Mathématiques sans frontières

Training test 2006

Graines de champions

Question 1
7 marks

Solution à rédiger en allemand, anglais, espagnol ou italien
en un minimum de 30 mots.

Anatole, Barnabé, Charles, Denis et Emile ont fini leur entraînement de football.
Monsieur Petit qui vient chercher les enfants après l'entraînement a droit au compte-rendu de son fils :
« J'ai marqué trois buts de moins qu'Anatole ; Charles trois de plus que Denis ; Anatole cinq de moins que Charles et Barnabé trois de plus que moi. »

Classer les enfants selon le nombre de buts marqués. Justifier.

Anton, Bruno, Charly, Dennis und Emilio kommen vom Fußballtraining. Als Herr Klein die Kinder abholt, wird ihm von seinem Sohn Bericht erstattet:
„Ich habe drei Tore weniger geschossen als Anton, Charly drei mehr als Dennis, und Anton fünf weniger als Charly. Bruno hat drei Tore mehr als ich geschossen."

Bewerte die Kinder nach der Anzahl der geschossenen Tore. Begründe.

Antonio, Bruno, Carlo, Dino ed Emilio hanno finito la loro partita di calcio.
Il signor Piccolo che è venuto a prendere i ragazzi dopo la partita ascolta il resoconto di suo figlio:
"Ho segnato tre reti meno di Antonio; Carlo ne ha segnate tre più di Dino; Antonio cinque meno di Carlo e Bruno tre più di me."

Classificare i ragazzi in base al numero di reti segnate. Motivare la risposta.

Anatolio, Bernabé, Carlos, Dionisio y Emilio han acabado su entrenamiento de fútbol.
Don Pequeño quien viene a buscar a los niños después del entrenamiento escucha lo que le cuenta su hijo:
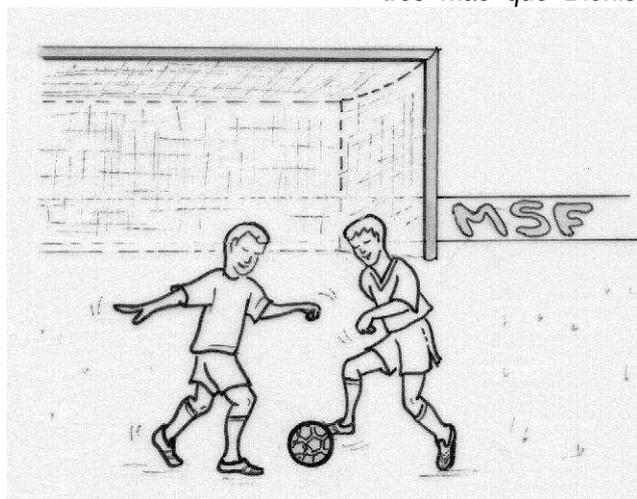*" He apuntado tres goles menos que Anatolio; Carlos tres más que Dionisio; Anatolio cinco menos que Carlos y Bernabé tres más que yo."*

Clasifica a los niños segun el número de goles que han apuntado. Justifica.

Alan, Ben, Charles, Dennis and Eliot's football training session is over.
Mr Small, who comes to get the children after their training, is being given the report by his son.
"I scored three goals less than Alan did; Charles three more than Dennis; Alan five less than Charles and Ben three more than I did."

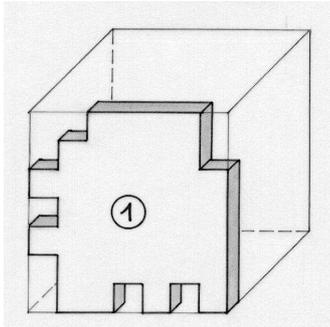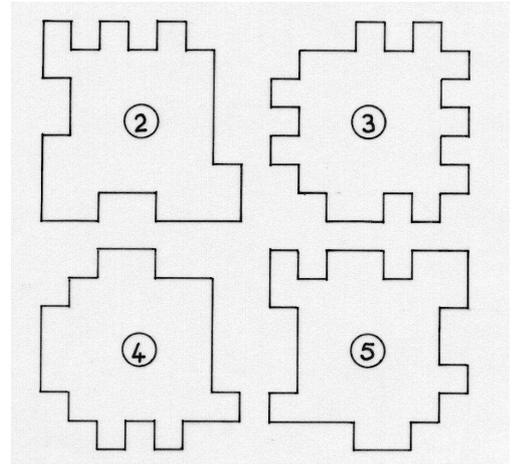**Grade the children according to the number of goals they have scored. Justify.**

