



2016

Spring 2016

Even partial solutions and attempts can gain marks.

Neat and careful work is important.

Hand in only one team answer sheet for each question.

Question 1 Chocologique

7 MARKS

Give your answer in French, German, Spanish or Italian using a minimum of 30 words.

Anatole, Benjamin et Chloé rentrent d'une sortie de ski. Leur maman leur demande :
« Est-ce que tout le monde veut un chocolat chaud ? ».
Anatole répond « Je ne sais pas ».
Benjamin, à son tour, répond : « Je ne sais pas ».
Chloé a écouté ses frères et répond « Oui ! »
La maman sert chacun.

Expliquer chaque réponse.

Anatol, Benjamin und Chloé kommen vom Skifahren nach Hause. Ihre Mutter fragt sie:
„Wollt ihr alle eine heiße Schokolade?“
Anatol antwortet: „Ich weiß nicht.“
Benjamin antwortet: „Ich weiß nicht.“
Chloé hat die Antworten ihrer Brüder gehört und antwortet: „Ja.“
Die Mutter schenkt daraufhin jedem heiße Schokolade aus.

Erklärt jede der drei Antworten

Anatole, Benjamin y Chloé vuelven de un día de esquí. Su madre les pregunta :
« ¿Todos quereis chocolate caliente ? ».
Anatole contesta « No lo sé ».
Benjamin, tras él, contesta : « No lo sé ».
Chloé , después de escuchar a sus hermanos, contesta « ¡Sí ! »
La madre les sirve a todos.

Explica cada respuesta.

Question 1

Feuilles volantes

7 MARKS

Dopo una uscita sugli sci Anatole, Benjamin e Chloé rientrano a casa. La mamma chiede loro: "Volete tutti una cioccolata calda?".

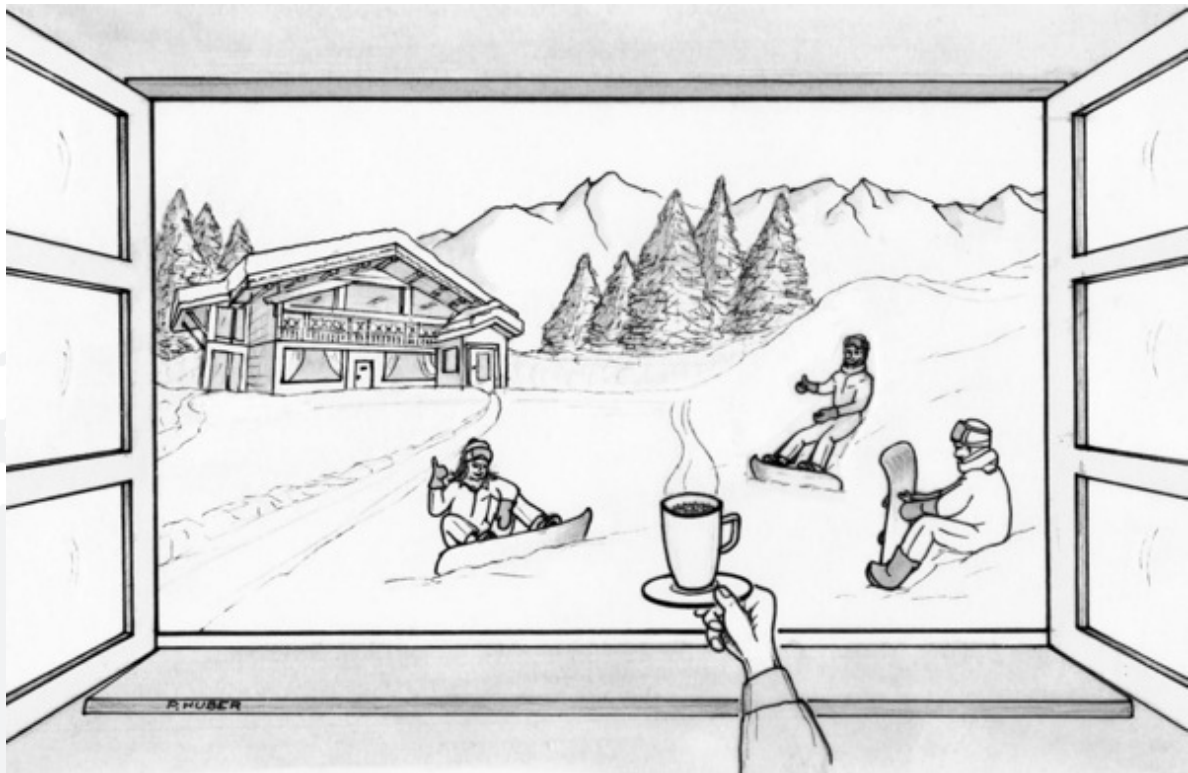
Anatole risponde "non lo so".

