

# FSJM – SEMI-FINAL- 16 MARCH 2019

Information and results at <http://www.fsjm.ch/>

START for ALL PARTICIPANTS

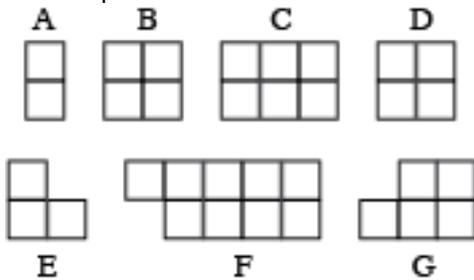
## 1. THE YEAR STAMP (coefficient 1)



With the stamp shown above, Theo has printed 483. **What would the markings be on another stamp that would print 2019?**

## 2. SHARING WITH NO BREAKS ! (coefficient 2)

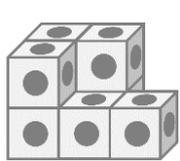
Alice, Bob and Cedric share some chocolate fairly. Here are the pieces to distribute.



Alice takes piece A, Bob takes B et Cédric takes C. **Without breaking any pieces, continue to create a fair distribution.**

Alice : A.... Bob : B.... Cedric : C....

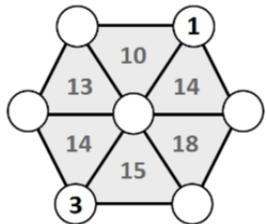
## 3. STICKY DOTS (coefficient 3)



Clement made a construction by gluing eight cubes together, as in the drawing. He then glued a sticky dot on each exposed square face, including on the underside of his construction.

**How many sticky dots did he use in all?**

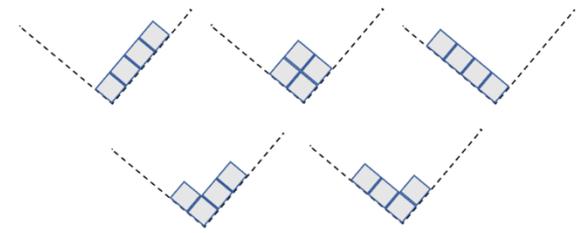
## 4. SUM OF SUMMITS (coefficient 4)



Harry has to place all the digits from 1 to 7, one in each circle. He knows that the number written in each of the six triangles equals the sum of the three digits at its vertices.

He has already placed 1 and 3. **Enter the missing numbers.**

## 5. MATTHEW'S CUBES (coefficient 5)



Matthew stores his cubes in a box with an inclined bottom as shown in the figure.

The thickness of the box allows only one layer of cubes.

There are five ways to store four cubes, as shown in the figure.

**In how many ways can he store five cubes?**

END for CE PARTICIPANTS

## 6. YEAR CALCULATION (coefficient 6)

$$6 \times aaa + 7 \times a = 2019$$

Here, the letter **a** always represents the same digit. In this calculation, **a** is therefore a single-digit number and **aaa** is a three-digit number with identical digits.

**What digit does a represent?**

## 7. MATTHEW'S STAMPS (coefficient 7)



Matthew buys a strip of three stamps worth 1, 2 and 3 Ludics at the post office.

To put it in his little purse, he folds the strip into a thickness of three, without any of the individual stamps being folded.

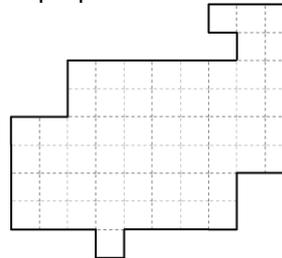
**In how many different ways can he do this folding?**

*Note: The back of the stamps is not self-adhesive.*

## 8. CUT IT OUT! (coefficient 8)

**Cut this figure along the dotted lines into two identical pieces.**

It is necessary to turn one of the two pieces over to superpose with the other.



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. CHOICE OF OPTIONS (coefficient 9)

In Matilda's class, each pupil must choose at least two options.

The options offered are:

- 1. mathematical games
- 2. language games
- 3. Strategy games.

All pupils chose two options, except for two who enrolled in all three options: 18 pupils chose option 1, 22 chose option 2 and 26 chose option 3.

**How many pupils are there in Matilda's class?**

### 10. SIX FRIENDS (coefficient 10)

Alice: "Dominic is older than Edward".

Berty: "Alice is older than Edward".

Colin: "Francis is older than Edward".

