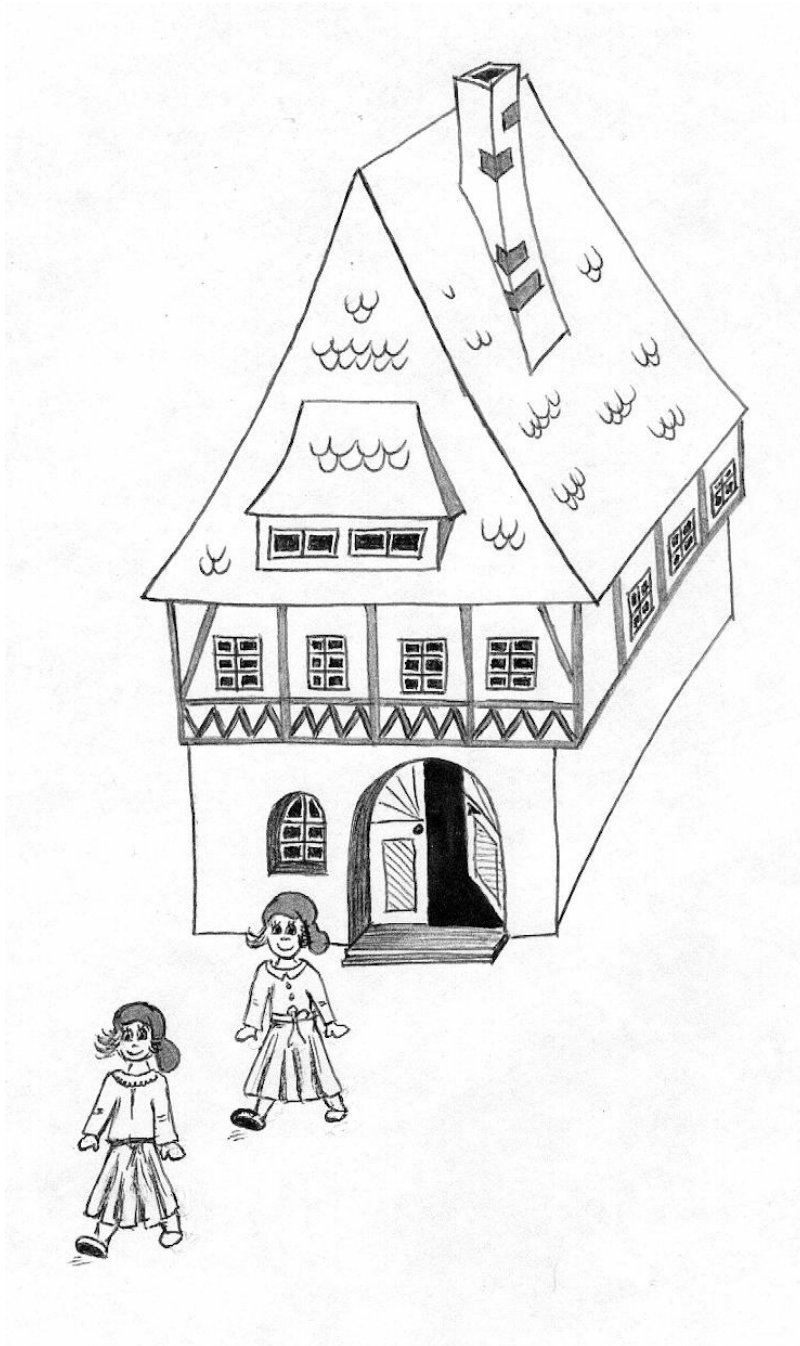


## Exercice 1 – Langue Vivante – 7 pts

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

### *Le bonnet d'Anne*



Dans une pièce obscure il y a trois bonnets, deux rouges et un blanc.  
Anne et Brigitte en prennent chacune un, s'en coiffent et sortent de la pièce, Anne d'abord, puis Brigitte.

Brigitte voit la couleur du bonnet d'Anne mais Anne ne voit pas la couleur du bonnet de Brigitte.

Brigitte dit: " Je ne suis pas sûre de la couleur de mon bonnet". Anne répond : " Alors moi, je connais la couleur du mien".

***De quelle couleur est le bonnet d'Anne ? Explique pourquoi Anne le sait.***

En un cuarto oscuro, hay tres gorros : dos rojos y uno blanco. Ana y Brígida cogen cada una un gorro, se lo ponen en la cabeza y salen del cuarto ; primero Ana y luego Brígida.

Brígida ve el color del gorro de Ana pero Ana no ve el del gorro de Brígida.

Brígida dice : “ No estoy segura del color de mi gorro “. Ana contesta : “ Entonces yo, conozco el color del mío “

***¿ De qué color es el gorro de Ana ? Explica por qué.***

In einem völlig dunklen Raum liegen drei Käppchen, zwei rote und ein weißes. Anna und Brigitte setzen sich je ein Käppchen auf und verlassen den Raum, Anna als erste, dann Brigitte.

Brigitte sieht die Farbe des Käppchens, das Anna trägt ; Anna sieht aber diejenige von Brigittes Käppchen nicht.

Brigitte sagt : “ Ich bin mir der Farbe meines Käppchens nicht sicher “. Anna antwortet : “ Dann kenne ich genau die Farbe des meinigen “.

***Welches ist die Farbe von Annas Käppchen ? Erkläre warum !***

In un locale buio vi sono tre berretti: due rossi e uno bianco.

Anna e Brigitta ne prendono uno ciascuna, lo infilano ed escono dalla stanza, prima Anna e poi Brigitta.

