

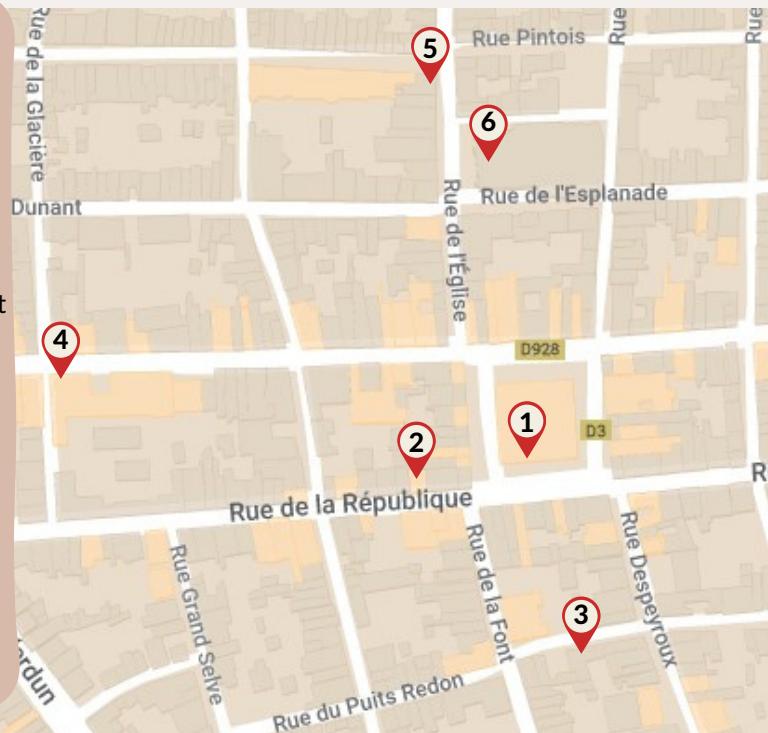
VISIT MATH



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# Itinerary

- 1 The halle
- 2 Jean I of Armagnac house
- 3 The resistance street
- 4 The chapel
- 5 Church street
- 6 ND de l'Assomption church



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# VisitMath Tour BEAUMONT- DE-LOMAGNE



Welcome, dear adventurers visitors, to the most charming ancient royal bastide of Tarn-et-Garonne.

Of course, I say that without any objectivity because I was born here and have walked up and down it. It's a geometric city!

But do you know where these terms that I use come from? From Mathematics! The passion of my life...

Come and discover Beaumont-de-Lomagne with me; there are plenty of things to find out with a mathematician's eye...

But before that, let me introduce myself: I am Pierre de Fermat, a famous mathematician of the 17th century.

I will be accompanied by my sidekicks, who are none other than the numbers! You would have understood it!



An emblematic character in the mathematical landscape, Pierre de Fermat is also in the hearts of Beaumont residents. At a very young age, he was promised a brilliant future thanks to his family lineage: his father was a rich local merchant, and his mother was from the nobility and the daughter of a magistrate.

Pierre continued his law studies and became a magistrate in the parliament of the city of Toulouse. But what thrills this man the most was mathematics!

And it may be that this geometric city awakened in him a taste for order and logic from a very young age. He participated with other scientists of the time in the adventure of science and contributed to numerous mathematical fields.

Are you ready? So let's go!



Be careful, dear adventurers; clues are present throughout this journey to decipher a secret code that will give you access to a treasure. So keep your eye open, but the right one, that of a mathematician!



## Step 1: The heart of the bastide

Let's begin our adventure in the city's heart, at the hall, on Place Gambetta.



Photo credit Wikipédia

Located in the heart of the town, the construction of this market hall was planned since the founding of the Bastide in 1278 but was only built in the 14th century. Its particularity is to be a square supported by 38 posts of different dimensions because it is located on a slope. As a focal point of the festivities, it is a real landmark for the people of Beaumont.



Note that the hall is located on a slope. Go to its lower part and look there.

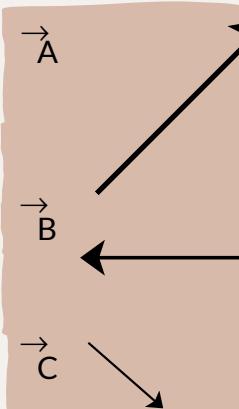
The diagram below represents the hall and its 38 posts. The starting point is located at the red hairpin.



By geometric interpretation or by adding the coordinates, find the location of the right post.

