

# Photomath19

$$\frac{2}{\pi} \frac{r}{r}$$

1 - Si el título se lee horizontalmente se lee pizza, y verticalmente es la fórmula del perímetro del círculo, y la pizza tiene forma de círculo. Y como curiosidad, la foto ha sido sacada el 14.03 que es el día pi.



2 - This panorama taken of the Forêt de Soignes near Brussels, Belgium spans an amazing 360° around. A whopping 13 photos were needed to stitch together this panorama. More than 150 trees are able to be counted in this panorama!

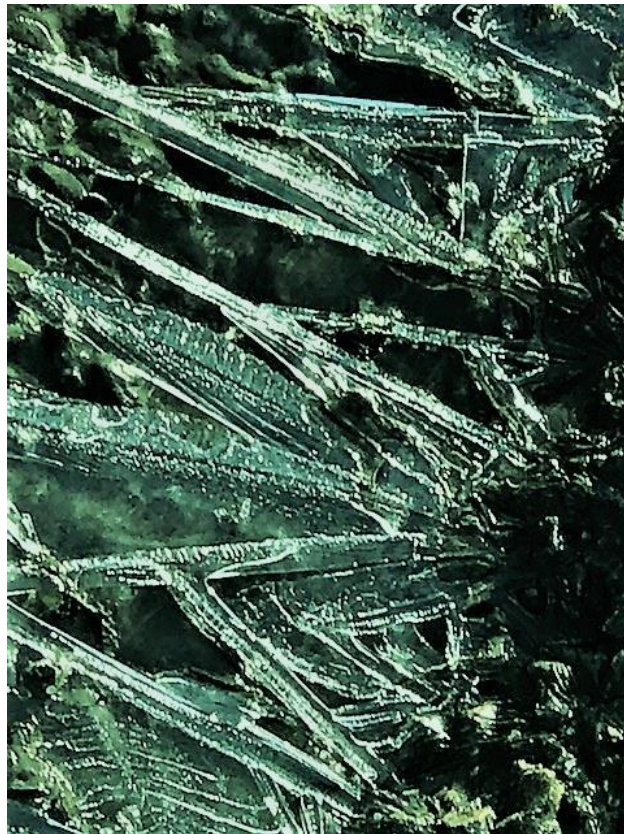


3 - This picture of the roof in the Liege train station resembles a net with its small squares but in fact it is just a roof. Not only the architecture of having to build this is mathematical but also the shape and form of the building. Every parallel line and

*perpendicular line form rectangles and squares. There are right angles, acute angles and obtuse angles all captured in one instance.*



*4 - I took this picture on the 15th February 2018. Me and my family were on a vacation trip in Antwerp (Belgium), which is known to be a very beautiful city with lots of different styles of architecture. This picture was taken in a big store depot. As you can see the main objective of this image is the golden decorated dome (cupola) with its huge circular lamps which perfectly fit into the shape of the dome. All in all, this image has a mathematic appearance due to its symmetrical and geometrical shapes.*



*5 - Maths has always been looked upon as the "logical, neat" side of our reality, but is it really? A structured mess of algorithms and equations, humanity's desperate attempt to understand the ever-so-complicated universe around us. Maths might seem incomprehensible at times, but it all goes back to nature. To the first person that looked down at a figure in the ground and decided to call it a triangle. Nature. Nature, which gives us fascinating, complex echoes of it everywhere we look... as long as we*

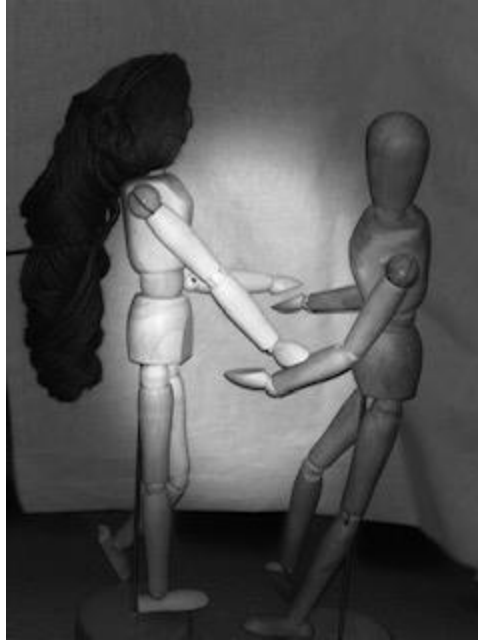
*take the time to zoom in. This photo is a magnified version of a common frozen puddle in the street, passed and ignored by many.*



*6 - Esta imagen tiene relación con la matemática simplemente porque aparecen(imaginarariamente) un semi-círculo y un rectángulo.*



*7 - In the summer of 2018, while travelling across the country by train, I managed to spot these two balloons. The smallest, one-person, basketless balloons have as little as 600 m<sup>3</sup> of envelope volume; while at the other end of the scale, balloons used by sightseeing companies may be able to carry well over two dozen people, with envelope volumes of up to 17000 m<sup>3</sup>. The most-used size (the two balloons on this image are this size) is about 2800 m<sup>3</sup> and can carry 3 to 5 people.*



8 - I choose this picture because I think that this is a beautiful way of presenting love. I tried to create the effect of two dolls getting married. It's black and white so you could see everything clearer. This image shows love. I don't know if we're allowed to use a filter.