Brigitta vede il colore del berretto d'Anna, ma Anna non vede il colore di quello di Brigitta.

Brigitta dice : “ Non sono sicura del colore del mio berretto ”. Anna risponde : “ Allora io conosco il colore del mio ”.

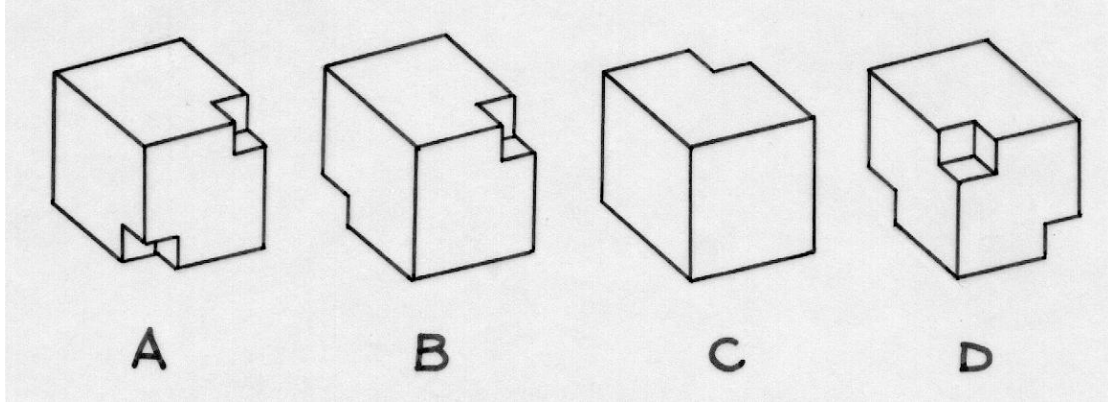
***Di quale colore è il berretto di Anna? Spiega perché Anna lo conosce.***

Question 2 Sense and

5 marks

The diagrams show 4 wooden cubes from which corners have been removed.

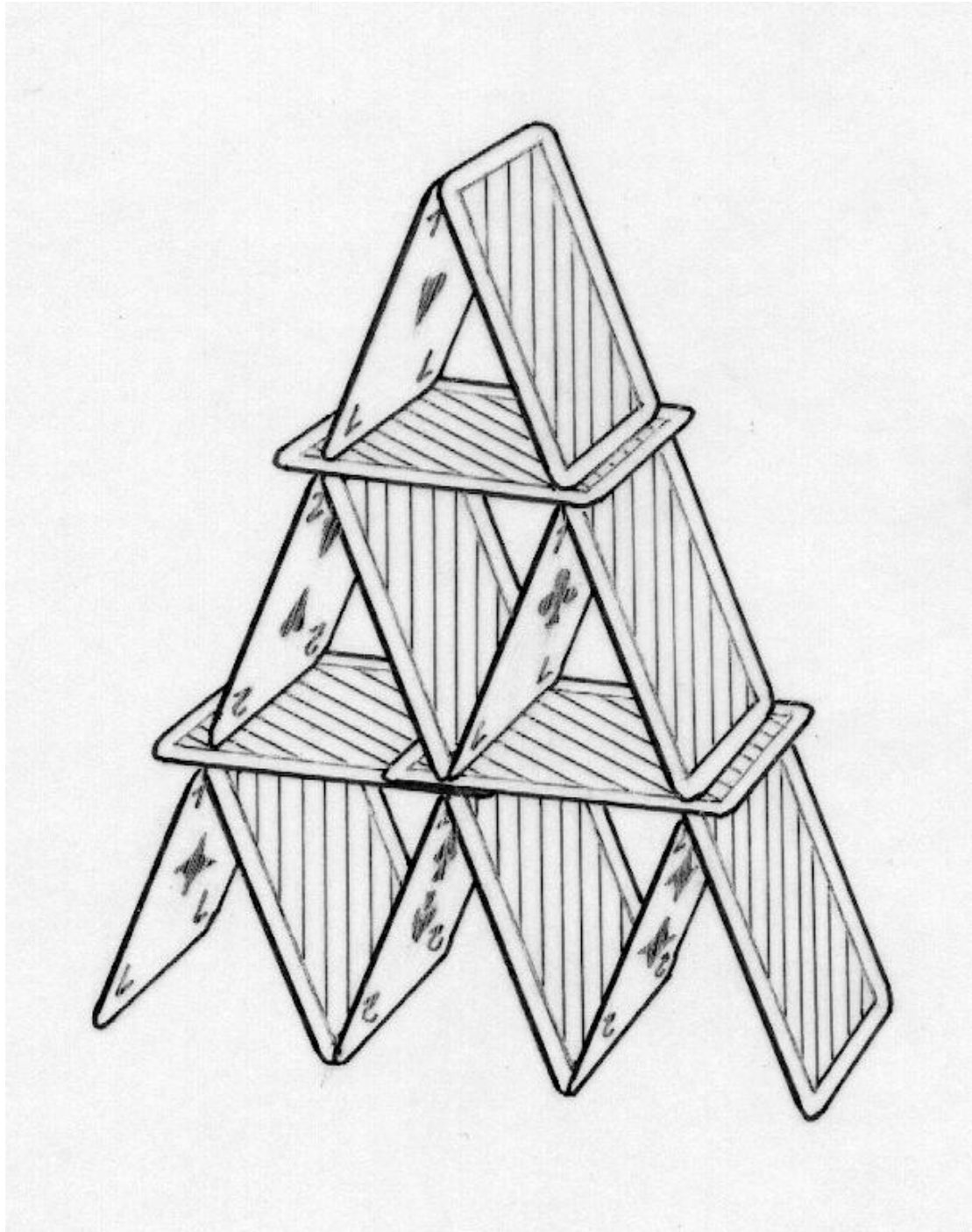
Only two of the cubes are identical. Which ones are they?



