THE HISTORY OF ENGLISH PODCAST
TRANSCRIPT

EPISODE 114:
THE CRAFT OF NUMBERING

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Welcome to the History of English Podcast – a podcast about the history of the English language. This is Episode 114: The Craft of Numbering. In this episode, we're going to shift gears a little bit. We usually look at the history of words, but this time we're going to look at the history of numbers. Actually, we're going to do both. We'll explore the origin of numbers and the words we use to talk about numbers. Number words are some of the most conservative words in most languages – including English. Almost all of the words we use for basic numbers can be traced back Old English. But in the 1300s, English started to borrow new number words from other languages. Those words came from the usual suspects – French, Latin and Greek. But English even picked up at least one number word from Arabic. And that was because the Hindu-Arabic numerals that we use today were starting to appear in England for the first time. Those new numerals gradually replaced the traditional Roman numerals which had been used since the Anglo-Saxon period. So this time, we'll look at those developments, and we'll also explore the interaction of language and numbers.

But before we begin, let me remind you that the website for the podcast is historyofenglishpodcast.com. And you can sign up to support the podcast at Patreon.com/historyofenglish.

Now this time, we're going to turn our attention to numbers and the way we express numbers in the English language. My original plan was to discuss numbers in the larger context of measurements and the words we use for measurements. After all, numbers are the fundamental tools we use to measure most things. But there was so much material to discuss that I've decided to treat the two topics separately. This time, I'm going to focus on how we talk about numbers, and next time, I'm going to explore how numbers were put to use to measure things – things like distance, speed, volume and time. Both of these applications were undergoing changes around the current point in our overall story of English in the early 1300s.

As I noted in the introduction, most of our words for numbers have been in the language for over a thousand years. Words like *one*, *two*, *three*, *four* and so on can be traced back not only to Old English, but all the way back to the original Indo-European language. That means that most of our number words have the same ultimate root as the number words used in Greek and Latin and French. And with the flow of French words into English in the Middle English period, English started to pick up some of those other ways to express numbers. For example, if we want to describe two of something, we might use the Old English word *two*. But in the early 1200s, that English guide for female recluses called the Ancrene Wisse introduced two new ways to express the same idea. That text gave us the first use of the French words *double* and *couple* in the English language. So by the current point in our story, English speakers had a variety of words to choose from – *two*, *double* and *couple*.

Around the year 1300, English speakers also found a new way to express 'one-ness' by borrowing the word *single* from French. The word *solitary* found its way in a few decades later. And other French words also started to come in around the same time. The word *dozen* was also borrowed in the early 1300s. And there was another French word that entered the language during this same period, and that word is especially important to this episode because it was word *number* itself.

In a manuscript called the "Lives of Saints" composed around the year 1300, the word *number* is recorded for the first time in the English language, at least according to the Oxford English dictionary. The word began to replace the Old English word for number which was *rim*. That word has long since disappeared from standard English, but it shares a common Indo-European root with the Latin word *arithmetic*. The 'rith' part of *arithmetic* comes from the same root as the Old English word *rim* meaning number. And I mention the word *arithmetic* because it was also borrowed into English around the current point it our story. It is first attested in English in the year 1305.

The word *arithmetic* referred to the process of calculating with numbers. It replaced the term *rimcræft* – literally 'the craft of rims' – or the 'craft of numbers.' This was actually an important field of study during this period because a brand-new numbering system was being introduced into England. And that numbering system is the system we use today. The Hindu-Arabic numerals that I discussed back in Episode 90 were finally starting to make their way to England, and they very gradually replaced the Roman numerals that had been used up to that point.

But when those new numerals were first introduced, people in England didn't really understand how they worked. They didn't understand the place value system – that in a number like 105, the 1 represented the total number of hundreds, the 0 represented the total number of tens, and 5 represented the number of individual units. Roman numerals didn't work that way. In Romans numerals, the number 105 would have been written as CV with C representing 100 and V representing 5. Notice that the version with Roman numerals doesn't have a 0 because the entire concept of a 0 was unknown in Roman numerals. That was the great disadvantage of Roman numerals and the great advantage of new Hindu-Arabic numerals. The new numerals made arithmetic easier thanks to the 0 and the place-value system. But in order to enjoy their benefits, Englishmen had to know how to use them.