9 - The intersection points between these car tracks imitate those of lines and parabolas on a graph. This is ironic, since roads often meet at intersections. The swerves of some of the tracks clash with the parallelism of the others creating these intersection points.





10 - This light installation reminds me of a church with its symmetrical parabolic arches. Such arches are used in maths to build bridges, cathedrals, and elsewhere in architecture and engineering.



11 - On peut observer sur la photo une infinité de cercles et/ou cylindres aplatis. La photo représente en fait une petite partie de vitre prise de très près.



12 - This picture was taken by me during the Christmas break in 2019. By that time, I was in Spain, Valencia. In my opinion this photograph displays several geometrical objects (ball/pyramid, cuboid, triangular, rectangular) and is dominated by the horizontal symmetry line, providing for a perfect reflexion of the whale-like shapes on the water surface.



13 - Este reloj está repleto de matemáticas. Dependiendo de que partes del reloj se tomen en cuenta, se pueden apreciar las siguientes: Una corona circular, dos semicírculos, un círculo, sectores circulares, rectas paralelas y perpendiculares. Además los números se representan de forma romana.



14 - This was taken at a Spanish market, the “Mercado Central De Las Palmas”. This reminded me of how I learned how to count, by using fruits. Whether I was at school or in the kitchen, I counted fruit. Research has shown that most of the children have the ability to learn and be proficient in it. If approached correctly, mathematical concepts and ideas can be made graspable even before starting with any formal primary schooling. In this case, fruits are a great start!



15 - Cuadrados estrellados cayendo del cielo, ligeros, pendiendo de hilos paralelos. Forman numerosos ángulos dependiendo de su posición, pero no caen libres...están sujetos por una diminuta esfera. Los brillantes cuadriláteros crean un efecto de reflexión sobre las esferas y los propios hilos de los que cuelgan estos cuadrados estrellados.



16 - Sucesión de Fibonacci (De comida)



17 - You might consider Mathematics as a subject, but it is all around us. If you just take a look, you can find it anywhere. The numbers on your alarm clock when you wake up, the shape of the material of your clothes, the circles we call tires underneath your car, it's everywhere! The picture I have made may seem ordinary at first, but if you look a little bit better you see there are all types of mathematical touches. The deep hole in the middle, the pattern the metal is braided in, the straight line of metal splitting through the picture. It is focused on the nearby braided metal, but the pattern goes on and on until it disappears in the dark. I see this picture as a metaphor for: don't judge a book by its cover. You never know what is happening behind something or someone you see. Anyone





18 - Mathematics is a very broad subject that a person can take a lot of photos of. In this case the picture I took was a close-up picture of the bottom of a green glass vase. The aspect that intrigued me into taking this photograph was the reflection from the glass gave the photo an interesting effect. To give the photo a bit more depth, I added exposure to the picture, to make the grooves on the picture clearer I also increased the contrast and sharpened the image. These modifications made the picture a lot more depth and colour



19 - He escogido esta foto ya que podemos observar que el paisaje se refleja en el lago, por lo que hay un eje de simetría.



20 - Esta fotografía, del Panteón de Agripa, además de la geometría aparente, tiene un trasfondo físico muy interesante. Es un espectro de difracción producido por electrones sobre un blanco en una hoja de aluminio. Este espectro fue fruto de un experimento para probar una hipótesis de Louis de Broglie, la cual afirmaba que, dado que las ondas son partículas, las partículas son ondas. Una hipótesis que sin duda fue el “hazmerreír” durante varios años, debido a la “absurda” lógica que siguió el físico francés. Pero si hay algo que nos enseñan las matemáticas es que la solución para un problema complejo suele ser la más sencilla. Así que Louis de Broglie comparó el espectro resultante con el de Rayos X (una onda) a través de una red de cristales de aluminio y comprobó que la similitud era más que clara. Así pues, Louis de Broglie recibió el Premio Nobel de Física en 1929 “por su descubrimiento de la naturaleza ondulatoria de los electrones”.