Question 3 House of cards 7 marks

Victor is a very patient and meticulous boy. He concentrates on building a castle with cards based on the design shown.

Victor would like to build a big castle using all his cards. Unfortunately his construction always falls down before it is finished. In spite of this Victor has calculated that his 5 packs of 52 cards will allow him to complete the castle of his dreams.



How many floors has the castle that Victor is dreaming of?

Question 4 5 marks

Here is a question, the answer and the diagram taken from a Chinese maths book.

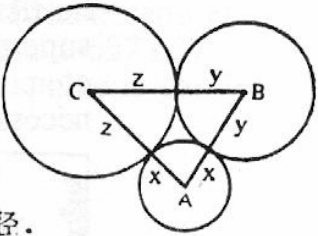
**ÉNONCÉ**      例 已知  $\odot A$ 、 $\odot B$ 、 $\odot C$  两两外切，它们的圆心距分别是 5cm、6cm、7cm，求这三个圆的半径。

**SOLUTION**      解 设  $\odot A$ 、 $\odot B$ 、 $\odot C$  的半径分别为  $x$ 、 $y$ 、 $z$ ，因为  $\odot A$ 、 $\odot B$ 、 $\odot C$  两两外切，于是有方程组

$$\begin{cases} x + y = 5 \\ y + z = 7 \\ x + z = 6 \end{cases}$$

解之得：  
 $x = 2, y = 3, z = 4$ 。

答  $\odot A$ 、 $\odot B$ 、 $\odot C$  的半径分别是 2cm、3cm、4cm。

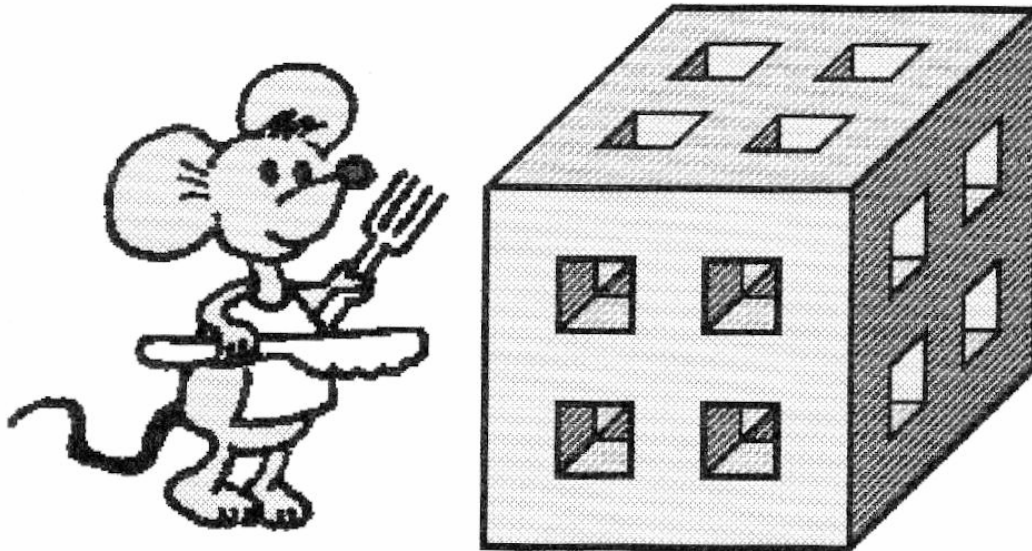


Think it over carefully and then write down what you think the question might be.

Question 5 Gruyere 7 marks

A cube has edges with length 5 cm.

The cube has been perforated by full length holes: each hole is a cuboid with a cross-section that is a square of side 1 cm. The 12 holes are arranged in a regular way as shown.