Jigsaw Cube

6 smaller pieces have been cut from a flat piece of wood 1 cm thick. They make a cube of side 7 cm when they are assembled in the right way.
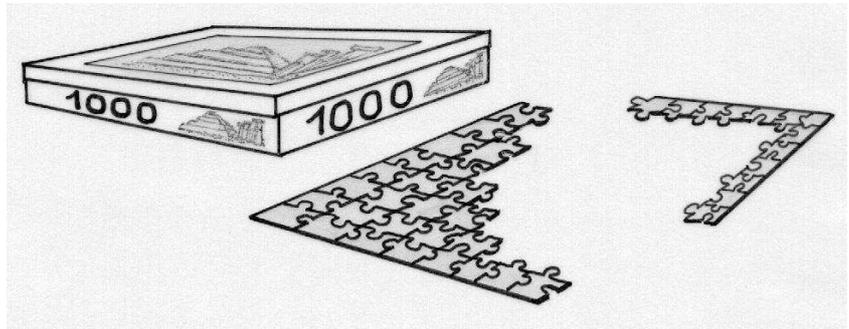The shapes of 5 of the pieces are shown here.

Draw the shape of the sixth piece.

Close to 1000

Melanie is going to do a jigsaw puzzle.
The cover of the box shows that the puzzle picture is a rectangle and indicates " 1000 pieces".
The puzzle has been cut using curved lines which still follow fairly closely two perpendicular directions. It can be thought of as a grid of slightly fuzzy squares.
Melanie starts by putting all the outside edge pieces to one side. She finds exactly 124 edge pieces including the 4 corners.
When she starts doing the puzzle Melanie suddenly realises that it is impossible for the puzzle to have exactly 1000 pieces.
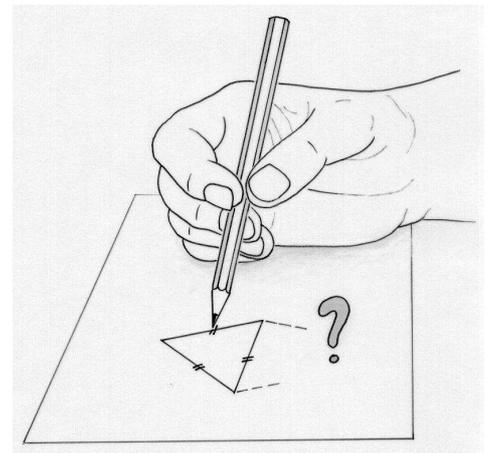
What could be the number of pieces in the puzzle, knowing it is close to 1000 ? Justify your answer.

Irregular

Alain is making a tetrahedron whose faces are 2 equilateral triangles and 2 right-angled triangles.

Draw a net of this tetrahedron on your answer sheet.
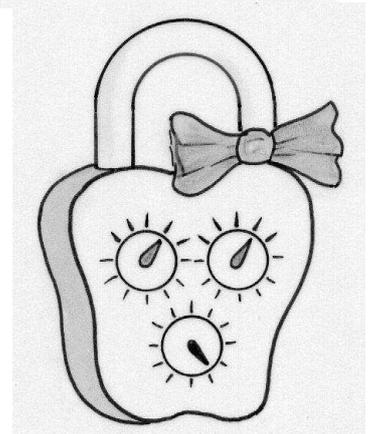
Good combination

Martine is really annoyed because she has forgotten the combination of her padlock.
It has 3 dials each with 12 numbered positions.

