VERBATIM POST

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UNIVERSAL HONOR SOCIETY

Home of Global Citizens

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PREFACE

***"D*o not ever settle for what you have done, get rid of stereotypes, push your potential and believe that you can do better, live a happy and fulfilling life."**

It has been nearly 15 years since I entered the world of College Counseling. I have had around 800 counselees who I have had the chance to directly or indirectly influence. Throughout this journey of working with almost all of them, I have always imparted the quotation above in regards to their academic studies and social development.

I've worked with great people. They have achieved fantastic results, even surpassing their own expectations , been admitted to the most prestigious universities in the world and received the education their hard work deserved.

I believe the first step in achieving goals is to devise a detailed plan, and the second step is to create the platform to act on this plan. To me, the best way to embody thoughts is through writing. Therefore, I congratulate the authors who have created this wonderful journal with their articles. It excites me to see that they are moving forward in pursuit of their goals with great enthusiasm.

Since the day it was founded, The Universal Honor Society has organized great programs that are extremely beneficial to attendees. These programs have made a huge difference. With this magnificent journal, UHS has added another new project to its program. I would like to take this opportunity to thank the Universal Honor Society team, especially all my friends who have contributed to the creation of this journal. I congratulate them on this wonderful project.

I wish success to both the staff of authors and the wonderful Universal Honor Society team.

Mehmet Saglam
Chief Executive Officer
Universal Counselor

A LETTER FROM THE EDITOR

*H*ello dear readers, I am Deniz Dedeoglu. As you know, this is the first issue of the Verbatim Post journal and as the editor, I would like to express a few things to you with this letter. First of all, I would like to tell you, our readers, that we have been working for months to create this journal and how happy we are to finally be able to share it with you. It is a great honor for us to present you the Verbatim Post, a product of Universal Honor Society: a society that allows students to improve themselves in both academic and social fields and show their achievements in a community.

We can say that our journal was first created with an observation. We, as the Verbatim Post staff, observed that most students don't have a platform where they can share the works they have written in the light of the subjects they are invested in. We proceeded with the idea that every solution arises from a shortcoming, and we created this journal where students can publish their works and share their views on and interests in life. We have included various topics that affect all of our lives in order to have a range in which students can demonstrate their specific knowledge and interests. We aimed for the students to reach an audience by publishing their work and to gain confidence in their fields. The Verbatim Post was created for this purpose and managed to see the light of day while remaining true to it.

To touch upon our verbatim motto, I believe that this Latin word, meaning "word for word", is a value that has been deprived of the freedom of expression of human beings over the years. In this age, the norms that restrict our right to free expression and the fences placed around our fields of thought prevent young minds from processing and articulating both their thoughts and their perspectives on the world in their purest forms. It was necessary to have a platform through which students could express themselves freely with the love of knowledge and life. Now, with the Verbatim Post, the students can write about their interests and passions "word for word", while being true to themselves. Therefore, by upholding the "verbatim" principle, we made sure that everyone who contributed to this journal could shed light on the issues they care about, in their own style.

I am grateful to everyone who contributed to this journal. I hope the Verbatim Post has been and will continue to be a journal where you can all freely express yourselves and share your passions. Our readers, I will end this letter with a short quote, and I hope you enjoy reading our journal…

"The unexamined life is not worth living."
- Socrates

Deniz Dedeoglu
Editor

SURVEY ESSAY ON ONLINE EDUCATION IN COVID-19 PHASE

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I was born on June 2nd 2004. I have been interested in biology for 3-4 years because I was amazed with it both being a science and having quite a lot of impacts on our lives. I have taken various courses on biology and observed different branches of it and its application in everyday life. In this case, I have connected biology to education: I conducted a survey on the effects of Covid-19 pandemic on Turkish education system, and supported my hypotheses with three different surveys directed to Turkish students. I hope the readers will take the key points made in my survey essay and gain a new perspective on how the pandemic was handled by the government and the students' opinions on this approach to online education.

The Covid-19 pandemic is a devastating health issue for the whole world and has affected quite a lot of areas, omit especially education. In the educational area, many countries were in a dilemma about either closing the schools or converting to online education due to the health conditions of students and employees or keeping the schools open for face-to-face, education with allowing workers to work to preserve the financial conditions. After coming to a conclusion from the dilemma, most countries decided to shut down all of the schools and convert to online education. This change has created a severe collapse in children's social and learning life and has been continuing since the closure of schools with an increasingly defective influence. Therefore, the children may start to lose their social and educational abilities which they usually gain in school during classes in which they discuss, communicate, argue, express opinions, etc. because they lose their environment to develop and enhance their social and educational abilities. Also, the assessments are canceled which helps families and teachers to see their children's or students' level due to the closure. Without having any information about the children's level, it may create long-term problems with the recognition of high potential or learning difficulties.

As mentioned above, this pandemic has forced many countries to take action on altering to online education and the first country that did this is China, the zero point of Covid-19. In a webinar recently hosted by EdSurge, with support from the school networking platform "ClassIn", Chinese school leadersshared their insights and lessons learned. As was mentioned, in China, Covid-19 appeared in December. As the numbers of infected people and death cases increased, the Chinese government started to act accordingly. On January 20th, the Chinese Ministry of Education decided on closing schools and they are closed for 10-14 weeks. The central government postponed all the K-12 and higher education and all their exams. In this attempt, they firstly altered their educational system to online education. They had a platform named "Empower Learning" which contains all K-12 curriculum. In addition, the Chinese Ministry of Education published its own internet site named "Educloud". This site features videos, teaching plans, and communities of the best teachers' lessons recorded over the past eight years. Secondly, the Chinese Ministry of Education declared that there wouldn't be any new topics in the curriculum until the new semester started due to the houses lack access to the internet. Lastly, they decreased the lesson's period because according to various research, spending hours in front of a screen is not helpful to students at any age due to concentration problems.

This massive change took place in Turkey. In Turkey, the schools were shut down on the 13th of March. Before the Covid-19 cases increased, the Turkish government acted. In the first place, The Ministry of Education announced that they changed one-week holiday dates and rescheduled it to a close date. Later on, The Ministry of Education announced that the online education phase would begin and they extended it week by week until the end of March. At the end of March, they expanded it for a month, and when the end of April came, they extended it for another month again. At this phase of online education, government schools continued their teaching via either internet or the new channels opened on TV. The private schools were allowed to use their own online teaching platforms. Additionally, the Ministry of Education announced that the grades from the second semester wouldn't be counted in students' GPA's and there would not be any graded exams or different forms of assessment because there can be some students who lack access to online education system. In addition, the high school entrance exam and university entrance exam were postponed by the Ministry of Education. Later on, it was declared that the schools

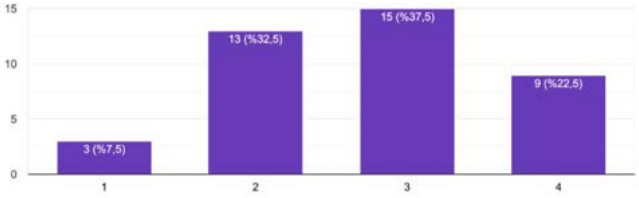
wouldn't open until the next education year and online education would continue until the school term was over.

In this system of online education, as a student, day by day, I adapted to it, yet at the beginning, I struggled. I wanted to see if my friends were struggling like me or they just adapted to it. I decided to make three different surveys each month starting from April, then May, and June. These surveys are generally about the online education system, and how it works in Turkey. Then, I wanted to write this research paper with the data from the surveys that I have done about the process of online education in Turkey. The surveys addressed 20-40 students -from preparation grade to 11th grade- from a private school in Istanbul. Also, in this research paper, I aim to gain reliable data for schools that conduct online education system and make the data available for them to use and act accordingly.

The first survey conducted is about the preparedness, motivation, and learning skills of the 40 students regarding the online education system. This survey is conducted in April, nearly the beginning of the online education system. In the survey, I directed 10 statements to be evaluated by multiple-choice answers. While evaluating statements the choices were:

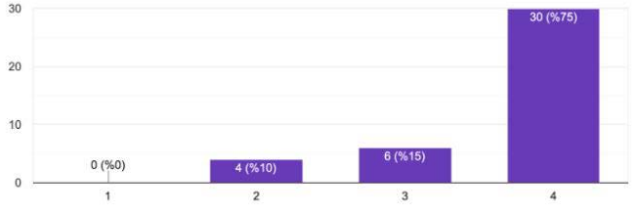
1: I completely disagree,
2: I disagree,
3: I agree,
4: I completely agree.

The 1st statement: My school informed me about online education beforehand.



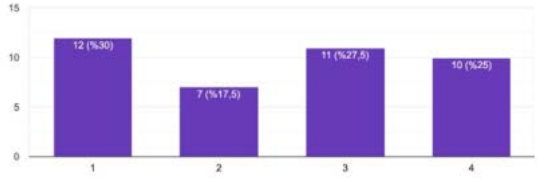
The graph above demonstrates the answers to the first statement. As can be seen in the graph, the majority of answers are collected under "I agree", meaning that the school did the informing. Yet, an absolute agreement is not considerably high which implies that the school's information was not clear enough due to the unplanned events that occurred.

The 2nd statement: I had sufficient technological equipment and setup before online education.



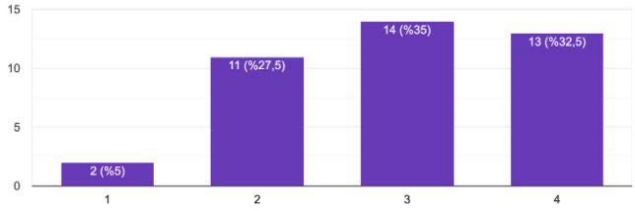
The graph above demonstrates the answers that are given to the second statement. As shown above, it is evident that the majority of students, 90%, who have completed this survey had sufficient technological equipment and setup before the online education which allowed them to attend lessons easily.

The 3rd statement: My motivation was high before the onset of online education.



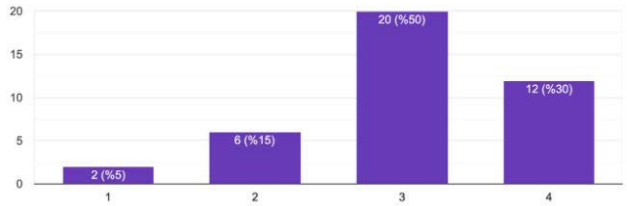
The graph above demonstrates the answers that are given to the third statement. As the graph above illustrates answers to this sentence are scattered around all possible choices. This demonstrates to us that not going to school degraded students' enthusiasm to attend lessons, and this reflected on their motivation. The motivation loss is normal because in school the students were required to only focus on the lessons and not get distracted in the classroom. Yet at home, students can be distracted quite easily by a variety of factors.

The 4th statement: I easily adapted to online education.



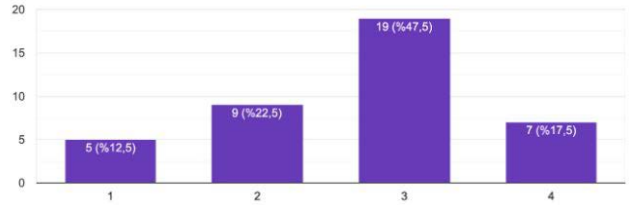
The graph above demonstrates the answers that are given to the fourth statement. As can be seen in the graph, the adaptation process wasn't necessarily hard for the majority of students, 67.5%. The smooth adaptation process could be linked to having sufficient technological equipment and setup before online education because having an accessible connection to online education promoted the students' adaptation. Yet, 32.5% of students who have struggled during the adaptation process should not be underestimated. Loss or lack of motivation can be considered as a critical factor in this struggle.

The 5th statement: During online education, I had sufficient materials and documents.



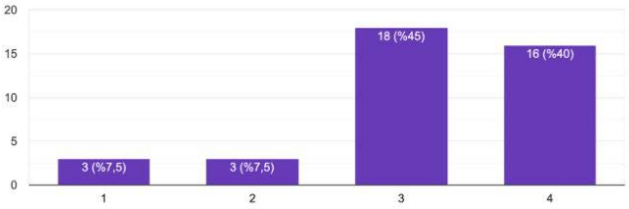
The graph above demonstrates the answers that are given to the fifth statement. According to the data, 80% of the students had sufficient materials and documents. This goes to show that the school continued to distribute the needed materials and documents, and the students had easy access to them during online education.

The 6th statement: I get regular feedback from my teachers.



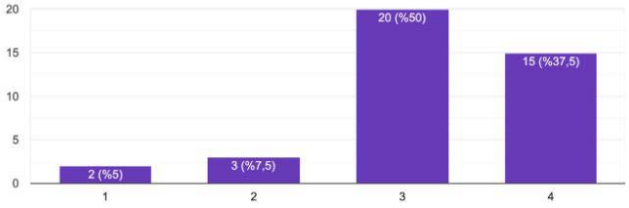
The graph above demonstrates the answers that are given to the sixth statement. As can be seen above, 65% of the students reported to get feedback regularly, yet 35% didn't. This could be because communication on an online platform is not as easy as face-to-face communication. Therefore, there could be misunderstandings that lead to interrupted feedback.

The 7th statement: During online education, pair, and group work continues.



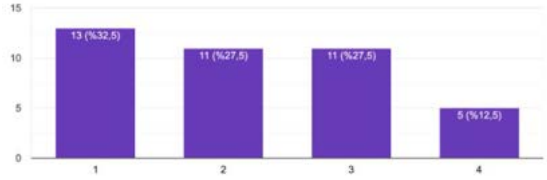
The graph above demonstrates the answers that are given to the seventh statement. As can be seen above, the school continued to involve group and pair work in students' schedules in order to not lose any academic contact that creates a more academically active online platform. This platform provides an opportunity to share learning skills and knowledge for better online education -including peer-learning.

The 8th statement: My parents have supported my motivation and learning process during online education.



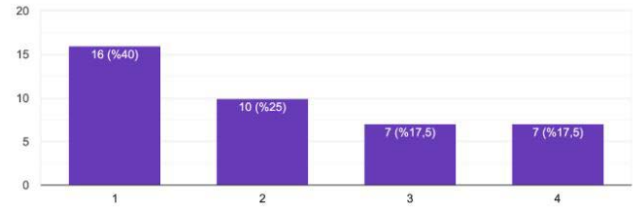
The graph above demonstrates the answers that are given to the eighth statement. As can be seen above nearly 90% percent of parents have supported their children's motivation and learning process during online education. Since the learning process was continuous and there were only parents present around students, they performed teachers' role to increase the students' motivation.

The 9th statement: During online education, my time management and planning was successful.



The graph above demonstrates the answers that are given to the ninth statement. As can be seen above, many students have failed to manage their time or plan their learning process. Since this is a new online process, and students didn't have any experience of managing their time and planning their learning process on their own beforehand, they experienced challenges. In this respect, the role of formal education in time management and planning should not be undervalued. Yet, too much student autonomy overwhelmed the students and they failed to schedule on their own.

The 10th statement: I think I will finish online education with the same productivity and success compared to school education.

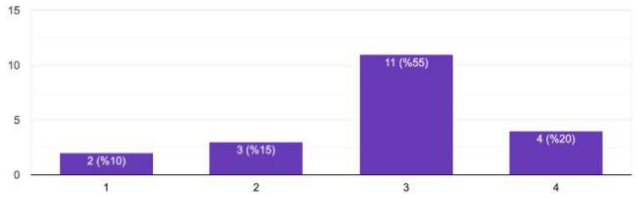


The graph above shows the answers that are given to the tenth statement. As can be seen above 65% of the students didn't think that they will finish online education with the same productivity and success compared to the education that they would get in school. This could be due to lack of motivation or not being able to plan their time and learning process wisely or both. Also indicates that being in a school environment where face-to-face communication occurs, positively influences learning process.

The second survey that I conducted is about the decision of the Ministry of Education, and its effects on 20 students' motivation, time management, and the quality of lessons. The Ministry of Education's declared that the notes from the first semester will only be counted in the school grade, everyone will pass their current grade, and there will be no examination. This survey is conducted in May, in the middle of the online education period. In the survey, I directed 4 statements that needed to be evaluated by multiple-choice answers and one open-ended answer. While evaluating multiple choice statements the choices were:

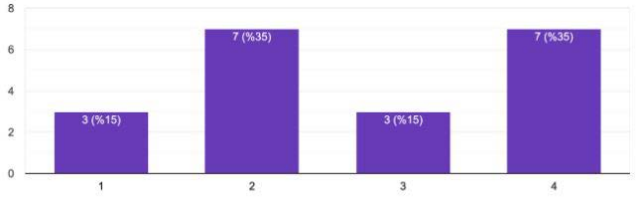
1: I completely disagree,
2: I disagree,
3: I agree,
4: I completely agree.

The 1st statement: The Ministry of Education's decision negatively affected the time that I schedule for lessons per day.



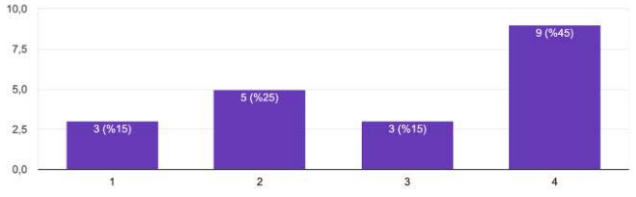
The graph above demonstrates the answers that are given to the first statement. As it is demonstrated, more than half of the participants agreed that the decision had a negative influence on their ability to regulate time spent on lessons per day. The cause of this may be that the Turkish education system's emphasis on exam grades. Therefore, when the exams are canceled, students were left with no academic purpose, thus they did not allocate regular study periods for their lessons.

