

May 26th

Memory Verse

In whom are hid all the treasures of wisdom and knowledge. Colossians 2:3

We are going to delve more into wisdom and knowledge again today. Do you know what a theorem is and how it differs from a theory? Keep reading...

Something to read

Abraham De Moivre (1667-1754)

If you were able to take a stroll through the streets of late seventeenth century or early eighteenth century London, you might bump into a Huguenot² gentleman. Literally bump into him that is! Abraham De Moivre, born in France on 26th May, had a habit of reading as he walked from the home of one pupil to another. He was a poor man and could only earn enough money to live by working all the time teaching either in private houses or in the popular London coffee-houses – where he also earned money by playing chess. His walks from house to house were the only spare time for reading that he had. But Abraham De Moivre was a brilliant mathematician whose memory is still honoured for his discoveries today.

De Moivre probably arrived in England sometime in that turbulent year 1687. To Charles II, who had relied on secret supplies of money from Louis XIV King of France to keep going without calling parliament, refugee Huguenot Christians fleeing to England from the French king's persecution had been a bit of an embarrassment. To James II, king when De Moivre arrived and an open Roman Catholic, they were even more so. No doubt De Moivre was very pleased when in 1688 William III, grandson of William the Silent³ and a champion of religious freedom, became king.

The Huguenots escaped from France with few possessions; like De Moivre, they were now poor. However, Louis XIV could not force them to leave their talents behind with their goods and chattels, and everywhere they went Huguenots brought ingenuity, skills and abilities. As Bible believing Christians they were free from the often cramping restraints that restricted the growth of education, training and economics in Roman Catholic countries. De Moivre had been educated at the Protestant academies of Sedan and Samur and by the time he arrived in England he was already a very competent mathematician. His education in France was interrupted when in 1685 Louis revoked the Edict of Nantes, unleashing persecution on the Huguenots. The Protestant schools were closed and the authorities had him sent to a special priory school that had been established for indoctrination of Protestant children into Catholicism.

We know only a very little about De Moivre's life. No one knows when he came to faith in Christ, for instance. However it is clear that whatever he was taught at the priory had no effect on De Moivre's faith and somehow or other he and his brother made their way to England where they joined the Savoy Huguenot church.

De Moivre admired the work of Sir Isaac Newton. It was Newton's *Principia Mathematica* that he studied as he walked round London, taking out separate pages since he could not carry about the whole book. He wrote a book on a branch of mathematics called “probability theory” *The Doctrine of Chances* and eventually became a friend of Newton.

De Moivre has a theorem named after him, De Moivre's Theorem. He also developed a very early version of what is now called the *Central Limit Theorem*, which is to do with probability. He was elected a Fellow of the Royal Society in 1697 in recognition of his work but was not able to become a university professor like other mathematicians of his ability. This may have been because of difficulties he encountered in taking the tests designed to prevent any but practising members of the

¹ Thanks are due to Tony Eastwood and Patience Jones for suggestions and corrections to today's lesson.

² Huguenot was the name given to Protestants in France.

³ See April 16th.

Church of England to be members of the universities. The French church at the Savoy was something of an anomaly and did not conform strictly with Church of England practice. De Moivre would not have been likely to change his opinions in order to get a chair at one of the universities and so he remained a poor man all his life.

Something to think about

De Moivre is known today for the theorem that bears his name but what is a **theorem** and how does it differ from a **theory**?

A scientific **theory** is an explanation of physical phenomena⁴ which can be verified by independent, repeatable, observable experiments.

A mathematical **theorem** is a deduction from a fixed set of axioms⁵.

The best way to understand these ideas is to look at some examples.

Here is an example of a scientific **theory**:

“An iron bar will get longer if heated.”

To prove the **theory**:

Get an iron bar, fix one end to the ground. Measure the height of the bar. Heat the bar and measure again.

If the bar is longer when heated the theory is proved correct. Further experiments can be done to prove that the expansion is proportional to the original length of the bar and so on.

Here is an example of a mathematical **theorem**:

“There is no greatest number.”

To prove the **theorem**:

Fred thinks he knows what the greatest number is. But if he tells it to me I can always add one to it. So there cannot be a greatest number.

Something to do

To look at De Moivre's theorem itself would be too difficult but there are other theorems which are easier to investigate. One of them is Pythagoras' theorem:

For all right-angled triangles, **the square on the hypotenuse is equal to the sum of the squares on the other two sides**. The hypotenuse is the longest side and it's always opposite the right angle.

