Épreuve de D.N.L. Mathématiques – Anglais **session 2013**

Sujet 6

You have to talk for ten minutes about this subject. Which mathematical notion(s) do you recognise? The questions may help you, but it's not compulsory to answer all of them: you can simply explain a way to solve an exercise, even if you can't find the solution

Knitting

Kate has just learnt knitting with her grandmother and is willing to knit her first scarf. The chosen model is four feet long, which is supposed to require approximately 245 rows. She realizes that the more she practices, the faster she knits. She starts by knitting 5 rows during the first day, and the number of rows she knits then goes up by 3 rows each day.

1) Show that during the fifth day, she has knitted 17 rows.

2) How long will it take her to finish her scarf ?

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Sujet 8

You have to talk for ten minutes about this subject. Which mathematical notion(s) do you recognise? The questions may help you, but it's not compulsory to answer all of them: you can simply explain a way to solve an exercise, even if you can't find the solution

Choose your job !

You are offered two different jobs:

Job A: Makes $20,000 the first year with annual raise of $1,500.
Job B: Makes $18,000 the first year with annual raise of 10%.

1) Salary : how much will you earn during the second year with job A? With job B?

2) Which of the two jobs will provide the higher salary during the fifth year of employment?

3) Which of the two jobs will be the more profitable after 10 years? How much more?

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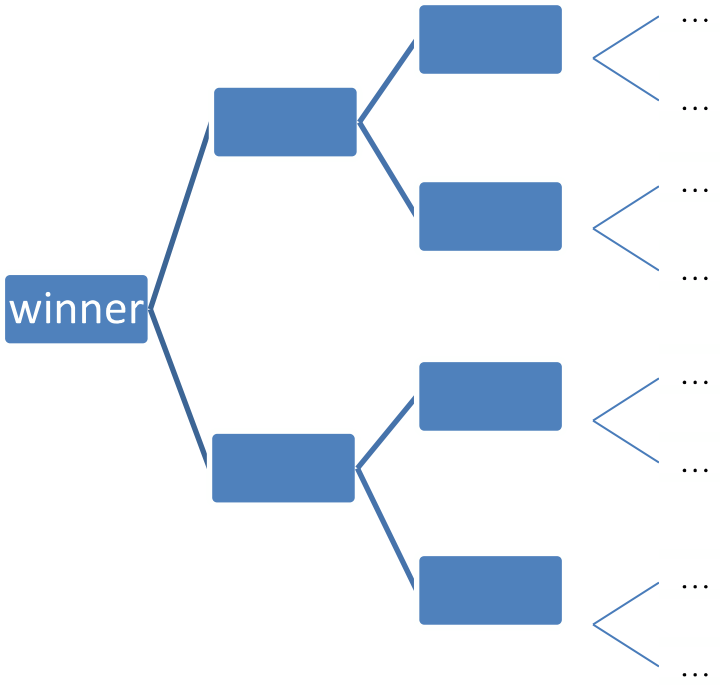
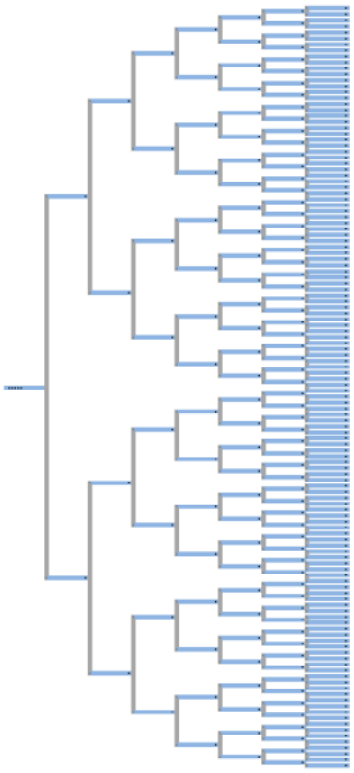
Sujet 10

You have to talk for ten minutes about this subject. Which mathematical notion(s) do you recognise? The questions may help you, but it's not compulsory to answer all of them: you can simply explain a way to solve an exercise, even if you can't find the solution

Wimbledon

« The Wimbledon Championships » is the oldest tennis tournament in the world.
The Ladies' singles draw is composed of seven successive rounds.