The 2nd statement: The Ministry of Education's decision affected the quality of lessons negatively.



The graph above demonstrates the answers that are given to the second statement. Surprisingly, the overall evaluation of the graph shows that the answers are equally distributed. The graph illustrates 50% agreement and 50% disagreement. Yet, in the disagreement part, there is more accumulation in the " disagree" compared to the agreement part where the accumulation is more in the "completely agree" part, not in the "agree" part. This shows us that, in general, the distribution is nearly equal to both parts, yet the agreement part is more determined on their choices. Therefore, it can be inferred that the quality of lessons didn't significantly decrease, yet they went through a problematic change. This may be due to a decrease in attendance in lessons or a lack of student motivation.

The 3rd statement: The Ministry of Education's decision affected the motivation of students negatively.



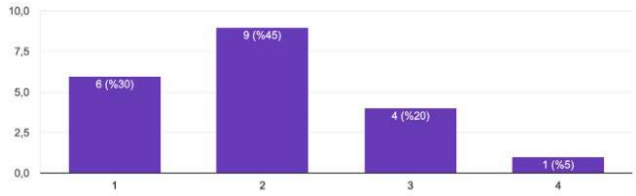
The graph above demonstrates the answers that are given to the third statement. It is seen that 60% percent of students lacked motivation for online education, and 45% in the "completely agree" part enhanced the idea that the lack of motivation was not a loss that can be reversed.

In addition, this lack of motivation might influence both the quality of lessons, and the time scheduled for lessons in a bad way. The open-ended question was the end of the survey, and it asked: "How would you evaluate the decision of the Ministry of Education? ". This question is answered by 11 students out of 20 participants. Out of these 11 students, 9 of them supported the decision and it was beneficial to students because the stress, and pressure inflicted on students in this process was already overwhelming enough without assessments and grading components . One example of a positive answer to the question is, "I think the Ministry of Education made the right decision. Students shouldn't be stressed out in this phase. The process is already quite hard as it is ". Yet, the other 2 students out of 11 participants think that the Ministry of Education made the wrong decision because they claimed that without any grading in the process, students' motivation would be affected in a negative way. Therefore, this lack of motivation would affect the quality of education and lessons. One example of a negative answer to this question is that, "as long as there are no grades present, the students motivation will decrease, which will affect lessons and students productivity". To sum up, mostly students thought that this decision of the Ministry of Education is beneficial to students, yet there were some exceptions claiming that it is detrimental.

The third survey that I conducted is about the last online educational views of 20 students In the survey, I directed 20 statements that needed to be evaluated by multiple-choice answers. While evaluating statements the choices were:

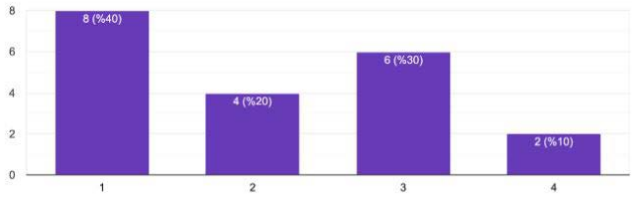
1: I completely disagree,
2: I disagree,
3: I agree,
4: I completely agree.

The 1st statement: During the online education process, I have developed my academic abilities.



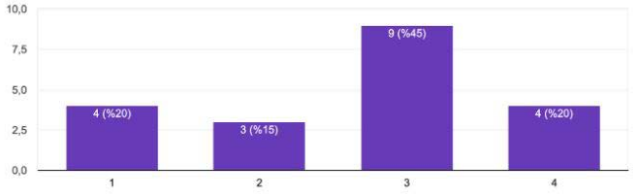
The graph above demonstrates the answers that are given to the first statement. As demonstrated, three fourth of the people gone through online education couldn't develop their academic abilities. This might be due to their declining motivation towards online education. As their motivation decreased, simply, their academic abilities failed to develop. Yet, still there are some students, one fourth, who claimed to have developed their academic abilities.

The 2nd statement: During the online education process, I have developed my social abilities such as pair or group work, and extracurricular activities.



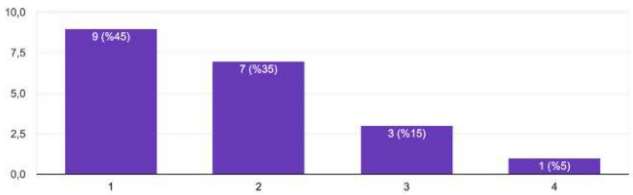
The graph above demonstrates the answers that are given to the second statement. As can be seen, more than half of the students gone through online education couldn't develop their social abilities. Since every part of students' lives became online, it became very hard to do any kind of activity other than lessons, or have social interaction within lessons. Therefore, students lost their chances to do any different social activities due to the lack of face to face interaction. Yet, less than half of the students managed to use their opportunities in online lessons for social activities in a more useful way without face to face interaction. This statement is a renewed version of a statement in the first survey, and surprisingly, the answers in the first survey are quite positive compared to this survey.

The 3rd statement: My school has sufficiently supported me during the online education process from various educational perspectives.



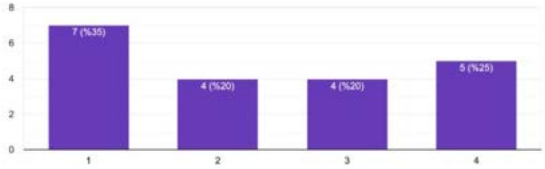
The graph above demonstrates the answers that are given to the third statement. As it is demonstrated, more than half of the students got sufficient support from their school. Mostly the school supported students with required materials and assignments. Yet, the school failed to support 35% of the students. This may be due to the lack of communication between school and students in the absence of face to face interaction.

The 4th statement: During online education, I have efficiently benefited from the lessons.



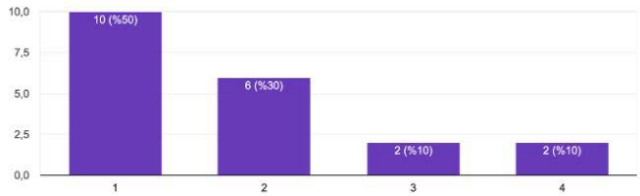
The graph above demonstrates the answers that are given to the fourth statement. As can be seen vividly, almost all of the students stated that their lessons lacked efficiency. Since the education was online, the physical activities enhancing the learning processes in lessons became unavailable, and the audial and visual examples giving real-life experience in the learning processes became artificial, and less effective. Therefore, students lost their chance to take advantage of physical, audial, and visual activities.

The 5th statement: I got sufficient feedback from my teachers during the online education process.



The graph above demonstrates the answers that are given to the fifth statement. The answers to this statement display similarity in agreeing and disagreeing. Yet, students disagreed 5% more than they agreed on the statement. The lack of sufficient feedback from teachers might occur because even though the online education seemed quite easy for students and teachers, it presented a lot of hardships such as technical and family issues, and as it continued these hardships continued to occur, too. Therefore, as the obstacles that teachers face day by day increased, their ability to cope with students' questions decreased because they had to allocate their spare time to eliminate the obstacles of online education.. Yet, the teachers who managed to keep their hardships on track were able to give feedback to their students, too. This statement is a renewed version of a statement in the first survey, and the difference is impressive. In the first survey, most of the students got sufficient feedback from their teachers, yet in the last survey most students lacked this opportunity.

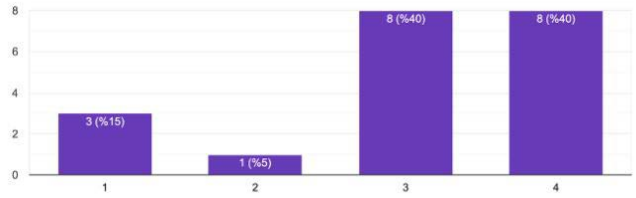
The 6th statement: I have maintained my motivation throughout the online education process.



The graph above demonstrates the answers that are given to the sixth statement. As is demonstrated, 80% of students could not maintain their motivation throughout the online education process. This was because as days went by, the time that students spent at home increased, thus increasing the level of boredom. This boredom led to a motivational breakdown among students. They lost their will to join online lessons, and learn new information because they became distracted easily knowing that they would not be kept responsible for what they have learned during this

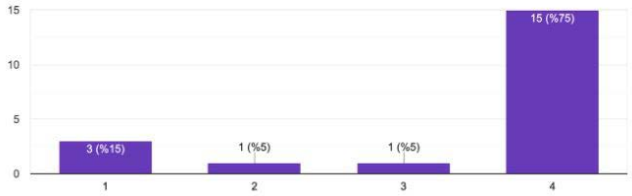
process. This statement is a renewed version of a statement in the first survey. Compared to this survey, in the first survey the percentage of students who agreed and disagreed was almost the same, yet in this survey, as can be seen, their motivation declined much more.

The 7th statement: During the online education process, the actions taken by the government and the Ministry of Education have negatively affected my learning skills.



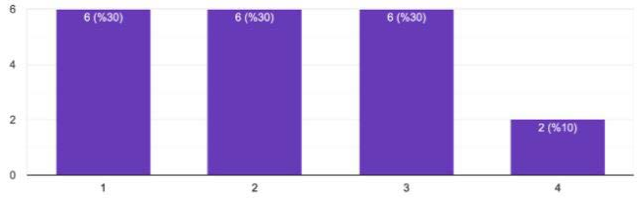
The graph above demonstrates the answers that are given to the seventh statement. As can be seen, 80% of the students agreed that the actions taken affected their learning skills. This effect occured as the students' interdependency on learning became wider, their wills to study lessons decreased. In other words, as the actions taken by the government and the Ministry of Education guaranteed their non-failure grade to the next grade and canceled the exams, students' needs to study greatly decreased.

The 8th statement: My family has supported my learning during the online education process.



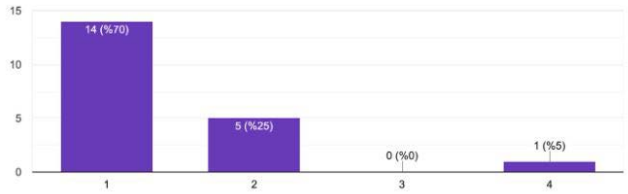
The graph above demonstrates the answers that are given to the eighth statement. As can be seen, all of the students' families supported them during online education because they wanted their children to be successful even though they would not be tested on the subjects studied online. This statement is a renewed version of a statement in the first survey, and since the beginning of online education families have always supported their children in the online education process.

The 9th statement: I have used my time wisely and efficiently during the online education process.



The graph above demonstrates the answers that are given to the ninth statement. More than half of the students failed to use their time wisely and efficiently during the online education process because as their motivation and will to learn decreased, their reasons to schedule their programs disappeared, too. Unfortunately, when they lost the grip on learning and had nothing to program, they had nothing to use their time for. This statement is a renewed version of a statement in the first survey, and the results were the same as percentages on agreeing and disagreeing.

The 10th statement: I think that I have finished online education with the same productivity and success compared to the education that I would get in school.



The graph above demonstrates the answers that are given to the ninth statement. As can be seen clearly, nearly 100% of students could not finish the online education process compared to the education that they would get in school. This is because they lacked many crucial aspects of learning that can only be achieved in face to face education.

In conclusion, by surveying 20-40 students attending a private school in Istanbul ranging from preparation grade to 11th grade in April, May, and June on the online education process during the Covid-19 pandemic, and analysing the results, I have shed light on both the benefits and the drawbacks of online education. As it can be inferred from these three surveys, face to face education is most probably better than online education in many different ways: face to face communication, different physical activities, motivation, time management, productivity, feedback based learning, peer learning, extracurricular activities, and other academic activities that can only be effectively achieved in a school environment. I have also developed awareness about the different kinds of obstacles my friends had to struggle with during the online education process. In addition, I have achieved my task to create a resource for schools to gain reliable and supportive data about the efficiency of the online education system and its impact on students. In the end, it is quite obvious that face to face education in schools is much better compared to online education, yet because a deadly virus, Covid-19, has entered our lives we need to be cautious on every aspect of life including education. This virus can stop spreading or it may continue, in either case, the future of the pandemic remains unknown to all of us. Consequently, we need to adapt our lives in a way that gives no available space or chance for this virus to spread, even though it might decline our learning because health is the most important aspect of human life.

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Turkish Education: Discipline or Indoctrination?

Deniz Dedeoglu

I was born in Istanbul in 2002 and am currently enrolled in University of Nebraska High School. I have always had a passion for reading and writing ever since I was a kid. I am constantly writing essays and articles on topics that I believe need to be voiced. I became interested in International Relations and Foreign Policy after attending multiple Model United Nations conferences, all of which transformed my perspective on world affairs and my role in them as a citizen of the world. I will pursue an education and a career in International Relations yet I am determined to continue writing on important topics of life; I fully believe in expression's power to make a change in the world.

I'm a female student in Turkey. I am a female student. I, most importantly, am an individual. Since I was a little kid, my only goal has been to improve myself and that only, that was because I thought our education system was already in its most improved state. I thought I would get through the difficulties in my life with the help of my school, not that my school would create the difficulties I had to get through. I thought my school would aggrandize me, not belittle me and my individuality. How can our institutions that have sworn themselves to the principles and reforms of Atatürk be so hypocritical? How can they jeopardize the bright futures of the youth that millions of our ancestors have been martyred for? We have dictated to our children that their ideals should be to rise above and to march forward; we have sworn them to do so every morning in the schoolyards. To put spokes in their wheels when they do so is to put them in a dilemma with no way out.

The institutions that try to put their students in a mold and to make them obey when there is no feasible reason to do so are betraying their sole purpose: the purpose to build strong individuals who aren't afraid to think. A society that is miseducated is as dangerous as a society that isn't educated at all. Our students are being robbed of reaching their full potential and if condoning this isn't a crime, what is it? To throw away all of this potential is to throw away the future of our country. With what I have observed in my region and almost all of Turkey, I can assure you that our students are being herded like sheep on a path that they don't understand, to a destination unknown to them. How could it not bother them to know that their schools and education system are their shepherds? Youth is being created, a youth that can't think for itself, a youth that doesn't question, a youth that has no ideals. Most importantly, a youth that has lost all hope to break the cycle is being created. This is because whenever they dare to step up and question the rules that are forced upon them, we punish them and tell them that they should be ashamed of their behavior and thoughts.

I should make a few remarks about being a female in this chaotic place we call houses of education. Should I talk about the ones who think my nail polish color is a corruption in my morals, or the ones who think of my hair color as a display for my indecency, or the ones who think of the length of my skirt as the determining factor of the "manners" my family has taught me, or the ones who think of every word that I have to say as an opposition to their authority? Why do our schools, in which we see sexism and degradation in their purest forms, prioritize these trivial issues before our students' education? The words of immoral accusations spewing out of the mouths of the guardians of decency and morality are knives to our students' confidence yet to be developed.

Our students, wounded in their individuality and oblivious of their true potential, are being forced to sacrifice their identities. They now graduate without meeting themselves thus without meeting real life, and because we speak for them, and we think for them; they go on to live their lives with minimum effort. We are extinguishing their love: the love of truth that we promised to raise them with. The schools that we have entrusted our children to raise with compassion and knowledge are the main reason our children have lost hope. The ministry of education, heads of the institutions, the principals, the teachers, the school personnel that abuse their position and abuse our students' minds… We have the obligation to ask them why they put our children down, why they depreciate our children instead of appreciating them, why they degrade the integrity of the promise they have made to this country and its citizens!

Our students now randomly choose a major, an occupation, a life that they have no true passion for. We have failed them miserably, yes, we the ones who should have been beacons of light on the path to their true and full potential. The education system is making them repeat and memorize information, it tells them that this is the right way to please others, and to please others is the key to success. We are not educating our children to improve their thought processes, we are educating them to adopt what we have set to be the right thought process. How many generations of beautiful wasted minds will it take for us to realize our country has been in its deathbed for decades, gasping for a breath of fresh thinking?

IS ARTIFICIAL INTELLIGENCE REALLY THAT INTELLIGENT?

Ada Nur Basar

My name is Ada Nur Başar and I was born on October 22nd in 2004. I am currently attending Üsküdar American Academy. Three years ago, when I joined the Girls in Tech Club in my school, I discovered my passion for computer science. My journey with computer science has been both complicated and fascinating since it is a very broad field that interacts with many distinct areas and in which I get to learn something new every single day. Throughout these three years, I have learned programming through intensive courses and self-studied. Yet, artificial intelligence has been the topic that I specifically would like to research. Regarding that, I plan to continue my research on this topic and hopefully become a computer scientist or a data scientist one day.

Do you believe artificial intelligence will ever become smarter than us? You are the most talented golf player in the world. You are unbelievably skilled; every time you hit the golf ball, it drops right into the center of the hole. You become widely known for your skills and everyone can picture you raising the gold cup with pride. Your fans even describe you as "invincible". A few years later, they want you to compete with artificial intelligence. AI's shots are much more consistent and accurate than yours. Your title "invincible" gradually fades away. In this way, a pile of metal that is deprived of the sense of victory receives the gold cup instead of you. At that moment, would you feel inadequate and think that AI is "more intelligent" than you? You should immediately put these gloomy thoughts aside. Humans spend a great deal of time to anthropomorphize AI and further enhance machine learning. On the other hand, humans are also afraid of both strong AI and the singularity which is the hypothetical period in which technology becomes uncontrollable and yields unforeseen consequences. However, although AI can perform various tasks effortlessly multiple times, human intelligence is much more complex due to its ability to be aware, experience, adapt, create, and learn.