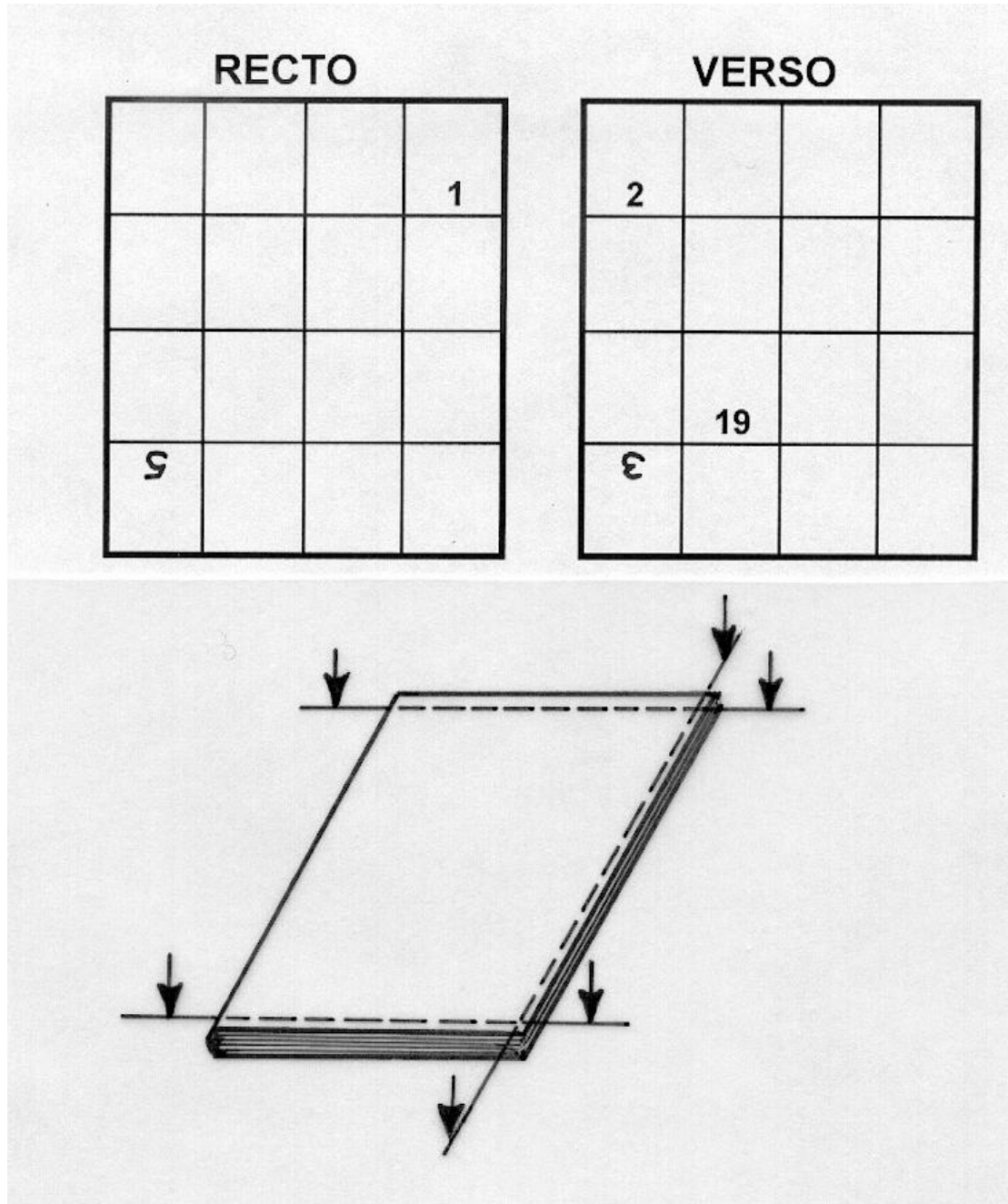


Calculate the total volume of the perforated cube.

Question 6 Good impression 5 marks

A printer produces a book with 32 pages. The 32 pages are printed on a single large sheet of paper so that 16 pages are printed on the front and 16 pages on the back. The sheet of paper is then simply folded in two, four times. In this way you get a book, 16 pages thick, which can be sewed along the last fold and cut along the other three sides.

On the front(recto) and the back(verso) of the large sheet shown, 5 page numbers are indicated.