Benjamin a sua volta risponde "non lo so".

Chloé ha ascoltato i suoi fratelli e risponde "sì!".

La mamma dà la cioccolata ad ognuno.

Motivate ogni risposta.

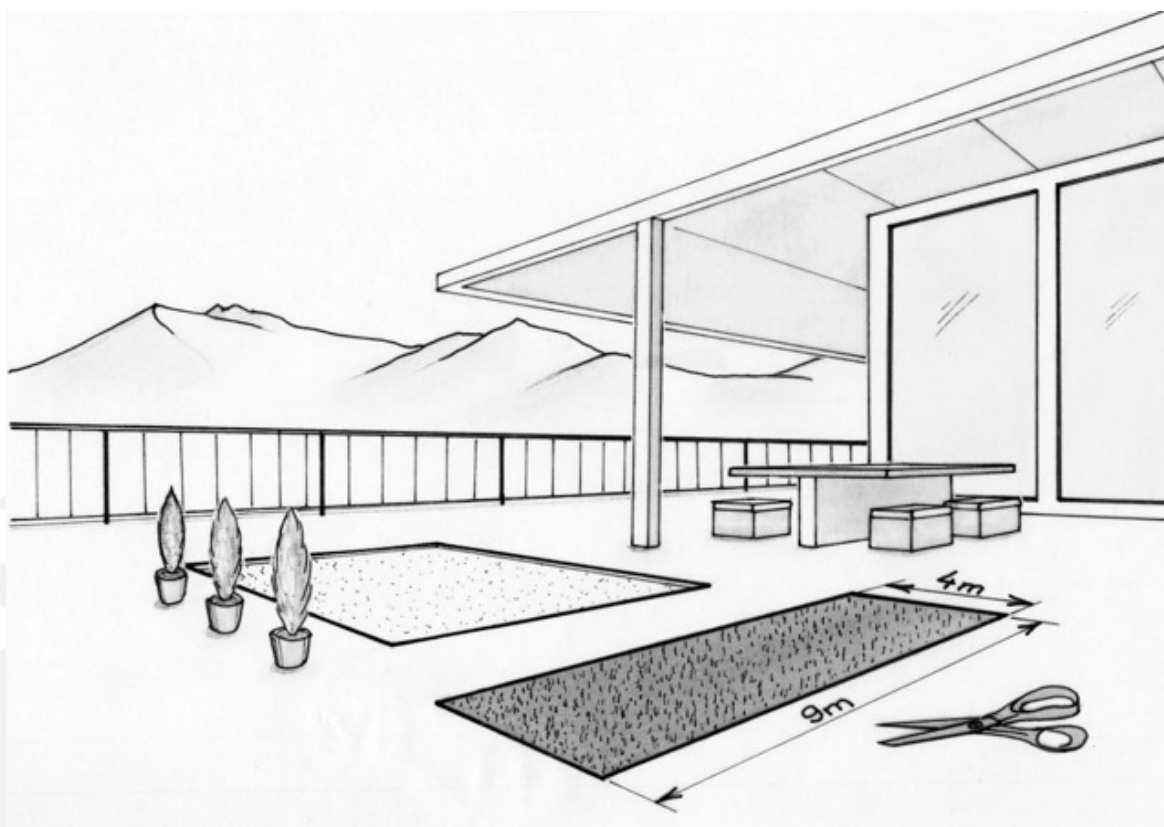


Question 2 Square dance

5 MARKS

Floriane has bought a rectangular strip of artificial turf measuring 9 m by 4 m. She wants to make it into a square using the smallest number of pieces possible and without throwing anything away.

Draw a diagram to show how Floriane can do this.



Question 3

Result !

7 MARKS

A sports organiser has arranged a football tournament for 3 campsites. Each campsite has put in a team.