1) Which kind of sequence describes this situation ?
Give its characteristics.

2) How many Ladies' players are there at the beginning of the tournament ?

3) Each match requires 50 balls. How many balls will be used during the ladies' competition?

http://www.wimbledon.com/en_GB/index.html

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Sujet 11

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Yes we can...

Can Knockdown is a game in which you're supposed to hit cans with a ball.
The cans are stacked in a pyramid (see illustration).

A school wants to enter the Guinness World Records™ and thus wants to organize the biggest Can Knockdown game ever.

Introduction:

1) How many cans will they need if they want the pyramid to have 23 rows?

2) Each can except n°1 supports one or two other cans. For example, if the cans are numbered like in the illustration, can n°9 is under both can 5 and can 6. What are the two numbers that will be above can n°280?

Time to play...

After this performance, small pyramids of only 21 cans are installed.
A player has three balls to knock them all down.
He wins one penny for the first can, two pence for the second one, four for the third one, eight for the fourth one and so on.
What is the biggest amount of money he can get?

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Oscar

From 1996 to 2004, the ages of the comedians winning the Oscar for best actor were 45, 59, 45, 42, 35, 46, 28, 42, and 36.

1) Observe the five following charts concerning this data.
   For each chart, give a title, label the axes, and list some advantages and drawbacks over some of the others.

