

**“Prove all things; hold fast to that which is good.”  
1 Thessalonians 5:21**

The origins of Freemasonry extends into our ancient past and is rooted in the secrets of Operative Freemasons or master builders, who through trial and error, discovered physical laws and rules that are unerring when applied correctly<sup>1</sup>. These discovered physical laws and rules allowed Operative Freemasons to become successful in construction and architecture. Operative Freemasons guarded their techniques, learned through trail and error, thereby increasing in importance to Potentates, Kings, and Emperors. The valuable knowledge contained within these Operative Freemasons placed them in high demand and provided opportunities to travel, within their own country as well as foreign countries, erecting monuments and structures according to the demands of their employer.

Over time, societies changed as new discoveries, ideas, and philosophies become dominant thereby forcing changes in traditional practices. Operative Freemasonry was not exempt from the influences of change<sup>2</sup>. The changes impacting Operative Freemasonry were tremendous as society moved away from constructing cathedrals. But, the rituals contained within Speculative Freemasonry have transmitted knowledge down through the millennia, to those who are initiated, passed, and raised into the Brotherhood and are willing to exert a little effort to study.

**What should be studied and why?**

The seven liberal arts and sciences are the curriculum promoted by Freemasonry. There is a specific order to the fields of study, which is grammar, rhetoric, logic, arithmetic, geometry, music, and astronomy. All individuals who have a desire to be educated would be wise to follow the specific sequence because each field of study logically flows into the next. Rhetoric can not be achieved if words can not be properly arranged; logic<sup>3</sup> will

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<sup>1</sup> Materials used to erect monuments and structures may fail over time. However, the techniques for leveling, plumbing, and squaring have withstood the test of time.

<sup>2</sup> Operative Freemasonry began to decline in the 16<sup>th</sup> century. Henry VIII suppressed guilds as Cathedrals and their functions were associated with the Catholic Church and thus viewed in a negative light. The waning of Operative Freemasonry placed a higher importance on Speculative Freemasonry which contains “secrets” long ago discovered by our brothers. Speculative Freemasons uses the symbols of Operative Freemasons for a more noble and glorious purpose. However, the study of geometry is said to yield the most beneficial information as it is the basis for which the superstructure of Masonry is erected.

<sup>3</sup> Logic is defined as correct reasoning. It is not enough for a person to be correct in their logic as he must convince his audience to the superiority of his reasoning over competing thoughts. This is achieved through rhetoric or the proper arrangement of words leading to a convincing argument. Exodus Ch. 4: 1-16 informs us that Moses was not eloquent in his speech, feared speaking before the Israelites, and felt he would not be

be found wanting if the rhetoric can not be delivered fluently, and with force and elegance; arithmetic<sup>4</sup> can not be comprehended if logic has not been properly shaped through inference, deduction, and the ability to reason and judge; geometry's<sup>5</sup> abstract richness can not be fully appreciated without the practical nature of arithmetic being mastered; music and its proportions producing sounds will be lost on a student who does not understand geometric means, ratios, and the harmonies they give birth to; the study of astronomy will not bear any fruit without the preceding six areas of study because astronomy is the sum total of all subjects being applied to the movement of the heavens as they impact and influence human activity.

Freemasonry informs its participants which branch of science would be most beneficial to study. All seven liberal arts are encouraged; however geometry holds a special place in the hearts of Masons. It states,

“The study of the liberal arts, that valuable branch of education that tends so effectually to polish and adorn the mind, is earnestly recommended to your consideration, especially the science of geometry, which is established as the basis of our art. Geometry, or Masonry, originally synonymous terms, being of a divine and moral nature, is enriched with the most useful knowledge . . .”<sup>6</sup>

Geometry and Masonry were originally synonymous which could possibly allude to Operative and Speculative Freemasonry being one<sup>7</sup>. The waning of Operative Masonry, individuals involved in construction and architecture, and the rise of Speculative Masonry, those who were less involved in construction and architecture a more interested in the noble and glorious purpose of the tools as they apply to conduct, could simply

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able to convince them that the God had sent him. Aaron did not have any limitations on his rhetoric and was chosen to be spokesperson in Moses' stead.