So during the 1300s or early 1400s, an English manuscript was composed called "The Crafte of Nombrynge" – literally 'The Craft of Numbering.' In other words, 'the craft of using the brand-new Hindu-Arabic numerals.' This was the first English manuscript to describe those numerals and to explain how to use them. The date of the text is uncertain with some scholars dating it to the early 1400s but others dating it as early as the year 1300 at the current point in our story. I'm going to look at this manuscript in some detail at the end of this episode, but before we look at how Englishmen were dealing with the new numbers, let's explore how they dealt with the traditional numbers. In other words, let's explore the history of numbers and the history of the English words for those numbers.

Now obviously, numbers are a universal concept, but the words and symbols we use for numbers vary from culture to culture. Evidence for the use of numbers can be traced back to the earliest humans. Archaeologists have discovered bones with notches marked in them that are between 20,000 and 30,000 years old. It is generally agreed that the notches in those ancient bones were used for counting. It is believed that early humans would run their thumb along the notches to count the total number of things they were observing, and that number could be recalled by running the thumb in the opposite direction back to the beginning.

Long after those first humans died out, the use of notched sticks for accounting continued on well into the Middle Ages. In French, this kind of stick was called a *taille*. In the early Middle English period, the word was borrowed into English as *tally* or tally stick. And even today, we might keep a 'tally' of the total number of some particular item.

The Anglo-Saxons had a word for the notches in those types of sticks. The word was *score*, and it was borrowed from Old Norse. We still use that word in the sense of making notch marks when we score a piece a meant before cooking it. And of course, we 'keep score' today when playing games. So *score* originally meant a mark – typically used when counting.

You might also know that the word *score* has another sense specifically related to numbers. It is sometimes used as another word for twenty. Many of us know it from the first line of Abraham Lincoln's Gettysburg Address. It begins with the line, "Four score and seven years ago" which literally meant 87 years ago. "Four score" meant 'four twenties' – so it meant 80. And "four score and seven" therefore meant 87. This use of the word *score* was common until the last century or so as represented by Lincoln's use of it in the mid-1800s. And it was a secondary meaning of the word *score* from the very beginning. So the word *score* always referred to both notches and the number twenty. But what was the connection between notches and the specific number 20?

Well, it has to do with the way some cultures counted in the past, and some still count that way today. We inherited our own counting system from the Indo-Europeans who apparently counted in groups of 10. We count to 10, then we repeat the same process for the next ten – generally using 'teen' at the end of each number. Then we repeat it again for the twenties, thirties and so on. When we reach 99, we run out of numbers, we introduce a hundred, and start all over again. And we can continue this approach as far as we need to go – from tens, to hundreds, to thousands, to tens of thousands, and on and on – all in regular increments and multiples of 10.

This system of counting based on units of 10 was the most common method used in the ancient world. And most scholars agree that it is rooted in the fact that ancient people tended to use their fingers when counting. Of course, they had 10 fingers and therefore they tended to think of numbers in units of 10. In fact, we can still see that connection in the word *digit* which was borrowed from Latin. *Digit* can refer to a finger. For example, we have 5 digits on each hand. And it can also refer to a numeral. So the number 125 has three digits using our modern Hindu-Arabic numerals. So the word *digit* reflects a time when fingers were used for counting, and that also explains why a counting system based on units of 10 was so common.

I should also note that the word *finger* is derived from the same Indo-European root as the word *five*. We have five fingers on each hand – assuming that we count the thumb as a finger. So these words show us that people once relied on their fingers when counting. Of course, many modern people do the same thing today.

But in a period before shoes and other foot coverings were common, it appears that some cultures used their fingers and their toes. That meant they used a counting system based on units of 20 instead of 10. The Mayans and the Aztecs used a 20-base counting system, as did the ancient Celts of Western Europe. And those Celtic people included the tribes who inhabited Gaul before it became France. In fact, vestiges of that old Celtic system still exist in Modern French. For example, the French word for 80 is *quatre-vingts* which literally means 'four twenties.' So it's essentially the same construction as English 'four score.' Again, both of these terms reflect an older system where people counted in groups of 20. But what's the connection between that counting method and notches on bones or sticks.

Well, ancient humans sometimes used tally sticks with 20 notches carved into them. And some of those old tally sticks have been found. The person would run his or her thumb along the notches to count the total number of items being observed, like the total number of sheep in a flock. After counting to 20, the shepherd would make a mark on another object. When he counted another 20, he would make another mark. For each group of 20, a new mark was made. In that way, the mark – or score – represented 20 sheep or whatever objects were being counted at the time. And that's why the word *score* came to have a secondary meaning as the number 20.