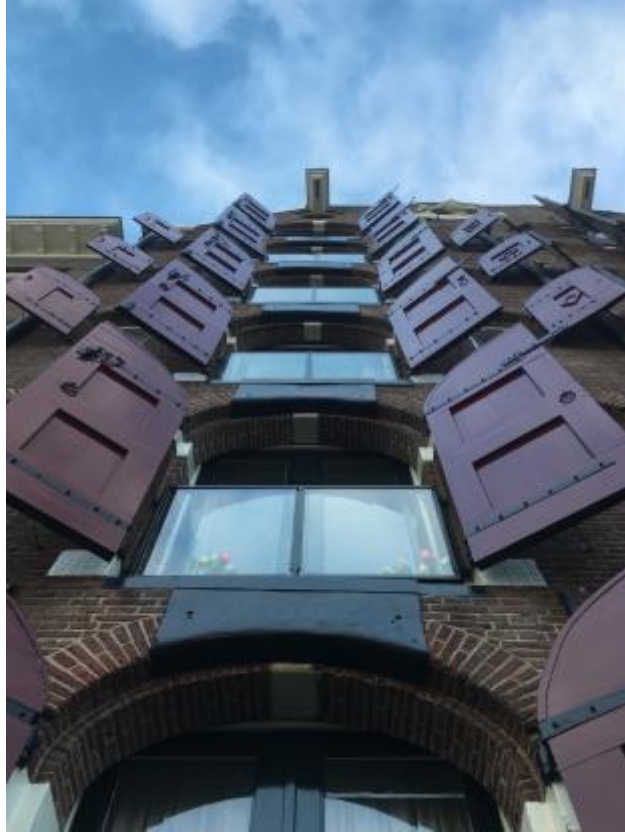
21 - En esta fotografía de un mantel se pueden observar distintas figuras geométricas con de distintos tamaños. Entre ellas se pueden ver líneas paralelas y secantes, triángulos equiláteros, rombos, trapecios, hexágono regular y algún cubo.



22 - Las gotas de agua no tienen una forma definida y cada una es diferente, ya que cada una tiene una forma aleatoria.



*23 - Geometrical forms are perceptible in the windows of the photo. There is a contrast that exists between the hard light and the soft light from the sunset coming out of the windows.*



24 - This picture contains multiple leading lines for the eyes. Every windows and windows doors are perfectly aligned . Geometrical forms such as squares, rectangles and lozenges can be observed on all of the building.



25 - Indonesia. A whole different world, incomparable culture and landscape and yet so simply connected to ours through mathematics. The universal language uniting people from all around the globe. The simplest everyday landscapes almost always represent mathematical configurations that keep on amazing me. Finding such a simple perfection around me is something I truly appreciate and admire. The love and interest I have for mathematics were brought on the surface as soon as I was confronted to the numerous rice fields in Asia. The one thing I find most mesmerizing and soothing in life is perfection present in simple things and this is what pushed me to take pictures of the nearly flawless positioning of rice crops, typical for Asian cultures.





26 - But inside the cone of his projection, is an imagined topography more exact and more intense than the countryside, a world where what is not immediate is infinite, a world of bottomless silences, of plane geometry of instantaneous movement



27 - En esta verdura podemos observar como las hojas o pétalos que la componen están colocados formando una serie, un patrón determinado. Quizás tenga alguna relación con el número áureo, cuyas proporciones se encuentran presentes en muchos aspectos diferentes de la naturaleza.



28 - La pirámide, esta formada por cartas de la baraja española y se relaciona con las matemáticas ya que se asemeja a una pirámide, que es una figura matemática frecuentemente usada en el ámbito de las matemáticas.



29 - En esta imagen podemos ver una perspectiva diferente de las escaleras.



30 - Lights in a school library resemble two converging functions obeying the sandwich theorem.





31 - The Eiffel Tower has 8 lines of symmetry, 4 straight down the middle of each face and 4 straight down the edges. Not only is it symmetrical, but it also has four main parabola featured in the four arcs of the base of the tower. Two of which are featured in this photograph.