The evaluation of human intelligence versus artificial intelligence should rely on the definition of intelligence which is "the mental quality that consists of the abilities to learn from experience, adapt to new situations, understand and handle abstract concepts, and use knowledge to manipulate one's environment," according to the Encyclopedia of Britannica. Seventy years ago, Alan Turing wanted to test whether computers can think and how similar they can be to humans. To briefly explain, the Turing Test is an "imitation game". The interrogator tries to distinguish a machine from a human in a conversation. In 2014, the computer AI representing Eugene Goostman had tricked over 30% of judges and passed the test (Oppy and Dowe). It was considered a historic event about the rare defeat of human intelligence as well as a menace of mental superiority. However, this mindset is arguable as Dr. Christoph Koch, Chief Scientific Officer, and the President of Allen Institute for Brain Science indicate that subjective experience and demonstration of intelligence, relating to this case, are entirely distinct concepts. Furthermore, according to Integrated Information Theory (IIT), even if computers were able to simulate human-equal attitude, they would not be aware of their experience. Therefore, a computer that is unconscious of a conversation is not more intelligent than humans. Calling them "intelligent" also opposes the aforementioned definition which comprises "being able to grasp abstract concepts."

Another influential incident in history is DeepMind's Go player AlphaGo defeating Lee Sedol with extraordinary strategies in 2011. Yet again people were frustrated by this mind-boggling victory due to the idea of it representing an early signal of "the singularity." Nevertheless, former MIT robotics professor and Rodney Brooks, one of the co-founders of Rethink Robotics, indicates that AlphaGo was designed to play Go on a 19x19 board only. when Brooks asked the DeepMind team about the potential change in AlphaGo's performance if the board was 29x29 (Miller 2017) the answer was "We would have been dead." Therefore, AI can be astonishingly successful but only in

specific areas of dominance. For example, in the case of an unexpected alteration in conditions, AI would fail to adapt to the new conditions, which again falls against the definition of pure intelligence.

At this stage, creativity is another significant element that hinders AI from surpassing human intelligence. Creativity and intelligence are interdependent skills. Humans can create with the help of their imagination and experiences. One of the prominent fields in which humans can demonstrate their creativity is art. On the other hand, the case for AI is the opposi te. AI is deprived of sensations and divergent thinking, and an artist or a creator needs to evoke emotions based on their experiences and demonstrate authentic ideas. Therefore, with today's technology, AI can only be a handy tool for artists. For instance, scientists from the Bethe Lab in Germany untangled the mystery of Van Gogh's painting method. They taught AI how to replicate Van Gogh's famous painting "Starry Night" (Prado 2015). The machine blends the colors according to the corresponding painting and Van Gogh's original work. For that matter, AI cannot create but rather imitate a piece of art. In the end, it is neither the creator nor the official owner of the unique idea.

Yet, it is important to know that there are some cases when AI is indispensable and convenient. For instance, Refik Anadol, a Turkish media artist and director, devoted himself to "creating a hybrid relationship between architecture and media arts with machine intelligence." He developed a new generation of machine intelligence with his team which reflected the hundred-year-old archive of the Los Angeles Philharmonic Orchestra on The Walt Disney Concert Hall (AI.Artists.org). In his interview with Sukanya Garg, an author and artist in STIRworld, Anadol made a unique analogy to describe AI's role in creativity: "I can dip my brush into the machine's mind and paint with it. So, it is not science fiction anymore, it is truly what we are doing" (Garg 2019). For media artists, AI is seemingly an essential tool that broadens artists' perspectives by providing them with the ability to push the limits of their creativity and making their ideas come true. However, as AI is not able to create, it cannot outsmart humans. AI can be used for solving specific types of problems. Yet, creativity is more about asking questions rather than answering them with algorithms in the fastest way possible.

AI is deprived of making critical decisions on its own since it lacks senses. It needs a large amount of data to learn and differentiate basic information. Take distinguishing between a banana and an orange, for example. A human toddler can distinguish a banana from an orange after being shown a photo of each fruit. However, AI needs megabytes of specific data to correctly differentiate the two fruits. Besides, AI can easily be tricked in terms of recognition. When a banana is shown to AI, it can identify it correctly but if there is another picture next to it and the environment is noisy, it identifies the objects as a "toaster" (Fernandez 2019). Although these basic examples may seem trivial, AI's inability to make critical decisions and differentiate caused complicated issues in the past. The driverless car trial of Uber is an example of these issues. The artificial intelligence of the car could not identify Elaine Herzberg walking her bicycle across the street. The AI of the car first identified it as a person, then, as an object, and finally, as an unknown object. The AI couldn't make the critical decision to put on the brakes or get out of her way and as a result of this fault detection, Herzberg died in the accident. Hence, we can assume that humans are more capable of differentiating basic information and making critical decisions.

To sum up, although AI outperforms humans in subject -specific areas, this does not imply that AI is superior to human intelligence. Today, AI relies on forming an up-to -date repository of knowledge. Humans use their memories, experiences, and emotions whilst thinking divergently to create and take action on their own while AI is not even aware of its existence. It fails to identify its weaknesses, update accordingly, and adapt to new conditions, the process of which resulted in the development of humanity throughout millions of years due to human intelligence.

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“LOVE”

Feride Dizdar

Love. The big, majestic, "extraordinary" feeling we are always looking for and ready to sacrifice something for it. The feeling that we sometimes come to the brink of giving up ourselves just to catch it. For someone to love us, to be with us, and to see us, we take on attitudes that are not "us" at all and put on a fake, vague jacket. We wear a sequin, shiny, gold mask on our faces. We always try to look better, more beautiful, more social, more "more." Unfortunately, we leave no trace of ourselves while doing this. Whereas that great, pure, epic feeling that we cultivate in our dreams does not know these games and rules; it merely knows how to love. It knows to love, think, dream, and hope for a lifetime. But themoment we put on that fake jacket and fancy mask, our lofty dream, love, gets further away from us. And after so many efforts, we are left with the thoughts of what went wrong and what we failed, what is missing in "us." We are then left with scenarios that have lost their reality a long time ago. As we approach the third hour of watching the ceiling with tears in our eyes which are the courtesy of a third-grade melodrama, the only thing we forget is that there is no such thing as "us" anymore. "Don't talk about your feelings!" "Don't show them that you care!" When we listen to this advice, we drive love away, the love that we've been waiting at the doorstep of our hearts for in countless nights, months, autumns. Because — if what you are looking for is love in its purest form — Love is unplanned. Love is your friend who does whatever comes from within. It is straightforward, spontaneous. It is free. Love is your uncle who goes to the mountains for a week when he feels like it. Or love is your sweet but always a little proud aunt, sitting in the nook of the dining table in large family meetings, arranging silent encomia to the beauty of the moon, always looking deeply at you. Love is the hectic man in a suit riding alone in the subway, with a warm smile on his face and graying hair on his head. Sometimes love is your next-door neighbor who is crazy, often cheerful, and often crying out loud. And sometimes, love is that quiet and strange, yet always gentle and soft desk mate whom you never expected to be love. Love is everywhere, and it's in us the most. But it should not be forgotten that love comes to the ones who always strive to be themselves, who are ready for all the pains of that authenticity. Contrary to popular belief, love is not a dream or a surreal illusion, on the contrary, it is the reality that you always run away from, to those who can feel it…

I was born in Istanbul in 2002, I am currently in my senior year at IMI Italian High School. I did theater at my school and at Baskent Iletisim. I also was a member of the debate club at my school. I love to write poems, stories, and essays. In 2018, I wrote a short story that won the Koç School's Suna Kıraç Story Competition. Last year, I attended a creative writing course in Marmaris. I aim to add something to myself and our readers by actively writing in this journal, thank you.

THE HIDDEN MATHEMATICS BEHIND THE COMPOSITION OF MUSIC HARMONY

Ece Karagoz

I am a student at Uskudar American Academy. In middle school, I was enrolled at Sarıyer Doga Schools. I have been playing violin since I was 6 years old, and I graduated from Istanbul University State Conservatory's certificate program of violin last year. I wanted to reflect on my passion for music by explaining it with mathematics in this project. I hope you will enjoy reading it.

ABSTRACT

Music was considered as an art of mathematics in the ancient Greek era due to the rhythmical, theoretical, and compositional harmony which cannot be explained without numerical patterns and calculations. This study attempts to investigate and explain how music is the audible form of mathematics, as well as analyzing some mathematical concepts that are used in the composition of classical music.

In this project, various online sources with printed sources from the UAA Library are used. In addition, some observations and non league experiments are made by benefiting from instruments such as the piano and the violin. Lastly, for deeper comprehension and specified knowledge, the methodology and theory of music are discussed with teachers and instructors from the Istanbul University State Conservatory.

Since I was 6 years old, I have been playing the violin. As I started taking music theory and solfege lessons, it became inevitable for me to see how patterns of fractional numbers and intervals created the atmosphere and the mood of the piece in infinitely many ways. Particularly, it is so fascinating to see such a dependency of melodies on numbers. I believe that even though mathematics is a mostly abstract subject, tangible parts of it are hidden in our daily lives, and music is a good place to start discovering the mystery of numbers.

THE HARMONY OF NUMBERS

1.Fundamentals of Music

1.1 Discovery of Notes

Throughout history, lots of mathematicians and scientists have been engaged with music and the reasoning of how and why melodies occur. The Greek philosopher and mathematician Pythagoras strongly believed that the numbers are the codes to solve the universe, the guidelines for interpreting nature. With this mindset, he knew that mathematics may explain everything, even music. According to an uncertified rumor, Pythagoras heard the sound of a hammer striking on iron sticks when he was passing by a blacksmith. Then, he noticed that not all the strikes produced the same note. Further, the sound that was produced was sometimes harmonic and melodious with the other hammers' sounds, and sometimes disturbing. So he devoted himself to understanding how pitches varied and created euphony or cacophony. As a hint, he realized that the size of the hammers was different. However, the size of each one was in a ratio: one being two-thirds the size of another, one being twice the size of another. At the end of his investigations, he declared the relationship of the hammers' sizes and sounds complementing each other or sounding terrible. This was the realization of notes.

1.2 Calculation of the Frequencies of Notes

1.2.1 History

Notes are the smallest building blocks of music. A note is nothing but a physical vibration of a mechanical system, and they are usually measured in hertz (Hz), 1 Hz meaning one vibration per second. In Western/classical music, only twelve notes have a defined frequency (do-do#-re-re#-...si), whereas in other music cultures like Eastern music, there are more fixed frequencies that are used. However, these fixed frequencies are mathematically related to each other. In both of the situations, all notes are calculated by taking the central A(la) as the origin. Worldwide, the central A is accepted as 440 Hz, and it is called 'standard pitch' or 'concert pitch'.

1.2.2 Frequency Equation

As mentioned in the previous part, there are totally twelve notes in classical music: do-do#-re-re#-mi-fa-fa#-sol-sol#-la-la#-si-do . We defined A as 440 Hz, and for the following equation, let's name A as $f0$ since we take it as the origin of frequencies. We will assign a number for the notes that we want to calculate. From looking at the note order, we will detect the

distance of the note to A(la). For example, if we're calculating the frequency of si, we will say that it is *f*2 because if la is 0, then la# is *f*1 and si is *f*2. In the case that the note has a lower position than A(la), we will assign a negative number. For example, the number of mi is *f*-5. The equation is as follows:

$$fn = f0 * (a)^n$$

where *f*0 = 440 Hz (central A)

n = the number of steps away from the fixed note A (if you are at a higher note, n is positive; if you are on a lower note, n is negative)

fn = the frequency of the note n steps away

a = (2) n/12

Therefore, we can manipulate the equation as:

$$f = 2n/12 * 440$$

For instance, we can find the frequency of C(do) that is above A(la). There are 3 steps between A and C (A - A# - B - C), thus n=3:

$$f = 23/12 * 440\ 523.2 \text{ Hz}$$

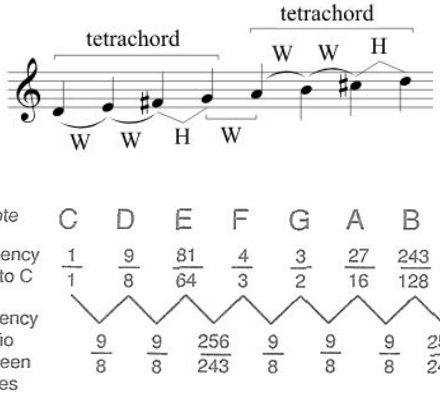
Likewise, we can find the frequency of F(fa) that is below A(la) which therefore has a negative value of n. There are 4 half-steps (A - G# - G - F# - F), thus n=-4:

$$f = 2{-}4/12 * 440\ 349.2 \text{ Hz}$$

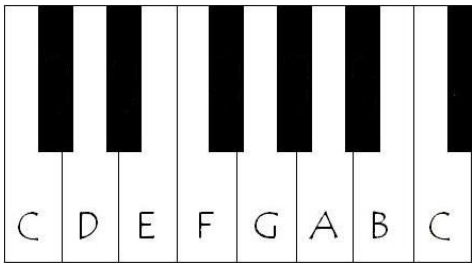
Notes	Frequency (octaves)				
A	55.00	110.00	220.00	440.00	880.00
A#	58.27	116.54	233.08	466.16	932.32
B	61.74	123.48	246.96	493.92	987.84
C	65.41	130.82	261.64	523.28	1046.56
C#	69.30	138.60	277.20	554.40	1108.80
D	73.42	146.84	293.68	587.36	1174.72
D#	77.78	155.56	311.12	622.24	1244.48
E	82.41	164.82	329.64	659.28	1318.56
F	87.31	174.62	349.24	698.48	1396.96
F#	92.50	185.00	370.00	740.00	1480.00
G	98.00	196.00	392.00	784.00	1568.00
A♭	103.83	207.66	415.32	830.64	1661.28

1.3 Arrangement of Scales

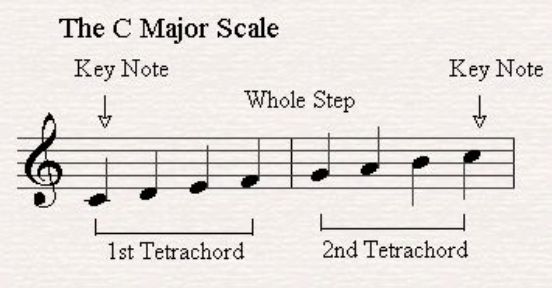
The word "tetrachord" comes from Greek; tetra (four of something) and chord (string or note). As understood by the name, a tetrachord embodies four notes. Every scale has two tetrachords which are the first tetrachord and the second tetrachord. Usually, tetrachords are recollected as the Pythagorean tetrachords. The reason behind this is that Pythagoras used initially the 2nd tetrachord of C Major scale to form other scales like G Major, A Major and so on. Moreover, he also formed other scales by using the first tetrachord of C Major like B Major. He had a defined interval formula that he used for forming each scale.

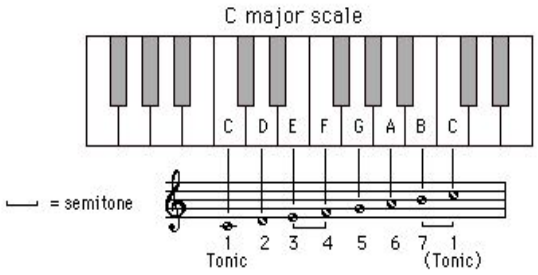


As we see from the image above, there is a C Major scale. The frequency ratios between notes are given, and the first thing that catches our attention is that not all of them are the same. Between E and F, followingly between B and C are 256/243 which is smaller than 9/8. From this scale, Pythagoras defined a pattern from the 9/8 value that we call the whole interval and 256/243 that we call half interval. It became an essential of major scales. Mentionable, this is how also black piano keys are placed. Between each key regardless of its color, there is halftone. So, between C and D, there is a whole tone: there is a black key between them, so there is a halftone from C to the black key and another halftone from the black key to D, making a whole tone totally. Assuring the 256/243 halftone between E with F and B with C, we can see that there are no black keys between those notes.

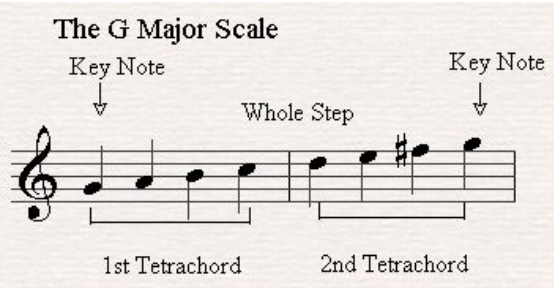


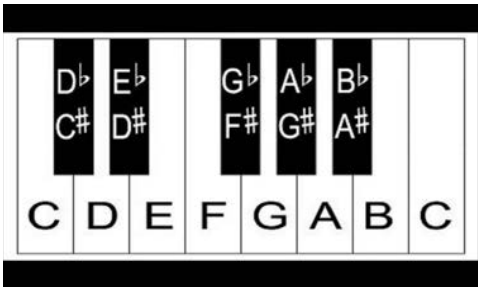
Therefore, the pattern that Pythagoras used for forming every major scale is as follows: whole+whole+half+whole +whole+whole+half. Regardless of the starting note-A(la), B(si), C(do), D(re) and so on- when the intervals obeyed the given Pythagoras' pattern, they created the same harmony, and except for the people who have absolute ears, we aren't able to identify which scale is played since they all create the same melodic structure. The way Pythagoras obtained all scales was so easy after the point of identifying the pattern. He first got the second tetrachord of C Major: G-A-B-C (sol-la-si-do)





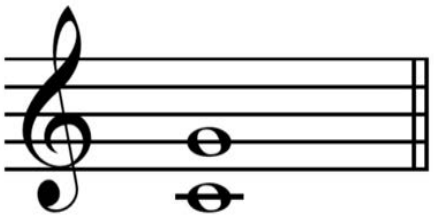
This second tetrachord's intervals are whole+whole+ half since between G and A is whole, A and B is whole, and B and C is a semitone. So it was in the formation of the pattern, and he used this second tetrachord of C major as the first tetrachord of another new scale: G Major. Further, Pythagoras needed whole+whole+whole+ half intervals for completing the second tetrachord of the new. So he added D-E-F-G (re-mi-fa-sol). When we check that if these notes obey the pattern, we face a challenge. Between F and G, there was a whole tone, whereas there should be a semitone according to the formula, and there was a semitone between E and F whereas there should be a whole tone. At this point, Pythagoras used diesis or sharps for F that made it F sharp which pushed the note halftone higher. As F got F sharp and went to a higher pitch, the interval between E and F got whole, and the whole tone between F and G got semitone since the F moved to higher and left a narrower tone between itself and G. The F sharp is the black key on the piano that is situated between F and E. Finally, Pythagoras obtained the G Major scale.