To open the lock Martine decides to try each possibility in a systematic way :
0-0-0   ; 0-0-1 ; 0-0-2 ; … ; 0-0-11 ; 0-1-0 ; 0-1-1 ; … ; 0-1-11 ; 0-2-0 ; … etc.
Every attempt takes 1 second.
After 16 minutes 45 seconds the padlock finally opens !

What is the combination of the padlock ? Explain your answer.
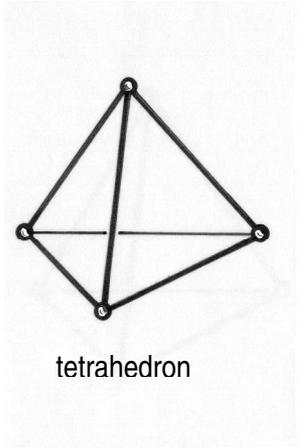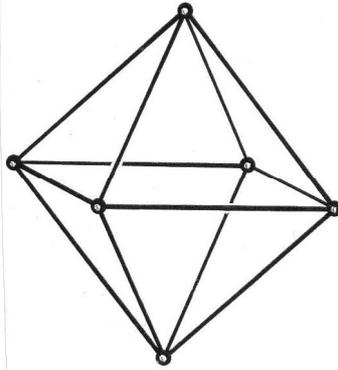
Platonic solids

A child's construction set can build models of regular polyhedra using metal spheres and rods. The spheres are all the same size and weight ; so are the rods. The model of the octahedron has a mass of 132 g and the tetrahedron model is 76 g.
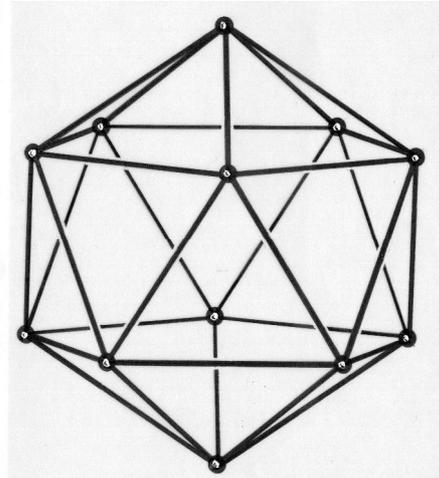
What is the mass of the model of the icosihedron shown here ? Justify your answer.

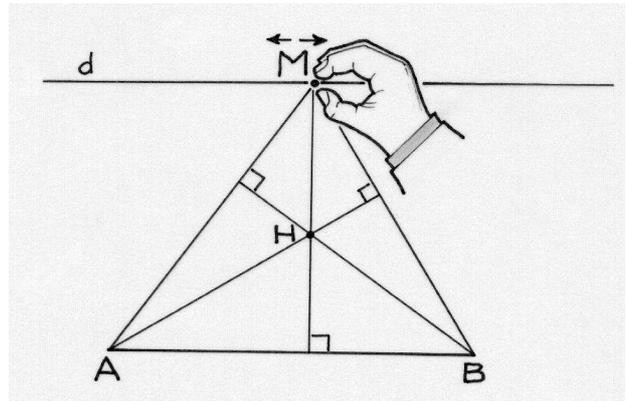tetrahedron

octahedron

icosihedron

So that's your altitude

MAB is a triangle whose base AB is 8 cm long. A and B are fixed points. The vertex M can move along the straight line **d** which is parallel to AB. The distance between the lines **d** and AB is 6 cm.