Each team has played once against the other teams.

The table shows some of the results so far but it is not completely filled in.

Team	Number of games won	Number of games drawn	Number of games lost	Number of goals scored	Number of goals conceded
<i>Les Flots Bleus</i>			1	3	2
<i>L'Étoile de Mer</i>		1	1	0	
<i>La Sapinière</i>					1

Draw the table on your answer sheet and fill it in

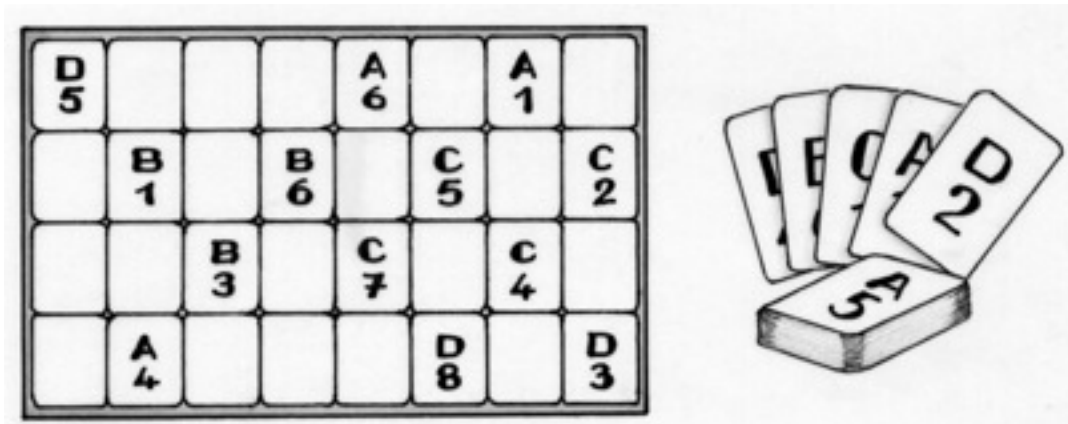


Question 4 Side by side

5 MARKS

Sylvie is playing cards. She has a pack of 32 cards, all different and all with a whole number between 1 and 8 and one of the letters A, B, C or D written on them.

In this game two cards which have touching sides must have either the same number or the same letter on them.



Sylvie has already put 13 cards down on the table.

On your answer sheet copy the grid and complete it correctly keeping to the rule.



Question 5

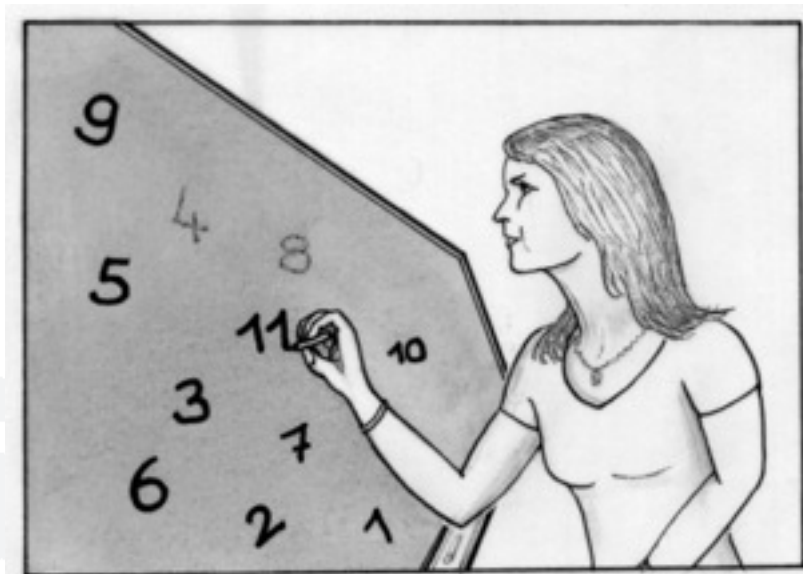
And then there was one

7 MARKS

Here is a mathematical process or algorithm:

- Pick a whole number $N \geq 2$.
- Write down all the whole numbers from 1 to N .
- Eliminate any two numbers of your choice, replacing them by their total less 1.
- Keep doing this till there is only one number left.
- Display the result.