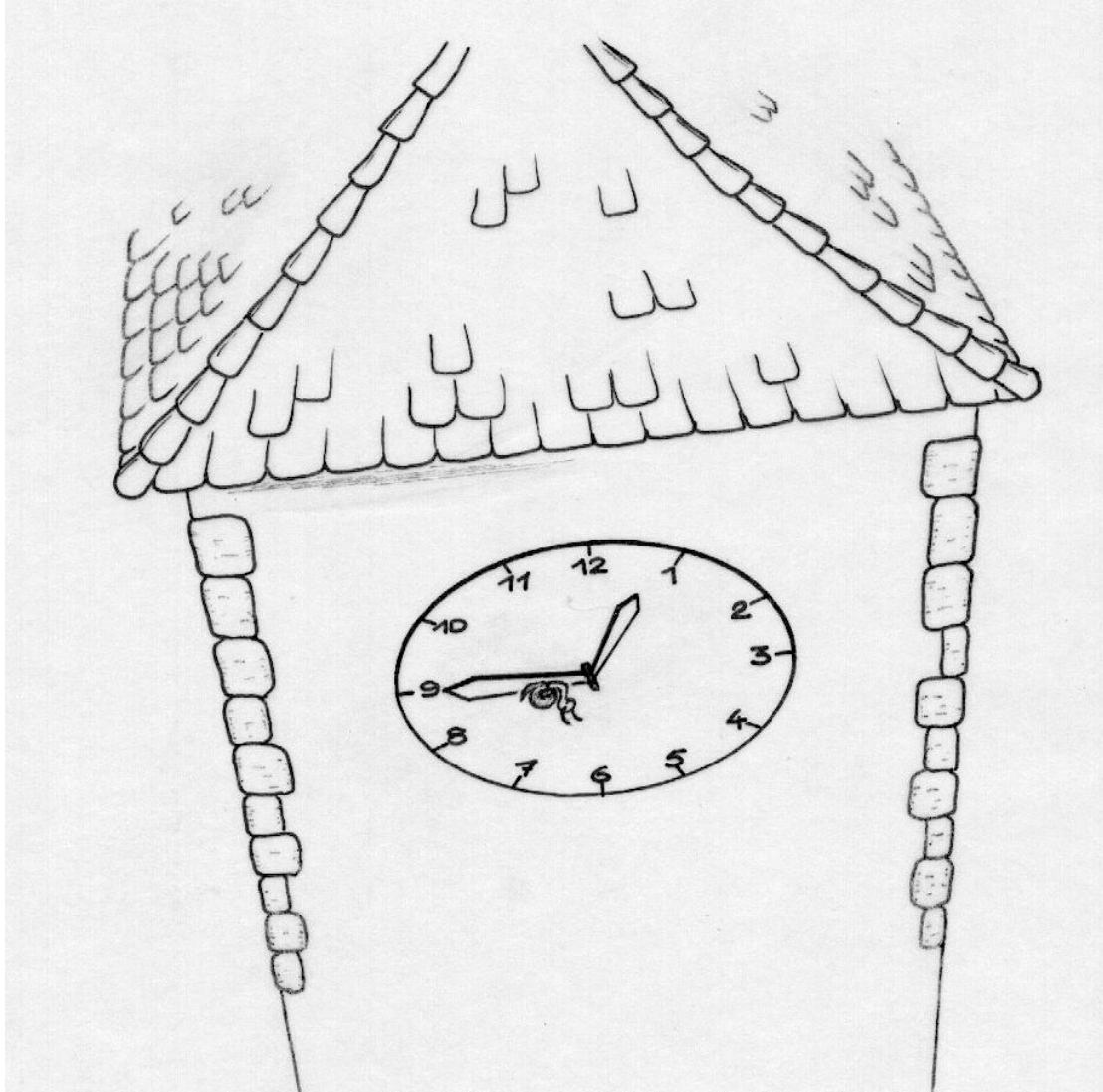


Copy the front and back of the large sheet and on it show the 27 numbers that are still missing so that the pages of the book are numbered in order 1 to 32.

Question 7 Snail's pace

7 marks

A snail crawls carefully at a constant speed along the big hand of the town hall clock. Starting out from the end of the hand it takes an hour to travel the length of the hand and reach the centre of the clock. The hand is 90 cm long.



Draw the face of the clock to a scale of 1:10 and sketch on it the path traced out by the snail.



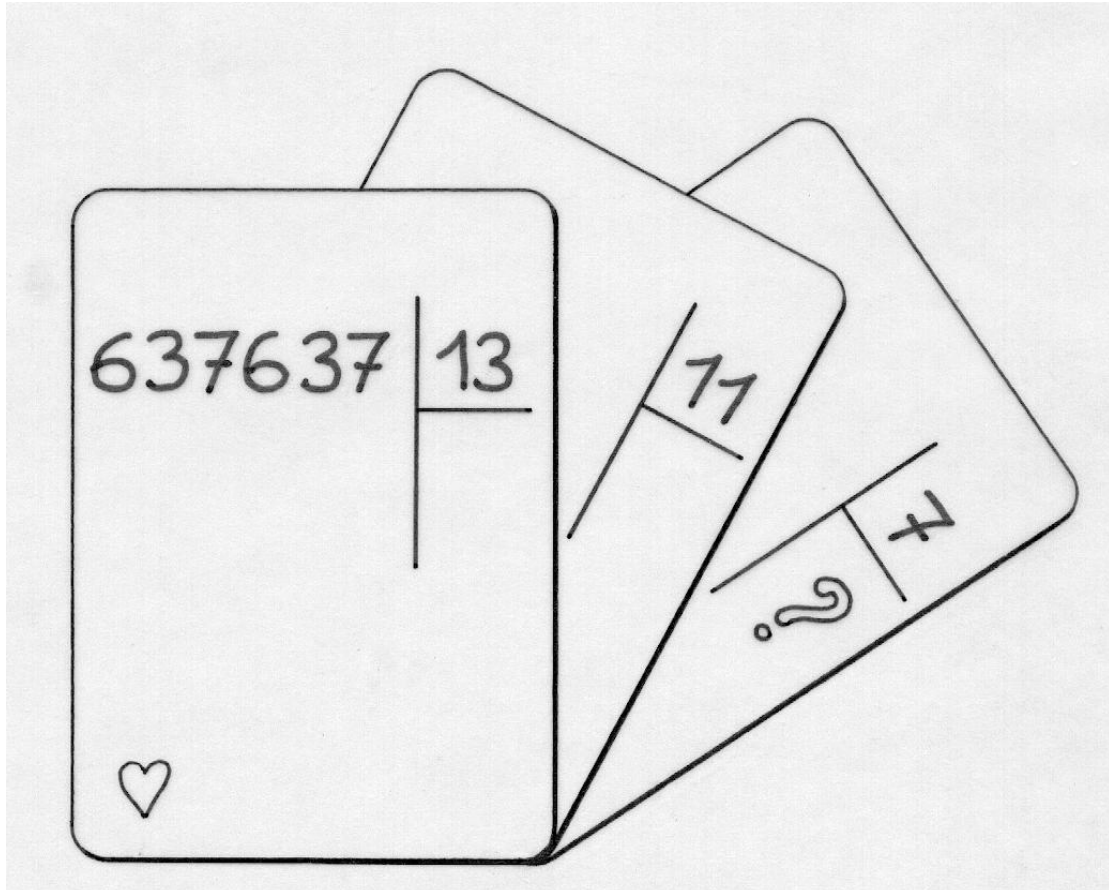
Question 8 Back to basics

5 marks

Take a three digit number.

Make the six digit number  $N$  by writing your three digit number twice. For example for 637,  $N$  is 637637.

Divide  $N$  by 13, divide the quotient that gives you by 11, and then divide the new quotient by 7.