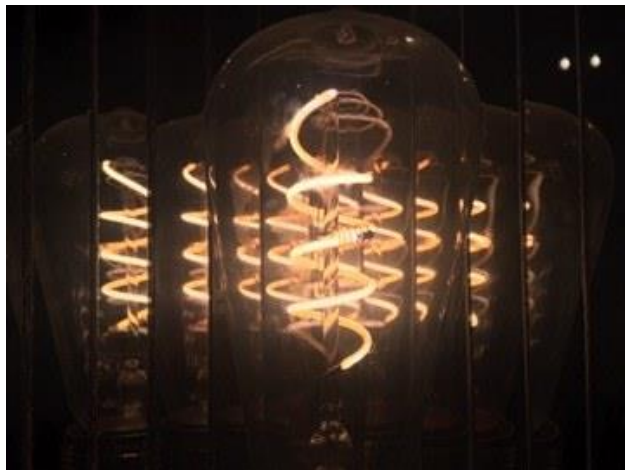
32 - This photo was taken at the Brussels Light Festival, an amazing festival with a route through the city made up of captivating artistic and interactive light installations. In this photo, the intense ray of light illuminates the whole scene and goes through the center of the two buildings, producing a spectacular line of symmetry. The symmetry of the three buildings aligning and the geometry of them is a branch of mathematics concerned with questions of shape, size, and the properties of space. This fascinating laser display is more than just a laser and a projector. A laserist combines technical knowledge with artistic sensibilities. The laser effects can be synchronized using "SMPT time codes" or by using computer software. This is all possible due to mathematics being a true form of art.



33 - On this glass building, we can see the reflection of what is behind. This is caused by reflection symmetry. Basically, it's as if there was an axis in the middle of the distance between the reflected building and the reflecting one. Some patterns are also noticeable on the glass. These geometrical shapes are repeated on the building countlessly without changing. What we can also see is that the buildings in themselves are tri-dimensional figures.



34 - We can appreciate symmetry very well in this photo , symmetry is crucial to maths therefore this photo is highly mathematical



35 - When you first take a quick look at this photo it seems complicated, but actually when you take a closer look everything becomes clear. It's the same with maths when you first see the exercise everything in your head becomes misty and unclear, if you study this exercise more deeply everything will brighten again. This is a photo of a light bulb with small thin mirrors creating an arch behind the bulb. The reflection of the light bulb in the mirrors creates a reproduction of the light, making it seem like there are many other lamps



36 - For the mathematical photo competition I have chosen to make a burst of a tennis ball flying through the air. I thought it had a cool effect because you can see how it travels through the air and what shape it makes. I thought that this would be a good mathematical example because the burst of the tennis ball shows that the ball makes a parabola (a mathematical term for a path of a projectile under the influence of gravity). Also you can see that as the ball gets to its highest point the distance between two balls is smaller, this shows that the ball slows down and the ball speeds up again as it goes down because the distance between two balls increases. To make this photo I used an app that was especially made to make these type of photos. I made a video of throwing the ball up and after every few seconds it takes a picture. At the end it overlaps all the pictures and as a result you get the parabola shape





37 - One of the mathematical aspects of bubbles are their shape. The round shape of the bubble is caused by the fact that the surface area of the bubble seeks to be as possible under a constraint. In this picture you can see a smaller bubble inside of a bigger bubble. These might be a metaphor, the smaller bubble could represent a child and the bigger one could represent the protection which you receive when you are young but at some point the protecting bubble will pop and the child will have to take care of itself. There are many other ways to see this picture its just a matter of perspective.



38 - This image contains many mathematical aspects. We can spot the geometry and the shapes such as triangles, rectangles and circles. Every circle is smaller than the previous one before it simply disappears in the picture. When we take a step back and look at it, we notice it is a simple cylinder. Altogether, this image contains many shapes that come together to form one.



39 - Consta de dos parábolas; las que forman la "m" amarilla de McDonald's, siendo estas simétricas.



40 - En esta foto podemos observar que la estela que hace el avión son líneas paralelas.



41 - He escogido este como el título para mi foto, ya que las líneas violetas diagonales son paralelas entre si y varias de las líneas violetas son secantes respecto a la barandilla de metal.



42 - En esta foto se puede ver la proporción de phi si sigues la espiral de la concha. La proporción phi está en la gran mayoría de cosas cotidianas, en este caso, una simple concha contiene el número de oro.



43 - It was only recently that I learned that pianos are in fact string instruments –and that was after about two years of playing the piano! The number of strings per piano depends on several factors, but as a rule, a piano can have anywhere from 216 to 250 strings. This photo is of the strings of a ‘baby grand’ piano.