Dominic: "Berty is younger than me".

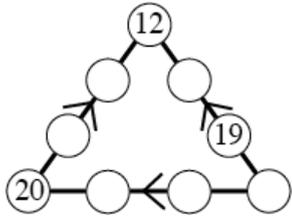
Edward: "Colin is older than Francis".

Francis: "Only two of you are younger than me".

Everyone who is older than Edward lied, the others all told the truth (including Edward).

**Put these six friends, all of whom have different ages, in order of age from the youngest to the oldest.**

### 11. THE TRIANGLE OF THE YEAR (coefficient 11)



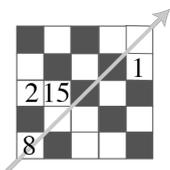
The circles of this triangle contain the numbers from 12 to 20. The numbers 12, 19 and 20 are already placed. The sum of the four numbers on each side of the triangle is the same.

**It's up to you to place the other numbers.**

*Note: The "<" signs on the sides of the triangle indicate inequality relations between two neighbouring numbers.*

END for C1 PARTICIPANTS

### 12. MAGIC SQUARE WITH HOLES (coefficient 12)



In this square, the numbers from 1 to 15 occupy the white boxes (1, 2, 8 and 15 are already placed). The sum of the three numbers written in each line, in each column and in the diagonal arrowed is the same.

**Fill in the empty boxes.**

### 13. THE CRYPTARITHM OF THE YEAR (coef. 13)

As in any cryptarithm, different letters always replace different digits, different digits are always replaced by different letters and no number begins with a 0.

$$\text{DIX} + \text{NEUF} = 19 \times \text{UN}$$

Moreover, in this case no letter replaces the digit 6 or the digit 9.

**What number does DEUX represent?**

### 14. REVERSE THE NUMBERS (coefficient 14)

The "reverse" of 12, i.e. 21, has a square of 441, which is the "reverse" of the square of 12, i.e. 144.

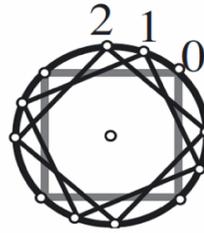
**Find a three-digit number, distinct from its "reverse", and such that the square of its reverse**

**is equal to the reverse of its square.**

*Note: the first digit of a number or of a "reverse" is never 0.*

END for C2 PARTICIPANTS

### 15. TURNTABLE (coefficient 15)

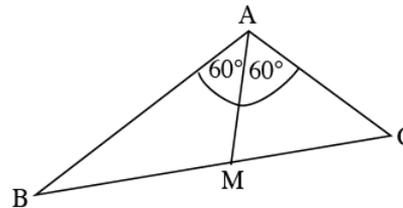


Matilda is playing with the turntable of her grandfather's old record player. It is decorated with a square whose vertices are not distinguishable from one another. With her self-triggering camera, Mathilde takes pictures of the turntable, which rotates at a

constant speed of 33 revolutions per minute, at intervals of exactly one second between two successive photos. The drawing shows (approximately) the first three photos numbered 0, 1 and 2, superimposed.

**What will be the number of the first photo where the square will be superimposed perfectly with that of photo number 0?**

### 16. THE TRIANGULAR FOREST (coefficient 16)



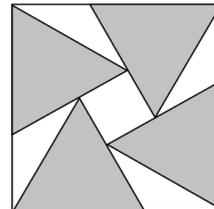
This forest has the shape of a triangle ABC such that  $AB = 2AC$  and whose vertex angle A is  $120^\circ$ . A rectilinear path AM crosses the forest along the bisector of the angle  $\hat{A}$ . This path has a length equal to 2019 metre.

**What is the length of the side [BC]?**

Round the answer to the nearest metre and, if necessary, take  $\sqrt{7}$  as being 2.646.

END for L1, GP PARTICIPANTS

### 17. 4 TRIANGLES IN A SQUARE (coef 17)



Matilda wedged four equilateral triangles in a 20 cm square box.

**What is the area of the small central square?**

Give the answer in  $\text{cm}^2$ , rounded to the nearest tenth and if necessary, take  $\sqrt{3}$  as 1.732.

### 18. INTEGERS OF THE YEAR (coefficient 18)

**Find three positive integers a, b, and c strictly smaller than 50 such that:**

$$20/19 = (a^3 + b^3) / (a^3 + c^3).$$

END for L2, HC PARTICIPANTS