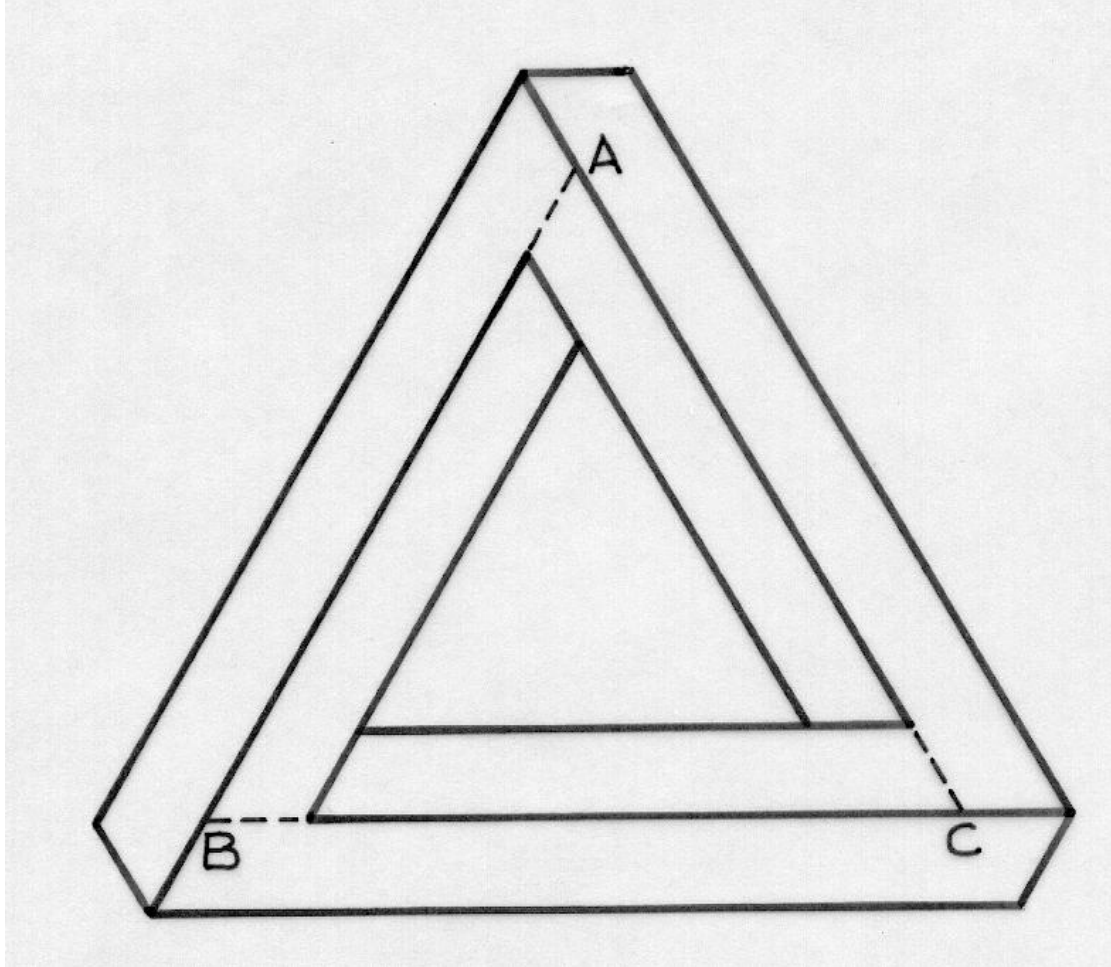


Try this a few times. What do you notice? Justify your conjecture.

Question 8 Penrose

7 marks

The diagram shows a Penrose triangle which is based on the equilateral triangle ABC.



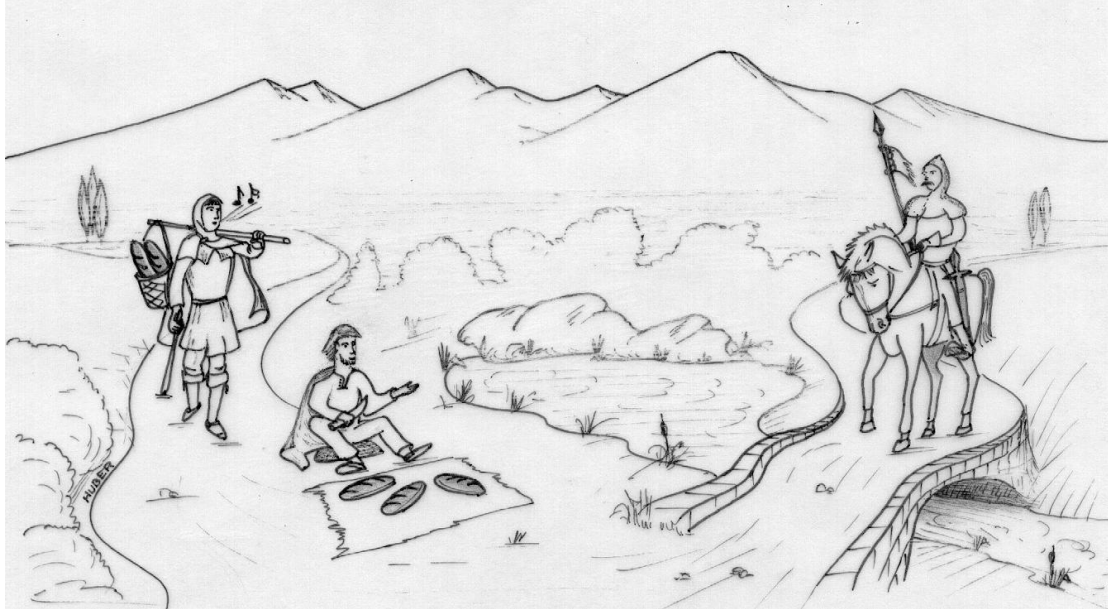
On your answer sheet draw a Penrose square by basing it on a square of side 8 cm.

Question 10

Wise words

10 marks

Once upon a time there were two men. One had three loaves of bread, the other two. Arriving at a spring of fresh water they sat down to eat. A soldier was passing by and they invited him to share their meal. Sitting and eating together each had an equal share of the loaves.