<sup>4</sup> Arithmetic concerns itself with concrete numbers. It is through the study and manipulation of concrete numbers that patterns are discovered: 1, 2, 4, 8 . . . 256 leads to understanding that doubling the preceding number or multiplying by 2 creates the next number in the sequence. 1, 1, 2, 3, 5, 8 . . . 55 is a sequence in which the next number is derived by adding the two previous consecutive numbers. Understanding patterns facilitates a transformation to generalization and abstract thought.

<sup>5</sup> Geometry is a journey in the world of abstract thought. Secondary education places geometry between algebra 1 and algebra 2, but any person who has sat in a geometry class understands the nature of geometry is completely different from arithmetic and algebra. Geometry is about conceptual development, imagination, and realm of possibility.

<sup>6</sup> Duncan's Ritual

<sup>7</sup> Can one say for certain that Operative Freemasonry and Speculative Freemasonry are distinct? Operative Freemasons have been attached to religion, as their main purpose was to erect cathedrals to honor the Roman Catholic Church. If the connections between the Knights Templars and Freemasonry are to be believed, then the religious aspect of the Knights Templars would be rooted in rituals that would allude to a more noble and glorious purpose. The Operative Freemasons' connection to the Catholic Church as well as the religious associations of the Warrior Monks, known as the Knights Templar, would indicate simultaneity of Operative and Speculative information. Oral traditions of Pythagoras, an ancient Brother, strengthen the argument for coexistence of Operative and Speculative Freemasonry, as made evident through the Pythagorean theorem. The theorem is Speculative in nature as Pythagoras was a philosopher. However, the theorem served as a practical method for measuring land, surveying property, and rebuilding structures. Egyptian Kings used the theorem for practical purposes. A rope with 12 (3-4-5) knots was used during ceremonies for the initial stage of temple building--laying of a cornerstone.

indicate a shift in emphasis. Whatever the case may be, studying geometry is equivalent to studying Masonry.

### **What is Geometry?**

It becomes necessary to define geometry before proceeding further. Geometry is known to Freemasons as the 5<sup>th</sup> science as well as being synonymous with Masonry. But, these facts do not assist in defining the science of geometry. Geometry is “the branch of mathematics concerned with properties, relationships, and measurement of points, lines, curves, and surfaces; a shape, configuration, or arrangement.”<sup>8</sup> The word geometry is derived from the Greek word *geometrien*, which means to measure land.<sup>9</sup> It can be gleaned that geometry was concerned with the abstract world of points, lines, planes, and curves, as well as with the practical application of measuring land, manipulating materials, and studying the relationships of properties as it applies to building sound structures (as above, so below—scripture?).

Geometry “is the basis for upon which the superstructure of Masonry is erected.”<sup>10</sup> In order to fully appreciate Masonry one necessarily has to study geometry.

### **Tools found in Masonry**

Operative Masons used the common gavel, plumb, square, level, compass<sup>11</sup>, trowel, and setting maul in their constructions and architectural designs. Speculative Masons use the same tools as a means of conveying truths and as a method for making good men better. For the purpose of this discussion, the compass and square will be examined.

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<sup>8</sup> Collins English Dictionary – Complete and Unabridged , HarperCollins Publishers 1991, 1994, 1998, 2000, 2003

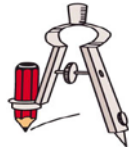
<sup>9</sup> *ibid*

<sup>10</sup> Duncan’s Ritual

<sup>11</sup> Coil’s Masonic Encyclopedia asserts that neither the compass nor the square is peculiar to Masonry. He believes them to be more appropriate for carpenters because “square work was not especially characteristic of Medieval Freemasons.” The history of the compass and its location in the Lodge appears to resist the assertion presented in Coil’s Masonic Encyclopedia. Thales, a Greek pre-Socratic philosopher (c. 620- c. 546 B.C), is credited with inventing compass and straightedge constructions as well as introducing geometry, learned in Egypt, into Greece. Greek mathematicians concerned themselves with circles since the introduction of geometry by Thales and were consumed with using the compass! Our ancient Brother Pythagoras (c. 570 - c. 495 B.C.) “discovered” the Square of the Hypotenuse Theorem while sojourning in Egypt. The Square of the Hypotenuse Theorem is part of Masonry as well as one of the most accurate ways to produce a square and circle of equal perimeter. Finally, T.G.A.O.T.U. was introduced into Masonry as early as 1730 or in the first half of the 18<sup>th</sup> century according to Coil’s Masonic Encyclopedia. However, a painting from the 13<sup>th</sup> century titled “God the Geometer” depicts God as a geometer designing the world with a compass. The idea of God as an architect predated the introduction of the phrase T.G.A.O.T.U. It seems highly unlikely that the compass was not part of Operative Freemasonry but that it lost its central focus in the designs of buildings during the unspecified time mentioned in Coil’s.



