ACADÉMIE DE STRASBOURG
Liberté Égalité Fraternité

Inter-class competition for National 5 and Higher Pupils
organized with the support of the regional mathematics education inspectorate of the Strasbourg Academy

Mathématiques Sans Frontières

DISCOVERY TEST EDITION 2026

- ✓ **Submit only one answer sheet per exercise..**
- ✓ **All working will be taken into account.**
- ✓ **Care, quality of writing, and precision of reasoning will be taken into account..**

Exercise 1 — 7 pts
Sure to Win ?

Solution to be written in German, French, Spanish or Italian in a minimum of 30 words..

Auf dem Tisch liegen zehn Lollis. Isabelle und Theo spielen folgendes Spiel: Sie nehmen immer abwechselnd Lollis weg. Bei jedem Zug können sie entweder einen oder zwei oder drei Lollis nehmen. Die Person, die den letzten Lolli wegnehmen kann, hat gewonnen.
Isabelle fängt an. Nach ein paar Spielen gewinnt immer sie.

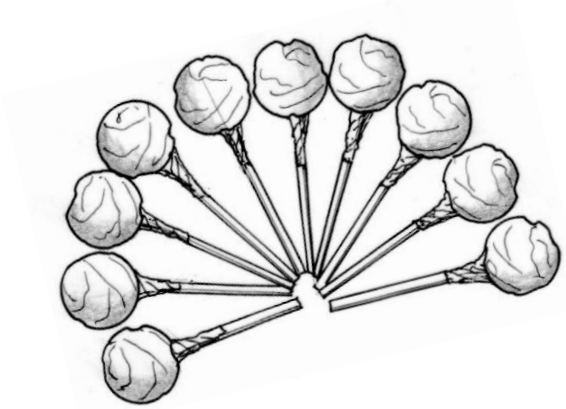
Spielt dieses Spiel mehrmals und findet die Strategie heraus, mit der Isabelle jedes Mal gewinnt. Erklärt diese Strategie.

Isabelle e Théo giocano con dieci lecca-lecca su un tavolo. A turno ciascuno deve toglierne uno, due o tre. Vince chi può prendere l'ultimo lecca-lecca. Isabelle inizia il gioco. Dopo un certo numero di partite, è Isabelle che vince sempre.

Giocate più volte a questo gioco, individuate la strategia che ha permesso a Isabelle di vincere ogni volta e spiegate il vostro ragionamento.

Isabelle y Théo juegan con diez piruletas sobre una mesa. Por turno, cada uno tiene que coger una, dos o tres. La persona que puede coger la última piruleta ha ganado.
Empieza Isabelle. Después de unas cuantas partidas, siempre gana ella.

Jugad a este juego varias veces y encontrad la estrategia que permite a Isabelle ganar siempre. Justifica tu respuesta.



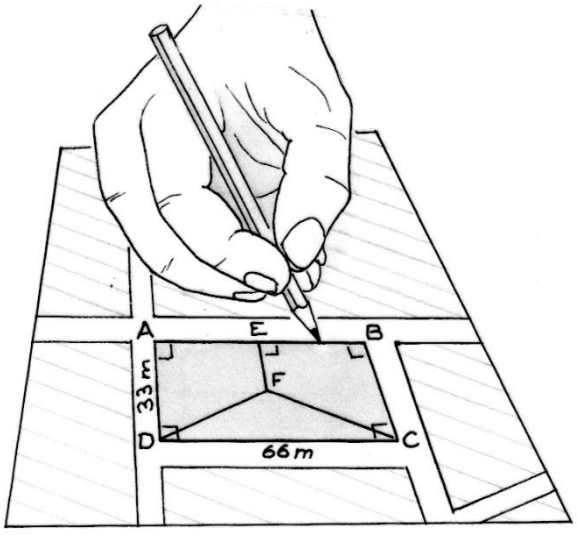
Isabelle et Théo jouent avec dix sucettes sur une table. Chacun son tour, ils en retirent une, deux ou trois. Le dernier joueur à prendre la dernière sucette gagne. Isabelle commence. Après un certain nombre de tours, elle gagne systématiquement.

Jouez à ce jeu plusieurs fois et trouvez la stratégie qui a permis à Isabelle de gagner à chaque fois. Expliquez votre raisonnement.

Exercise 2 — 5 pts
Plan Ter

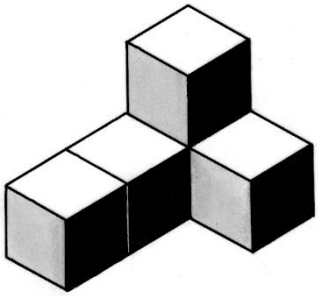
A rectangular plot of land, 66 m long and 33 m wide, is divided into three polygonal parcels of equal area. Lines (EF) and (AB) are perpendicular.

Calculate the length of EF.



Exercise 3 — 7 pts
Illusions

The drawing presents an arrangement of eleven adjoining rhombuses (four white, four black, and three gray), forming a perspective view of four visible cubes. All rhombuses oriented in the same direction have been colored with the same color.