Using as many points as you need, draw the curve that shows how the orthocentre H of the triangle MAB moves as M moves the line d.
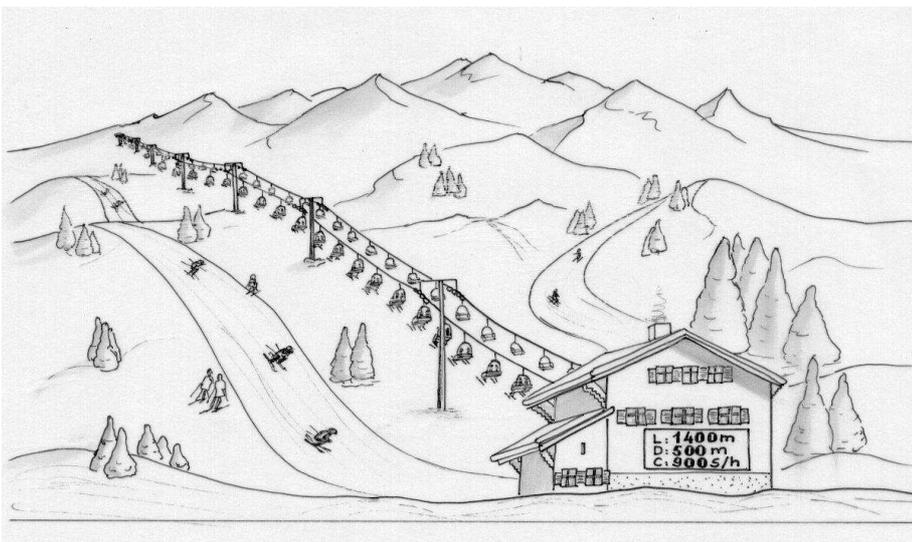
Note: the orthocentre is the point of intersection of the altitudes.

Chairlift

Annabelle is at the bottom of the ski run waiting her turn for the chairlift.
A notice gives the details of the chairlift.

Length	1 400 m
Ascent	500 m
Maximum delivery 900 skiers per hour	
150 chairs each with two places	

The delivery is the number of skiers who arrive at the top in one hour. It is a maximum when all the places are occupied.

How long does the ascent on the chairlift last for each skier ?

Euro tour

Six 50-cent euro coins are arranged in a triangle as shown in Figure 1.The word "CENT" is horizontal. The coin A is moved by rolling it , without letting it slip over the others coils as shown in Figure 2. It is always in contact with at least one other coin. It goes right round the other coins and back to its initial position.

Show the 6 coins after the coin A has completed its tour. Through what angle has the coin A turned ? Justify your answer.
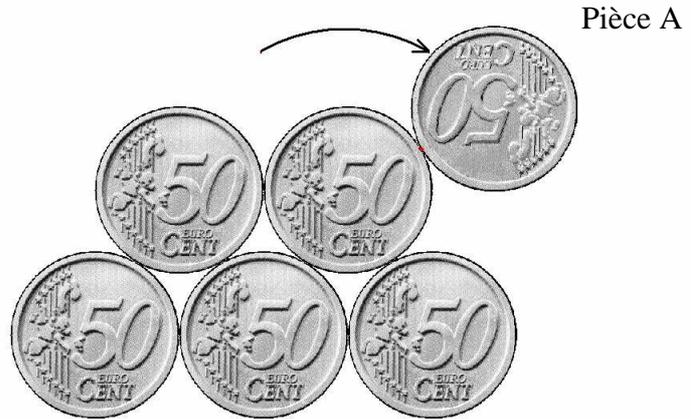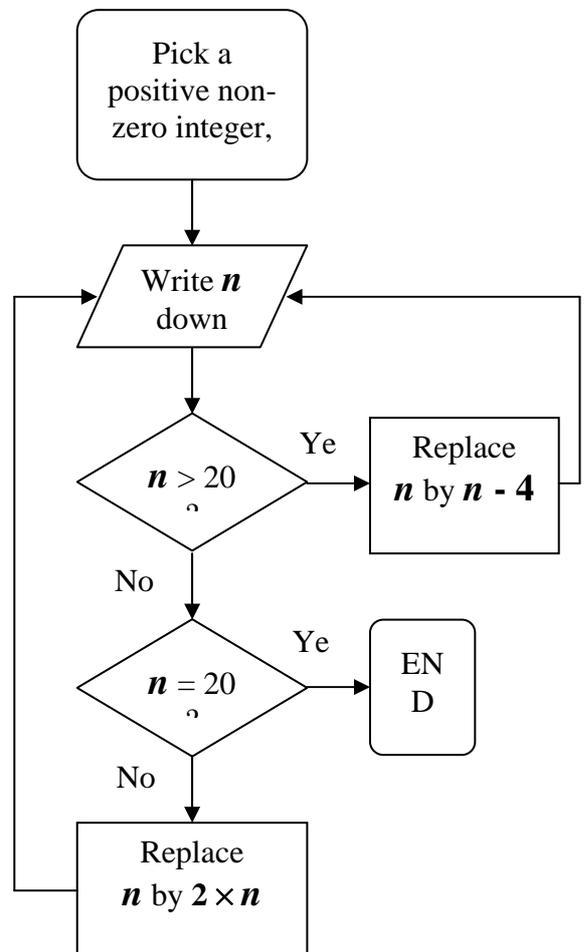
Pièce A