The compass is an instrument used to produce circles of varying sizes by manipulating the distance between a fixed and a moveable point. Geometry names the distance between the fixed and moveable points a radius. The moveable component of the compass travels a fixed distance around a specific point, delineated by the fixed point of a compass, and traces a path known as the circumference. Special properties come into existence when a circle is drawn: every point on the circumference is equidistant from the fixed point, the area bound by the circumference of a circle is the maximum area<sup>12</sup> that can be bound by that length, two radii forming a 180 degree angle is called a diameter and divides the circle in half, a special ratio or proportion called  $\pi$  is produced when the circumference is divided by the diameter, a circle has 360 degree.



A square is an implement used for checking right angles. The name square and its function are synonymous with the geometric shape called the same. Special properties are found in the square shape: all sides are of equal length, it contains 4 right angles, the diagonal is the irrational number  $\sqrt{2}$ , rectangular areas are maximized when the dimensions produce a square<sup>13</sup>, a square has 360 degrees.

The compass and square, or the circle and square have a unique relationship in geometry. They are the only shapes with equivalent degrees. Both the circle and square have a total of 360 degrees.<sup>14</sup> They are of the same quantity but are of different qualities.<sup>15</sup> A circle stands as the symbol of God, which has no beginning and no end. The square is a symbol

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<sup>12</sup> If we were to have a specific length for the circumference/perimeter of a circle and all other shapes had the same perimeter, the area bound by the circle would be the greatest. For example, a circle with a circumference of 12 units will bound an area of 11.46 units, a triangle's area would be 6.93 units, while a square of the same perimeter would bound an area of 9.

<sup>13</sup> If given a fixed perimeter for a rectangle, one maximizes the area bound by that rectangle when the dimensions of the rectangular area are those of a square. For example, a rectangle has a perimeter of 36 units and one wants to maximize the area contained by 36 units. Transforming the equation would give all the possible dimensions for a rectangle:  $36 = 2*1 + 2*w$ ;  $36 = 2(1 + w)$ ;  $18 = 1 + w$ . Any combination of length and width totaling 18 units would produce a perimeter of 36 units. So, 2 + 16, 5 + 13, 7 + 11, 9 + 9 or any other combination totaling 18 units would be appropriate. The area of each figure can be determined by multiplying the two numbers being added. A rectangle with dimensions 2+16 has an area of 32 units; 5+13 has an area of 65; 7 +11 has an area of 77; 9+9 has an area of 81. There are not any possibilities capable of producing an area greater than the one produced by the 9 + 9 dimensions.

<sup>14</sup> The total number of degrees for any regular polygon can be determined by the formula  $180(n-2)$ , where "n" equals the number of sides for the given polygon. A triangle has 3 sides, which would give  $180(3-2)$ . This equals 180. A square has 4 sides and would give  $180(4-2)$ , which equals 360. One can continue along this path and determine the total number of degrees for 5, 5, 7, and 8-sided figures.

<sup>15</sup> Genesis 1:27. Man was made in the image of God.

of manifested perfection on the earthly plane. The significance of this relationship cannot be underestimated!

A circle is symbolic of spirit, heaven, and things above, whereas the square is symbolic of action, earth, things manifested for the eyes to see. It can be said that the relationship of the circle and square, or the compass and square, represents the saying, “As above, so below.”<sup>16</sup> This has a particular interest to Freemasons who have at the center of the Lodge a Holy Bible, square, and compass. The Holy Bible is the guide and rule for Masons. But, what purpose does the square and compass serve?