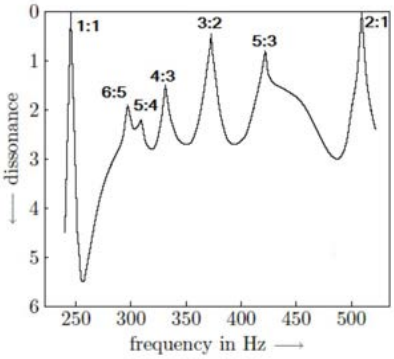


1.4 Interval Notation

1.4.1 Explanation of Interval Notation



In terms of music, when the ratio of pitches' frequencies are taken, we find the interval ratio of these notes. For instance, when we take C and G (do and sol), we see that they create perfect fifths. They create a perfect fifth because there are five notes from C to G (do-re-mi-fa-sol) and that they contain three whole intervals from one to another and a half one between E and F (mi and fa) as explained in the previous subclause. As we take the frequency ratio of a perfect fifth note couple like C and G, we obtain 3/2. Furthermore, this ratio stays constant for every perfect fifth regardless of their pitch like F to C (fa-sol-la-si-do). On the left, there is the visual of C to G, a perfect fifth with 3/2 frequency ratio. Moreover, there are lots of other intervals besides the perfect fifths(3/2) like perfect fourths(4/3) or major seconds(9/8). Those intervals may be categorized as consonant and dissonant, and as the ratio gets smaller, the dissonance -in other words uneasy sounds- gets more dominant. In contrast, greater ratios like 3/2 found in the perfect fifths sound harmonical. We see the graph of dissonance vs. the frequency ratio on the right.



1.4.2 Pythagorean Tuning with Interval Notation

Except the gifted ones who have absolute ears that can comprehend direct frequency measurements, musicians use ratios that allow them to memorize and work on more complicated pieces. Alternatively, with the obligation of conserving the ratio between each note, musicians change the pitch of songs and pieces.

Since perfect fifths sound highly consonant and complete, it is one of the easiest pitch duos for human ears. Pythagoras used the 3/2 ratio for tuning and calculated frequency ratios of all intervals based on it. This system was used by musicians until the beginning of the 16th century.

MATHEMATIC CONCEPTS IN MUSIC

2. The Golden Ratio

2.1 History of the Golden Ratio

In the book "Stokheia" by Euclid which influenced the next generations undeniably, it is mentioned that when a stick is divided in a certain proportion, the division of the complete stick to the bigg er piece is equal to the division of the bigger piece to the small one. Furthermore, it is asserted that this ratio was introduced to the Ancient Greeks by Pythagoras. The golden ratio was firstly defined in the book "De Divina Proportione" (On the Divine Proportion) by Luca Pacioli (1445-1515) in 1509 for which Leonardo da Vinci made illustrations, being the idea owner of the book. Later on, Leonardo da Vinci renamed the book "Sectio Aurea" (Golden Ratio) that became an inseparable part of science, geometry, art, and music.

2.2 Definition and Calculation of Golden Ratio

In mathematics , when two quantities' ratio s are the same as the ratio of their sum to the larger one of the two quantities, those values are in the golden ratio. Expressed algebraically, for quantities a and b with a > b > 0,

$$\frac{a+b}{a} = \frac{a}{b} = \varphi \text{ (golden ratio)}$$

We simplify the fraction further.

$$\frac{a+b}{a} = \frac{a}{a} + \frac{b}{a} = 1 + \frac{b}{a} = 1 + \frac{1}{\varphi}$$

Therefore,

$$1 + \frac{1}{\varphi} = \varphi$$

When we multiply the equations with φ

$$\varphi + 1 = \varphi^2$$

Which may be arranged to

$$\varphi^2 - \varphi - 1 = 0$$

Furthermore, by using the quadratic formula, we obtain two solutions:

$$\frac{1+\sqrt{5}}{2} = 1.6180339887\ldots$$

and

$$\frac{1-\sqrt{5}}{2} = -0.6180339887\ldots$$

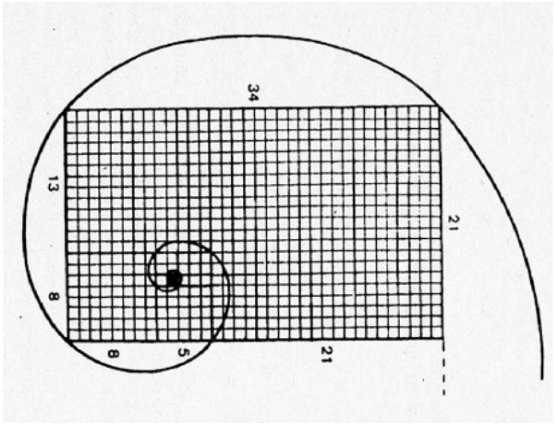
Because the golden ratio is always between positive quantities, φ is compulsorily positive:

$$\frac{1+\sqrt{5}}{2} = 1.6180339887\ldots$$

2.3 Fibonacci Numbers

Through the riddle " Suppose a newly-born pair of rabbits, one male, one female, are put in a field. Rabbits are able to mate at the age of one month so that at the end of its second month a female can produce another pair of rabbits. Suppose that our rabbits never die and that the female always produces one new pair (one male, one female) every month from the second month on. How many pairs will there be in one year?", we obtain the Fibonacci series:

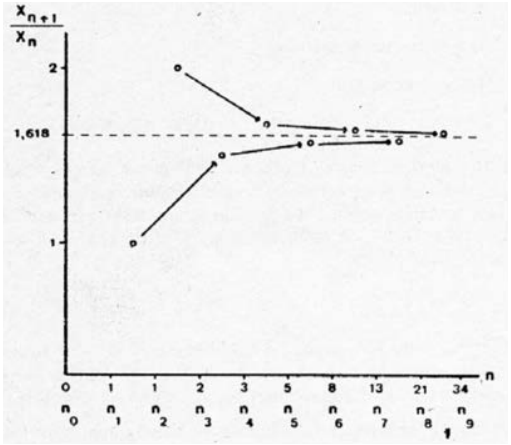
1,1,2,3,5,8,13,21,34,55,89,144,...



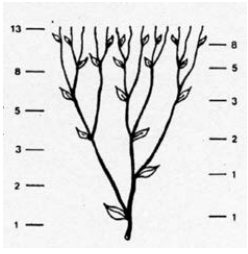
When we look deeper, we realize that starting from the third element, all the following elements are the sum of the two previous numbers.

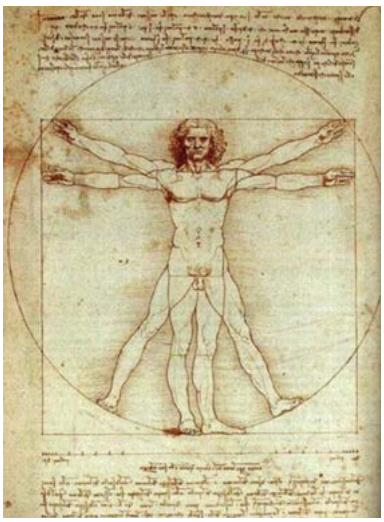
1+1=2, 2+3=5, 3+5=8, 5+8=13, 8+13=21,…

This number sequence has lots of interesting properties, including the golden ratio. When consequent Fibonacci elements are divided by each other, they appear to give 1.618 (Φ) in a way getting more accurate. In other words, the ratio of Fibonacci numbers that form this sequence is in the golden ratio.



We may find this distinctive ratio apart from mathematics in lots of fields including nature, astronomy, zoology, anatomy, sculpture, and music.





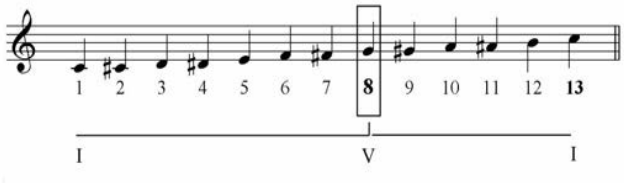
2.4 Music Through Golden Ratio

Convincingly providing balance and concordance, it is still a mystery that how and why the golden ratio creates such an impression of congruity and aesthetic. Music is one of the arts that harbors that powder of mystery of the golden ratio. The idea of music being a window opening to a broader knowledge of nature was adopted by ancient civilizations older than Christianity. The source of this conviction in the west was the Greek philosopher Pythagoras who created the scales with different notes by implementing the interval patterns and contributed to the discovery of the golden ratio. Pythagoras and his followers believed that the entire universe is built on the same mathematical principles, and the music that we hear is the sound of the cohesiveness that keeps the Earth, the Sun, and the stars together.

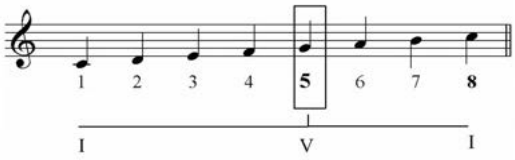
The musicians had the need to regulate the notes in an order which would help them understand the intervals between two or more sounds. However, after a certain time, they realized that some specific intervals have the same impression on every human. For instance, the 8s- also known as an octave- are perceived as the high note of the chord is the copy of the base sound but in a higher pitch.

The second easiest interval that people can identify is 5s as mentioned in the first chapter. In between two other sounds that don't create 5s or 8s, it is possible to change the interval and have the same sense of hearing. In contrast, the slightest difference between the 5s and 8s intervals will ruin the entireness because they are built on a very precise balance that the slightest flaw will be a huge error among the perfection.

All scales have degrees that are dominant and subdued. According to the music theorist Heinrich Schenker who brought a new perspective of analyzing pieces with "Schenkerian analysis" and who was a professor at the University of Vienna, music was only constructed with the first and the fifth degrees of the tone/scale. Mentionably, all scales are constructed by 8 notes. In fact, this notion is just a natural conclusion of the golden ratio being music's one of the most critical blocks. A chromatic scale is the scale in which we include all notes like sharps(#) or flats(b). For instance, a C major chromatic scale is as follows: C-C#-D-D#-E… A diatonic scale is the scale which we formulized in the previous chapter as whole-whole-half-whole-whole-whole-half. Hence, the C major diatonic scale is as follows: C-D-E-F-... When we construct the same scale in chromatic and diatonic forms, we see that the dominant chord of the scale corresponds to the 5th and the 8th degrees. In the images below, we have a C major scale (Do Major) that starts from the note C and ends again in C, but one-octave higher. Since it is a major scale, it is formed by the Pythagoras' interval formation that we apply for all major scales (whole-whole-half-whole-whole-whole-half). The scales below represent the same scale in a different formation.



1. Chromatic C Major Scale



2. Diatonic C Major Scale

The dominant degree of the chord is the note G (sol) since the dominant degree is defined as the 5th sound of the scale. On the first scale, we see that there are 13 notes that compose the chromatic scale, and the dominant note G corresponds to the 8th degree. Likewise, on the diatonic scale, we see that there are 8 notes and the dominant note G corresponds to the 5th degree in this case. We may assure the golden ratio by dividing the number of notes in the scale to the dominant degree and see if the quotient gives phi (φ).

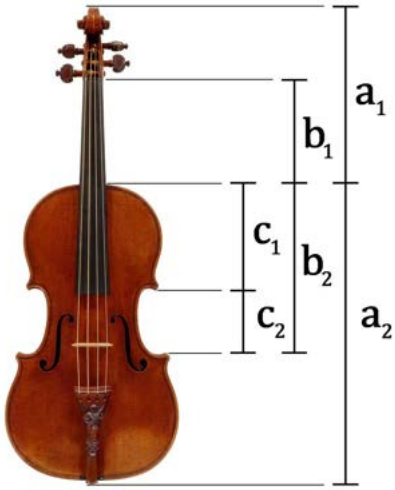
1.Chromatic Scale: 13/8=1.618
2. Diatonic Scale: 8/5= 1.618

2.5 Golden Ratio in Instruments

2.5.1 Stradivarius Violin

Antonio Stradivari is an Italian violin maker who is widely considered the greatest of all times. His interpretation of geometry and design for the violin has served as a conceptual

model for violin makers for more than 250 years. On top of that, one of his violins has been sold for 16 million dollars. For millions of musicians as well as non-musicians, the sound of the Stradivarius violins are distinct from other instruments in an incredibly sensational and heart-touching way. For centuries, the mysterious reason for that superior sound has been questioned by lots of people and remains a hot topic. The impact of wood type, the implication of the violin-making procedure, and the materials have an undeniable place for the quality of the sound. Interestingly, the golden ratio that Stradivari used in his instruments is critical.



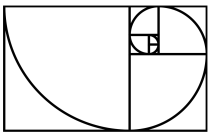
$a_2 / a_1 = \Phi$

$b_2 / b_1 = \Phi$

$c_1 / c_2 = \Phi$

2.5.2 French Horn

The modern orchestral French horn was an invention based on early hunting horns. Horns were first used as musical instruments during 16th century operas. As time passed, the significance of the French horn got greater which led to the revolution about its shape in order to enhance the sound and tone quality. The fact that the final touches of the modern French horn which were made in the 19th century were done in the consideration of the golden ratio through fibonacci numbers draws remarkable attention. Both visually and auditory, this has a great effect on the aesthetic of the orchestra and the harmony of the music.

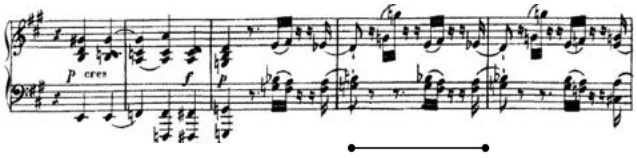


2.6 Utilization of the Golden Ratio in Classical Works

2.6.2 Johann Sebastian Bach: Fantasia and Fugue BWV 537

Johann Sebastian Bach is one of the most well-known composers of the Baroque era . During his lifetime, he composed 1128 pieces of music for organ and other keyboard instruments, orchestras, choirs, and concertos for many different instrumental combinations. Because the impact of the Catholic church was massive in the Baroque era, Bach composed most of his music for the church. In addition, there are 23 works which he left unfinished. No one really knew much about his music until 100 years after his death, when another composer, Felix Mendelssohn, conducted a performance of Bach's St. Matthew Passion. Today, it is accepted that Bach is among the greatest geniuses in music history.

In Bach's work of Fantasia and Fugue BWV 537, we encounter that the golden ratio is used at the turning points of the piece. As mentioned in the previous sections, the dominant degree of a scale has a vital place in terms of golden ratio. In a chromatic scale that is made up of 13 notes, it corresponds to the 8 th note (13/8=1.618). In a diatonic scale which has 8 notes, the dominant degree corresponds to the 5th note (8/5= 1.618). In music, the term 'meter' is used for the segments of the piece which are enclosed by straight lines. If we make a metaphor of a song/piece as a paragraph, the meters would be the words.