The important thing to keep in mind about this system is that it didn't require any particular words for numbers. The numbers were represented by notches or fingers or sometimes toes. And that's why many of these tally sticks with notches have been found in excavations of early human settlements. They were commonly used before a standard vocabulary of larger numbers had developed. Early humans probably had words for a few basic numbers – perhaps 1 through 10 or 1 through 20, but beyond that, it appears that they relied on physical objects to help them count.

Sometimes they used stones of various sizes to keep track of things. Small pebbles could be used to represent units of 1. And larger rocks could be used to represent units of 10 or 20 or some other amount. So if the big rock represented a unit of 10, then the number 25 could be represented with two big rocks and 5 small pebbles.

Believe it or not, this method of using pebbles and stones for counting is still reflected in our language. The Latin word for a small stone was *calculus*. And of course, that word exists today in its original form as an advanced form of mathematics. But that root also gave us the words *calculate* and *calculation* and *calculator*. Again, all of those words derived from a root that meant small stones – the type usually used when counting objects. By the way, that root first appeared in English in the late 1300s when it was used by Geoffrey Chaucer. He referred to the process of *calculing* which meant calculating or working with numbers. The word *calculator* appeared around the same time, but it originally referred to a person who calculates – not a mechanical device.

And here's another interesting fact. The early Germanic tribes encountered the Romans through trading networks. And they picked up this Latin word for rocks or stones. The word then passed into Old English as *cealc*, or as we know it today, *chalk*. The early Anglo-Saxons used that word to refer to the soft white limestone found in the south of England. That limestone made very distinctive marks when it used, so it became common to use that stone for writing. And even today, some teachers still do mathematical equations with chalk on a chalkboard. So the word *chalk* comes from the same Latin root as words like *calculate* and *calculus*. They all go back to a root word that meant stones or pebbles

And there's another connection between stones and counting in Modern English. This one should be very apparent if you are from Britain, but less so if you are American. That's because British English still uses the word *stone* to mean 14 pounds. So, for example, a person might weigh 12 stone. The specific use of the word *stone* to mean 14 pounds is first recorded in the late 1300s. But of course, the use of stones for counting goes back much further than that.

And you can also start to see how the use of pebbles and stones eventually led to the invention of the abacus with stones or beads attached to wires to that they could be moved around for counting and calculations.

Now the use of stones for counting is very similar to the use of notches on sticks because both systems can be used without specific words for numbers. You don't have to have a word for 84 in order to count to 84 with these methods. You can just add a pebble or make a mark for each additional item being counted. And these methods also have something else in common. They both rely on a base counting system for larger numbers.

Even when ancient humans counted 84 items, they didn't tend to use 84 separate individual marks or 84 separate pebbles. They used number groupings. As I noted, they might use smaller pebbles to represent individual items and a larger rock to represent a group of those items like a group of ten. This made it easier to keep track of the total number.

Markings or notches often worked the same way. Scholars have noted that early humans tended to use specific marks for individual items up to a certain point. But then, they would use a new mark to indicate a group of items.

Across many cultures, the mark for one item was usually represented by a single straight line. And it is amazing how that simple little line found across so many different cultures has survived the centuries. Our modern number 1 is still a simple straight line. And think about Roman numerals which used letters for numbers. It is widely believed that the Romans used the letter I for one because it so closely resembled the simple straight lines traditionally used to represent one item.

After that, if you wanted to represent additional items, you could just add more of those lines – 2 lines for 2, 3 lines for 3, and so on. And again, Roman numerals worked the same way. The Roman symbol for 2 is I-I. The symbol for 3 is I-I-I. And early on, the Roman symbol for 4 was I-I-I-I.

But at some point, all those straight lines or I's became too difficult to read a glance. You would have to count each mark to determine the total number. So it became common to introduce additional symbols to represent larger groups of items. This was the same idea as using a big rock to represent a specific group of items rather than using a bunch of small pebbles. It made it easier to keep track of larger figures by grouping a certain number together.

The Romans did that by introducing new letters or symbols for groups of 5, 10, 50, 100, 500 and 1000. Specifically, they used V for 5, X for 10, L for 50, C for 100, D for 500, and M for 1000.

Again this was the Roman system, but other cultures operated on a similar principle. For example, the Greeks also used letters for numbers, and they introduced new letters in many of the same increments. Other cultures used other symbols and other increments, but the principle was always the same. Some symbols represented individual items, and some represented larger groups of items. And the larger groupings usually reflected the base number that was used in the counting system. The Romans used a system based on increments of 10, so naturally, they had specific symbols for groups of 10, 100, 1000 and so on.