When the bread was finished the soldier left leaving five coins as the price of his meal. From the money the first man took three coins because he had brought three loaves. The other took the two coins which were left as the price of his two loaves.

Was the sharing of the money fair? If you think it wasn't make a suggestion for a better way of sharing. Justify your answer.

(This question was first posed by Leonardo of Pisa better known as Fibonacci)

Question 11

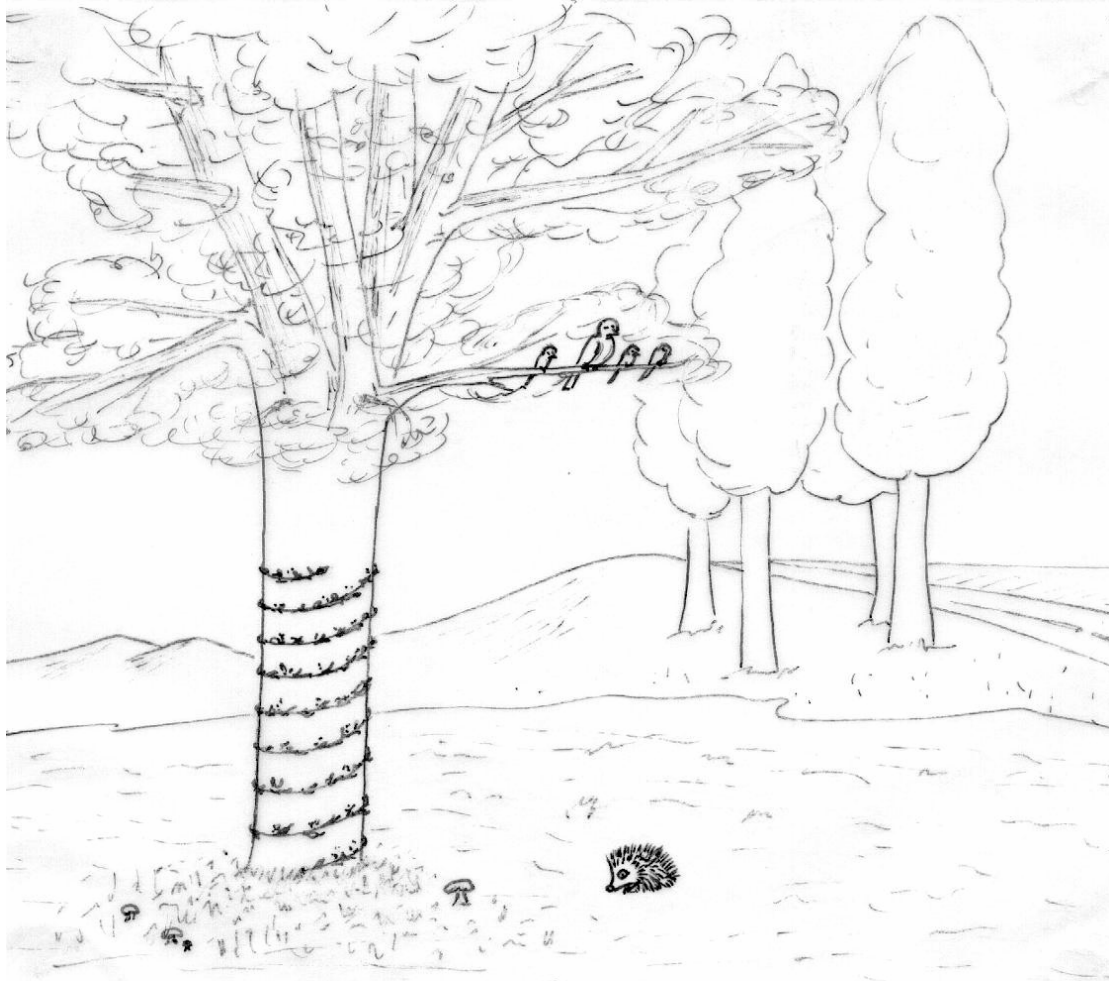
The Honeysuckle

5 marks

Senior classes only

The honeysuckle is a tree-climbing plant with sweet-smelling flowers belonging to the caprifoliacea family.