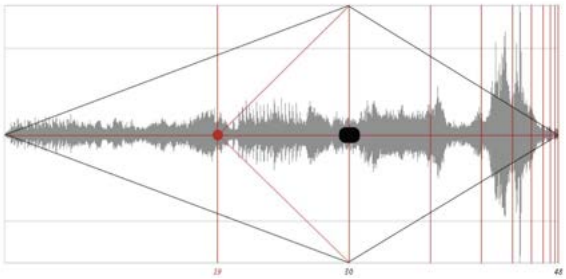


(1 meter)

This piece is written in the tone of C minor (do minor). In the 19th meter, the tone gets modulated to G minor (sol minor) which is the dominant degree of C minor. This modulation ends in the 21st meter. After this meter, G minor translates to the original tone C minor. However, at the 30th meter, with the note B, the G minor initiates again. From this meter on until the end of the piece, a rising tension strengthens. The fantasia part of the piece ends at the 48th meter. We can observe that the 19th and the 30th meters of the piece are the milestones since they highlight the dominant degree of C minor which is G minor. More significantly, the ratio of the ending meter 48 to the 30th and the 19th meters give us the golden ratio.

$$48/30 = \Phi$$
$$48/19 \sim \Phi 2$$

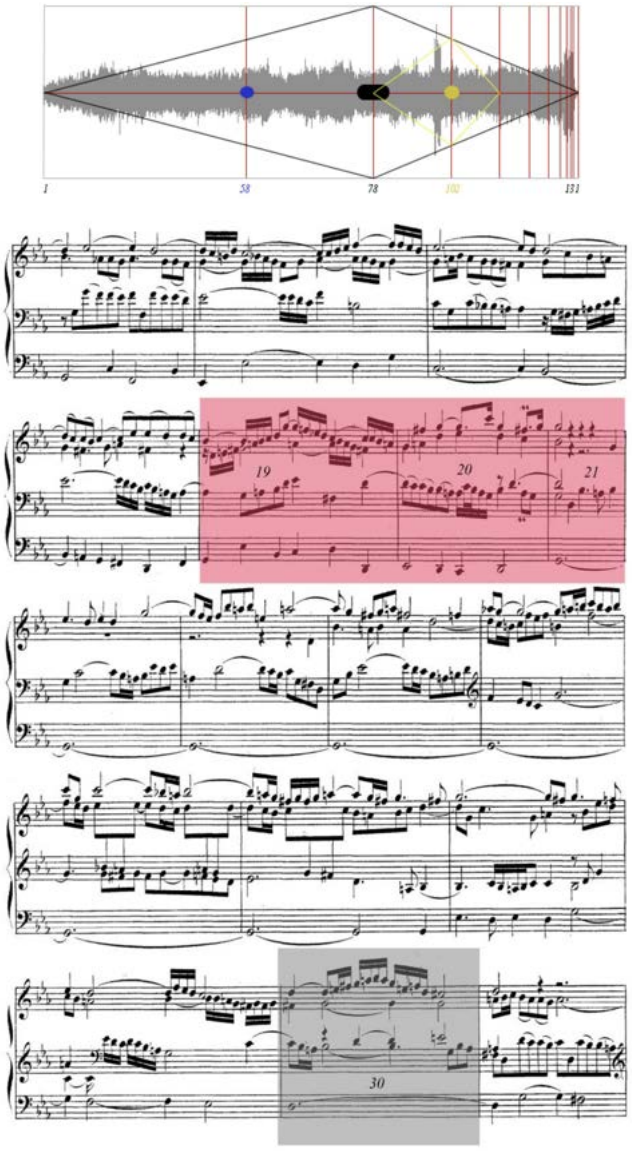
Frequency Chart Analysis of Fantasia



The second part of the piece which is the fugue starts at the 58th meter. This new section starts with C minor (do minor) as well. Until the 78th meter, Bach uses the chromatic scale whose notes get higher and higher. In the 78th meter, the tone translates to the dominant degree, G minor. In the 102nd meter, the soprano, alto and tenor parties reach the climax together. In this case, the function of the 78th meter is to prepare the tension and the thrill that climbs to the climax, meter 102. The piece once again turns to its original tone C minor, and the entire work finishes at the 131st meter. Remarkably, we again find the golden ratio in the division of rising meter 78 to the finishing meter 131.

$$131/78 = \Phi$$

Frequency Chart Analysis of Fugue

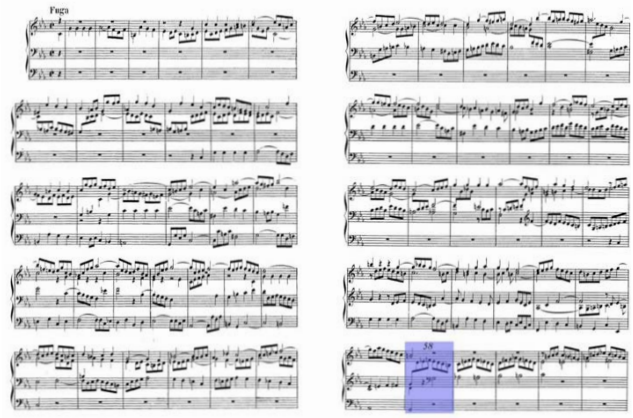


CONCLUSION

Before starting this project, I was seeking the meaning of mathematics. I believed that it is much more than what we learn at school, and I am delighted to see that mathematics truly is the building block of life. Some people tend to think of mathematics as a conceptual or abstract notion. Yet, it is like gravity; not only the earth but the entire universe would disperse in an instant of blink if gravity didn't exist. We don't see gravity, but we can feel it for sure. While doing this study, I realized that music is a way to feel the 'invisible' mathematics.

In the second chapter, with my discovery of the golden ratio, I found out that this ratio is the measure of congruity and balance. Even though there is no right or wrong in any kind of art and music, because the perception of beauty and aesthetic is integrated with balance, the mathematical concept of golden ratio locates itself in the heart of brilliance. I am sure that in this project, I could just touch a tiny bit of an endless ocean. There is more and more mathematics waiting to be discovered in music, astronomy, sculpture, and most significantly life.

When I consider the inseparable relation of mathematics and music that I observed, I became able to rationalize why conservatories asked a certain point on the numeric section of the university exams. I am so glad that I had the chance to make myself dizzy by the magnificence of numbers and saw the steps of investigating. Finally, I want to express my gratitude to my devoted and inspiring teacher Elvan Yaralılar. She always reflects mathematics as a lunapark full of joy.



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IMPACT OF YEMEN CIVIL WAR ON ITS ECONOMY

Kerem Koruk

Possessing abundant underground reserves of crude oil and natural gas, Yemen has gradually gained extensive experience and a good reputation with its energy resources since 1986. This foreseeable opulence of resources intrigued foreigner investors and corporations as well as the governments to receive their share.

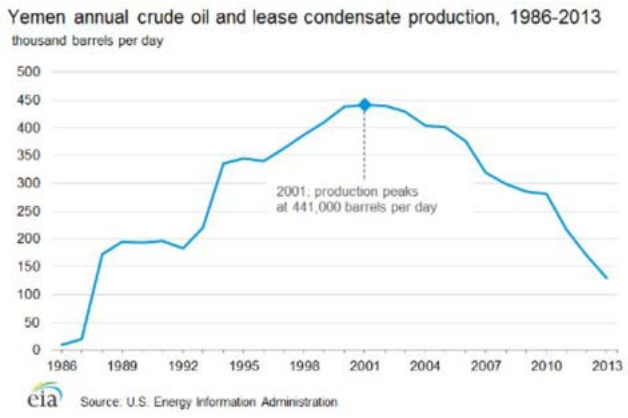
Yemen, located at Bab el-Mandeb (a strait connecting the Red Sea with the Gulf of Aden), is a strategic chokepoint for the international shipping passage. Supervising the merchant ships with United Nations forces at Bab el-Mandeb and the Gulf of Aden, Yemen holds the legal right to partake in the international shipping trade.

Among the exports of Yemen, crude petroleum and gold account for 41% and 32%, respectively. This high dependency on mineral products and precious metals leaves Yemen's economy vulnerable. For instance, if the production of crude oil and gold halts for any reason, the economy of Yemen would become severely weakened.

Imports of Yemen are relatively varied, with no exceptionally dominant product class. Fifty-two percent of its import, however, depends on a few countries including China, Turkey, India, and Oman. Nonetheless, the effects of the Saudi Arabia-Iran proxy war (Sunni-Shia sectarian war), which escalated the tension and followingly led to the Yemen Civil War, restrained Yemen from prospering. Emerging in 2015 from the rebellion of the Houthis — allegedly supported by Iran — against the Abdrabbuh Mansur Hadi (the Hadis), the Yemen Civil War has caused thousands of civilians to starve to death due to lack of food supply (referred to as the worst famine in the world in 100 years) and to be killed, based on the UN statements.

In addition to the atrocious outcome on civilians, Yemen's factors of production are substantially damaged. In the first week of the civil war, a total of five factories were destroyed. Furthermore, attacks on Yemen's oil infrastructure crucially hampered the production and export of crude oil. Yemen's annual crude oil and lease condensate production, which peaked in 2001 with approximately 450 thousand barrels per day, showed a decreasing trend ever since. According to a recent estimate by the US Energy Information Administration, overall annual production of oil, including lease condensate, was scarcely 29 thousand barrels per day in 2016, downgrading to the same amount in 1987.

Born in Gaziantep in 2001, I am currently a freshman at Erasmus University Rotterdam where I am majoring in International Bachelor Economics and Business Economics. I also have a part-time job and am working on a business idea with my friend. My main interests are to do research and write essays. I hope to contribute to this journal as much as possible.

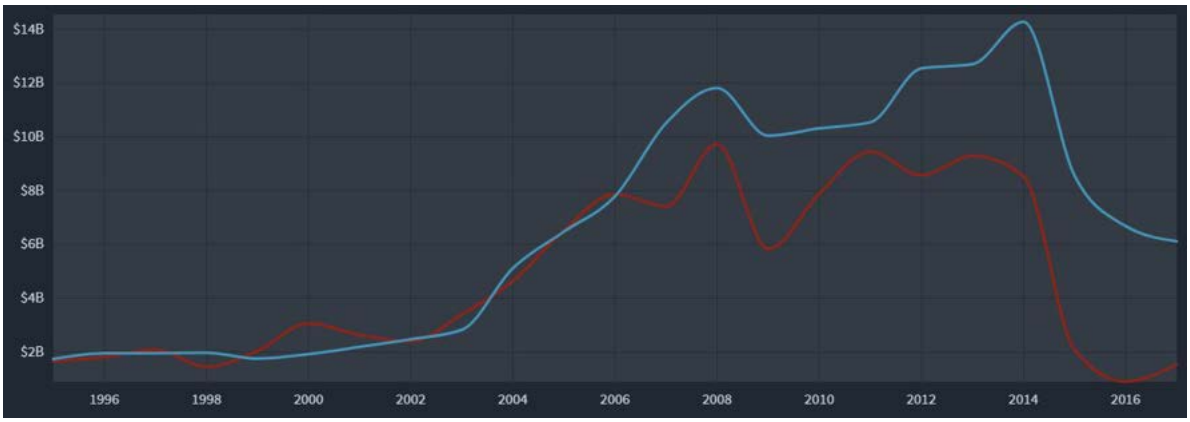


Since the initial extraction of oil and natural gas, foreign corporations such as Nexen (Canada), Total (France), and Austrian OMV have made sizable investments in order to be a shareholder in both oil and gas reserves, particularly Masila basin and Shabwa basin. The uncertainty that the civil war brought has left some corporations hanging in midair.

IISBF

Minds For Development

Between 1995 and 2013, the trade balance explicitly shows a continuous increase in both exports and imports. Exports even exceeded imports in 1997 and 2000. By 2013, the overall imports and exports were worth 13B $ and 9.18B $, respectively. However, as the Yemen Civil War began in 2014, the exports didn't remain steady, let alone show an increase. Undoubtedly, the civil war economically reverted Yemen to 1988. From 2013 to 2015, its economy shrank 77 percent.



(source: https://oec.world/en/visualize/line/hs92/show/yem/all/all/1995.2017/)

Human Development Index (HDI), ranging from 0 to 1, is an indicator of how productive a country is. HDI approaching 1 infers the higher welfare of a country while HDI approaching 0 means the opposite. Between 1990 and 2013, the HDI of Yemen progressively increased to 0.507 from 0.399. However, by the onset of the Yemen Crisis, the HDI regressed to 0.452 in 2017 as it was 0.450 in 2001. The decrease demonstrates that the civil war affected Yemen not only economically, but also socially.

In 2009, Yemen's liquefied natural gas (LNG) project, led by French Total, was embarked upon — the greatest industrial investment ($4.5 billion) in Yemen. Foreign partners held 78,73% of the project; Yemen Gas Company and The General Authority for Social Security & Pensions possessed the gas reserve for the project.

Anticipations regarding the Yemen LNG project were initially favorable, however, the course of events the Yemen Crisis brought upon the country, starting in 2011, severely eliminated the optimistic and opportunistic desires of the shareholders as well as the public. The Yemen Crisis in 2011, and followingly the Yemen Civil War in 2015, compelled the Yemen LNG to shut down due to force majeure. The civil war set Yemen back from maintaining its promising and steady development and attaining its long-term goals. Damage to capitals, deterrence of foreign investors, and social uneasiness will take a long time to be recovered. However, there is no room for pessimism. If opponent parties come to an agreement to end the war, the overall production can be enhanced to its pre-war amounts.

ANIMAL RIGHTS

Sena Gönel

Animals are an inseparable part of our lives. You might have home pets that you love, or take care of those on the streets. No matter where they are, none of us can deny their existence. Precisely for this reason, some laws protect them as well as there are for humans. In this article, we will talk about the progress of animal rights through World's history and Turkey's stand on this matter.

World History

The first animals who became close to humans, between B.C 1400-1000, were dogs, cats, chickens, pigs, horses, and ducks. They were animals who could be tamed by humans and so they were used by many civilizations even before we can know. Between the years B.C. 1000 and C.E. 700, roughly progress, many religions started teaching to not be violent towards any living organism thus forbid harming, eating, and sacrificing animals. Religions like Hinduism, Jainism, and Buddhism were a lot more serious about these teachings than Judaism, Christianity, and Islam. These religions were less tight about matters that concerned animals. Some ancient Greek and Roman philosophers were even offering people to not eat meat at all and treat animals with more care. In the first century of B.C., an ancient Indian philosopher named Valluvar wrote a chapter concerning animal rights and pressed on the issue of animal eating, saying that people should feed on a completely plant-based plate. And he also wrote chapters on not killing or harming animals separately. One of the previously mentioned religions, Buddhism, affected Japan and thus Japan initiated an order to not eat animals.

In B.C. 530, the Greek philosopher Pythagoras was one of the first people to believe and state that animals had souls and minds as well and encouraged people not to eat meat and not to harm animals in any way. Between the years B.C. 269-232 the Indian emperor Ashoka started believing in Buddhism and forbade eating meat and harming animals. He also started offering protection to wild animals. In the 100s a Greek medical researcher named Galen did experiments on animals and caused vivisection (surgery conducted on living organisms for experimental purposes.) to be spread widely which would become a very big problem in the future. In 675 a Japanese emperor Tenmu, who was also a very believing Buddhist, forbade eating any kind of animal, excluding fishes and wild animals. In the early 1600s, a French philosopher and scientist Rene Descartes said that animals were living machines and did not feel pain or emotions and did experiments on them. In 1635, the

"Hello, my name is Sena Gönel. I am currently attending Eyuboglu College as a 10th grader. I have always been scared of animals. That is, until my family adopted a cat on my request. We all fell in love with the little creature in the house, and further became engaged in many activities to help the ones outside. I witnessed them being mistreated many times and for this reason, I wanted to share my knowledge and ideas about this issue in our country. I hope you will find my writing helpful as well as informative."

Parliament of Ireland issued one of the first known animal protection legislation. In 1687, Japanese people who were already banned from eating meat were also banned from killing animals regardless of the reasons. In 1780 a British philosopher named Jeremy Bentham wrote "an introduction to the principles of morals and legislation" and became known with the words " The questions are not "Can they reason?", "Can they talk?", or "Can they suffer?" He argued for better treatment against animals and pressed that they could feel pleasure and pain. In 1822 Britain, led by Richard Martin, the parliament passed the "Act to prevent the cruel and improper treatment of cattle". Just two years after that in Britain, again, Richard Martin, Arthur Broome, and William Wilberforce founded the Society for the Prevention of Cruelty to Animals and they became the founders of the first organization for animal rights in the history we know of. In the same year Lewis Gompertz, who was also a vegan, published one of the first books for animals.

In the 1830s, Gompertz founded the Animal' Friend Society and opposed any use of animals for people's benefit. In 1835, Britain passed its first Cruelty to Animal Act and expanded existing law to protect bulls, dogs, bears, and sheep. In 1847, the term vegetarian was found and Britain found the Vegetarian Society. In 1859, Charles Darwin developed a theory declaring that humans are the descendants of animals, which made people think they could be harming, even eating, their ancestors or kins. In 1866, the American Society for the Prevention of Cruelty to animals was established. In the same year, the Japanese ban to eat meat was supported by the government, and not eating meat became an official rule. In 1875, Francis Power Cobbe founded the first establishment that protested animals being used in experiments, the National Anti-Vivisection Society in Britain. After that, affected by the Society, in 1876, Britain issued the first legislation to forbid animals from being used for experiments. In 1877, Anna Sewell's book named Black Beauty made people take notice of the horse's well-being and took attention to the farm's treatment of animals, which was also going to be argued in the future. In 1903, the Brown Dog Affair brought vivisection to public sight and it became a topic for public debate which lasted until 1910.

In the U.S. 1906, J. Howard Moore published The Universal Kinship which supported Darwin's descendant theory. In 1944 Britain, Donald Watson found the term vegan and also founded The Vegan Society. In 1955 U.S., the first establishment to support humane slaughter(1) was founded. Because of that, in 1958, The American Humane Slaughter act was passed. In 1960, India passed its first animal protection law, which would lead them to have sympathy in the future. In 1964, an organization called the Hunt Saboteurs Association was founded in England, which opposed hunts and, as you can understand from the name, sabotaged them. In the same year, British Parliament formed a committee to investigate animal welfare. They concluded that animals would have Five Freedoms (2). In 1966, the Animal Welfare Act was passed in the U.S. In 1974, Britain, Ronnie Lee and Cliff Goodman bombed a British animal research center. They were in the Band of Mercy, which was a group founded by former members of Hunt Sabotage Association. The two were imprisoned. But after Ronnie Lee was released in two years, he founded Animal Liberation Front, and it spread to the U.S. in a short time. In 1974, The Council of Europe passed an order that wanted animals to be unconscious before slaughter, which was very much alike with humane slaughter.