The Master of the Lodge is given the square while the craft is given a compass.. A square represents right conduct as well as being an emblem of morality. Conduct and morality are actions that can be seen. They are manifestations of hidden thoughts that reside in high places. Any conduct that appears inappropriate, or deviating from what is right (right angle/90 degrees), can be tested by the Master of the Lodge, who has in his possession a tool of morality. A compass, or circle maker, is given to the craft. The compass is tool that draws a circumference by which a Mason can prevent himself from materially erring if his passions remain within due bounds. When traveling around the circumference we necessarily touch upon perpendicular parallel lines and the Holy Bible.

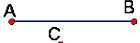
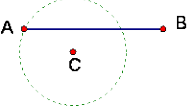
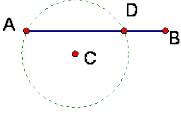
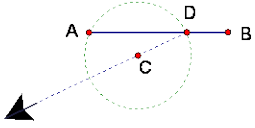
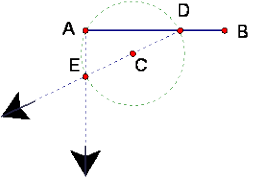
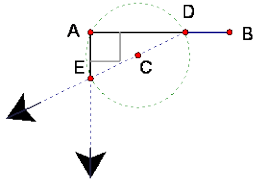
### **The Underlying Geometry Behind the Compass and Square**

Building a square can be a challenging task without a compass and a square. Laws and/or rules of geometry, when coupled with a square and compass, reduce the difficulty for producing a right angle or 90 degree angle.<sup>17</sup>

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<sup>16</sup> Matthew 16:19

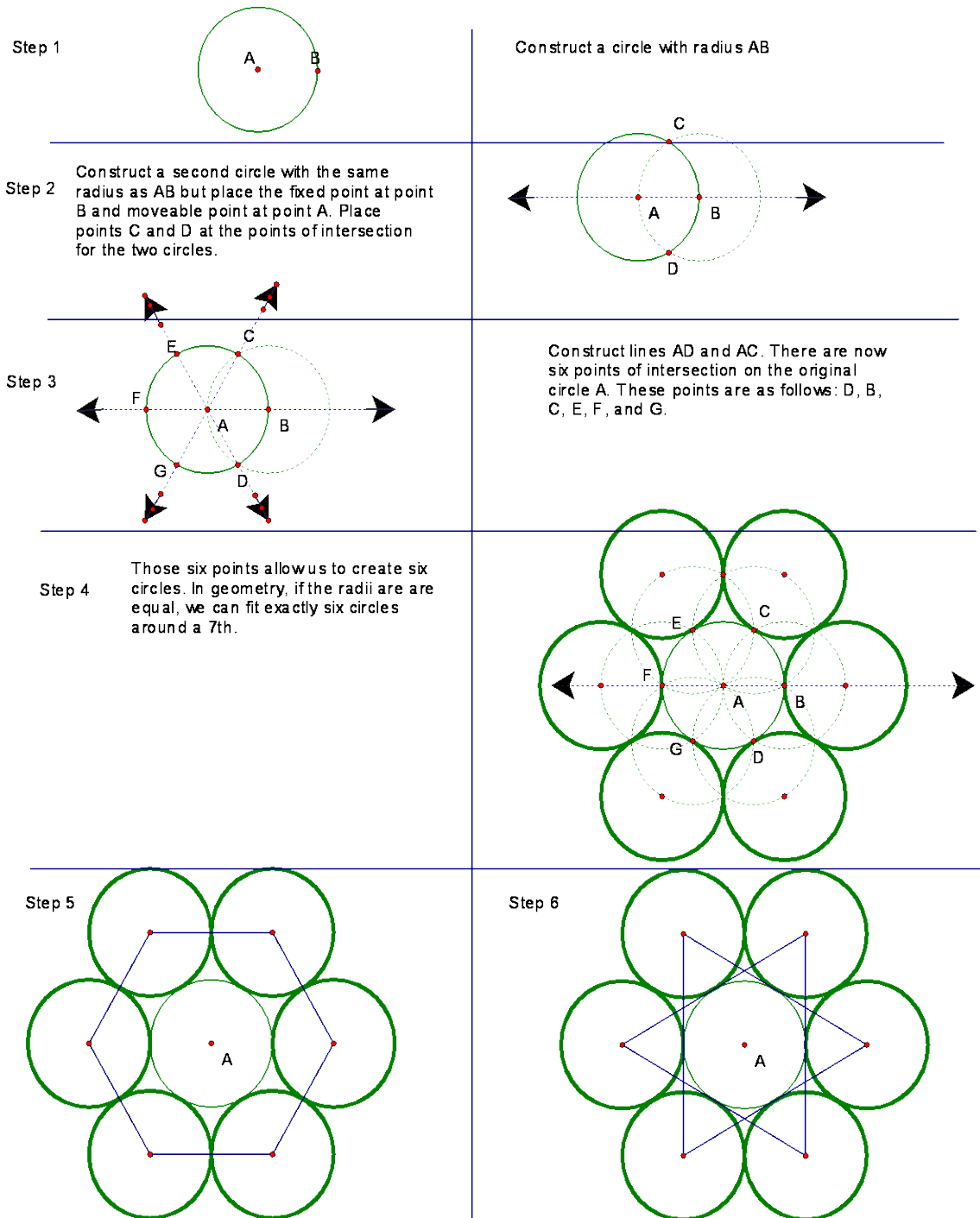
<sup>17</sup> Egyptians were able to produce a right angle or 90 degree angle with a rope and 12 knots. The rope was staked down at the third knot. The rope was then stretched 4 knots and staked as well. Now the two end points were stretched until their tips touched and a stake was driven through both end points creating a triangle. A right angle was formed between the 3 and 4 knots. This is known as the 3-4-5 triangle and the first Pythagorean triple. Egyptians used this method for creating a right angle after the Nile’s annual flood. They were proficient in building right angles with this rope and were called “rope stretchers” by the Greeks. The term was not used as a form of flattery.