Similarly, propose an assembly composed solely of twenty-four adjoining rhombuses that represents twelve cubes visible in perspective, with twelve white rhombuses, seven black rhombuses, and five gray rhombuses.

Note: Isometric grid paper is provided in the appendix.

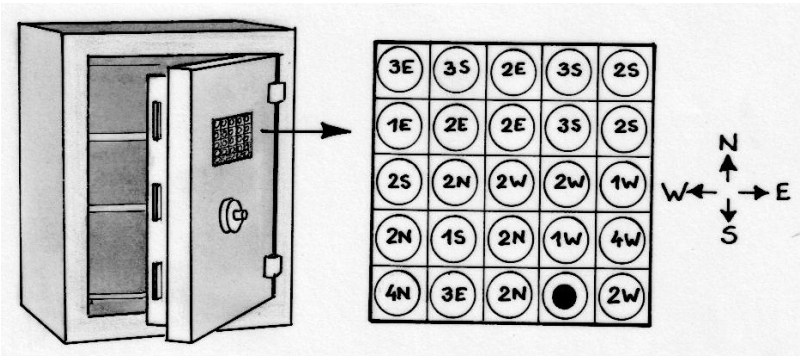
Exercise 5 — 7 pts
The War of Buttons

The safe below has a lock that only opens when all the buttons have been pressed in the correct order. Each button has an instruction that tells you where to go.

For example, 4N means "move 4 spaces north." The letter S means South, W means West, and E means East.

The last button to press before opening the safe is indicated by a black disc.

Find the first button pressed.



Exercise 6 — 5 pts
Polygonal

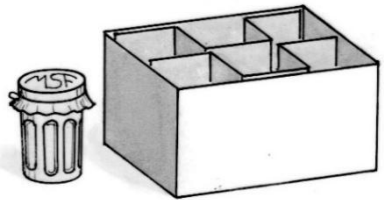
The diagram shows the construction of the first four pentagonal numbers.

These pentagonal numbers are obtained by counting the points in the figures.

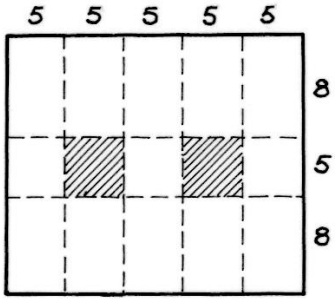
Thus, the first pentagonal numbers are: 1, 5, 12, 22, etc.

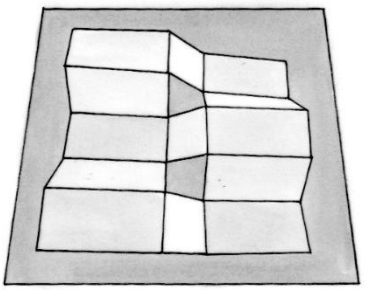
Exercise 4 — 5 pts
Confined Jam

To deliver his jars of jam, a producer requested the manufacture of easily foldable cardboard dividers to secure the jars inside a box and prevent them from bumping against each other.



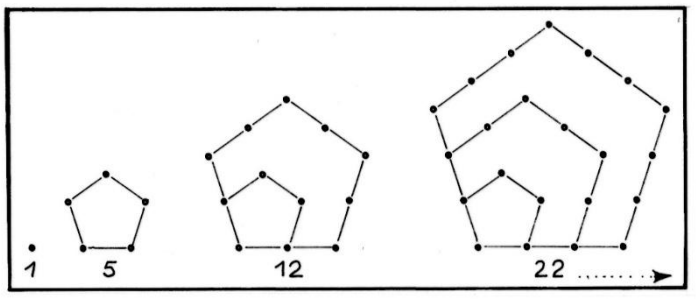
This divider, shown in the figure below, is made up of ten rectangles measuring 8 cm by 5 cm and three squares measuring 5 cm on each side. The two shaded squares have been removed. The dividers are folded as shown in the figure below and placed inside the box.





Make this partition and this box.
Give the dimensions of the box.
Show your teacher the box with the partition inside..

Mathématiques SANS Frontières



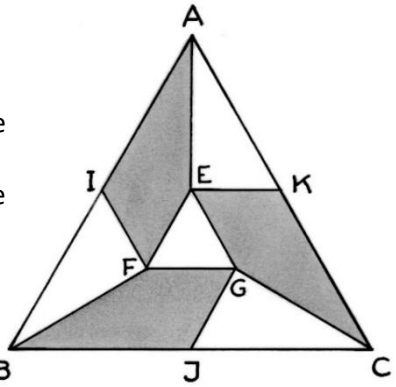
Similarly, construct the first four hexagonal numbers.

The number 231 is the eleventh hexagonal number.

What is the next one? Explain with a calculation.

