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

Pour les candidats de la voie générale inscrits en spécialité Mathématiques
ou en Mathématiques complémentaires

Giants in Liverpool

The Royal de Luxe giant street puppets came back to the city of Liverpool in October 2018 for a farewell performance. 1.3 million people travelled to the area to enjoy the show.

From The Echo
https://i2prod.liverpoolecho.co.uk

From the BBC
https://ichef.bbci.co.uk/images/ic/720x405/p06n2wrf.jpg

Let's pick one of the visitors at random. The routes of these puppets were carefully studied because the French manager Jean-Luc Courcoult wanted these two following events to be independent:

event B: « the random visitor meets the Big Giant in the streets on Saturday »;
event L: « the random visitor meets the Little Boy Giant in the streets on Saturday ».

Since the Big Giant is really huge, the probability for the random visitor to meet him in the streets was 80 %. It was also claimed that the probability to meet none of the Giants in the streets that Saturday was only 6%.

1) Sketch the situation.
2) Check that the probability for the visitor to meet both Giants that Saturday was greater than a half.
3) A visitor missed the Little Boy Giant. What is the probability that he or she didn't see the Big Giant either ?

The icing on the cake was the arrival on Sunday of the Little Girl Giant. People talked on the social networks. Because nobody wanted to miss such a performance it was said that:

– the probability for the random visitor to meet the Little Girl Giant on Sunday given that he or she had met none of the Giants on Saturday was extremely high: 95%.

– the probability for the random visitor to meet the Little Girl Giant on Sunday given that he or she had met at least one of the Giants on Saturday was 80%.

From The Echo
https://i2prod.liverpoolecho.co.uk

4) Is it true that any visitor was certain to have seen at least one famous Giant during the week-end ?

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Pour les candidats de la voie générale non spécialistes en Mathématiques et non inscrits en Mathématiques complémentaires, et pour les candidats de la voie technologique

Playing darts

Chris is in a pub with two friends Jon and Guy. They want to play darts.

His friend Jon challenges him saying:

"You're a better player than us Chris so, in order to enhance fairness, would you agree to play three games with Guy and I as alternate opponents? If you win two games in a row*, we'll buy you dinner, but if you lose, you'll pay fish and chips for everyone."

Chris responds: "Whom do I play first, you or Guy?"

"You may have your choice", answers Jon, his eyes twinkling.

Chris knows that Guy plays a stronger game than Jon.

In fact, his probability of success against Guy is equal to $\frac{3}{5}$ whereas his probability of winning against Jon is $\frac{4}{5}$.

1) Sketch the situation assuming that he first plays Jon, then Guy, then Jon again.

2) To maximize his chances of winning two games in a row, should he play Jon-Guy-Jon or Guy-Jon-Guy? Explain.

3) Would the result be any different if, instead of having to win two games in a row, Chris was declared the winner by winning two games (in a row or not)?

If you have time:
Is it true that Chris is more likely to win two games in a row if he plays twice against the strongest player? Don't you find this surprising?

*In a row : d'affilée

![ACADÉMIE DE NANTES]

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Pour tous les candidats

The rabbit invasion
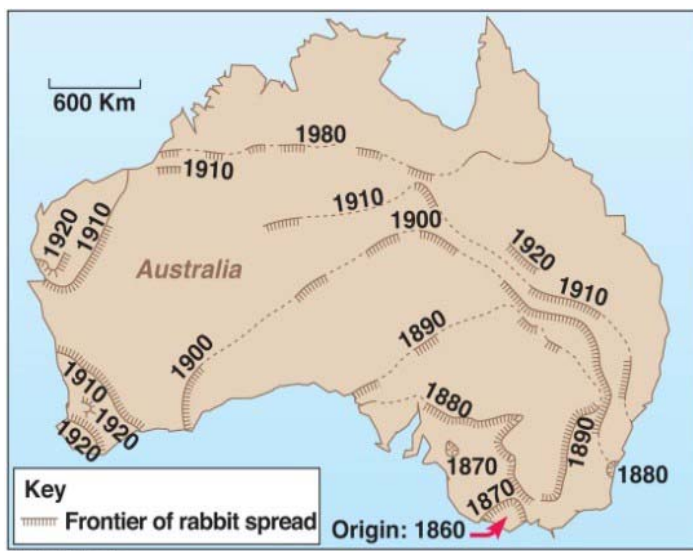
Domesticated European rabbits arrived in
Australia with the First Fleet in 1788. They
were introduced for food and wild rabbits
introduced for hunting.