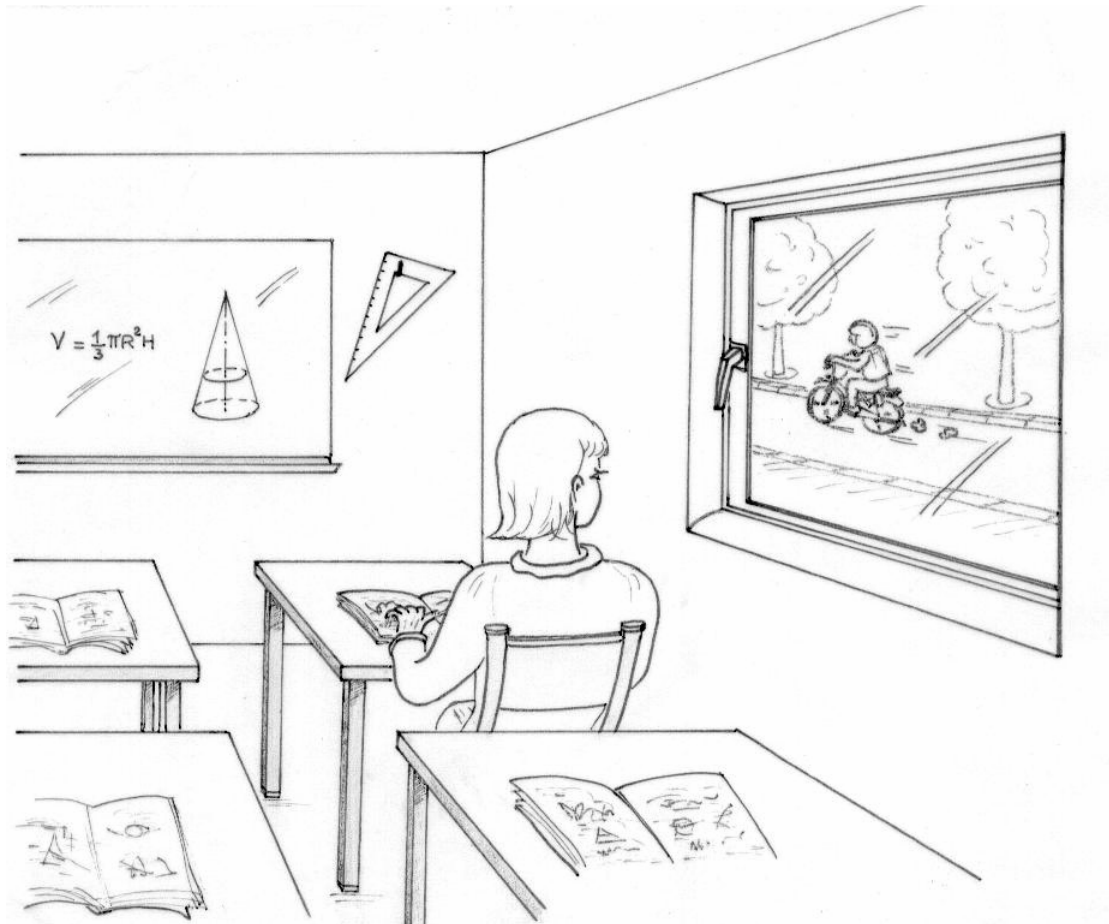
This honeysuckle is wrapped round a cylindrical trunk 40 cm in diameter. It goes round eight times in a regular helix and reaches a height of 12 metres.



Calculate the length of the plant.

Question 12 Daydream 7 marks  
Senior classes only

Classes were over. Looking out the window, Zazie saw her friend Prosper passing on his scooter. Two seconds and he was gone. What speed was he going at, she asked herself.

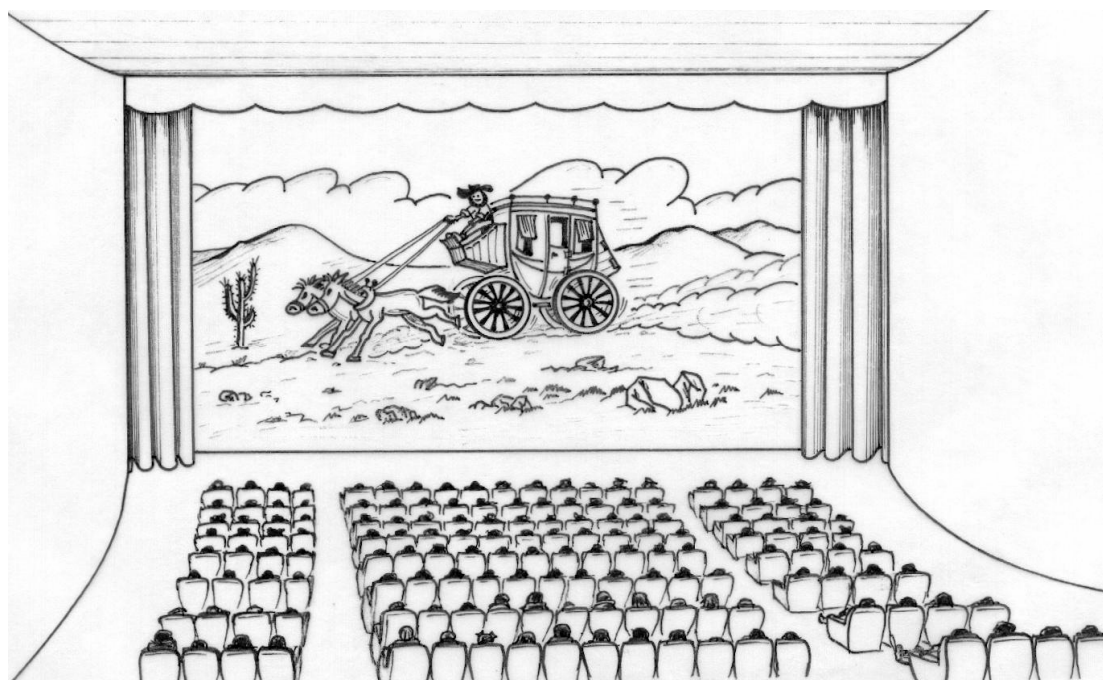


Help Zazie out, given that she is sitting 1 m from the window, that the window is 1 m wide, and that the road beside the school is 25 m from the wall.

Question 13 Cinema 10 marks

Senior classes only

At the cinema we frequently see a coach managing to escape from the Indians even though its wheels seem to go backwards or even seem to stand still. This phenomenon happens because the film is made up of single frames projected in rapid succession onto the screen.



If between two images a wheel advances by an angle that is just enough so that a spoke of the wheel takes the place of its predecessor, the succeeding frames show the spokes always in the same position and the wheel seems not to be turning.

In this example what is the speed of the coach? The wheels have diameter 1.20 m and have 12 spokes. The film is projected at a frequency of 24 frames per second. Show all your calculation and give your answer in km/h.