As I noted earlier, this numbering system based on units of 10 was the most common base used by ancient cultures, but some cultures settled on other base numbers. As we've seen, the Celts used a base of 20. And the Sumerians of Mesopotamia used a completely different base. They counted in groups of 60, and from that 60-base, they also developed an auxiliary unit of 12. So Sumerian mathematicians routinely worked in units of 12 and 60. That system may seem odd to us today, but we have many remnants of it in our daily lives. The fact that we have 60 seconds in a minute, and 60 minutes in an hour, is ultimately due to this numbering system. It's also why clocks count up to 12 o'clock, and it explains why we have 12 inches in a foot, and why we buy a dozen eggs, instead of 10 eggs. In the next episode, I'll explain how some of these modern measurements developed, but this time I want to explain how that Sumerian numbering system worked and how it originated.

The Sumerian civilization was one of the oldest civilizations on Earth. It was located in modern-day Iraq, and the Sumerian people used this numbering system based on units of 60. Whereas the later Romans had unique symbols for 1, 5, 10, 50, 100, 500 and 1000, and they worked with those specific increments, the Sumerians used different groupings and different increments. The Sumerians had specific symbols for 1, 10, 60, 600, 3600 and 36,000, but except for the different increments, they worked much the same way as Roman numerals. If you wanted to represent 250 with Sumerian numerals, you would use the symbol for 60 four times giving you 240. Then you would add the symbol for 10 giving you 250.

The Sumerian civilization was eventually replaced by that of the Babylonians who used a numbering system based on units of 10. For a while, the Babylonians blended the two systems together. For example, they added new symbols for 100 and 1000. But eventually, much of the old Sumerian system eroded, and the Babylonians reverted to their traditional system based on units of 10. However, they kept the old Sumerian 60-base system for use in astronomy and other advanced mathematical calculations. So some of that old system survived, and it passed to other

cultures around the Mediterranean and eventually passed into Western Europe. And that ultimately helps to explain why we count some things today in increments of 12 and 60.

But why did the Sumerians adopt a numbering system based on units of 60 in the first place? I mean, they had 10 fingers like everybody else. How did they come up with 60? And why did they use 12 as a common divisor instead of 10? Well, unfortunately, no one from that period left a tablet explaining why they did that, but there are lots of theories.

The most commonly accepted theory is that 12 and 60 are simply better numbers to work with because they can be divided into so many different equal segments. The number 10 can be divided in half into two 5's. But it can't be divided into thirds or quarters without having to use a fraction. So if you want to avoid fractions – which ancient traders preferred to do – 10 wasn't really a good number to work with. But if you moved up to 12, it solved a lot of problems. 12 could be divided in half with two 6's. It could be divided into thirds with three 4's. And it could be divided into fourthswith four 3's. So it was very flexible. Traders working in units of 12 could easily divide money and goods into a variety of shares. And if we take this one step further, we find something very interesting about the number 60. It is the smallest number that can be divided into 2 equal parts, 3 equal parts, 4 equal parts, 5 equal parts and 6 equal parts. So if you were choosing the most flexible base number to work with – that could be divided into the most equal shares without fractions – you would have settled on the number 60, with 12 being a common subgroup because it is almost as flexible. So that's the most popular explanation for this old Sumerian and Babylonian numbering system.

Another theory is that the Sumerians used numbers like 60 and 12 because they were consistent with natural phenomena which they tracked very closely. They estimated that there were approximately 360 days in a year. There was 12 lunar months in a year, and that left about 30 days in each month. So working with basic units of 12, 30 and 360, they settled on a base number of 60. This theory may explains why the Babylonians maintained much of this system for use in astronomy long after the Sumerian civilization had disappeared. This system worked very well with those astronomical calculations. But whether or not it was the reason why the Sumerians came up with the system in the first place, we may never know.

Another theory has been proposed by Georges Ifrah who has written several books on the history of numbers. I used two of those books for some of this research, so let me recommend those to you. One is titled "From One to Zero" and the other is "The Universal History of Numbers." Anyway, Ifrah suggests that the Sumerian system based on units of 60 was also derived from finger counting like the more common base of 10. It was just a different type finger counting. In fact, it is a system that is still used in parts of Iraq, Iran, India and Turkey. This other system is used for counting on one hand. And it is based on the fact that each finger has three joints and thus three segments. There is the segment at the top by the fingertip. There is the segment in the middle. And there is the segment at the bottom by the palm. This counting system uses those three segments. You actually count those segments with the thumb – one finger at a time. And when you count those three segments on each of the four fingers, you end up with a total of 12. So that finger-counting method gives you a base unit of 12. But what if you want to go beyond 12? Well, you can use your other hand.