<p>Step 1</p> 	<p>start with a segment AB and point C off the line</p>
<p>Step 2</p> <p>place fixed point of compass at point C and moveable point at point A and draw a circle</p>	
<p>Step 3</p> 	<p>Place a point D at the intersection of segment AB and the circumference</p>
<p>Step 4</p> <p>draw Ray DC</p>	
<p>Step 5</p> 	<p>Place point E at the intersection of Ray DC and the circumference of the circle. Now, draw Ray AE.</p>
<p>Step 6</p> <p>Angle DAE is a right angle or 90 degrees.</p> <p>Why?</p> <p>Geometry has a rule that states any point on the circumference, when connected to the end points of a diameter necessarily forms a right angle or 90 degrees</p>	

Various symbols that are known to Freemasons have their origins in geometric shapes and often times are associated with Biblical verses. It has been said that mathematics/geometry was the first religion and words replaced them, but to those that know, they can see the underlying mathematics behind the words.

God completed creation in six days and on the seventh day he rested. A geometric shape captures this belief exactly. Some have taken the story to be literal while others choose to think figuratively. One can argue concerning literal and figurative interpretations indefinitely; however, the geometric representation of the six days of creation and resting

on the 7<sup>th</sup> does not depend on literal or figurative interpretation of the Word of God. The symbol exists on its own and lends strength to either the literal or figurative interpretation.



