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# An Approach to Geometric Principles in Vakil Mosque

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## Abstract

Using the geometric drawings has a long history in Iranian art and architecture. Architects of the past time, were using basic geometric drawings for shaping the architectural work, or at least benefit it to gain and adjust the proportions of the building components. Mosques are among the buildings for shaping of which the geometric drawings and proportions have been used. Architecture of mosques in Islamic art, is of a great importance. This importance and focus is resulted from translating the thoughts and beliefs of the artists who have dedicated their lives to reach unity. Vakil Mosque or Great Vakil Mosque is one of the valuable and beautiful architectural Iranian-Islamic buildings of Zandian period which was built by the command of Karim Khan Zand, in Shiraz. The importance and selection of this building is due to its architecture and decorative tiling and reasonable proportions which actually indicates the easthetic taste of the architecture. The exact design and proportions of the building in design and implementation, makes any researcher to speculate. The present article (paper) is attempting to find the basic geometric drawings of Vakil Mosque where we have indicated the geometric design forming the plan and view of Vakil Mosque through repeated investigations and analysis and concluded that the resulting geometry in facade and plan in this period have mostly been the golden proportions and these proportions, have created a beautiful and significant building. results of this paper along with other similar studies can be used in order to recognize the architectural monuments of Iran and retrieve Iranian-Islamic identity.

**Keywords:**Vakil Mosque; Islamic-Iranian architecture; Golden proportions; Geometry

## Introduction

Architecture looks like a system the constituting particles of which have placed together based on a codified and coherent system, and this system is the same geometry used in the buildings. Geometry can be considered as the knowledge of the status of its constituent grains, and understanding the relationship between them and finally, the companionship system of the particles. Geometry is the visualization of most divine secrets and a tool to get to the meanings of the universe which has been manifested in buildings and the arts. This reached the peak of its glory not only in ancient Iran but also continued in the Islamic Iran Several definitions of geometry have been provided in different areas the most important of which is: geometry, the common spirit in any type of architecture and reflects the the spatial order through measuring the forms. According to these definitions, we can say that: the introvert geometry of Iranian houses, the extrovert geometry of Greek pagodas, centeralist geometry of the Sassanid penthauses, the axis-oriented geometry of Roman Basilicas, hierarchical geometry of Egyptian temples and … define various approaches of geometry in architecture and the understanding of different architectural bodies is getting easier through getting the spirit of architecture [1].

Vakil Mosque is one of the most beautiful and strong monuments of Zandiyan period which is of a great importance in terms of art and architecture, it has a bi-porch design and has two southern and eastern seraglios. The building has three magnificent vaults (the entrance vault – pearl vault and the entrance vault to the larger vault), which is the architectural masterpiece and less such imposing vaults have been made in Shiraz. According to traditional-architectural tissue of the country, Vakil Mosque has been placed in a social complex and has created a beautiful harmony of the relation between religion and the world.this building has been built by a capable architect or architects who have indicated an example of Iranian-Islamic architecture with a religious faith and divine inspiration. Unfortunately, no analysis have been conducted so far on discovering the geometry of this building and the lack of such investigations will keep the geometry used in this building to be unknown as well as weakening its architectural identity [2].

## Materials and methods

This is a descriptive-analytical study and was conducted on the basis of library studies. For the preparation of this study some of the most important books of Muslim scholars in the field of theoretical foundations of applying geometry, drawing techniques and the related sciences, the basic principles and their general principles were taken from other studies and after a lot of tests and finding acceptable answers, some options were provided as the geometry of Vakil Mosque.