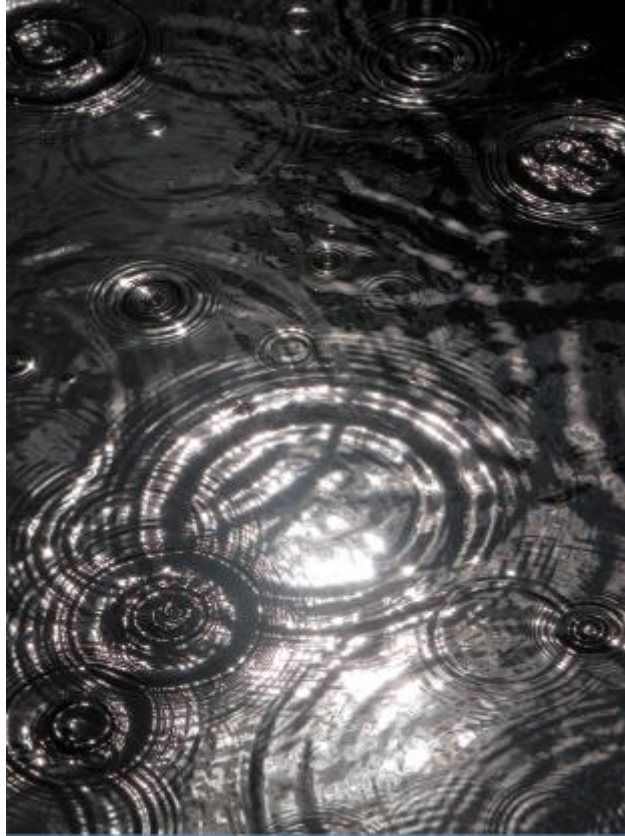


44 - The four vibrant rays of red, orange, yellow and green are in perfect proportion to the rest of the symmetrical buildings. This is a branch of mathematics concerned with questions of shape, size and the properties of space.



*45 - El punto de fuga es el lugar en el infinito donde convergen líneas oblicuas imaginarias o reales que si estuviéramos en tres dimensiones serían paralelas. Es el lugar donde las líneas parecen curzarse*





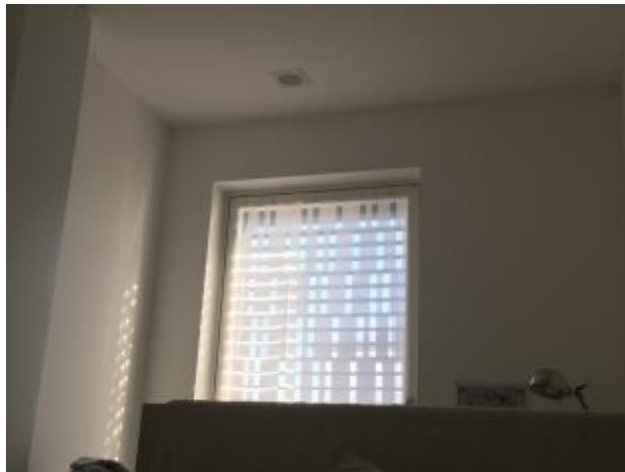
46 - //Pluviophile\\ is a lover of rain; someone who finds joy and peace of mind during rainy days. Some people love rain and I am one of those persons. I feel like rain gives you reasons to think about anything you want. Is just so mesmerizing that you get completely lost in your thoughts and than you wake up and still stare at the rain how it falls so perfectly in straight lines and forms perfect circles when it heats the Earth. Always calm, always the same, perfectly shaped.



47 - En esta imagen vemos el reflejo de un torii japonés en el agua



48 - I took this photo while hiking in the High Tatras in Slovakia, while the rescue was in full swing. I set the camera to a shutter speed of  $1/200$  of a second; and that was not enough to 'freeze' the rotors of this helicopter (you can still see some motion blur). In fact, most helicopter blades spin at around 500 times a minute, which is around eight times a second!



49 - He nombrado esta foto "secantes" porque las rayas de la cortina y las de la "cortina automatizada" se cortan.



50 - Es un sector circular porque la pupila esta comprendida en el arco del iris.



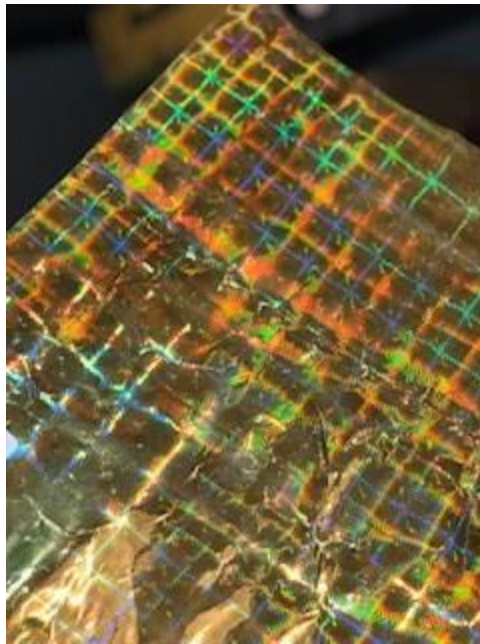
51 - En esta imagen podemos ver una escultura de sempere que forma una piramide



52 - Como podemos observar en la imagen, la gárgola del desagüe y su sombra forman un 7



53 - En esta foto podemos observar el asiento de un tren y el conducto por el que sale el aire, y todo esto está simetricamente reflejado en la ventana y la foto está tomada desde el principio del conducto haciendo que el otro extremo los dos puntos reflejados se junten



54 - I find this picture very fascinating because of the shapes and the little stars. I made this picture by reflecting the light on a piece of some sort of paper. When I look at this I feel really happy and calm because the colors. The shapes and the colors give the photo a very interesting affect.