Chart 1

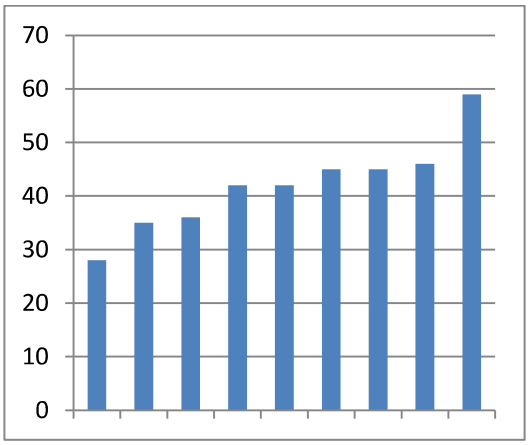


chart 2

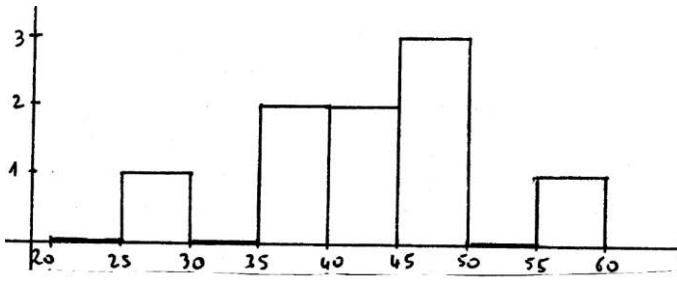


Chart 3

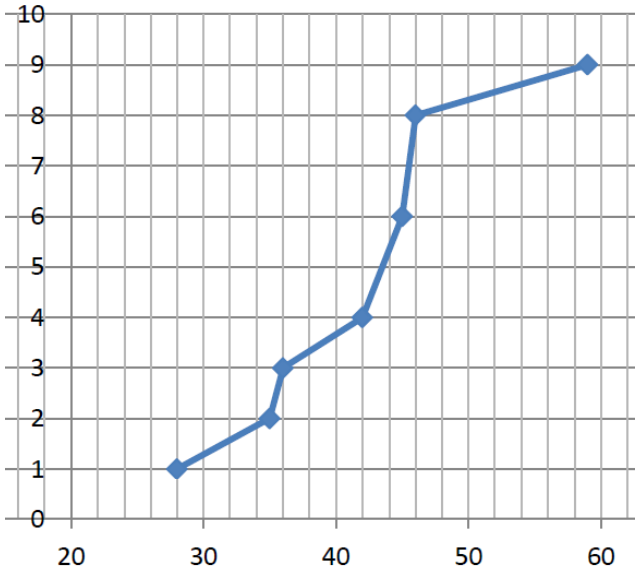
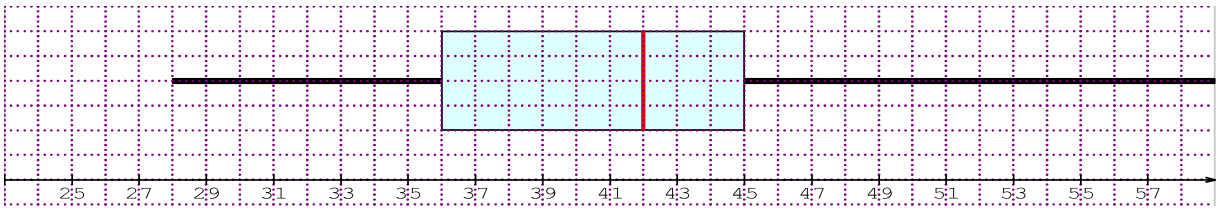


Chart 4

Males	
2	8
3	5 6
4	2 2 5 5 6
5	9

Chart 5



2) The ages of the actresses winning the same award for this same time period were:
   39, 33, 25, 24, 32, 32, 34, 27, and 30.
   Compare the two sets of data, and comment on the similarities and differences that can be observed.
3) Work out the mean ages of best actors and best actresses, and the standard deviations.

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Sujet 26

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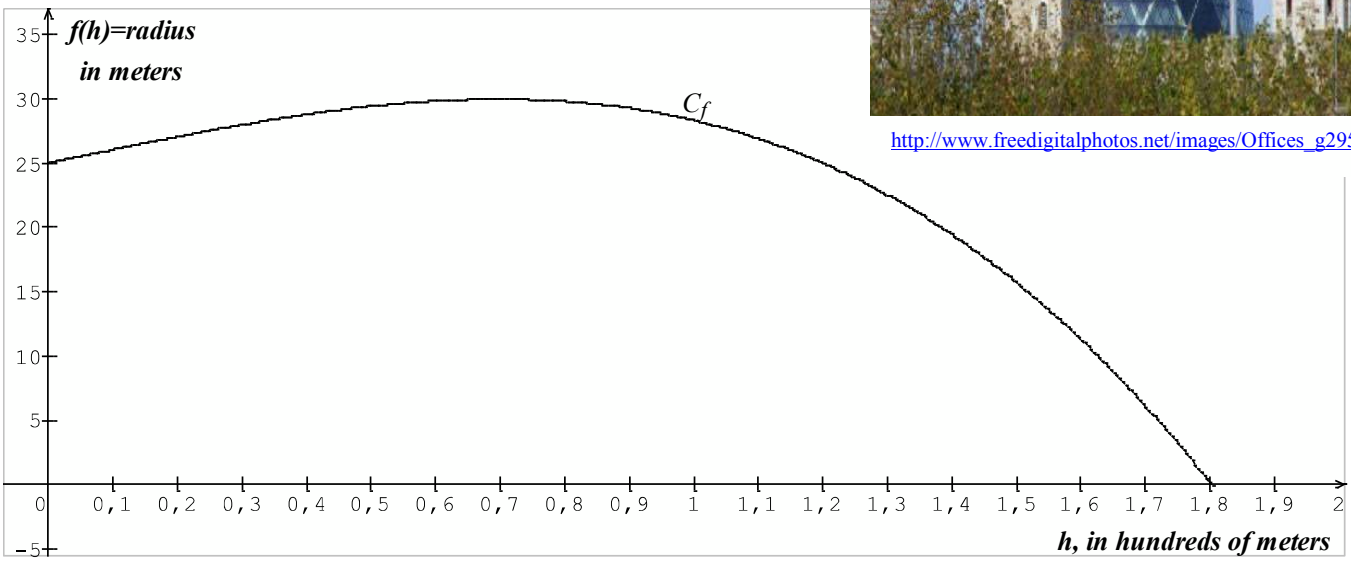
A visit to The Gherkin...