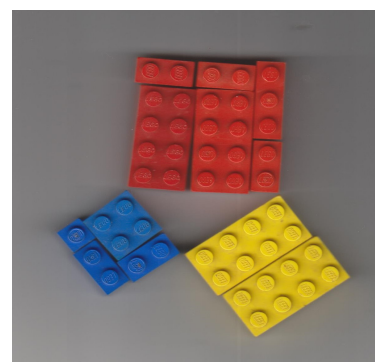
You can demonstrate this with Lego bricks.

You will need:

Two “eight dot” bricks of the same colour which you can lay out as a square with four dots on each side. In the picture mine are yellow.

One square nine dot brick of a different colour. If you do not have a nine dot brick make up the shape, three dots by three dots, from separate bricks. In the picture mine are blue.

You also need to make a third square of another colour. This must have twenty-five dots altogether arranged with five dots on each side. In the picture mine are red.



⁴ A phenomenon is an observable fact or event and a physical phenomenon is a natural phenomenon involving the physical properties of matter and energy.

⁵ An axiom is a self-evident truth that requires no proof. You might remember this from yesterday!

Lay out your Lego bricks on a piece of card or other flat surface. Each of your squares should touch another square at the corner and there will be a right angle triangle in the middle. Count up the number of dots on the three sides. You will find that the number of dots on the longest side of the triangle is equal to the sum of the number of dots on the other two sides. My picture is a bit wobbly: you can do much better, especially if you strengthen your Lego squares by sticking another layer of bricks on the back.⁶

Also on 26th May...

Professor James Bell Pettigrew (1834 – 1908) was born on 26th May. He was a Scot who was not only an anatomist, noted amateur naturalist and a museum curator but a pioneer of aviation as well. His interest in aviation was a result of the process we considered yesterday of “thinking God's thoughts after him” because Professor Pettigrew's speciality was animal locomotion and bird flight, on which he was an international authority. His final book was called *Design in Nature* and in it he wrote “I cannot reconcile myself to the production of organs by infinite modifications in infinite time.” What popular idea was he questioning?⁷ Does that popular idea match up to the definition of a scientific theory given above? Can it be verified by independent, repeatable, observable experiments?

How History came to be written down

One of the world's great scholars died on 26th May 672AD. We would know almost nothing about the early history of Britain had it not been for the Venerable Bede (672AD-735AD) who took the trouble to search out and collect together all the available information he could for his *Ecclesiastical History of The English People*. You will find the story of Bede as retold by H E Marshall in the Optional Resources file for today.⁸

Here is some written work you could do based on the story of Bede:

What was the difference between the kind of history that Bede wrote and the kind of history others had written before him?

Re-read the story about the sparrow flying through the hall. A word that is often used to describe human life is *transitory*. Look this word up in your dictionary. Why does the story of the sparrow illustrate the meaning of this word so well?

List the things we can deduce about how the Saxons lived from this brief description.

Re-write the story of the sparrow imagining that you are the sparrow.

H E Marshall does not disentangle the legendary elements from the story and it is interesting to read them.⁹

Bede was a keen user of the BC/AD¹⁰ dating system and his work made it popular. As well as being a translator and a historian he was also an astronomer. In his book *On the Reckoning of Time (De temporum ratione)* he carefully added up the dates in the chrono-genealogies in Genesis arriving at a date of 3952 BC for the creation of the world. He also explained clearly that the world was a ball shape not flat¹¹ and – centuries ahead of Galileo (who got it wrong) – he worked out that the tides

⁶ You can see how to demonstrate the theorem with paper here: <https://www.youtube.com/watch?v=z6lL83w131E>

⁷ He was questioning the idea of the evolution over a vast period of time of all the species of animals and plants on earth from a single common ancestor.

⁸ This is taken from the *Mothers' Companion* Flashdrive obtainable here: <https://motherscompanion.weebly.com>.

⁹ If you want more facts about Bede you can find them here: <https://www.gotquestions.org/Venerable-Bede.html>

¹⁰ BC means before Christ, AD stands for *Anno Domini* “in the year of Our Lord”.

¹¹ See the lesson for 3rd May.

were caused by the pull of the moon. Next time you hear anyone saying that people in the middle ages thought the earth was flat tell them (politely) about Bede!

26th May 1940 was a National Day of Prayer for Deliverance. What was taking place and about to take place?¹² Find out the answer in tomorrow's lesson!

¹² You can see old film footage of it here: <https://www.youtube.com/watch?v=1zbUqeYnyxw>