**Can you forecast the result when the number N is 10? Explain your answer.
What would the result be if the number N was 100?**



Question 6

Ae fond kiss

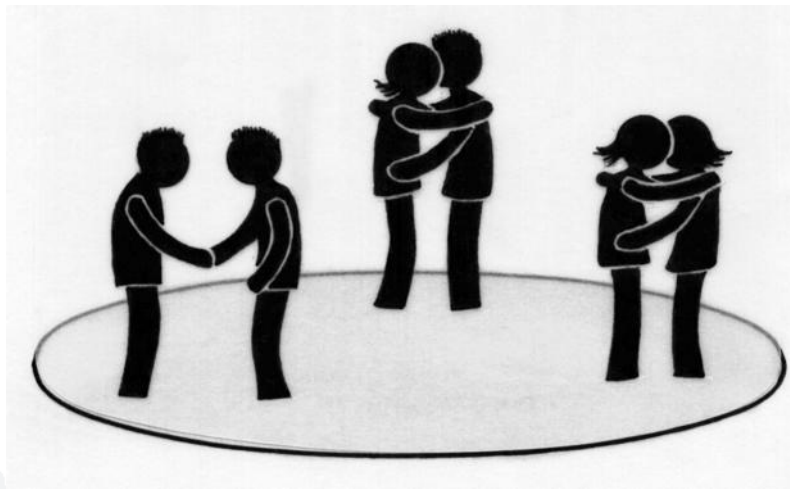
5 MARKS

24 pupils and 3 teachers have just come back from a school trip.

Before saying goodbye the girls all kiss each other; the girls also kiss the boys; the boys shake hands with each other. The teachers keep to the same rules as the pupils amongst each other. But of course each pupil, boys and girls, shake hands with their teachers.

All together there were 118 handshakes.

Find the number of girls and women teachers on the trip. Explain your answer.



Question 7

Behind the curve

7 MARKS

Two straight lines d and d' meet at right angles at O . The line OA bisects the right angle between d and d' . $OA = 5$ cm.

Take any point B on the line d . The straight line AB cuts the line d' at C . Mark the point M , the mid-point of BC .

**As the point B moves along the line d , the point M traces out a curve.
Draw this curve.**



Question 8 Kirigami

5 MARKS

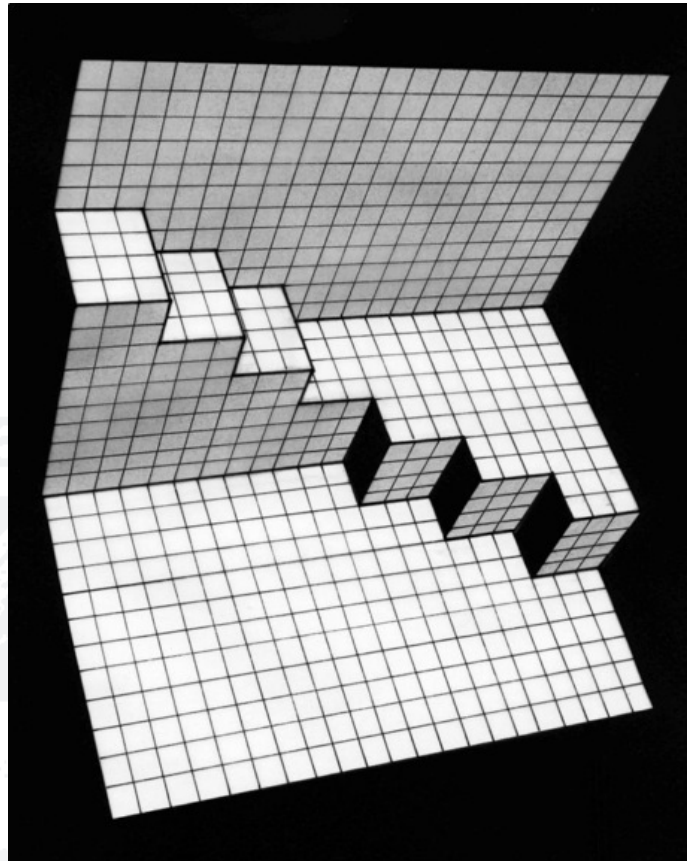
In Japan kirigami is the art of cutting and folding paper so that three dimensional objects appear when the paper is folded.

This kirigami model shows two staircases that are linked in a strange way. It is created by making some cuts and then folding a single sheet of paper.