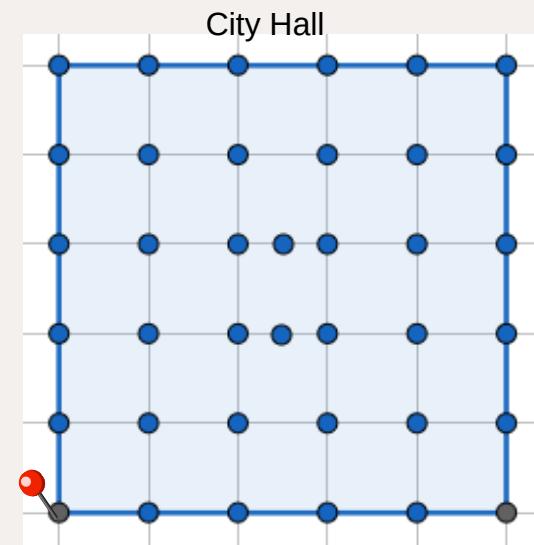
**Answer:**

- => Wheat (3)
- => Oats (6)
- => Beans (16)



Coordinates:

- A = (2,2)
- B = (-2,0)
- C = (1,-1)



Good start young mathematicians!



Now, let's head to the corner of Rue de la République and pass under the arcades. Take the opportunity to observe the architecture and the ceiling!

As soon as you see a muse there, stop and observe it carefully.



**What a captivating beauty! It's like I'm travelling in music.**

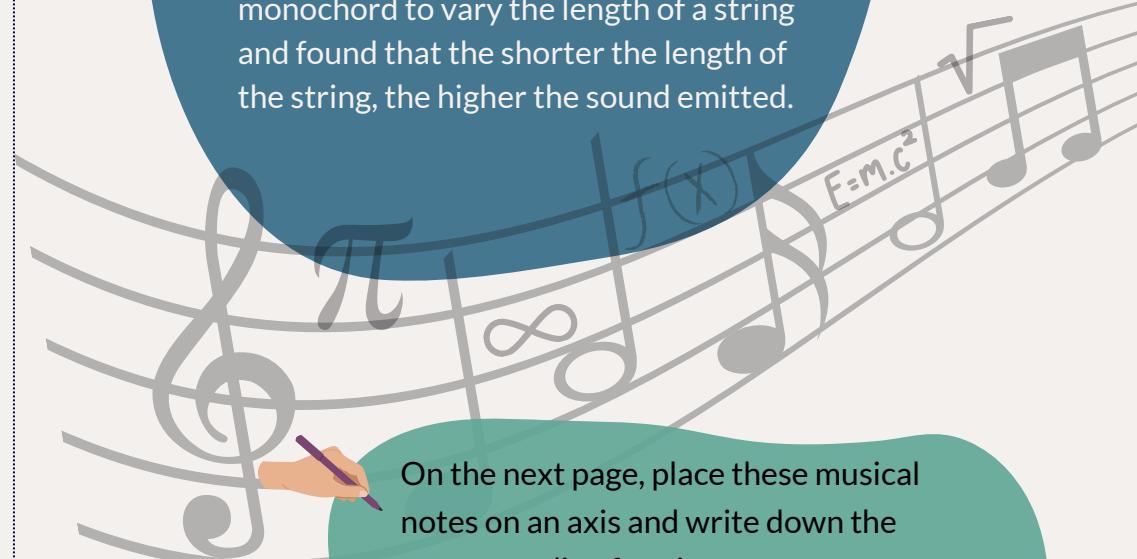


Photo credit Fermat Science

This fresco evokes the muse of music who holds a lyre.



Mathematics and music have many links. From the 6th century BC, the Pythagoreans were interested in the relationships between notes. They used a monochord to vary the length of a string and found that the shorter the length of the string, the higher the sound emitted.



On the next page, place these musical notes on an axis and write down the corresponding fraction:

- Acute G
- Acute AF

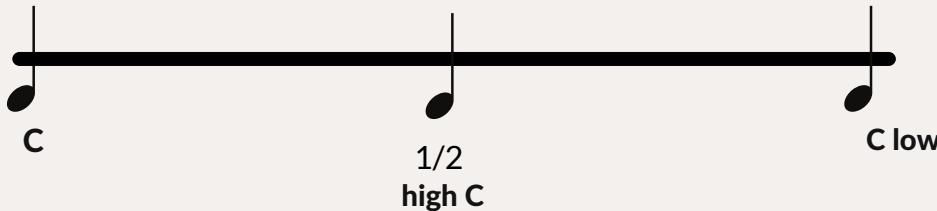
Hint :

If you place a bridge in the middle of the string, the sound emitted by plucking the half-string is identical to the sound emitted by the whole string, but it is higher (one octave higher) The octave corresponds to a ratio of 2 to 1.



Photo credit Fermat Science

Here is an example that shows the position of high C on the low C string. Its fraction is 1/2.