55 - Everywhere around us, we see trusses and girders. Or rather, we don't see them – they're inside of the buildings we are in! This here, is a visible Pratt truss which makes up part of a stage in a festival in our school. Trusses are structural components where force is only applied to two points, hence why they are so widely used



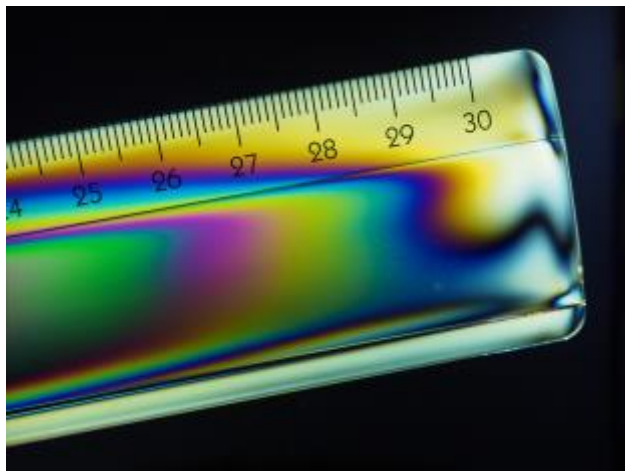
56 - Photography takes many forms, but I chose a symmetrical subject for my Photomath entry. Math is shown through the arcs, lines, shadows and shapes. These are highlighted by contrasts between light and dark. Repetition of shapes and lines makes the eye travel across the photo. At first glance, you are not quite sure what it is, this draws you in and peaks your interest. Looking closely you start to see reflections which add to the depth of the shape. This is the stern of the HMS Victory and over two hundred years ago Admiral Nelson also gazed through these windows and, no doubt, marveled at its beauty.



57 - *Strings and shadows: This is a photo of strings used to close window blinds. Although it looks like there is a black and white filter on it, these are the true colours of the photograph. This is interesting because of the many different shades of grey in the photo. The shadows cast on the wall are each a different level of opaque because of the angle the sun rays hit them.*



58 - *En la foto se ven Matrioshkas componiendo un fractal, extendiéndose hasta el infinito.*



59 - *The picture "The beauty of stress" is a picture taken through a polarising filter under polarised light of a simple plastic ruler. Under these conditions, you can see lines of different colour in the ruler. These are there because in the process of making the ruler, tension in it is frozen in place. You can calculate these tensions as well, but when you want to draw the results, you will get the same lines which you can see through the camera. The different tension patterns are represented by the different colours in*

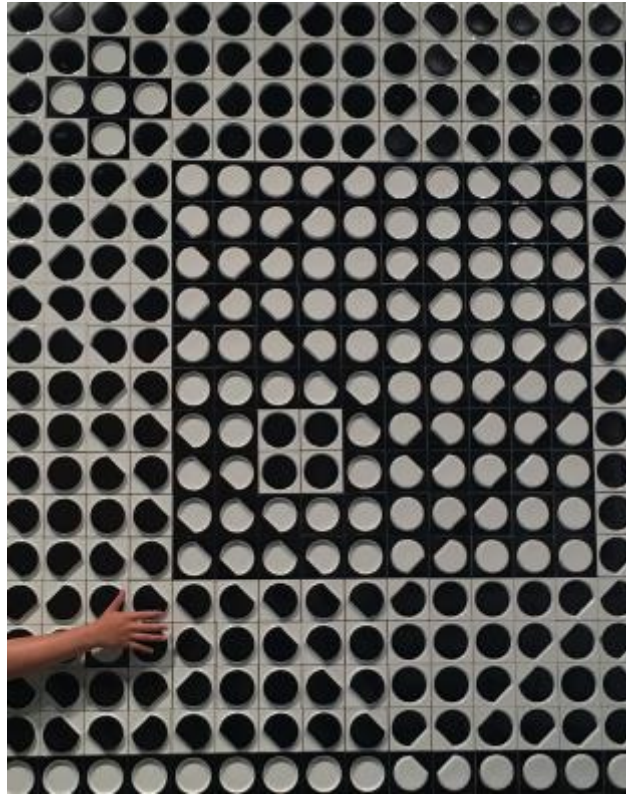
the ruler. By bending the ruler, different tension patterns can be seen. Note that this experiment only works with polycarbonate objects. The whole experiment is a high level of mechanics and the calculations involve vectors and matrix operations. This amazing mathematics can be easily seen and understood in this way and scientist use this to make models of real life object such as bridges and tools to make sure that these don't break when used and to optimise their shapes