The staircase will appear when the paper is folded.

Make the correct cuts and folds to produce the model of the staircase. Use squared paper and keep to the same dimensions.

Stick your kirigami object onto the answer sheet.



Question 9

Pyramid

7 marks

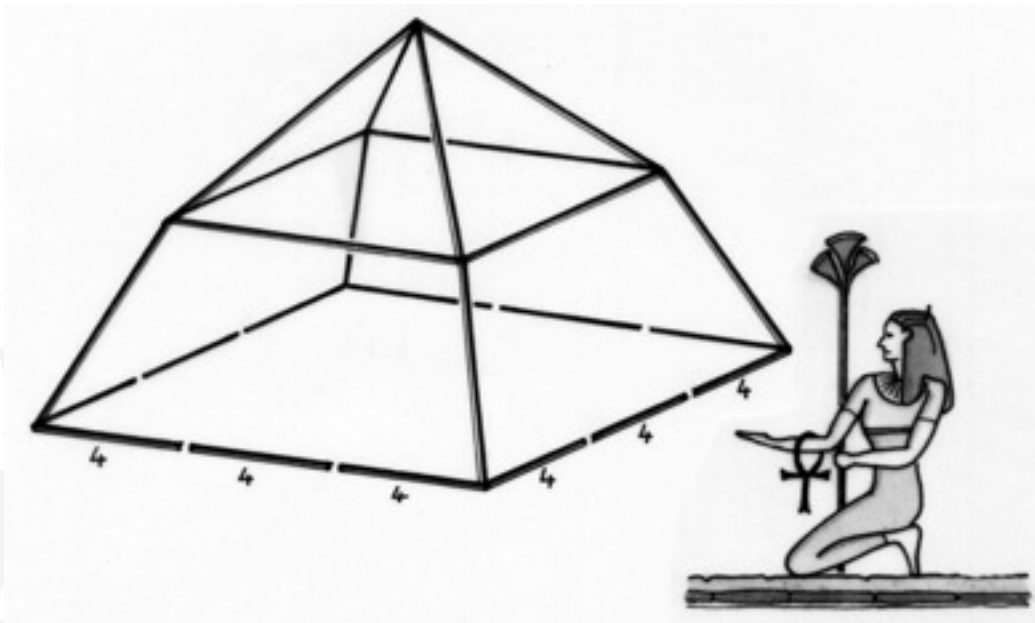
Hugo has a box full of rods of length 4 and 8 cm.

He makes the model shown here. He uses 4 cm rods for the square base and 8 cm rods for all the others.

His solid is not a pyramid because the sloping edges are not straight lines.

Using 4 more rods find at least one way of changing this shape into a proper pyramid. Justify your choice.

Calculate the height of one of your pyramids to the nearest mm.



Question 10

Hands up for the revolution

10 MARKS

During the French Revolution the new government wanted to introduce a decimal system for all units of measurement. Because of that successful decision we use metres and litres to this day. They brought in a decimal system for time too but that did not last long. The measures of time and all the clock faces had to be changed.