The other two fundamental consonants are the fifth (ratio of 3 to 2) and the fourth (ratio of 4 to 3)



**It's up to you to play this part!**



High G on low C string (fifth)



High F on low C string (fourth)



 **This little musical-mathematical parenthesis is very pleasant.** 

Let's continue going under the arcades and turn right onto Rue de la République up to number 4.

## Step 2 : At Jean I of Armagnac

Ha! Here is a typical residence of this bastide.  
The timber-framed house.  
It was built in the 14th century and belonged to the famous Jean d'Armagnac.



Photo credit Fermat Science



Can you decode the following message using the Caesar code that you will find on the next page?  
**WAYZL**

The first step is to find the decryption key...

**Answer =>**

**Hint:**

The key is equal to the number of Roman numerals "10" of identical size present on the facade.



**Well done! Beautiful agility of mind!**



The timber-framed houses bear witness to the architectural heritage of the Middle Ages. When the Bastide was built, each resident received a location to build their house.

It has immense attics intended for the storage of grains and goods, which testify to the wealth of its owners.

Food was brought into the attic using a pulley

## Step 3 : Horse help

Beaumont has many specificities, and I would like you to discover one located not far from there.

Let's retrace our steps and walk along the hall. Then, take Rue Despeyrous on the right.

We will turn right at the next intersection, Rue de la Résistance. A testimony to the history of France.



Even without being from the same period, Théodore Despeyrous is somehow linked to Pierre de Fermat. Born in Beaumont-de-Lomagne in 1815, he obtained a doctorate in science in Paris and later became a professor of mathematics and astronomy. He was responsible for recovering unpublished manuscripts by Pierre de Fermat in Vienna, Austria, and was a substitute in a probability course at the University of Paris.



Stop between No. 13 and No. 15 of Rue de la Résistance and take a good look at the top of the facade. There is a pulley. Do you see it?

Do you know what this pulley was used for?

At the time, horses were a means of transport but also a valuable aid for men in various jobs, particularly that of carrying the grains harvested during the harvest into the attics of houses.



Can you calculate the time it will take for a horse to hoist all the bags into the attic on the upper floor of the building?

Answer =>

Clues:

Each bag weighs 75 kg.

The average traction speed of the horse = 3 km/h.

Height to upper floor = 4 m.

The time between unhooking the bag, moving the horse back and anchoring the next bag = 6 seconds between each bag



Photo credit Fermat Science



I told you it's an undeniable time saver!



Let's continue to the end of the street and make a stop at the left corner of Rue du Puits Redon and Rue de la Font, more precisely at No. 39 at the Hôtel du Chevalier.

Here's another curiosity... But what an idea to put these enormous stones at the bottom of the wall!

What was their use?

This is a mounting or bridle stone is designed to help the rider mount the horse more easily.



Photo credit Fermat Science



QED, more math!



I love this city: there is math on every street corner!  
Where will I take you now...? Eureka!



Direction Rue Lomagne: straight on Rue du Puits Redon, then right at the first intersection, rue Lomagne. Then left rue Pierre Fermat.

I see you are on the right track to cracking the secret code.



## Step 4 : The Chapel

Let's continue our exploration by going up this rue Lomagne to the street that bears my name.

What a privilege to see that my memory is honoured in this way!

At the intersection of the two streets, turn left and walk to the chapel at number 15.

Besides, it needs a renovation.

I will see many beautiful facing bricks there.

And since we're here, let's take the opportunity to see this in more detail.



Considering the given parameters, can you calculate the total area that must be renovated?

Please note that several elements must be removed, such as windows for example.

Answer =>



No worries,  
step by step, it happens by itself!



Clues:

The length of the building is 32 m, and its height is 9.90 m.

Say :

The three large arch-shaped windows each measure  $3.31 \text{ m}^2$

The two average windows on the first floor each measure  $1.73 \text{ m}^2$

The average second-floor window is  $1.67 \text{ m}^2$

The four small windows at the top each measure  $0.78 \text{ m}^2$

The four ventilation squares measuring 70 cm high and wide are added to this.

As well as the ventilation rectangle at the bottom of the wall whose dimensions are: 1.30 m high and 1 m wide.

And, the small rectangle with wrought iron which measures 50 cm high and 60 cm wide.



This is a challenge well executed!



Congratulations!

Let's take rue Pierre Fermat on the sidewalk upstream, up to the intersection with rue de l'Église and take the latter to n°35.

### Step 5 : The lords of Argoumbat

Here, we are facing the residence of the lords of Argoumbat, a magnificent half-timbered house.

I see this as an excellent opportunity to test another math concept.