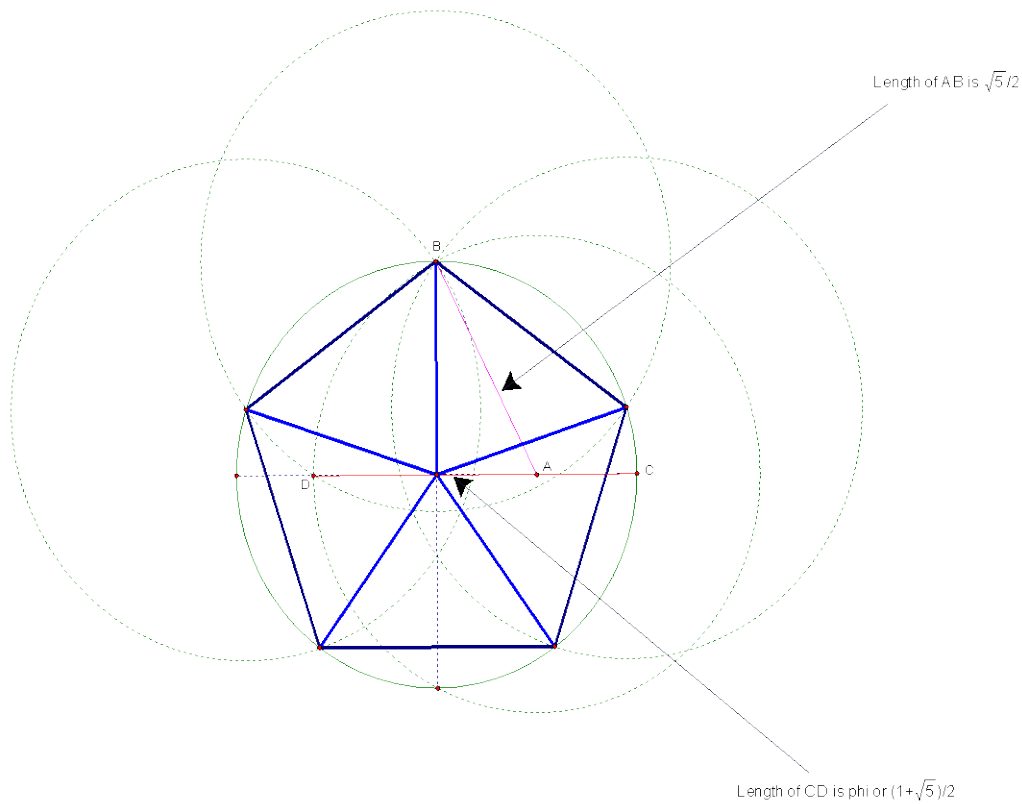
Steps 5 and six produce geometric figures that should be familiar all Masons as it represented on aprons and rests at the center of every regular Lodge.

Geometry is also represented in nature. That discussion will be reserved for another time. But, here are a few visuals of geometry at work in nature.



A cross section of an apple, a flower, and a star fish are natural occurrences of the pentagonal shape which is associated with the Fibonacci sequence, phi, and the proportions of the human body among other things.

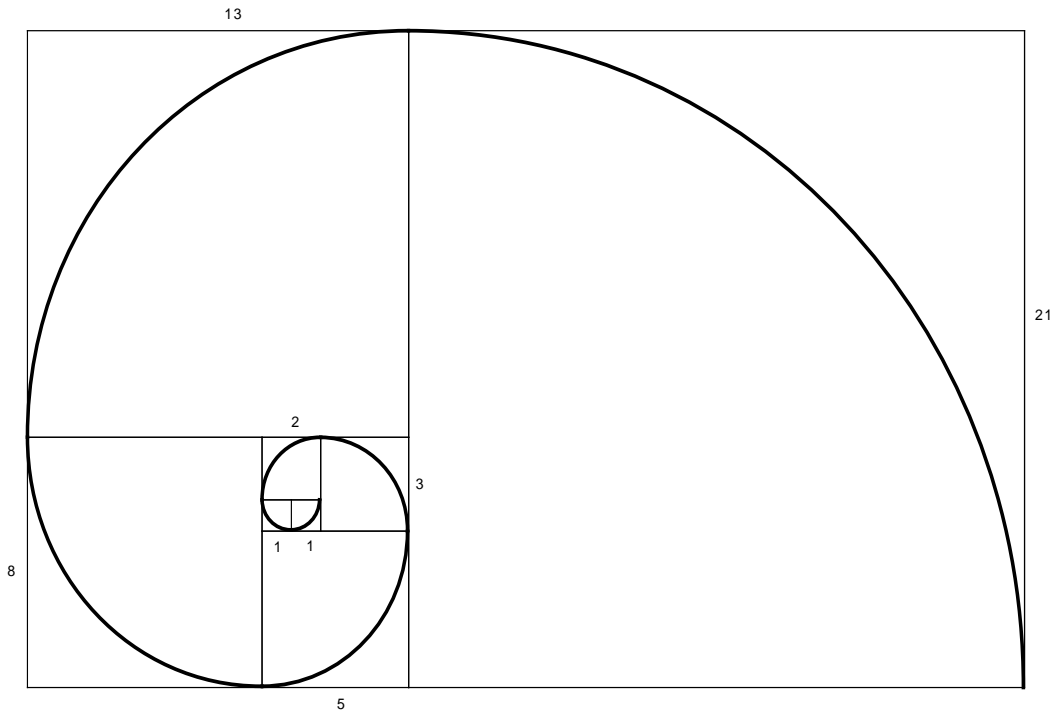
The apple, flower, and star fish represent the pentagon or the pentagram. It has a form and shape related to square root 5 as well as the numbers 36, 72, 108, and 540. Geometry represents it as follows:



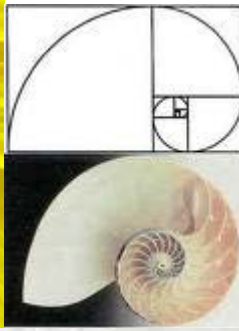
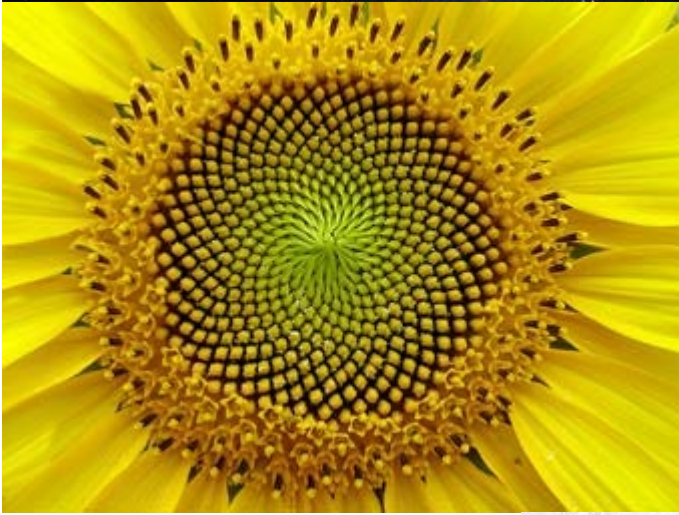
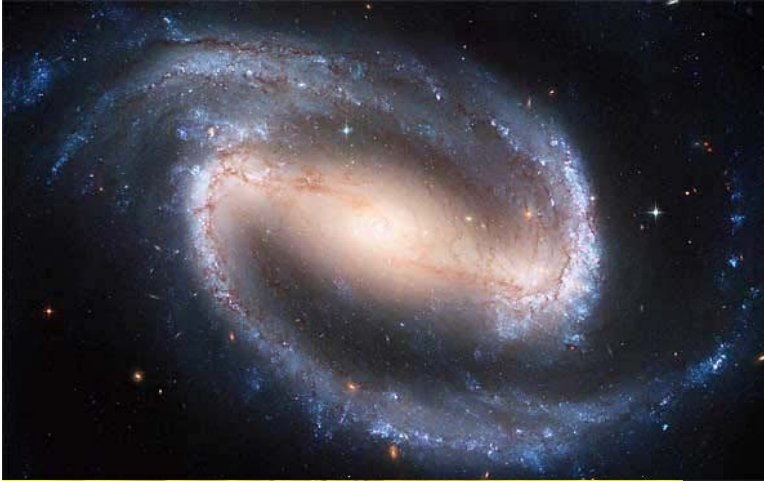


Fibonacci sequence: 1, 1, 2, 3, 5, 8, 13, 21, 34, 55 . . . The next number in the Fibonacci sequence is derived by determining the sum of the 2 consecutive numbers preceding it. So, 3+5=8, 5+8=13, 8+13=21 etc. This sequence is associated with the ubiquitous ratio or

proportion known as phi. Phi is the number  $\frac{1+\sqrt{5}}{2} = 1.618$ . The Fibonacci sequence alternates above and below this number as ratios are generated with the consecutive numbers: 1/1=1, 2/1=2, 3/2=1.5, 5/3=1.67, 8/5=1.6, 13/8=1.625 etc. Ratios continue to alternate above and below the number 1.618 as they quickly approach its value. Phi, the golden number or the golden ratio has a geometric representation that is built on a square and one-fourth part of a circle.



The golden spiral is generated through a square and compass and captures a pattern that exists throughout nature. One can view this pattern in the structure of galaxies, plants, nautilus shells, and hurricanes. Human form is built on this same pattern.