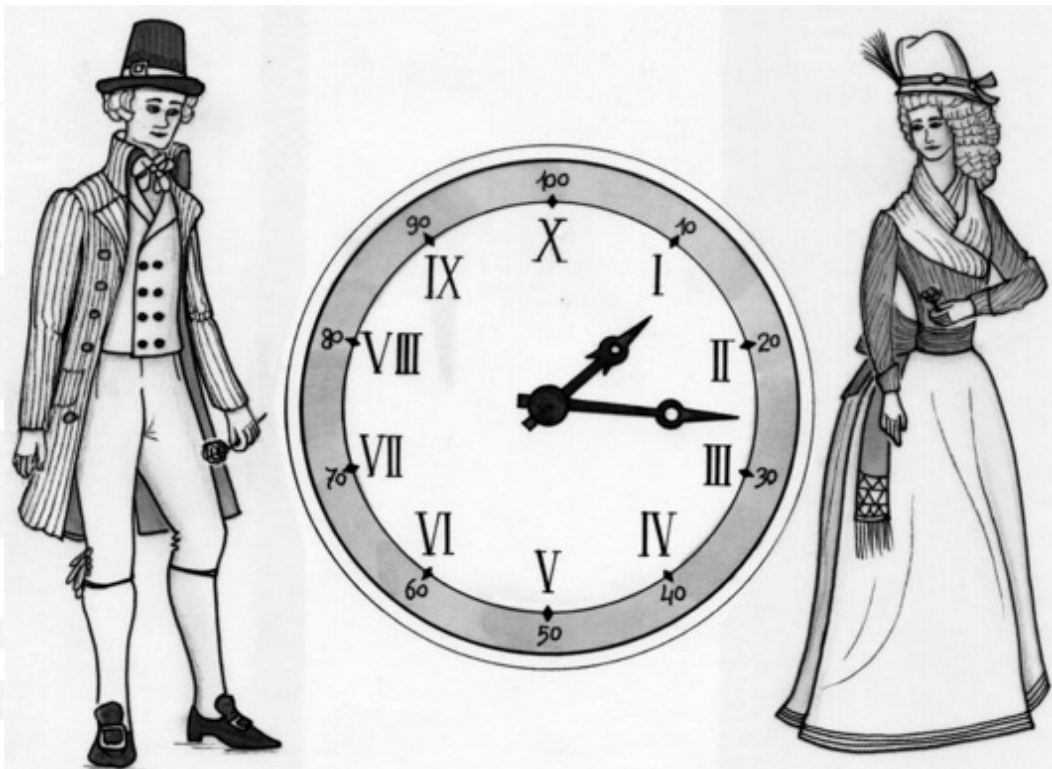
A day from midnight to midnight was divided into 10 hours decimal, with every hour having 100 decimal minutes. Each minute was divided into 100 decimal seconds. On a decimal clock the face showed the whole day.

So on a decimal clock the small hand for the hours made a complete revolution in 10 decimal hours. And the big hand for the minutes made a complete revolution in 1 decimal hour.

Draw the clock face for a decimal clock when it shows midday.

Draw another decimal clock face showing the equivalent time to 13.20 before the revolution (and nowadays too).

Explain your answers.



Question 11

Bits and pieces

5 MARKS

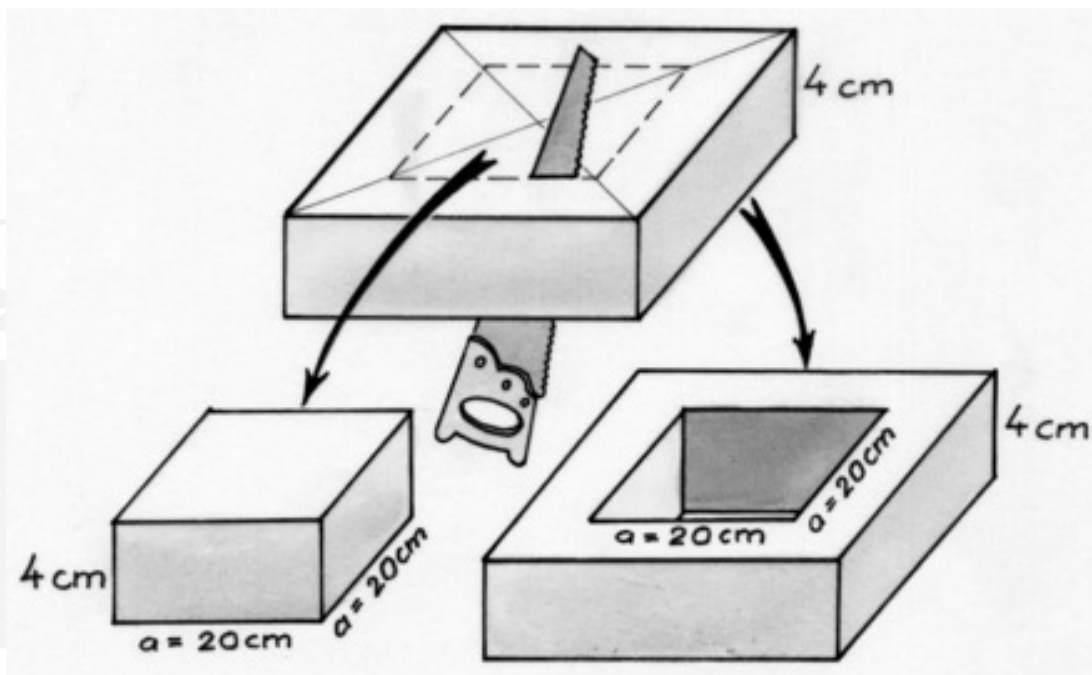
Senior classes only

Myriam has a piece of polystyrene 4 cm thick. The piece is a cuboid on a square base.