60 - In mathematics we speak of the probability tree. The point of origin is the root of the tree, then there are the branches that lead to the leaves that are the possible events. In this photo, made in the forest, the trees have the probability of being destroyed by man, that's why I called this picture "The Destructive Intruder". Indeed, we can see from a low point of view, the head of a human among some trees, some branches and some leaves that is taking the place of these living beings that make us live, the trees. Furthermore, the lines represented by the three trees trunks lead us to the sky creating an imaginary triangle.

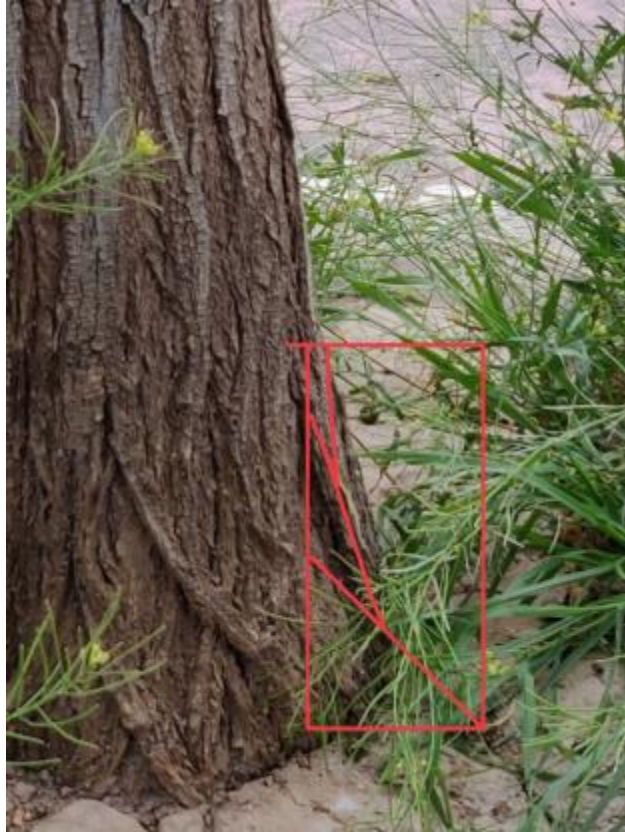


61 - The inverted glass pyramid designed by architect Ieoh Ming Pei gracefully complements the Louvre pyramid. Today, we still build pyramids, not because of beliefs, but because we admire their geometry. Pei choose to embrace the individuality of this project and tents to favor clean, geometric shapes without a lot of curves. As a result, different shapes are highlighted in this image such as triangles, squares, rhombuses, rectangles, circles and different irregular shapes. Besides shapes we can identify a ratio of sides of a right-angled triangle: sine, cosine and tangent. Certain measures create the feeling of being outside; the lighting generates an accelerated perspective. It acts just like a light prism, on sunny days, it reflects all colors of the rainbow.



62 - I took this picture in a castle in the south of France. We can see a work by Victor Vasarely, a famous Hungarian artist, who once again proved that we can talk about art with the help of mathematics. On the bottom left of the photograph, we can notice an arm and a hand that allow to know approximately the length of the masterpiece. These two parts of a human body are, in my artistic point of view, a ruler which serves to measure the diameters of the circles, the lengths of the squares,... Moreover, the optical illusion created by Vasarely makes it possible to discover each time new hidden forms, which I find very interesting. We do not see it, but everything is mathematical, including art and photography.





63 - The physicist at the Karlsruhe Institute of Technology studies the shapes that trunks and leaves take, and has used some of them to describe fundamental properties of naturally occurring forms. He has found that using this specific mathematical pattern that is so often found in nature, we can multiply the strength of a traditional, architectural arc by 40.



64 - To take a picture with a mathematic feature can be anything, but one thing is symmetry. Symmetry is when two or more parts are identical, for example a star. This is an example of symmetry in nature, as you can see the right side is the same as the left side. In this picture you can also see a pattern. This thing has a whole in both sides of it. Nature is full of these amazing symmetries, just by looking around you can will find lots of these things. Can you guess what this is?