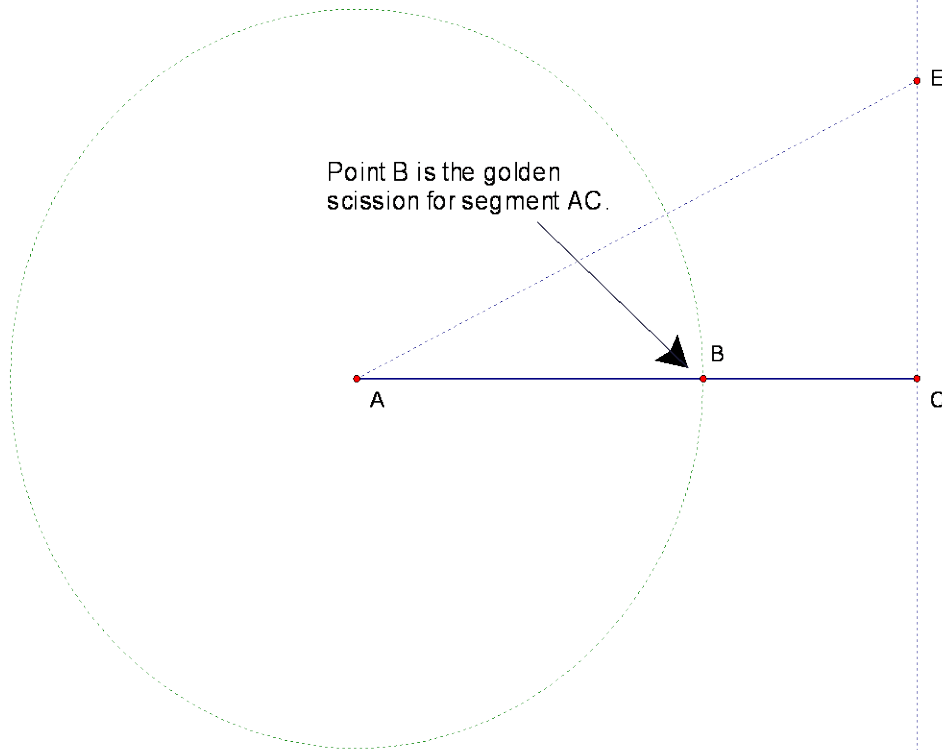
Phi, the golden spiral, or the golden proportion can be determined geometrically. It is the ability to take a segment and divide it in a proportion that allows for the ratio of the longer piece to the shorter piece being equal to the ratio of the entire piece to the longer piece.

AC is the unit piece to be divided = 8.599 cm

AB is the longer piece = 5.31 cm    BC is shorter piece = 3.28 cm

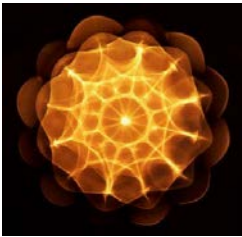
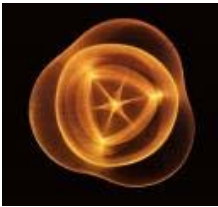
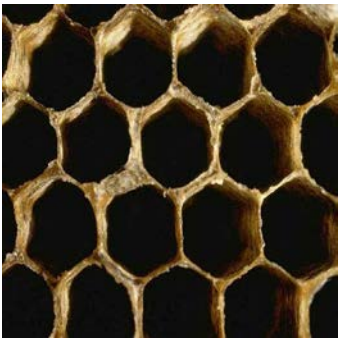
$$\frac{(\text{AC is the unit piece to be divided})}{(\text{AB is the longer piece})} = 1.618$$

$$\frac{(\text{AB is the longer piece})}{(\text{BC is shorter piece})} = 1.618$$



The line segment AC is said divided into the golden proportion because the length  $AB/BC = AC/AB$ . This scission is said to give rise to life.

The beehive and the Star of David, or the Seal of Solomon, hold a special place in Freemasonry. It can be found in the ritual, represented in the center of every Lodge, and on aprons within the Brotherhood. Its geometric importance will be explained at a later date.



The hexagonal shape occurring in nature in the form of a beehive and sound vibrations.

# Squaring the circle using the 3-4-5 Triangle