She cuts a cuboid with a square base of side 20cm from the polystyrene.

She says to Sofia. "Look I now have two solids. The volume of one is smaller than the volume of the other. If I had cut out a cuboid with a square base of side 19cm it would have been the other way round."

For what values, in whole numbers and in cm, of the side of the square base is Myriam's statement true. Justify your answer.



Question 12

It's all the same to me

7 MARKS

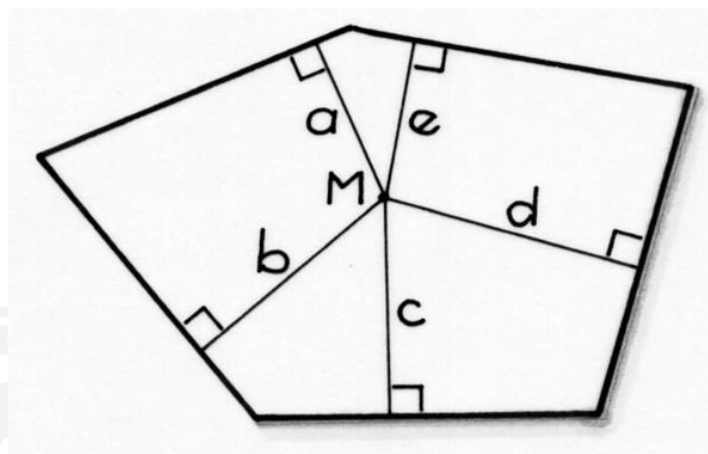
Senior classes only

Jean has used a geometry software program to construct a pentagon with five sides of the same length but with the interior angles all different.

He then placed a point M inside the pentagon and measured the distances of this point from each of the sides.

He moves the point M around the pentagon and claims that the sum of the five distances a , b , c , d and e will always be the same no matter where M is put.

Find a relationship between the area of the pentagon and the sum of the distances of the point M from each side of the pentagon. Show why Jean's claim is correct.



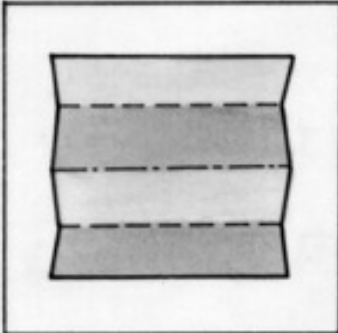


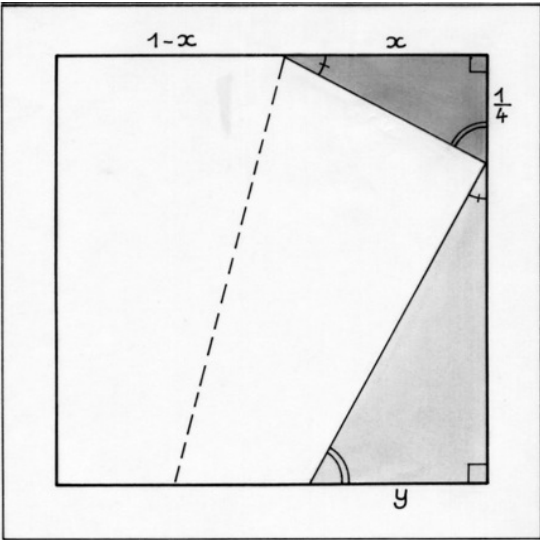
Question 13

The method unfolds

10 MARKS

Senior classes only

M. Kazuo Haga, the master of origami has found an ingenious method for dividing the sides of a square piece of paper into equal parts. The first steps of his method for finding $\frac{1}{5}$ of a side are set out here:

1. Fold your paper square into four equal parts (that's easy of course)	2. Bring the left hand corner over to the point at a quarter of the right side and fold	3. Colour the two triangles and then unfold
		
		

Cut out the two coloured triangles. Put them one of top of the other to show they are similar triangles. Stick that onto your answer sheet. Calculate x and then y .

What fold would finally show the $\frac{1}{5}$ of the side of the square?