Exercice 7 — 7 pts
Logo

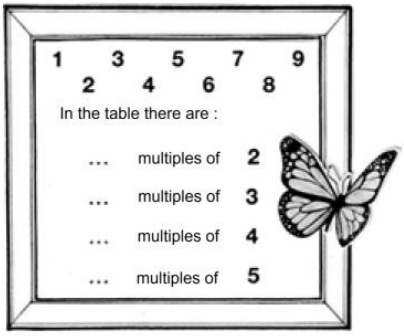
Here is a drawing of a logo.
ABC is an equilateral triangle.
I, J, and K are the midpoints of the sides of triangle ABC.
E, F, and G are the midpoints of the sides of triangle IJK.



Construct the figure opposite.

If the area of triangle ABC is 1 dm², what is the area of the shaded region?

Exercise 8 — 5 pts
Multiportrait



Find numbers to place in the four dotted spaces so that all the statements are true. Complete the table and glue it onto the answer sheet.

Exercise 9 — 7 pts
Hidden Card !

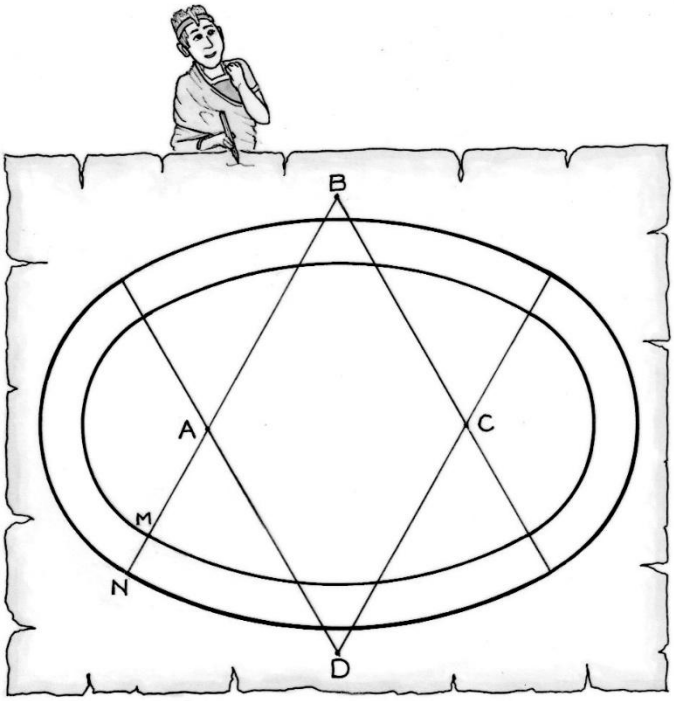
Gabin writes three two-digit numbers on three cards.
He then writes down, on a piece of paper, all the six-digit numbers he can make by placing these three cards side by side.
The sum of all the numbers Gabin manages to make with the three cards is 1,434,342.
On one of the three cards, he writes the number 12, and on another, the number 25.
He hides the third card.

Determine the number written on the third card. Explain your method.

Mathématiques SANS Frontières

Exercise 10 — 10 pts
Arena

Here is the plan of the oval Roman arena.
Triangles ABC and ACD are equilateral.
The outline of the inner oval of the arena is formed by four circular arcs with centers A, B, C, and D.
To form the outer oval, the radius of each of the previously constructed circular arcs is increased. Thus, the distance between the two ovals remains constant.



Draw a construction plan with AB = 6 cm, AM = 3 cm, and AN = 4 cm.

Calculate the difference in length between the two ovals.

SPÉCIAL SECONDE

Exercise 11 5 pts
3 D

When three six-sided dice are rolled simultaneously and the results are added together, values between 3 and 18 appear, but two of these values are more likely to appear..

What numbers would you bet on? Justify your choice.

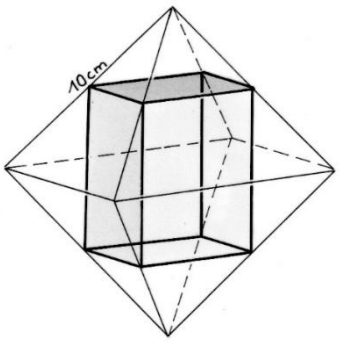
Mathématiques SANS Frontières

Exercise 12 7 pts
Depleted

Titus has two meadows, a large one and a small one. The large meadow is twice the size of the small one.
His friends offer to mow them for him. They arrange to meet in the morning and all begin mowing the large meadow. They work until noon, take a break, and resume in the afternoon. Then, half of them go to the small meadow and the other half stay in the large one. Everyone works well and at the same speed. At the end of the workday, the large meadow is mowed, but the small one still needs to be finished.
The next day, after working all day, Titus finishes mowing the small meadow by himself.
How many friends came to help Titus? Justify your answer.

Exercise 13 10 pts
2nde GT
Paving Stones of Good Dimensions

A cuboid is placed in a regular octahedron with 10 cm edges. The vertices of the cuboid are in the middle of the edges.



Calculate the dimensions of the rectangular prism. Explain.
Calculate the percentage of the octahedron's volume occupied by the rectangular prism..

Mathématiques SANS Frontières