At the first unit of 12, you can extend one finger of the other hand. At the second unit of 12, you can extend a second finger. And since you have five digits on that other hand, you can repeat this process 5 times. And 5 times 12 gives you 60. So using this finger counting method – which still survives in this same part of the world – you would routinely count in units of 12 with a total base system of 60. So this might provide another explanation for the origin of this Sumerian and Babylonian system.

Now the reason I went through that exercise is because that 60 base system, with 12 as an sub-unit, is also reflected in some of our English words for numbers. So with all of that history as a background, let's look at how the English language deals with numbers

As I noted earlier, most of our number words were preserved from Old English. And those words were inherited from the original Proto-Germanic language. And most of those words can be traced back to the original Indo-Europeans. So given all of that, we should expect that English number words are closely related to the number words found in other Indo-European languages, and that is indeed the case. And around the current point in our overall history of English in the early 1300s, a lot of those other words started to filter into English giving English multiple ways to express numerical concepts. Of course, Latin, Greek and French were the primary sources of those new terms.

So let's go through the numbers beginning with number one. Of course, that word is *one* today, but it was *an* in Old English. I discussed the evolution of that pronunciation change back in Episode 96, so I won't repeat it here. We have also seen that the original form of the word still survives as our modern articles *a* and *an*. So 'an apple' literally means 'one apple' if we use the original meaning of the word *an*.

The Latin word for one was *unus* from the same Indo-European root as *one*. And *unus* passed into English as the prefix *uni-* meaning one. This prefix was starting to pass into English in the early 1300s, and it gave English speakers a new way to indicate one-ness. The word *unicorn* is one of the first known words with that prefix to pass into English. It was actually used in the Ancrene Wisse because it was also used in the Bible. It was a direct translation of the Greek word *monoceros* which literally mean 'one horn.' *Unicorn* meant 'one horn' in Latin, and English actually used a direct translation of that word early on. English had the word as *anhorn* before the Latin *unicorn* won out. The next word with that prefix to enter English was the word *university* which is first attested in English at the current point in our overall story in the year 1300.

Now I noted that the word *unicorn* was a direct translation of the Greek word *monoceros*. And that's because the Greeks sometimes used the word *monos* to mean one. And that word also entered English as a prefix usually as *mono-*. The first known use of that prefix in English occurred in the late 1300s with the appearance of the word *monarchy* which meant rule by a single king or sovereign. But English already had at least one word with that Greek root by the beginning of the Middle English period, and that was the word *monk*. As I noted in an earlier episode, *monk* was a Greek word that originally referred to someone who lived alone in solitude.

I also noted earlier that the French word *single* entered English around the year 1300. So English was acquiring lots of new ways to express one-ness.

The next number in English is *two* derived from the Old English word *twa* – usually spelled T-W-A. So the 'w' was actually pronounced in Old English. And that's why the number *two* has a 'w' in it, whereas the preposition *to* – T-O – does not. The 'w' started to disappear in the south of England during the Middle English period, but I should note that the original form of the word still survives in Scots where the number is still pronounced as *twa*. The 'w' also exists in closely-related words based on the same root – words like *twelve*, *twenty*, *twice*, and *twin*.

Now I noted that modern *two* came from Old English *twa*, but I should note that *twa* was the feminine version of the word. Remember that Old English had grammatical gender. So the form of some of the number words varied depending on how it was being used in the sentence. The masculine version was *twegen*, and that word still survives as the word *twain*. We use that word in a phrase like 'Never the twain shall meet.' Again, *twain* was just a different form of *two* in Old English.

I should also mention the word *between* which uses a variation of the same root word as *two* and *twain*. *Between* is the state of being in the middle of two or more other objects.

So that's English, but if we think back to laws of sound change identified by Jacob Grimm, we know that the Germanic languages developed a 't' sound from an original Indo-European 'd' sound. So when we look to Latin and Greek, we should expect to find words meaning 'two' that begin with a 'd' sound, and that's exactly what we find in the Greek and Latin words *duo* (/dwo/) which became *duo* (/do-oh/) over time – D-U-O. So *duo* is cognate with *two*. Of course, the Latin root gave us words like *duo*, *dual*, *duet*, and *deuce* – all of which were borrowed in later periods of English. However, as I noted earlier, English had borrowed the word *double* by the current point in our story from the same root.