Source:
http://australian-rabbit-invasion.weebly.co
m/the-inva sion.html

In 1860, 22 wild European rabbits were released in Victoria, Australia.
During the first years of spread*, the average monthly growth rate of the number of rabbits was 21%.

1) How could you model the number of rabbits in Australia from 1860 onwards?
2) Prove that the population of rabbits amounted to around 20,000,000 animals after 6 full years.
3) Currently, rabbits inhabit around 84% of
   Australia with an estimated population of over
   200 million.
   Since their introduction, the effect of rabbits on
   the ecology of Australia has been devastating.
   In 2000, after more than a century of control
   programs, rabbits cost Australian primary
   producers $113 million in lost production and
   control costs.
   We assume that the cost steadily increased
   each year by $ 3 million.

Erosion of a gully in South Australia caused
by rabbits
Source: https://en.wikipedia.org/wi
ki/Rabbits_in_Australia

   a) How much did the damage due to rabbits cost in 2016?
   b) Find an expression for the total amount of money lost over the period 2000-2016.
   c) Determine the year when the total amount of money lost exceeds $ 3,000,000,000.

Vocabulary: *spread: expansion

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Pour les candidats de la voie générale inscrits en spécialité Mathématiques
ou en Mathématiques complémentaires

The Thames Estuary

Near Tilbury, the depth of the Thames in the estuary is about 8 metres.

We admit that on a winter day in the Thames estuary the water temperature (in degrees Celsius) expressed according to the depth x (in metres) can be modelled by the following function:

$$f(x) = 6 - 5xe^{-2x+2}.$$

Source: Primaryhomeworkhelp.co.uk/riverthames /estuary.htm

1) Show that for any real $x \geq 0$,
   $f'(x) = 5(2x - 1)e^{-2x+2}$.

2) Study the variations of the function f over the interval $[0; 8]$ and check the depth at which the temperature is the lowest on the graph of f given below:

3)
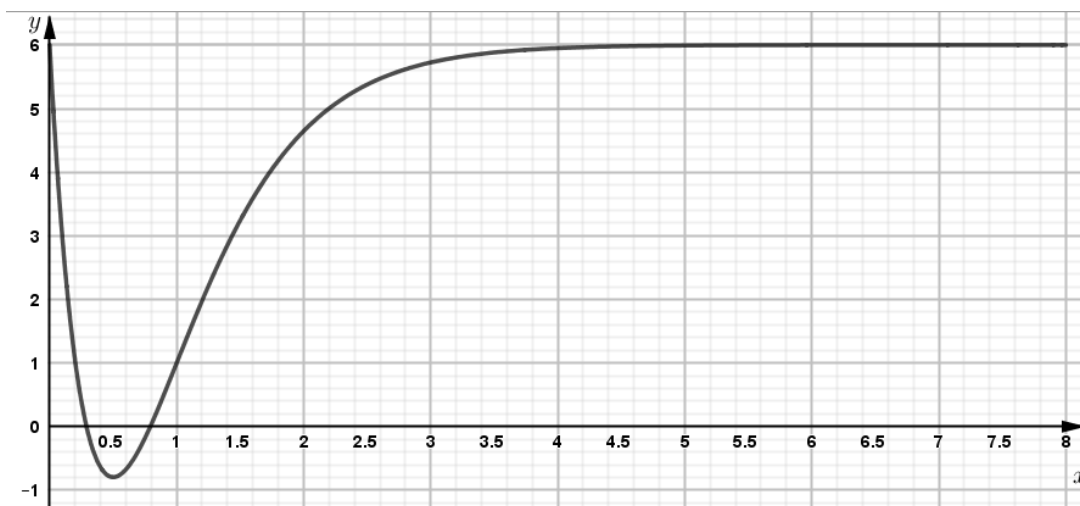
Thanks to the graph, determine for which depths the temperature is below 0°C. The values will be rounded up. Does it mean the water in the Thames will be frozen?

If you have time
« Between 1309 and 1814, the Thames froze at least 23 times and on five of these occasions the ice was thick enough to hold a fun fair. »
Source: BBC News Magazine
Do you think that such a thing could be repeated today?