In the U.S., 1975, Peter Singer published Animal Liberation. Again in the U.S. in 1977, led by Henry Spira, who was the student of the previously mentioned Peter Singer in an animal rights lesson, Animal Rights International succeeded in igniting a campaign to end experiments on cats. Similarly, in the U.S., 1981, Alex Pacheco went undercover to investigate experiments on monkeys and the head was arrested. But the custody of the monkeys remained in the institution until they lost in court in 1990. In 1992, even though they hadn't done any other improvement before, Switzerland became the first country to include animal protection in its constitution. In 1997, the European Committee recognized animals as sentient beings, not property. But it wasn't until 2008 that some countries like Spain gave animals rights, and they weren't even included in the law. In 2009 Bolivia became the first country to ban circuses using animals. In 2010, in an underwater organization named Seaworld, a whale killed its trainer. In 2012-2013, European Union banned battery cages and cosmetic tests on animals. In 2014, India became the first Asian country to ban cosmetic tests on animals and also the import of products. In 2015, New Zealand stated animals were sentient beings like humans and passed a law. In the U.S., the Federal Dog and Cat Meat Trade Prohibition Act was put into law in 2018, which made killing cats and dogs for food illegal in the U.S. But that Act was excluding ritual slaughters. That was the progress of animal rights in the world.

1) Humane slaughter happens when an animal is either killed instantly or when they are not able to sense the pain and suffering due to being stunned.

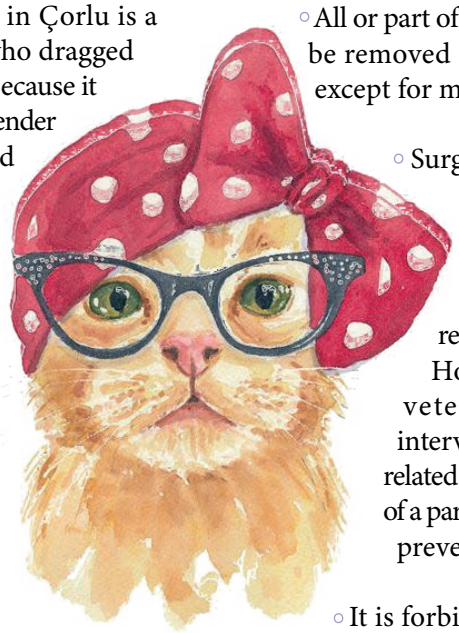
2) Five freedoms are the rights given to animals: freedom from hunger and thirst, freedom from discomfort, freedom from pain and disease, freedom to express normal behavior, and freedom from fear and distress.

Situation in Turkey

Most countries in the world have laws on animals or their ways to protect their rights. The notes given about the interest and actions of each country in this subject in the research show how advanced these countries are in animal rights and protection. Examples of these grades given between A and F: Switzerland's grade is A and Russia's grade is F. Turkey, with an E indicating a below-average grade, is among the countries still trying to progress in this matter. England, which is among the A-rated countries, has more than fourteen different legal regulations within the scope of animal rights. These laws cover pets, stray animals, animals living in pet shops (there are very few since it is very difficult to open a pet shop), animals living in zoos, namely animals in almost all conditions. Also, in case of harming these animals, some fines can reach 20,000 pounds and 6 months in prison. The reason for this is that animals are seen as "sentient beings" and they need to be protected. Similar situations are seen in all A-rated countries, but these countries are not in the majority. In Russia, which is one of the countries with the worst animal rights regulations with an F rating, animals are not accepted in

the "sentient beings" category, so there is no law protecting them. The indifference of the state towards animals gives people the courage to behave as they wish. This permission can be exemplified by violence, rape, and murder of animals. An example could be that animals were collected and killed in 11 different cities before the World Cup in Russia in 2018. Unfortunately, Turkey is closer to Russia than in other countries in terms of animal rights.

Animal rights in Turkey have been rearranged under the 5199 law. However, this law does not mention animals as "sentient beings", the basis of animal rights. Instead, animals are considered as items of "property", which limits their protection. So, harming someone's pet is similar to harming someone's property. In addition, while the penalty for animal cruelty can include a prison term of up to several years in A-grade countries, in Turkey the penalty includes a fine. The heinous incident that occurred in Çorlu is a striking example. The dog of the offender who dragged his dog by tying it to the back of his car only because it did not fit in the car was taken away, but the offender was released merely on a fine. Besides, owned animals are considered as the property of their owners. Unclaimed animals are not protected at all; they are only allowed to be fed. In other words, crimes against stray animals do not have any consequences. Violence against animals, regardless of if they are stray or owned, is not considered a crime; this is basically because of the absence of deterrent laws. The Animal Protection Law 5199 is not even close to providing the protection that animals need.



Law in Turkey

Penalties of crimes committed against animals in Turkish legislation are regulated in Article 28 of Law No.5199, titled Administrative fines. According to this article, some of the acts that have the harshest punishments are;

◦ Those who intervene to destroy a generation of animals are fined ten thousand Turkish lira per animal.

◦ In order to prevent uncontrolled reproduction, cats and dogs fed and housed in community living areas must be neutered by their owners. However, those who want to breed their animals are obliged to register and/or distribute the babies to be born by the municipality. In case of non-compliance with this article, an administrative fine of three hundred Turkish lira per animal is applied.

◦ Pets and ornamental animals and those who are not able to adapt to their natural habitats again cannot be abandoned; It cannot be left in an environment where it cannot be fed and adapted to its climate. However, it can be reclaimed or handed over to animal shelters. In case of non-compliance with this article, a fine of two hundred Turkish lira is imposed.

◦ It is forbidden to kill ownerless or incapacitated animals, except in cases stipulated in the Animal Health Police Law No. 3285.

◦ Anyone who does not comply with this article, that is, acts to kill an animal, is fined six hundred Turkish lira.

◦ Medical and surgical interventions in animals are carried out only by veterinarians. Persons who carry out operations on animals by not complying with this article are fined two hundred Turkish lira.

◦ All or part of the organs or tissues of animals cannot be removed or destroyed for as long as they live, except for medical purposes.

◦ Surgical interventions aimed at changing the external appearance of the pet or ornamental animal or other non-therapeutic cutting of the tail and ear, removal of the vocal cords, and removal of nails and teeth are prohibited. However, these prohibitions; Where a veterinarian deems non-therapeutic intervention necessary for medical reasons related to veterinary practices or for the benefit of a particular animal, or in cases of reproductive prevention.

◦ It is forbidden to give hormones and drugs to an animal in a way and in a dose that will make it contrary to its species and ethological characteristics, to doping with various substances, to change the behavior and physical characteristics of animals by artificial methods except for medical purposes. Those who do not comply with these will be fined one thousand two hundred Turkish lira.

◦ It is essential to apply medical and scientific experiments and to conduct the experiments in a way to protect the animals, to properly care for them, and to shelter the animals to be used in the experiments. If there is no other option, animals can be used as experimental animals in scientific studies. In institutions and organizations that conduct animal experiments, these experiments are allowed through ethical committees established and to be established within their organization. Those who do not comply with these are fined three hundred Turkish lira per animal.

◦ The establishment of ethical committees, their working procedures and principles are determined by a regulation to be issued by the Ministry by obtaining the opinions of

the Ministry of Agriculture and Rural Affairs, the Ministry of Health and relevant organizations. Breeding, feeding, housing, caring of experimental animals, registration of enterprises feeding, supplying and using experimental animals, qualifications of working personnel, records to be kept, what kind of animals will be bred and the principles to be followed by the enterprises feeding, supplying and using test animals will be issued by the Ministry of Agriculture and Rural Affairs. Those who do not follow the regulation and perform unauthorized experiments are fined one thousand two hundred Turkish lira.

◦ An administrative fine of one thousand Turkish lira is issued to those who do not obtain permission for animal trade and act in violation of the prohibitions and provisions of the regulation.

◦ The slaughter of the animals of those who want to sacrifice for religious purposes, in accordance with the religious provisions, health conditions, environmental cleanliness, in a way that will cause the least pain to the animal, the slaughter places, the persons who will slaughter with the minimum of competence and other related issues, by taking the opinion of the Ministry, institutions, and organizations, is determined by a regulation to be issued by the Ministry. Those who violate this article are fined one thousand five hundred Turkish lira per animal.

◦ It is essential to organize formal educational programs for the protection and welfare of animals. One way is to broadcast informative and educational programs on the radio and television channels. Turkey Radio and Television Corporation and private television channels are obliged to broadcast programs involving relevant content at least two hours per month, and private radio channels must involve at least half an hour-long programs with relevant content every month. 20% of these broadcasts must take place during the highest-rated hours.

◦ Radio and Television Supreme Council (RTÜK) is obliged to follow this article.

◦ National radio and television institutions and organizations that are found to be acting contrary to RTÜK are fined six thousand Turkish lira every month.

◦ The driver who hits and harms an animal must take it or have it taken to the nearest veterinarian or treatment unit. An administrative fine of three hundred Turkish lira per animal is given to those acting contrary.

As can be seen in Law No. 5199 mentioned above, the penalty for killing street animals is six hundred Turkish lira. Stray animals, which are not otherwise protected, live in danger relying on fines and insufficient measures.

World Standard

Actions that are prohibited by the content of the Universal Declaration of Animal Rights published by UNESCO in 1978 and which must be followed:

All animals are born equal in life and have the same right to exist.

All animals have the right to be respected. Humans cannot destroy animals. They cannot exploit animals by violating this right. Humans are tasked to put their knowledge and resources in the service of animals. All animals have the right to care and protection.

No animal can be exposed to mistreatment or ruthlessness or cruelty. If an animal has to be killed, it must be done in an instant, painless or fearless manner.

All animals of the wild species have the right to live and breed on land, in the air, and the water, in their particular natural environment. Any kind of deprivation of liberty, even for educational purposes, is against this right.

All animals of a species traditionally living in the vicinity of humans have the right to live and reproduce in harmony with the living conditions specific to their species and freedom. All animals that people take with them have the right to live as long as their natural lifespan. Leaving an animal is cruel and a despicable act.

All working animals have the right to restrict the duration and intensity of work and to have a diet and rest that increases their strength.

It is against animal rights to experiment on animals that cause physical or psychological pain. This is the case for all kinds of experiments in medical, scientific, commercial, and other forms. Even if the animal was raised for food, it should be cared for, sheltered, transported, and its death should be without pain or fear.

Animals cannot be used for human entertainment; it is against the dignity of animals. Killing an animal without obligation is a crime against life.

Any act that means killing large numbers of wild animals is a genocide, a crime. Animal death must also be respected. Scenes of violence in which the animal is killed should be banned in the cinema and on television. Animal welfare rules should be regulated at the government level, and animal rights, like human rights, should be protected by law.

What Can Be Done?

Our country includes some of the articles in the declaration published by UNESCO in Law No. 5199, but it does not provide sufficient and necessary security measures for animals because only a fine is enacted as a penalty. One of the most effective ways to ensure this protection is to transfer the animal rights law from the Law of Misdemeanors to the Criminal Law. In this way, the protection provided in the discretion of imposing a deterrent penalty such as imprisonment, not limited to administrative penalties, will increase exponentially.

To make this possible, public awareness must be increased. Helping people striving for change in animal rights in various social responsibility projects is another way to raise awareness. Also, it is necessary to have information about the ways followed by countries with an A grade in animal rights laws.

According to an animal rights lawyer: "where the level of welfare and education is high, the treatment of animals is noticeable, for the better, different. Whilst there are people in developed countries who understand the value of animals, in the backward regions there is a fanatical society that has not yet understood the value of humans. How do we expect these people to treat animals properly? Moreover, this is not merely a difference between countries. Such differences of attitude exist in different cities of a country, even in different districts of a city. For a society that values and protects animals, the welfare and education level must first be increased. Otherwise, no matter how hard those of great awareness try, while only part of the society is aware of animal rights and their need for protection, all efforts will be in vain."

Consequently, it is obvious that even if deterrent laws are enacted, it will not be enough to fully solve this problem. Besides legal regulations, it is necessary to raise the awareness and educational level of individuals on this issue. To achieve this, we need to work patiently and without despair through including the issue in school textbooks, encouraging school clubs to take action, and supporting social responsibility projects in the hope to become an exemplary country in animal rights one day.

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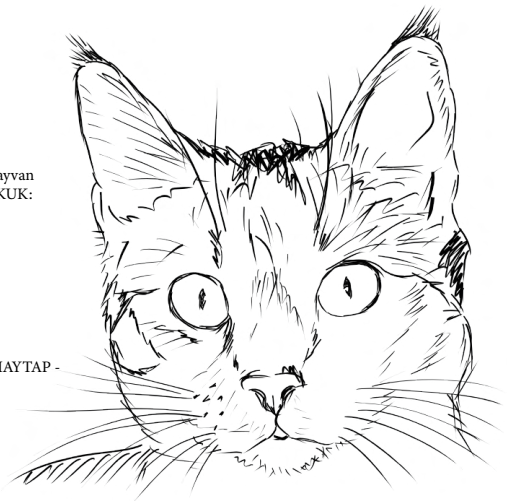
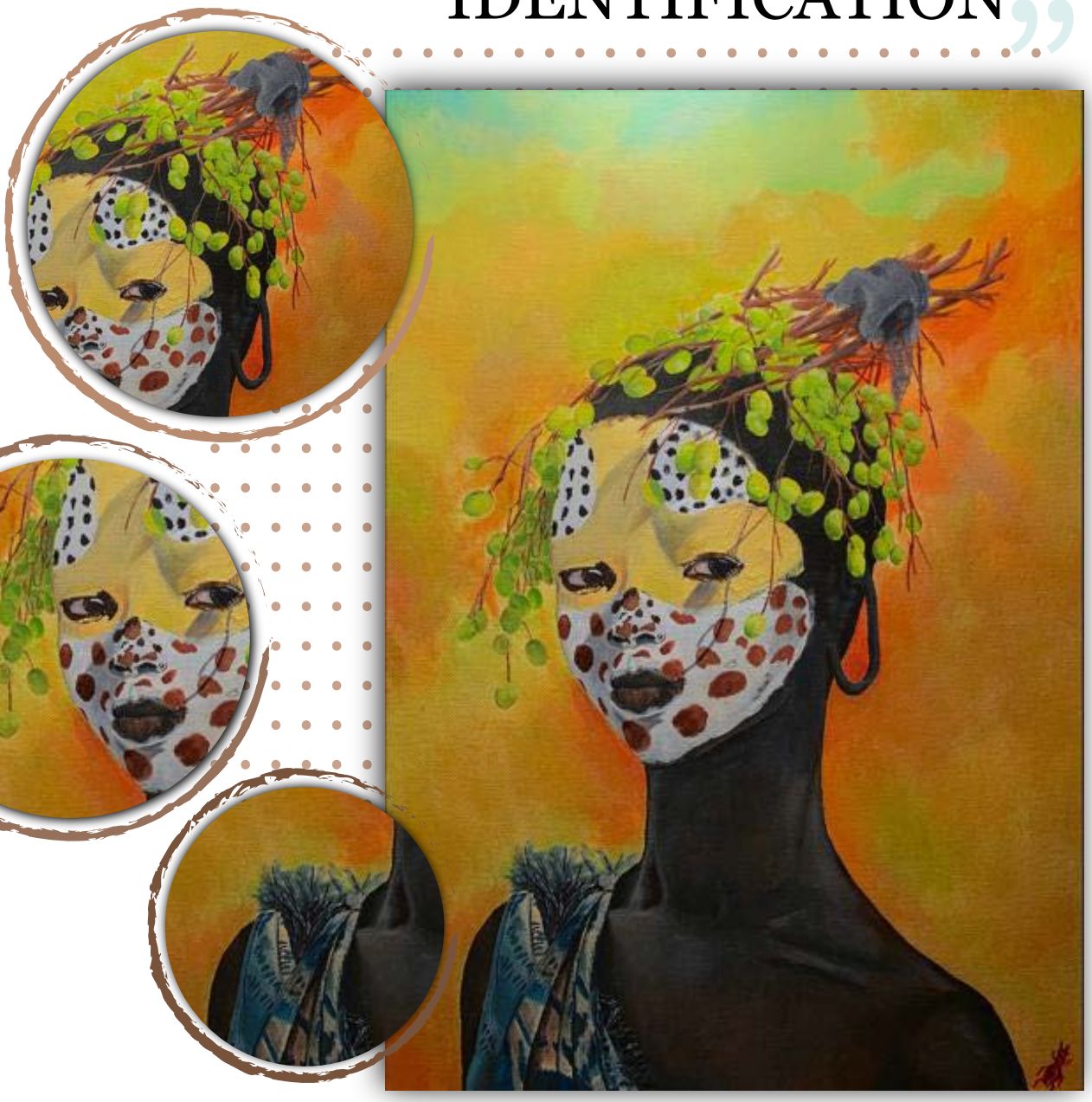


Hello, I am Öykü Ünver and I am a senior student at TED Rönesans College. I have been interested in art and drawing since I was little. Expressing myself and my thoughts through painting has become a way of communication for me. I believe that art will play a big role in my future and career. Academic, sportive, and social responsibility activities are also really important for me. I have been active in intelligence contests and volleyball; I have also attended The Duke of Edinburgh's Program. I like to set my goals so that I can improve myself and benefit my surroundings by using my art.

Öykü Ünver

IDENTIFICATION



"TORTURE"

"ANOTHER"

"AMMONITE GALLERY: A COMMUNITY FOR ACTIVISTS AND ARTISTS"

Vanessa Ponte, the co-founder of Ammonite Gallery, shares the vision of their community and gives an inside look at the young artists of Generation Z in Turkey.

BY DENIZ DEDEOGLU

I would like to start out by telling you how grateful I am to do this interview with you and how much I admire your work. We are honored to have you here at the beginning of our family here at Verbatim Post. Would you like to introduce yourself to our readers?