*65 - Math is usually just seen as number sequences in a boring order, but there's so much more to it. Shapes, patterns, light and dark. My picture is called "the Other Side" because us as a humanity always want to discover more. We feel the need to look for more than we already see, and my picture is a snippet of what you would call "looking at a different world".*



*66 - This tree could be seen as dead, deprived of its natural outfit, but to me, it is the perfect illustration of life. Everything starts at the trunk, then, the branches take life and evolve differently, each of them has their own life. In math we study the geometrical aspect of things, but we can also study the none symmetrical aspect, this tree has unique branches, and this is what makes it mathematically interesting.*



67 - En esta foto podemos observar un reloj de arena a contraluz con el fondo del cielo. Esta foto pretende que la gente reflexione sobre el paso del tiempo y empiece a disfrutar de los pequeños momentos.



68 - A esta fotografía, tomada durante las vacaciones de Semana Santa del pasado año 2018 en el Parque Nacional de "Monument Valley", le he puesto ese título porque la silueta de esta mesa (nombre que se le da a este tipo de colinas) tiene cierta semejanza con un Trapecio Rectángulo (hay que ponerle un poco de imaginación para ver el parecido).



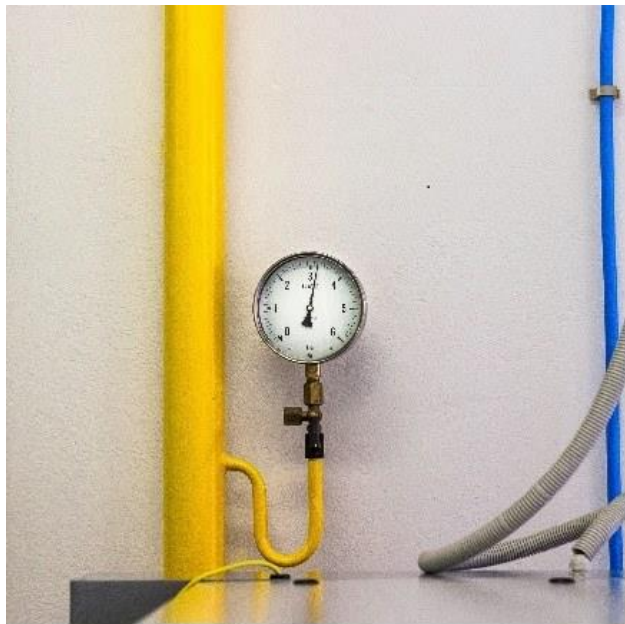
69 - Esta imagen está tomada del desagüe de una bañera ya que su forma, recuerda a algunas figuras geométricas relacionadas con los círculos.



70 - Ce ne sont pas des triangles, mais des pyramides que l'on observe. La pyramide supérieure, comporte une multitude de droites et parallèles formant diverses formes géométriques.



71 - Debido a la diferencia de ángulos que representa la silla en la que se aprecian una serie de triángulos no euclidianos ya que sus ángulos no suman  $180^\circ$ \*



72 - While working at an industrial services company over the summer, I spotted this colourful and minimalistic combination of gauge and pipe. It is a gauge that tells us what pressure is in the machine is; around 3.2kPa. Standard atmospheric pressure (1



atmosphere) is defined at around 101kPa, so the pressure in the machine's vessel is around 32 times lower than atmospheric pressure!



73 - This picture was taken in the center of Brussel, Roger Square, from the inside of a building giving view on this square. What struck me first was the color of the sky: between blue and gray, it reflected perfectly on the beside building and on the strange construction that covers the square. Secondly, those two modern construction, representation of the modern world and the architectural Developpement, makes a strong contrast with the rest of the urban architecture. Large and massive, these buildings and offices seem to hang above all these lower houses, with red roofs and highly concentrated, which are drawn till the horizon.



74 - Math is everywhere. Everything is related to math. Our lives are largely influenced by math. The way we get to school is related to math. The computer I'm writing this on is related to math. Architecture is related to math. In the picture below you can see the math on the wall made of barrels. The symmetry and the variation combine to make a beautiful pattern showing wealth and power. It must have taken days for the artists to create this pattern, this is one of the things that I like about this photo. I took this photo because I think it shows the beauty of math and art together



75 - The photo that I have taken is that of a truly magnificent, crystal bottle of whiskey. Just for the record I'm not aware of name of the whiskey for I have little if not any interests in the title of different alcoholic beverages. (because I am under age). the mathematical aspect of this picture is a small list. the first mathematical aspect of my photo is incredibly perfect symmetry. the second mathematical aspect would be the incredible geometric design near the base of the crystal bottle. It is covered in amazing diamonds/squares that are stacked up perfectly side by side, creating this fascinating pattern you can see below. I'm not quite sure if you can call this a mathematical aspect, but I found the way that the light refracted on/through the crystal and traveled through the whiskey it's self very mesmerising. Now can't forget about the most beautiful crystal cork which has so much of a mathematical aspect that I could've probably made it the main subject of this project. It is covered with perfectly equal sized transparent hexagons.