http://www.freedigitalphotos.net/images/Offices_g295.html

30 St Mary Axe (The Gherkin) is a skyscraper located in the City of London. It was opened to the public in 2004. All the floors have a circle
shape but the radius changes on each floor.

If *h* is the height in hundreds of meters, the radius of the circle (in meters) at this height is given by the function *f* drawn below.



1) How high is this building?

2) What is the area of the ground floor?

3) Actually, function *f* is defined by $f(h) = -8h^3 + h^2 + 10.3h + 25$.
At what height is the largest floor?

4) Knowing that there are 41 floors (regularly distributed), which floor is the largest?

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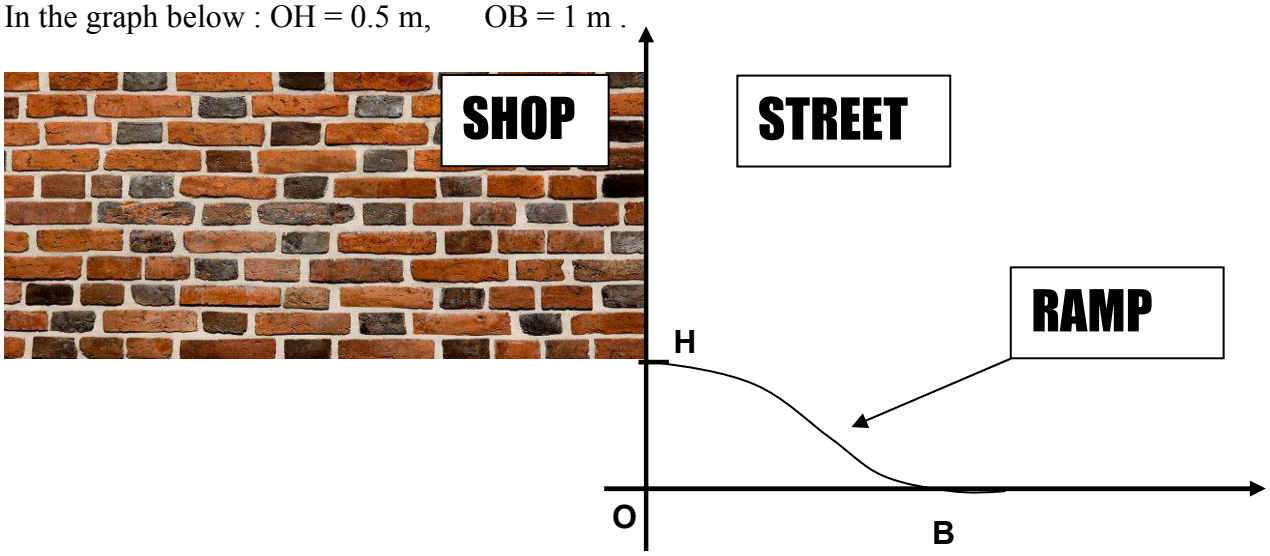
Sujet 28

You have to talk for ten minutes about this subject. Which mathematical notion(s) do you recognise? The questions may help you, but it's not compulsory to answer all of them: you can simply explain a way to solve an exercise, even if you can't find the solution

The owner of a shop is carrying out a few alterations in order to allow people in wheelchairs or parents pushing a pram to get more easily into the premises:

In the graph below : OH = 0.5 m, OB = 1 m .



The aim is to design a new ramp to replace the steps.