Pièce A

Figure 1

Figure 2

And where is the way out ?

Here is the flow chart for a computer programme

Test out the programme for n = 11 and for another two values. Will the programme stop no matter what non-zero positive integer is chosen at the start ? Explain your answer

Pick a positive non-zero integer,

Write **n** down

$n > 20$?

Ye — Replace **n** by **n - 4**

No

$n = 20$?

Ye — END
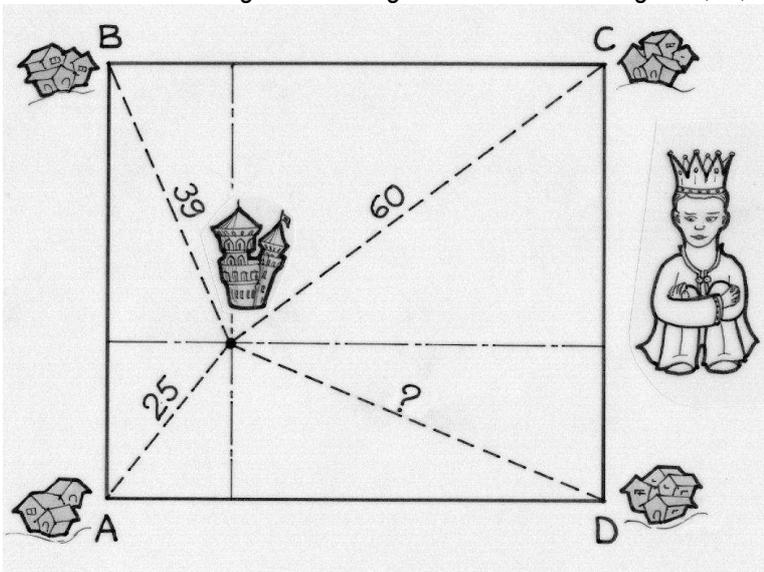
No

Replace **n** by $2 \times n$

ABBA 2005

Find two positive integers " a" and " b", with "a" greater than " b", so that when you add their sum, their product and their difference the result is 2005.

$$a+b$$
$$+ \; a \times b$$
$$+ \; a-b$$
$$\overline{}$$
$$2005$$

Distance learning

The kingdom of King Anselm has 4 villages A, B, C, D which are at the vertices of a rectangle. His castle is inside this rectangle, 25 km from A , 39 km from B and 60 km from C.

Anselm wonders what distance his castle is from D.

He asks his adviser Gyropathe and gets the following answer:

In four right triangles not the same
Use the theorem with the famous name
The four equations then you add
And wisely group the terms you had
If find the distance be your aim

Calculate the distance of the castle from village D.

Fresh salad

A snail is on the rim of a well at point A. A salad leaf is at point B. The rim is formed by two concentric circles centre O. The large radius is 75 cm, the smaller radius 45 cm. The points A , O and B lie on a straight line.

Calculate to the nearest cm the shortest possible path that the snail can take to get to the salad.