My name is Vanessa Ponte. I'm a beginner artist and one of the co-founders of Ammonite Gallery. I'm 19 years old, I'm half Polish and half Portuguese. I was born in Belgium. My family and I moved to Turkey when I was five years old and I've been living here ever since. I am very grateful to be living in Istanbul. As Istanbul is a cosmopolitan city, I meet new people from various cultures and backgrounds whenever I go out. I have always been passionate about art and these days I am focused on my drawing. I am currently studying architecture in Bilgi University.

What exactly is Ammonite Gallery and how did it start?

We created Ammonite Gallery because we think that being an artist in Turkey is difficult. People aren't very familiar with the world of art and there are a lot of artists who are young and want to express themselves but they don't have a community. We know that young artists need a lot of support, especially mental support. So, at the beginning of the quarantine, my friend Nart Özel and I were talking and we thought "Why don't we create a community for such artists?" A community that is a safe place for the artists. We began the journey with this idea and we presented our idea to our friends who were beginner artists like us. Ammonite Gallery was created with this purpose; we started posting their work on social media to provide them with the recognition they deserved and selling the artworks of the artists that needed the money to continue to make art. Now we are opening new doors to everyone and we recently held an exhibition where we collaborated with Istanbul Women's Museum and Fridays For Future. Everyone was shocked by how much we had accomplished in only 6 months. Every artist expressed that this project gave them motivation, power, and a new family which is the most important thing. We wanted to have a community of artists and help them make something magical and I believe we have accomplished our goal.

Your main objective in the creation of Girls on the Climate Crisis exhibition was climate change. Why was this your first subject to touch upon?

First of all, climate change is very real and at this point, we can feel the disruption in nature. We can feel the world getting warmer each day and we can see the waste around us poisoning the Earth. We can't even breathe fresh air because of the heavy air pollution in cities. So, in our first gallery exhibition, we wanted to raise awareness about the issue of climate change and stress its urgency. Not many people read articles about climate change because they think that they can't do anything about it but when they see an art piece that demonstrates the issue, it's easier to put that image into someone's mind. This way they can open their eyes, start to look around, and see what's going on. So that idea blossomed into this exhibition. My friends Nart, Duru, and I worked very hard to give life to this project.

I believe that almost every artwork in the exhibition had an essay related to climate change, how did you obtain these and what do you think the articles' roles were in the exhibition?

The articles in the exhibition played a role in getting the young activist girls to express their concerns and spread their message to the world. We took those articles and everyone who attended the exhibition read them and chose which one they felt closest to. Every artwork in the exhibition came to life with the collaboration of the young activist writers and the young artists. The writers gave a message to the artists and the artists gave that message to the whole world so that process was fascinating to observe.

In what ways do you think Ammonite Gallery can contribute to the involved artists' goals?

It can open a lot of doors for them. Thanks to Ammonite Gallery, the artists had their first exhibition and we had our voices heard in radios, television programs, magazines, and journals like Verbatim Post. So I think Ammonite Gallery gives a lot of hope and offers new opportunities for the artists involved. The artists of Ammonite Gallery have eyes on them right now because of our projects. A thousand people visited our exhibition in three weeks and many more have visited the online gallery. I think this exposure and recognition is helping them achieve their goals as they now have a lot of new opportunities ahead of them.

How do you think Ammonite Gallery can benefit our society?

I think that as their works are getting recognized by people, the artists can pursue their passion further and possibly hold their exhibitions and spread new messages across the globe. Ammonite Gallery can also benefit our society from a cultural perspective; perhaps our artists can even start a new movement. I believe the artworks that are being created by our artists can eventually represent this period and the society of the present-day centuries later. Even now, when you want to understand the mindset of the society in the 900 C.E, for example, you see the artwork of that period and you can feel what the society felt at that time. We aim to create timeless works and express how our generation feels and thinks.

What is your view on art?

Art is weird; every time you look at art, you feel something different. Let's say you go to an exhibition and you look at an artwork, you can see that the artist has put their entire life into it. You can see all the protests. They are giving their whole life to you. You go ahead and look at another artwork and maybe it is only a cube, but if you know how to dig deep into its meaning, you can understand that this artist is also opening a window to their life and you can feel that as well. Art is magical and very spiritual. It definitely holds magic in its roots and we know that it originated from it. Art has to be seen, it is alive and its energy should flow into people and this flow should never stop. We have to appreciate it every day.

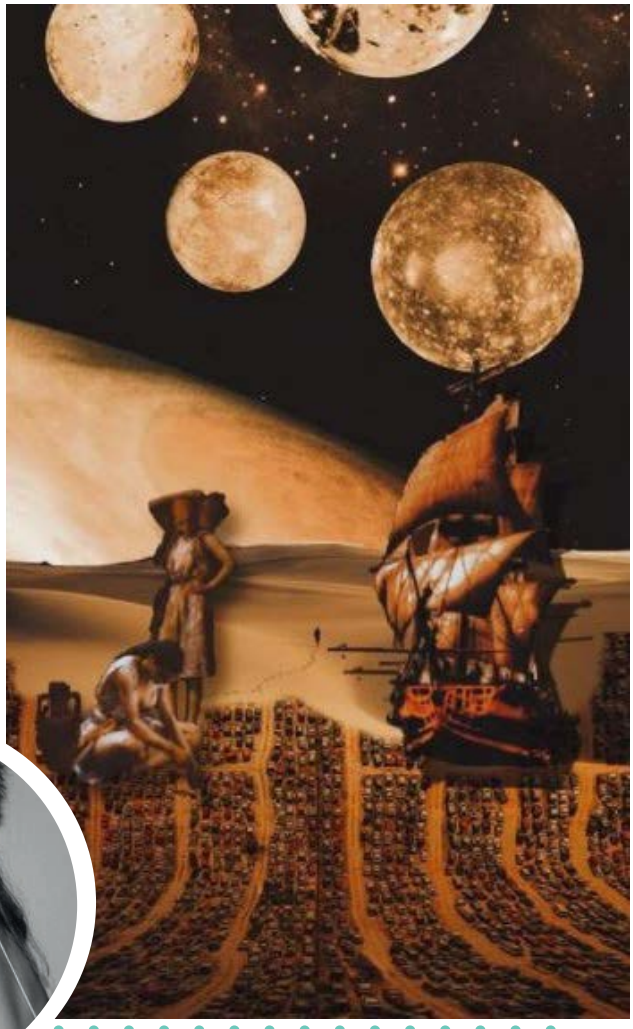
Last but not least, can we know what your future plans are for the Ammonite Gallery?

We want to hold more exhibitions, all of which will focus on events that are happening in Turkey and all around the world; our goal is to put the spotlight on different communities and share their concerns and wishes through art. We plan to build a bridge between Turkey and other countries, especially Europe. We want to include the misfit kids in our community; we want them to be seen. We will help these artists achieve their dreams: being who they are and getting the recognition they deserve. That's our future plan for Ammonite Gallery.

Thank you so much for taking your time to do this interview with Verbatim Post. We value your contributions and your effort in making a change in the world.

Thank you for inviting me and allowing Ammonite Gallery to share this experience.

"Social Slavery"
by Refia Dermancioglu
Digital Collage
@refiadermancioglu



EXPLORING TRIANGULAR, SQUARE AND HEXAGONAL NUMBERS

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The purpose of this study is to discover triangular, square and hexagonal numbers in terms of definitions, illustrations, calculations, relationships and extensions. These numbers are only a few examples of what is known as polygonal numbers (Weisstein, n.d. E). Polygonal numbers can be represented in a 2-dimensional, geometrical arrangement of equally spaced points to create a regular polygon of sides, n where $n \in Z^+$ and $n \geq 3$ (Weisstein, n.d. E); figures are provided in Appendix A to illustrate these arrangements. In addition to triangular, square and hexagonal numbers, there are also pentagonal, heptagonal and up to any n-gon numbers that can be arranged to represent pentagons, heptagons, and any n-gons (Weisstein, n.d. E). Furthermore, polygonal numbers are themselves a subset of figurate numbers, which are numbers that can be represented as a 2- and/or 3-dimensional, geometrical arrangements (Weisstein, n.d. B). Examples and illustrations of figurate, polygonal, triangular, square, and hexagonal numbers are provided in Figures 1, 2, 3 4, and 5, respectively.

Definitions

Figurate Numbers

A *figurate number* is a number that can be represented by a regular geometrical arrangement of equally spaced points or balls (Weisstein, n.d. B). Examples of figurate numbers are provided in Figure 1, under Appendix A.

Triangular Numbers

A *triangular number* (T_n, where $n \in Z^+$) is a polygonal number that can be represented in the form of a triangular grid of equally spaced points where the first column contains a single element and each subsequent column contains one more element than the previous one (Weisstein, n.d. D).

The n-*th* triangular number, denoted by $T(n)$ in Subramaniam [1], is defined by

$$T(n) = \frac{n(n+1)}{2} \qquad (1)$$

or as the sum

$$T(n) = \sum_{i=1}^{n} i$$

(M.A Asiru)

Examples of triangular numbers are shown in figure under Appendix A.

Square Numbers

A *square number* (S_n, where $n \in Z^+$) is a polygonal number that can be represented as a square grid of equally spaced points composed of n^2, where the first column contains a single element and each subsequent "L-shape" column contains two more elements than the previous one (Goodman & Weisstein, n.d.).The formula of the n th number is

$$T_n = 1 + 2 + \cdots + n = \frac{n(n+1)}{2}.$$

In this formula T represents the Triangular number. (Recall for triangular number.)

Examples of square numbers are shown in Figure 4, under Appendix A.

Hexagonal Numbers

$$n + 2T_{n-1} = n^2 = S_n$$

A *hexagonal number* (H_n, where $n \in Z^+$) is a polygonal number that can be represented as a hexagonal grid of equally spaced points where the first column contains a single element and each subsequent "C-shape" column contains three more elements than the previous one (Weisstein, n.d. C).

Examples of hexagonal numbers are shown in Figure 5, under Appendix A.

Calculating Triangular, Square and Pentagonal Numbers

Triangular Number Formula

For calculating the n^{th} triangular number, the general formula is $T_n = \frac{n(n+1)}{2}$ where $n \in Z^+$. This formula counts the number of points in each triangular number arrangement. For instance, in the second triangular number arrangement, $T_2 = \frac{2(2+1)}{2} = \frac{6}{2} = 3$; thereby, there are 3 points in the second triangular number arrangement (see Figure 3). Moreover, the general formula for triangular numbers may also be explained through recursive addition where $T_{n+1} = T_n + (n+1)$, provided that $T_1 = 1$. This recursive definition of triangular numbers is taken from its formal definition whereby each n^{th} triangular number (for $n \geq 1$) can be represented in the form of a triangular grid of equally spaced points *where* the first column contains a single element (i.e., $T_1 = 1$) and each subsequent column contains one more element than the previous one (i.e., $T_{n+1} = T_n + (n+1)$) (Weisstein, n.d. D). For instant, re-examining T_2, we note that T_2 is defined *recursively* as shown here: $T_2 = T_1 + 2 = 1 + 2 = 3$.

For $n > 1$, we note that T_n is also defined recursively in $T_{n+1} = T_n + (n+1)$, such that $T_n = T_{n-1} + n$. For example, consider $T_3 = T_2 + 3$. Since T_2 is also defined recursively, we can substitute T_2 for its recursive definition as shown here: $T_3 = T_2 + 3 = (T_1 + 2) + 3 = 1 + 2 + 3 = 6$; thereby, there are 6 points in the third triangular number arrangement (see Figure 3). Similarly, T_4 can be defined recursively as $T_3 + 4$. We note that since T_3 is defined recursively, $T_4 = (T_2 + 3) + 4$. Once again, T_2 is also defined recursively so that $T_4 = [(T_1 + 2) + 3] + 4$. Since $T_1 = 1$, we have that $T_4 = 1 + 2 + 3 + 4 = 10$; thereby there are 10 points in the fourth triangular number arrangement (see Figure 3). It is important to note that this pattern continues such that for any n^{th} triangular number, $T_n = 1 + 2 + 3 + \ldots + n$ for $n \in Z^+$. As a result, to compute any n^{th} triangular number, one simply finds its summation. So then, $T_n = \sum_{i=1}^{n} i$, where the general formula for this summation is given by $\frac{n(n+1)}{2}$ where $n \in Z^+$. Consequently, $T_n = \frac{n(n+1)}{2}$ for $n \in Z^+$, as it was shown in the beginning of this section. The first 50 triangular numbers have been generated using Mathematica software and are listed in Table 1, under Appendix A.

Square Number Formula

For calculating the n^{th} square number, the general formula is $S_n = n^2$, where $n \in Z^+$. This formula counts the number of points in each square number arrangement. For instance, in the second square number arrangement, $S_2 = 2^2 = 4$; thereby, there are 4 points in the second square number arrangement (see Figure 4).

Moreover, it is important to note that the general square number formula may be derived recursively *through* triangular numbers by $S_n = T_n + T_{n-1}$, where $S_1 = T_1 = 1$ (Asiru, 2008). For example, reconsidering S_2,

we note that S_2 is defined recursively *through* triangular numbers as shown here: $S_2 = T_2 + T_1 = 3 + 1 = 4$. Since we know the general formula for the n^{th} triangular number (i.e., $T_n = \frac{n(n+1)}{2}$ for $n \in Z^+$), we may also re-adjust the general formula for the $(n\text{-}1)^{th}$ triangular number to yield $T_{n-1} = \frac{(n-1)((n-1)+1)}{2} = \frac{(n-1)n}{2}$ for $n \in Z^+$. So then, the n^{th} square number may be defined as $S_n = \frac{n(n+1)}{2} + \frac{(n-1)n}{2}$, which after simplification, we note that $S_n = \frac{n(n+1)}{2} + \frac{(n-1)n}{2} = \frac{n(n+1)+n(n-1)}{2} = \frac{n^2+n+n^2-n}{2} = \frac{2n^2}{2} = n^2$, as desired. The first 50 square numbers have been generated using Mathematica software and are listed in Table 1, under Appendix A, along with the first 50 triangular numbers.

Hexagonal Number Formula

For calculating the n^{th} hexagonal number, the general formula is $H_n = 2n^2\text{-}n$, where $n \in Z^+$. This formula counts the number of points in each hexagonal number arrangement. For instance, in the second hexagonal number arrangement, $H_2 = 2(2)^2 - 2 = 2(4) - 2 = 8 - 2 = 6$; thereby, there are 6 points in the second hexagonal number arrangement (see Figure 5).

Similar to the square number formula, the hexagonal number formula also has roots in the triangular number formula such that $H_n = T_{2n-1}$, where $H_1 = T_1 = 1$ (Weisstein, n.d. C). In other words, every hexagonal number is a triangular number, but only every other triangular number is a hexagonal number (i.e., $H_1 = T_1$, $H_2 = T_3$, $H_3 = T_5$, $H_4 = T_7$, and etc.) Re-examining $n = 2$, we see that $H_2 = T_3 = 1 + 2 + 3 = 6$. Similarly, when re-examining $n = 3$, we also note that $H_3 = T_5 = 1 + 2 + 3 + 4 + 5 = 15$. The relationship brings forth the recursive formula $H_n = T_{2n-1} = 1 + 2 + 3 + \ldots + (2n\text{-}1)$ which yields $\sum_{i=1}^{2n-1} i = \frac{(2n-1)((2n-1)+1)}{2} = \frac{1}{2}[(2n-1)(2n)] = \frac{1}{2}(2)(2n^2 - n) = 2n^2 - n$, as desired. The first 50 hexagonal numbers have been generated using Mathematica software and are listed in Table 1, under Appendix A, along with the first 50 triangular and square numbers.

Relationships Between Triangular, Square and Hexagonal Numbers

Adding Triangular, Square and Hexagonal Numbers

Triangular numbers have a wide variety of relations to other polygonal numbers. In other words, the sum of two consecutive triangular numbers is a square number. For example, given that T_1=1 and T_2 = 3, the sum of these consecutive triangular numbers equals 4, or S_2. The sum may also be seen as the square of the difference between the two; $3\text{-}1=2^2$ (PlanetMath, n.d.).

There are infinitely many triangular numbers that are also square numbers as proven that eight triangles increased by unity produce a square (Beiler, 1996). An example of this formula $\frac{8r(r+1)}{2} + 1$ (which is simplified to $4r^2 + 4r + 1$, and finally $(2r+1)^2$) would demonstrate the first triangle number (T_1=1) as $\frac{8(1)[(1)+1]}{2} + 1 = 9$ or S_3.

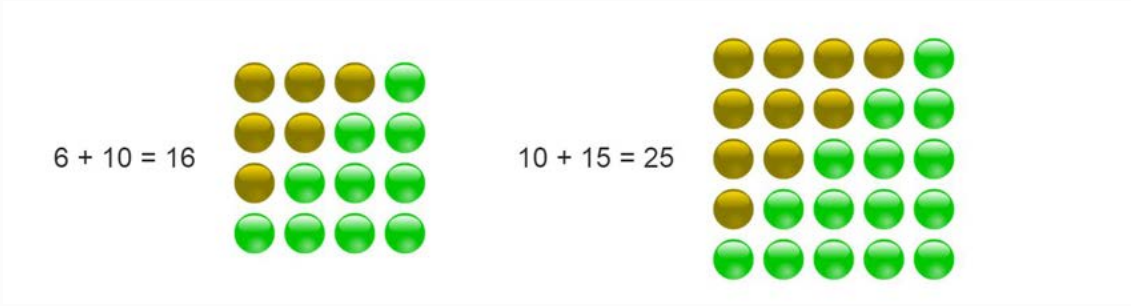
More generally, the difference between the n^{th} m-gonal number and the n^{th} $(m+1)$-gonal number is the $(n\text{-}1)^{th}$ triangular number (Weisstein, n.d.D). For example, $H_4 - P_4 = T_3$, or 28-22=6.

