Blaise Pascal Essay, Research Paper

Blaise Pascal was born in Clermont France on June 19, 1623 to Etienne Pascal. His mother died when he was only 3. He was the third of four children and the only boy. He was described as a man of: small stature, poor health, loud spoken, somewhat overbearing, precious, stubbornly persevering, a perfectionist, highly pugnacious yet seeking to be humble and meek.

Pascal’s father had somewhat unorthodox views on education, so he decided to teach his son himself. He forbade any mathematic teachings or material to be given to him and had any such texts removed from their house. Blaise became engulfed with curiosity due to this rule. He started to work with geometry on his own at the age of 12. He discovered that the sum of the three angles of a triangle is equivalent to two right angles. When his father discovered this he then allowed Blaise a copy of Euclid.

At the age of 14 Blaise began accompanying his father to Mersenne’s meetings. Mersenne was a member of a religious order of Minims. His cell held many meetings for the likes of Gassendi, Roberval, Carcavi, Auzout, Mydorge, Mylon, Desargues and others. By the time he was 15 Blaise admired the work of Desargues greatly. At 16 Pascal presented a single piece of paper at a Mersenne’s meeting in June 1639. It held many of his geometry theorems, including his mystic hexagon.

In December 1639 he and his family left Paris and moved to Rouen where his father Etienne was appointed tax collector for Upper Normandy. Soon after settling down in Rouen his Essay on Conic Sections was published in February of 1640. It was his first great work.

Pascal also invented the first digital calculator to aid his father in his tax collecting duties. For three years he worked 1642 – 1545. Dubbed the Pascaline, it resembled a mechanical calculator of the 1940’s. This almost assuredly makes Pascal second only to Shickard who manufactured the first in 1624.

Pascal faced problems with the design of the calculator due to the design of French currency at the time. There were 12 deniers in a sol, and 20 sols in a livre. Therefore there were 240 deniers in a livre. Hence Pascal had to deal with more technical problems to work with this odd way of dividing by 240. Yet the currency system remained the same in France until 1799, but Britain’s similar system lasted until 1971. Production of the Pascaline began in 1642. It was recorded by Adamson that:

“By 1652 fifty prototypes had been produced, but few machines were sold, and manufacturing of Pascal’s arithmetical calculator ceased in that year.”

In 1646 Etienne Pascal injured his leg and had to recuperate in his house. Two young brothers from a religious movement outside of Rouen came to help take care of him. Pascal was affected deeply and became very religious. It was at this time that Pascal began many experiments on atmospheric pressure. By 1647 he proved to himself that a vacuum existed. Descartes visited Pascal September the 23rd for 2 days in which they argued about the vacuum which Descartes did not believe existed. Descartes wrote a rather cruel letter to Huygens after visiting the young Pascal. he believed “?has too much vacuum in his head.”

In August of 1648 Pascal deduced that, because the atmospheric pressure decreases with height, there must be a vacuum that exists above the atmosphere. Descartes wrote to Carcavi in June 1647 about Pascal’s experiment stating: “It was I who two years ago advised him to do it, for although I have not performed it myself, I did not doubt of its success.” In October of 1647 Pascal wrote New Experiments Concerning Vacuums which would lead to disputes with various scientists who didn’t believe in vacuums.

Etienne Pascal died in September of 1651, which hurt Blaise badly. He wrote to one his sisters giving a deep Christian meaning to death in general and also to his father’s death particularly. These ideas were to later form the basis of his philosophical work called Pensees.

Then in May 1653 Pascal worked with mathematics and physics writing Treatise on the Equilibrium of Liquids which he explains his law of pressure called Pascal’s law of pressure. Adamson writes: “This treatise is a complete outline of a system of hydrostatics, the first in the history of science, it embodies his most distinctive and important contribution to physical theory.”

He also worked on conic sections and he also produced some important theorems in projective geometry. In The Generation of Conic Sections (which he mostly finished by March 1648, but he worked on again in 1653-54) he considered conics generated by central projection of a circle. Though never completed, this was meant to be the first part of a treatise on conics. Although the work was lost Leibniz and Tschirnhuas made notes from it. Using those very notes a fairly complete portrayal of the work is now possible.

Pascal was not the only one to study the Pascal triangle, but his work on the topic Treatise on the Arithmetical Triangle as the most important. With the work of Wallis, Pascal’s work on the binomial coefficients was to lead to the binomial theorem discovery by Newton for fractional and negative powers.

Along with the help of Fermat they achieved the foundation for the theory of probability. This collective effort obtained five letters and occurred in the summer of 1654. They considered the dice problem, and the problem of points, both of which were considered by Cardan, Pacioli, and Tartaglia. The dice problem raised the question of how many times one must roll a pair of dice before one expects double sixes while the problem of points asks how to divide the stakes if a game of dice is incomplete. They solved the problem of points for a two-player game, but unfortunately were not able to develop powerful enough mechanical algorithms to solve it for three or more players. Pascal was poor in health during their correspondence. In July of 1654 Pascal wrote to Fermat, here is an excerpt: “?though I am still bedridden, I must tell you that yesterday evening I was given your letter.”

In spite of his health problems Pascal worked fervently on scientific and mathematical questions until October 1654. It was then that he nearly lost his life in a horse carriage accident. The horses that were pulling the carriage bolted and when the carriage halted he was left hanging over a bridge of the River of Seine. Though he was rescued he suffered severe mental disorders from the incident. Soon afterward Blaise underwent another religious experience and on November 23rd of 1654 he pledged his life to Christianity.

It was then that Pascal made visits to the Jansenist monastery Port-Royal des Champs which was 30 km south west of Paris. He then began publishing anonymous works on religious topics, eighteen Provincial Letters during 1656 and 1657. These writings were written for the defense of his friend Antoine Arnauld who was an open opponent to the Jesuits and a fellow defender of Jansenism. At the time Arnauld was on trial before the faculty of theology in Paris for his controversial religious works. Pensees was Pascal’s most famous work, which was a collection of personal thoughts on human suffering and faith in God which he worked on from 1656 to 1658. Pensees contained “Pascal’s Wager” which claims to prove that belief in God is rational with the following argument: “If God does exist, one will lose nothing by believing in him, while if he does exist, one will loses everything by not believing.” With “Pascal’s Wager” he uses probabilistic and mathematical arguments coming to his main conclusion that “?we are all compelled to gamble?”

His last work was on the curve traced by a point on a circumference of a rolling stone. This is defined as the cycloid. In 1658 Pascal began to think about mathematical problems again as he lay awake at night due to pain. He associated Cavalieri’s calculus of indivisibles to the problem of the area of any segment of a cycloid and center of gravity of any segment. He also solved the problem of volume and surface area of the solid of revolution formed by rotating x-axis of the cycloid. Pascal also issued a challenge offering two prizes for the solution to these problems. Wren, Laloubere, Leibniz, Huygens, Wallis, Fermat and other various mathematicians were issued the invitation. Wallis and Laloubere entered the competition officially. Laloubere’s and Wallis’ solution were unsuccessful. Sluze, Ricci, Huygens, Wren and Fermat all conveyed their discoveries to Pascal, but didn’t enter the competition. Wren had worked on Pascal’s challenge and decided to issue a challenge of his own. Wren challenged Pascal, Fermat, and Roberval to find the arc length and the length of the arch of the cycloid.

Pascal published his own solutions to his own problems in the Letters to Carcavi. This seemed to be his last great interest in science. He spent his last years giving to the poor and attending church in Paris one service after another. He died at the age of 39 in intense pain after a malignant growth in his stomach spread to the brain.