Look closely at the facade. Do you see, like me, an equation with several unknowns revealing itself? We're going to look at this more closely.



Photo credit Fermat Science

Let's name the window on the left "Z".

Let's count the number of Xs on the light background; there are 25.

Let's name the window on the right "Y".

We are at number 35, so let's say the result of the equation is equal to 35.

So let's imagine the following equation with three unknowns:  $25X + Y + Z = 35$

Try to find other equations, for example, between X and Y, then between X and Z.

Answer 1 =>

You now have a system of equations with three unknowns! Calculate X, Y and Z.

Answer 2 =>



I congratulate you; you have a mathematical eye!



### Step 6 : The Sirens of Beaumont

Now I really want to show you something strange. Go to the church square next to its "geometric" well.

You certainly know that church bells ring; that goes without saying! If you are a little curious, stand on the small step of the well and look over the roofs towards the market.

Do you see the siren? Hoisted on a roof and ready to emit the signal? Here is an example



They ring every day at a fixed time, sharp noon! Perhaps so that Beaumont residents don't forget to take a lunch break.





Do you know Marin Mersenne?

He is one of Pierre de Fermat's faithful friends. He published a work in 1636 entitled "Universal Harmony", where he laid the foundations which will make it possible to demonstrate that sound is a mechanical vibration which propagates in a medium in the form of longitudinal waves.



Photo credit Wikipedia



Sirens are considered audible over a long distance as long as the sound intensity level is > 70 decibels.

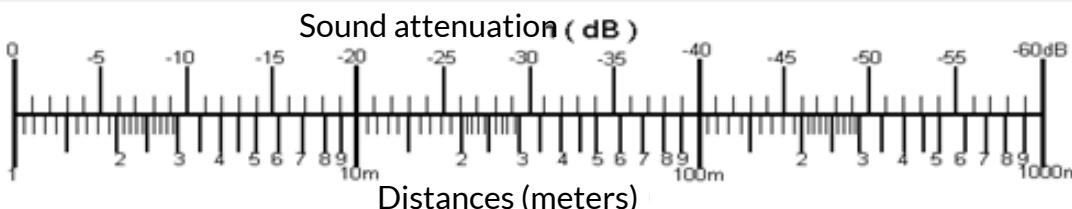
Here in Beaumont, sirens blare at 150 decibels.

How far can we still hear them?

Answer =>

Hint :

Use the calculation chart below.



I am amazed by your speed!



Let's go around our beautiful Notre Dame de l'Assomption church on the right, Rue de l'Esplanade, then go down Rue Vernhes to reach Place Gambetta in front of the market.

No, no, you are not dreaming; there is indeed a statue of me erected here.

This is such an honour to me!

After all, I was just an amateur\*...

Even if I have made appreciated contributions to the mathematics of my century and the centuries that followed.



Photo credit Wikipedia

Look closely at the statue's base and find part of the mathematical formula of Pierre de Fermat's Theorem.

$$X^n + Y^n \neq Z^n$$

"If n is greater than 2.



With what other well-known theorem can we make the connection?

Answer =>



Well done!



It is now time to move on to the final phase of this adventure.

The 4-digit secret code!

(\*the etymological definition of the word "amateur" means: one who loves).

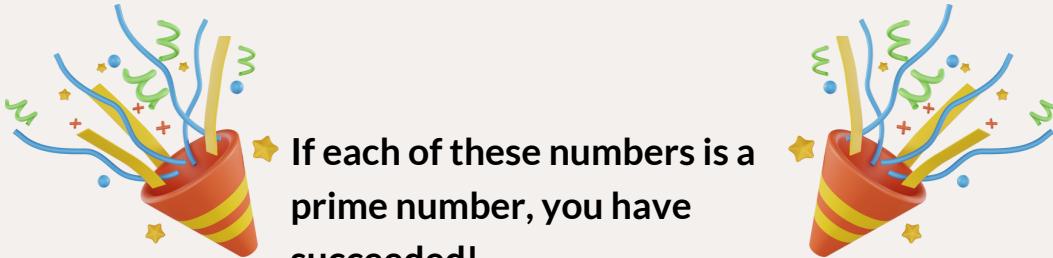


So, dear adventurers, have you completed all the challenges correctly to finally access the treasure?



Up to you!

- Collect the number found in the first step under the hall and write it down here:
- Now note here the number decoded using the Caesar code in step 2 reduced by the number from the first step:
- Find the century of the birth of Pierre de Fermat and note it here:



If each of these numbers is a prime number, you have succeeded!

Please meet at the museum that bears my name, 3 rue Pierre Fermat.  
Could you find the small gate?  
Open the padlock and finally discover the treasure!