The n^{th} Square and Hexagonal numbers (as well as other polygonal numbers) may also be manipulated by finding sums of m and n numbers. This sum will also be added to the number of triangles within a polygon multiplied by the product of m and n. For example, the formula for square numbers is $S_{m+n} = S_m + S_n + 2mn$ (Weisstein, n.d.B). The multiplicand *2* is derived from the formula $(n\text{-}2)180$ (used to find the sum of interior angles) in which n refers to the number of sides composing the polygon. Randomly choosing m to equal 1 and n to equal 4, the formula is then re-written as $S_{1+4} = S_1 + S_4 + 2[(1)(4)]$. The sum of the first and fourth Square number should be the fifth Square number; therefore, $S_1+S_4+8=S_5$, or 1+16+8(the product of $2mn$) =25.

Following the same pattern as the formula for Square numbers, the equation for Hexagonal numbers is $H_{m+n} = H_m + H_n + 4mn$ (Weisstein, n.d.C). Working with the first three Hexagonal numbers to keep it brief, $H_{1+2} = H_1+H_2+4[(1)(2)]$. As a result, $H_3 = 1 + 6 + 4[(1)(2)]$. Indeed, H_3 is equal to 15 (Table 1, Appendix B).

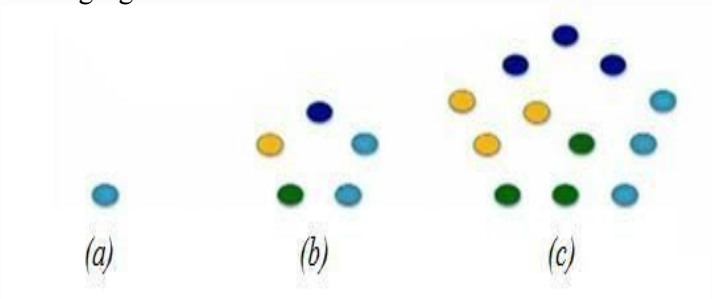
Geometric Relationship Between Triangular, Square and Hexagonal Numbers

As previously stated, "[S]um of two consecutive triangular numbers is a square number" (Goodman, n.d.). Triangular numbers have a wide variety of relations to other figurate numbers. Most simply, the sum of two consecutive triangular number is a "square number", with the sum being the square of the difference between the two (and thus the difference of the two being the square root of the sum)



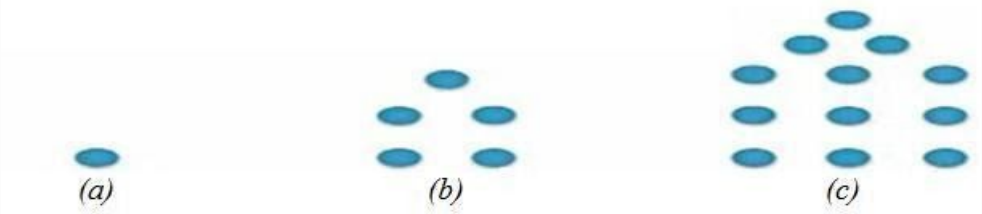
- *Figure 6.* For example *a*, consider $S_4=T_3+T_4$. The sum of all points in which $T_3=6$ and $T_4=10$ is 16 or S_4. For example *b*, $T_4+T_5=S_5$; 10+15=25.

Before a geometric relationship with hexagonal numbers is demonstrated, a direct geometric relationship between triangular, square, and pentagonal numbers in the algebraic equation $P_n = 3t_{n-1} + n$ may be pictorially seen in the following figures:



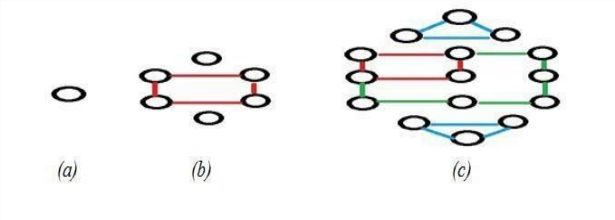
- *Figure 7.* From left to right; *(a)* $P_1= 3t_0+1 = 1$(a single blue point *n*), *(b)* $P_2=3t_1+2=5$ (the green, yellow, and violet points represent the three T_1 and 2 *n* points), *(c)* $P_3= 3t_2+3=12$ (three sets of T_2 in green , yellow, and violet plus 3 *n*)

The top figure continues with the notion that when the *n*-gon increases, it retains its regular shape by adding the gnomon; the piece of the figure that needs to be added to a given figurate number in order to get the next greater figurate number (Figurate numbers, n.d.). In the formula $P_n = 3t_{n-1} + n$, we can clearly see the incorporation of the triangular numbers within the pentagonal numbers; yet, the arrangement in figure 8 (below) gives us a clear, and elementary, visual of how many triangular and square numbers make up a pentagonal number. It must be noted that the pattern does not suggest that the sum of T_n and S_n equals P_n.



- *Figure 8.*From left to right, *(a)* $P_1=T_1=S_1=1$, *(b)* $P_2=5$ (T_1+S_2), *(c)* $P_3=12$ ($T_{2+}S_3$)

For P_2 we see that the top portion of the pentagon (resembles a roof) is the triangular number, while the base is the square number. For P_2, we see that it took S_2+T_1 (not T_2, because it cannot share the points used to make up the square number beneath) to create the pictorial representation of $P_2=5$. The Hexagonal numbers may also be drawn in a similar pattern (not a regular polygon) with the triangular numbers visible on the top and bottom of the figure and the square number located in the center.



- *Figure 9*. From left to right, (a) $H_1=T_1=S_1=1$, (b) $H_2=2T_1+S_2$, (c) $H_3=2T_2+S_3$

When n=2 for P_2, we see that it is composed of four points ($S_{2)}$ in the center and one point ($T_{1)}$ on top and one on the bottom. When the hexagonal number increases to P_3, we find nine points ($S_{3)}$ in the center, and three points ($T_{2)}$ on the top and bottom of the figure.

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Appendix A

Figure 1

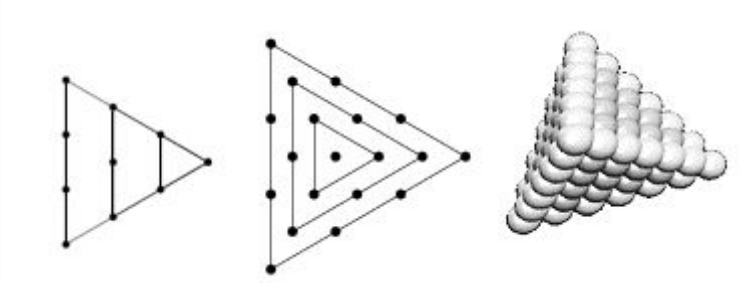


Figure 1. Taken from Mathematica and from http://figuratenumbers.org/. From left to right, figurate numbers can be polygonal numbers, center polygon numbers, and three-dimensional solids.

Figure 2

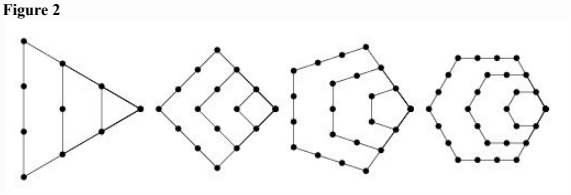


Figure 2. Taken from Wolfram Mathematica. Starting from the left to right, polygonal numbers include 10 (4th triangular number or $P_3(4)$), 16 (4th square number or $P_4(4)$), 22 (4th pentagonal number or $P_5(4)$), and 28 (4th hexagonal number or $P_6(4)$).

Figure 3

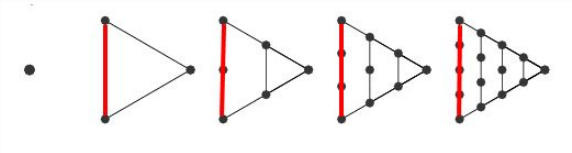


Figure 3. Taken from Wolfram Mathematica. Starting from the left to right, triangular numbers include 1 (T_1), 3(T_2), 6 (T_3), 10 (T_4), and 15 (T_5).

Figure 4

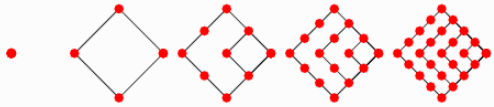


Figure 4. Taken from Wolfram Mathematica. Starting from left to right, square numbers include 1 (S_1), 4 (S_2), 9 (S_3), 16 (S_4), and 25 (S_5).

Figure 5

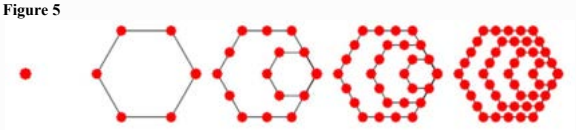


Figure 5. Taken from Wolfram Mathematica. Starting from left to right, hexagonal numbers include 1 (H_1), 6 (H_2), 15 (H_3), 28 (H_4), and 45 (H_5).

Appendix B

Table 1

List of Triangular, Square, Hexagonal Numbers and Sum of *at most* 3 Triangular Numbers

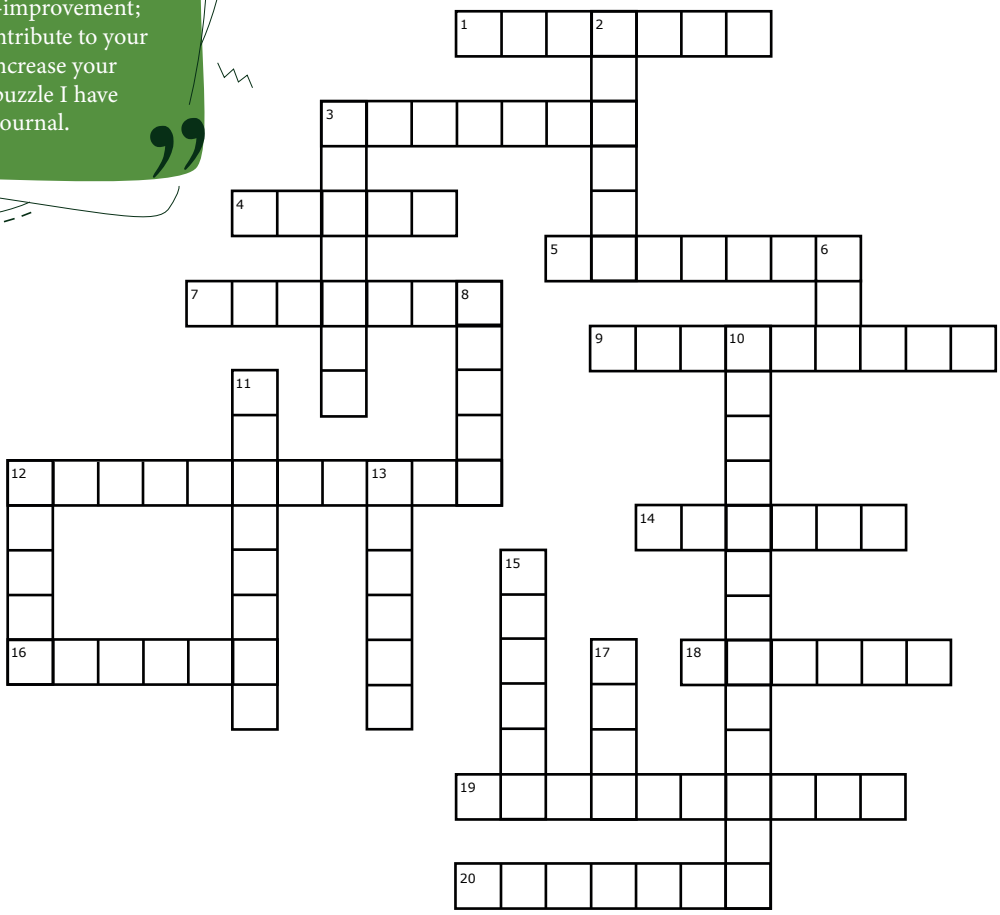
$n \in Z^+$	$T_n = \frac{1}{2}(n^2 + n)$	$S_n = n^2$	$H_{n=2n^2-n}$	$n = T_x + T_y + T_z$ for $n, x, y, z \in Z^+$
1	1	1	1	T_1 = **1**
2	3	4	6	$T_1 + T_1$ = 1 + 1 = **2**
3	6	9	15	T_2 = **3**
4	10	16	28	$T_2 + T_1$ = 3 + 1 = **4**
5	15	25	45	$T_2 + T_1 + T_1$ = 3 + 1 + 1 = **5**
6	21	36	66	T_3 = **6**
7	28	49	91	$T_3 + T_1$ = 6 + 1 = **7**
8	36	64	120	$T_3 + T_1 + T_1$ = 6 + 1 + 1 = **8**
9	45	81	153	$T_3 + T_3$ = 6 + 3 = **9**
10	55	100	190	T_4 = **10**
11	66	121	231	$T_4 + T_1$ = 10 + 1 = **11**
12	78	144	276	$T_4 + T_1 + T_1$ = 10 + 1 + 1 = **12**
13	91	169	325	$T_4 + T_3$ = 10 + 3 = **13**
14	105	196	378	$T_4 + T_3 + T_1$ = 10 + 3 + 1 = **14**
15	120	225	435	T_5 = **15**
16	136	256	496	$T_5 + T_1$ = **16**
17	153	289	561	$T_5 + T_1 + T_1$ = **17**
18	171	324	630	$T_5 + T_2$ = 15 + 3 = **18**
19	190	361	703	$T_5 + T_3 + T_1$ = 15 + 3 + 1 = **19**
20	210	400	780	$T_5 + T_4$ = 10 + 10 = **20**
21	231	441	861	T_6 = **21**
22	253	484	946	$T_6 + T_1$ = 21 + 1 = **22**
23	276	529	1035	$T_6 + T_1 + T_1$ = 21 + 1 + 1 = **23**
24	300	576	1128	$T_6 + T_2$ = 21 + 3 = **24**
25	325	625	1225	$T_5 + T_5$ = 15 + 10 = **25**
26	351	676	1326	$T_5 + T_4 + T_1$ = 15 + 10 + 1 = **26**
27	378	729	1431	$T_6 + T_3$ = 21 + 6 = **27**
28	406	784	1540	T_7 = **28**
29	435	841	1653	$T_7 + T_1$ = 28 + 1 = **29**
30	465	900	1770	$T_7 + T_1 + T_1$ = 28 + 1 + 1 = **30**
31	496	961	1891	$T_7 + T_3$ = 28 + 3 = **31**
32	528	1024	2016	$T_7 + T_3 + T_1$ = 28 + 3 + 1 = **32**
33	561	1089	2145	$T_5 + T_5 + T_3$ = 15 + 15 + 3 = **33**
34	595	1156	2278	$T_6 + T_4 + T_3$ = 21 + 10 + 3 = **34**
35	630	1225	2415	$T_5 + T_5 + T_4$ = 15 + 15 + 10 = **35**
36	666	1296	2556	T_8 = **36**
37	703	1369	2701	$T_8 + T_5 + T_1$ = 21 + 15 + 1 = **37**
38	741	1444	2850	$T_7 + T_4$ = 28 + 10 = **38**
39	780	1521	3003	$T_7 + T_4 + T_1$ = 28 + 10 + 1 = **39**
40	820	1600	3160	$T_8 + T_3 + T_1$ = 36 + 3 + 1 = **40**
41	861	1681	3321	$T_6 + T_4 + T_3$ = 21 + 10 + 10 = **41**
42	903	1764	3486	$T_8 + T_3$ = 36 + 6 = **42**
43	946	1849	3655	$T_8 + T_3 + T_1$ = 36 + 6 + 1 = **43**
44	990	1936	3828	$T_7 + T_5 + T_1$ = 28 + 15 + 1 + **44**
45	1035	2025	4005	T_9 = **45**
46	1081	2116	4186	$T_9 + T_1$ = 45 + 1 = **46**
47	1128	2209	4371	$T_9 + T_1 + T_1$ = **47**
48	1176	2304	4560	$T_7 + T_4 + T_4$ = 28 + 10 + 10 = **48**
49	1225	2401	4753	$T_7 + T_8$ = 28 + 21 = **49**
50	1275	2500	4950	$T_7 + T_8 + T_1$ = 28 + 21 + 1 = **50**

Note: Calculations were made using Wolfram Mathematica software.

CROSSWORD

Zeynep Yılmaz

I was born on April 6th 2000. I have been interested in mind games since I was a kid and I have won four Abalone championships since then. I wrote a poetry book in my high school sophomore year and a non-fiction book titled "Why Did I Become a Vegetarian in the Light of the Past?" which was published in two different languages. I enjoy writing and self-improvement; I decided to not only contribute to your knowledge but also increase your motivation with the puzzle I have created for this journal.



Across

1. time for hobbies
3. oldest europian university
4. last letter in the greek alphabet
5. first female mathematician
7. performed the famous oil drop experiment & received Nobel Physics Prize
9. university hall of residence
12. essential
14. former student of a particular school
16. a set of examinations taken in the final year of high school in Germany
18. name of an activist for female education and the youngest Nobel Prize laureate
19. the position of a student who works in an organization in order to gain work experience
20. mascot of Tulane University

Down

2. mascot of Michigan State University
3. synonym of "conciseness"
6. test used for college admissions in the United States
8. innovative, new
10. current chess champion of the world
11. study technique with 25 min study 5 min break
12. Federal Application for Student Aid
13. father of western philosophy
15. name of the founder of Khan Academy
17. an Ivy League university