You are in charge of finding a function which graph will meet the two main requirements:

The tangent to the curve at point H must be horizontal (floor level inside the shop)

The tangent to the curve at point B must be horizontal (ground level outside)

You can choose between : $f(x) = x^3 - 1.5x^2 + 0.5$; $g(x) = \frac{-2}{15}x^2 - \frac{11}{30}x + 0.5$ and $h(x) = 2.1x^3 - 3.1x^2 + 1$

1) Which is the best choice ?

2) What is the area between the chosen curve and the ground, from the wall to the point of contact with the ground ?

3) You are planning to build the ramp with a soft material made of recycled tyres, much better than concrete, but quite expensive.
The width of the ramp will be 2m, and you want to order just the right amount of material.
What volume will you need ?

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Sujet 30

You have to talk for ten minutes about this subject. Which mathematical notion(s) do you recognise? The questions may help you, but it's not compulsory to answer all of them: you can simply explain a way to solve an exercise, even if you can't find the solution

The gardener

A gardener wants to build a flower bed in her garden.
She has 10 m of edging to construct a rectangular bed.

1) Find the maximum area of flower bed she can make with this edging.
2) If the gardener wants the area of the flower bed to be 4 m² what should the length be?
3) Find several ways to check your answers.

http://www.fotocommunity.fr/pc/pc/display/28482734

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Sujet 34

You have to talk for ten minutes about this subject. Which mathematical notion(s) do you recognise? The questions may help you, but it's not compulsory to answer all of them: you can simply explain a way to solve an exercise, even if you can't find the solution

Boys and girls

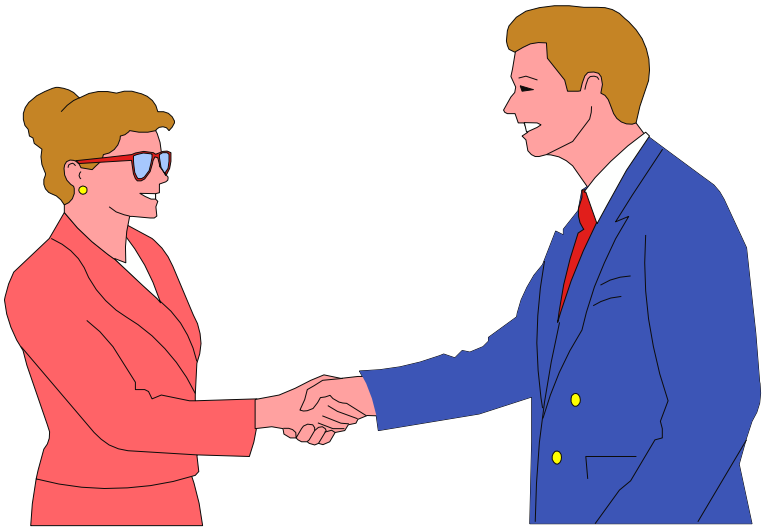
"Girls around the world are not worse at maths than boys, even though boys are more confident in their maths abilities" (From *Science Daily*, Jan, 6, 2010). In 2010, a survey was carried out by the US National Science Foundation (NSF) among graduate students. 556,532 of them study in a science university, 43% of whom are girls. 4% of the students studying in a science university have chosen maths, 35% of whom are girls. To prevent gender discrimination, one student is selected randomly to represent the whole community of students in this university.

Work out the probability of

1) The student being a boy.

2) The student studying maths knowing that he's a boy.

3) The student being a girl knowing that she doesn't study maths.



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Sujet 38

You have to talk for ten minutes about this subject. Which mathematical notion(s) do you recognise? The questions may help you, but it's not compulsory to answer all of them: you can simply explain a way to solve an exercise, even if you can't find the solution

Bus or car ?

To go to work several employees drive or go by bus. If they drive they have half a chance of being late, if they go on the bus only a quarter of a chance to be late. If they are on time one day they will take the same means of transportation the following day, if they are late they switch. 1/3 is the probability that an employee drives to work on day 1.

1) What is the probability that he will be late on day 1?

2) What is the probability that he drives on day 1, given that he is not late?

3) What is the probability that he drives on day 2?