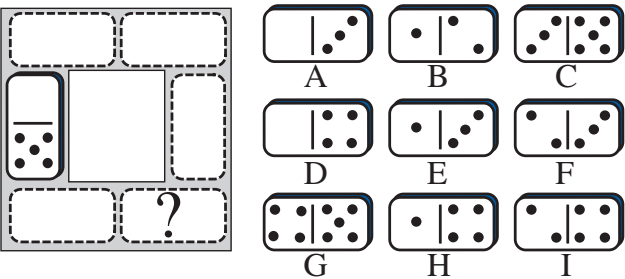
9. Consecutive Integers (coef. 9)

2	3	4	3	4	5
14	15	16			

In the table on the left, the integers 2, 3 and 4 have been written on the first line. Below them, are the three smallest consecutive integers such that the number written under the 2 is different from 2 and is divisible by 2, the one written under the 3 is divisible by 3 and the one under the 4 is divisible by 4. We want to fill the second row of the table on the right with the three smallest consecutive integers, respecting the same rule.
What number will be written in the shaded box?

10. Divide to Succeed (coefficient 10)
 In a class of fewer than 30 students, 52.4% of them (value rounded to the nearest tenth percent) obtained the average mark on the last assignment.
How many students are in the class?

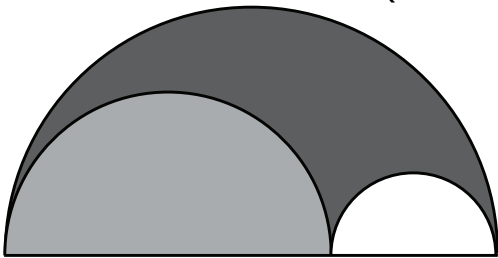
11. Dominoes (coefficient 11)



Matthew wants to place five dominoes taken from among the nine dominoes on the right in the empty places of the drawing on the left.
 Two touching dominoes must have the same number of dots on the touching squares.
 Which domino will go in the square marked with a question mark?

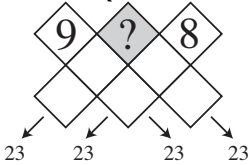
END for C1 PARTICIPANTS

12. Round the Farm Pens (coef. 12)



At Round the Farm, all the land is used to form three pens: shaped using straight lines and semi-circles as shown.
 The pig has the light grey enclosure, the donkey the dark grey enclosure and the hen the white enclosure, each with enough space to frolic. Knowing that the pig and the donkey have the same amount of space, **what is the ratio between the area of the farm and the area of the hen's pen?**

13. Crayon Box (coefficient 13)



Matilda has 60 coloured pencils. She wants to store them in the box shown in the figure, placing at least one pencil per compartment. The eight compartments

must contain all different numbers of pencils. The arrows indicate the sums of the numbers of pencils placed in the compartments of the corresponding rows, all equal to 23. Two compartments have already been filled with nine and eight pencils.

Indicate the number of pencils that Matilda places in the compartment that is marked with a question mark.

14. Scrooge's Accounts (coef. 14)

Scrooge is rich. He has N euros where N is an integer with ten digits, all different, the first digit not being a 0.

He just got some extra money. Amazing! The money he now has only needs two different digits to be written.

How much money did Scrooge receive at least?

END for C2 PARTICIPANTS

15. Two Polygons (coefficient 15)

Two regular polygons are chatting:

A: "I have one more side than you."

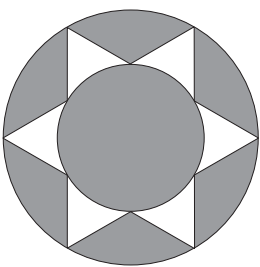
B: "Between us, we have 2023 diagonals."

A: "Between us, we have ... sides."

What number completes the last sentence of A?

16. Rosette (coefficient 16)

Mathilde designed this pretty rosette.



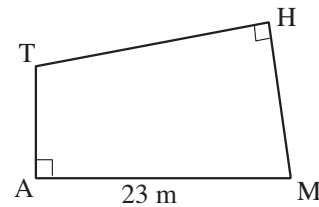
The larger circle is 21 cm in diameter, and the smaller circle passes through the points of intersection of two equilateral triangles that form a regular six-pointed star.

What is the total area of the white zones?

If necessary, we will take π as $22/7$ and $\sqrt{3}$ as 1.732. Give the answer in cm^2 , rounded to tenths.

END for L1, GP PARTICIPANTS

17. Old Father Thyme's Plot (cf. 17)



Father Justin Thyme owns a herb garden in the shape of a quadrilateral, two opposite angles of which are right and

the sides of which all measure whole numbers of metres less than 150 m.

Also, $AM = 23 \text{ m}$ and the MH side is exactly 1 metre longer than the AT side.

What is the area of Justin's plot in m^2 ?

Note: the drawing is not in proportion.

18. 23 Points (coefficient 18)

23 points are drawn in a plane, and all the pairs of points are connected by a line segment.

How many triangles are created at most?

We count all non-flat triangles, even those whose vertices are not amongst the 23 starting points, and even if segments cross them

Be careful, we draw segments and not straight lines!

END for L2, HC PARTICIPANTS

The Swiss Federation of Mathematical Games warmly thanks its sponsors for their help in organizing this event.



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