**Figure 1:**Geometry of Vakil Mosque.
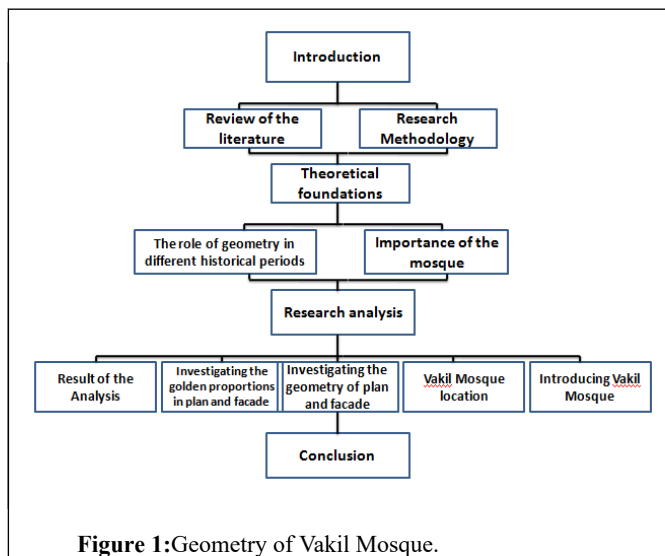
Many people, inside or outside the country, including Galileo, Abolvafa Bozjani, Omar Khayyam, and Avicenna have dealt with the subject of geometry. These people have viewed this concept through a specific approach. In 1623, Galileo stated that, "the world's great book is written in Mathematics and its symptoms are the triangles, circles, and other geometric shapes ... and without them we are wandering in a dark labyrinth» has a work on geometry entitled as "the requirements of creating engineering work" that has written it especially for the apprentices. Ozdural believes that the two mathematical sources of "the requirements of workers and producers of engineering forms" by Abolvafa Bozjani and "Overlapping of similar and compatible forms" from an unknown author which is added to a version of the translated dissertation of Bozjani in the ninth century has established an interaction between the mathematicians and artists [3] . Brooke also notes that Bozjani was strengthening the relationship between architects and mathematicians through raising common problems in meetings that he was holding in Baghdad. Also Avicenna "In the second chapter of the third technique of the nature, in "Shifa" book, considers geometric shapes for the elements . Another important document in this regard, is an untitled essay by the famous philosopher, mathematician and astronomer, which is written about a geometric problem , has an unearthly look on geometry and considers particular attributes for geometric shapes in "Geometry through the Pythagoreans.In an article entitled "manifestation of the Islamic and Christian Philosophy on the geometry of mosques and churches" concluded that religious teachings not only can get the overall objectives of organizing the place but also by exploring themwe can obtain the hierarchy of the objectives from the whole to the detail and detail to whole for the organization of the space. with the geometric analysis ofSheikh Lotfollah Mosque in Isfahan to determine the geometrical relationship of the prayers' room with the entrance forecourt of the building.It explained the conceptsrelated to geometry and its philosophyin nature and Iranian architecture. In an article entitled as"reinvestigatingthe application of geometric principles in traditional architecture, theydealt with studying the hidden geometry in Qasr-e Khorshid [4].

## Results and Discussion

In this paper, it is tried to retrieve the hidden geometry in one of the valuable works of Iranian-Islamic Architecture (Vakil Mosque) after the introduction of a work with a specific methodology. To achieve this goal, some information is collected in this field and by several examinations and drawings on Vakil Mosque's plan and facades, and taking into account the collected information, we discovered the precise geometry of this building as the most important discovery of the Zandieh era and the first hypothesis about the relationship between geometry and architecture of Vakil Mosque in Shiraz was approved. Matching the plan geometry and the facade of Vakil Mosque we came to the conclusion that golden proportions are mostly used in building (plan and facade) this construction. And these golden proportions attract more attention in Vakil Mosque. This issue indicates and confirms the second hypothesis that geometry can be a common element between vertical and horizontal surfaces of Vakil Mosque [5].

## Conclusion

From among the opinions expressed in this article, it can be inferred that the human during his history has always felt the need to understand geometry and mathematics and has used the output of this recognition for building and creating worthy and spiritual spaces like mosques and had always attempted to create beautiful and indelible buildings using this element. Considering this, the last architects used geometric drawings to shape their architectural work, or at least get and set the proportions of buildings' components. Taking the importance of this issue into consideration in this study, we achieved the basic geometry of the plan and facade of Vakil Mosque and indicated that the unique design of the mosque cannot be formed only based on the principles of the structure to decorate it, and for sure, the special geometric design principles have been used. Although understanding the way that designers of that time had used to build their architectural designs was based on the geometric themes, it requires more detailed research in this area. As a suggestion for future research, additional samples of this type can be collected and compared with other samples to determine the certain practices in the application of geometry in architecture of Zandieh period. Similar studies on other samples can provide the setting to understand the basics of how to choose geometric shapes, and their arrangement, and how that geometric theme affects the work design.

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