Latin also had the prefix *bi-* which was used to indicate two of something. We find it in modern words like *bicycle* and *bilingual*. That prefix was also starting to enter English around the current point in our overall story. One of the first occurrences of that prefix in English is the word *bigamy* found in a document from the early 1300s. Of course, it referred to a situation where a person was married to two or more people. Before *bigamy* was borrowed, Old English has the same concept as *twie-wifing* – literally 'two-wifing.' So as you can see, English was starting to tap into Latin and French for new ways to express two-ness.

For the next number we have *three* which was *þrie* in Old English. So it hasn't changed very much. The Indo-European root was **trei* which produced Latin *tres*. The Greek form was very similar to that Latin form. These Latin and Greek forms gave us the prefix *tri-* (/tree/) or *tri-* (/try/) meaning three. And this is another classic example of Grimm's Law at work. The Indo-European 't' sound became a Germanic 'th' sound. And once we account for that sound change, we can see the clear connection between T-R-I – as in *triangle* or *trio* – and the English word *three*.

By the current point in our story, English had borrowed the word *trinity* with that Latin root for three. And English speakers were probably familiar with the Latin word *trivium* for the three basic courses taught in schools, even though that word isn't found in an English document until much later. Also, the word *triangle* appeared in English for the first time in the late 1300s. So English was starting to borrow that common prefix from Latin and Greek.

Of course, after *three*, we have *four* which was *feower* in Old English. It has been shortened over time from a multi-syllable word into a single-syllable word. The Latin word for four was *quattuor* – which gave us words like *quarter* and *quart*. Now English *four* and Latin *quattuor* came from the same Indo-European root word meaning four, but there is a little bit of mystery here. The Indo-European word began with a 'k' sound as found in that Latin word *quattuor*. Under Grimm's Law, that 'k' sound should have switched to an 'h' sound in the Germanic languages. So English should have ended up with 'heower' or 'hor' instead of *four*. So where did that 'f' sound in four come from? It was already there in the original Germanic language, so whatever happened, it happened very early on.

The most popular theory is that the Germanic speakers were influenced by the following number *five* – or **fimfe* in Proto-Germanic. So the original Germanic words began with the same sounds as the modern English words. And just as today, people were accustomed to reciting the numbers in order – 1, 2, 3, 4, 5 ,6 and so on. And in a time when alliteration was common in Germanic poetry, it became common to give the word after *three* an 'f' sound so that it began with the same sound as *five*. In fact, if we look at the preceding and following numbers, we see that *two* and *three* begin with similar sounds – T and TH. And *six* and *seven* both begin with the 's' sound. So if we give the word for *four* an 'f' sound, we get a nice little rhythm – 2,3 – 4,5 – 6,7. Again, Germanic culture would have been much more focused on alliteration that our modern culture. Where we tend to use rhyming schemes and focus on similar sounds at the end of words, they used alliteration. So they would have been accustomed to the rhythm of repeating sounds at the beginning of words. And this is the most popular theory for the 'f' sound at the beginning of *four*.

As I noted, the related Latin word was *quattuor*, and the Q-U-A-R root was just starting to enter English at the current point in our story around the year 1300. In fact, several documents composed in that year provide us with the oldest examples of that root in the English language. The word *quarter* appeared for first time in that year. Of course, it meant one-fourth. The word *quart* appeared a short time later. A *quart* was one-fourth of a gallon. The year 1300 is also the year in which we find the first known use of the word *square* in the English language. It actually appeared for the first time in the Cursor Mundi – that northern text that I discussed a couple of episodes back.

Now we know that a square has four equal sides, but you might not have ever noticed that it has that Latin word for 'four' buried right in the middle of it. Take away the 'S' at the front and the 'E' at the end, and you have that root – Q-U-A-R. And that's because the word originally combined the Latin prefix *ex-* meaning 'out' with the root *quadrus*.

It originally referred to the tool that is still used by carpenters to draw a right angle. And four of those right angles with equal sides forms the pattern which became known as a square. And again, that word is first recorded in English around the year 1300.

The next number on the list is *five* from the Old English word *fif*. I noted a few minutes ago that it came from the Germanic word **fimfe*, but that word was derived from the Indo-European root **penkwe*. And once again, we see Grimm's Law at work here. The original 'p' sound became an 'f' sound in the Germanic languages. But Greek retained the original 'p' sound, and it produced the Greek word for five which was *pente* – found in words like *pentagon* and *pentagram*. Those words were borrowed during later periods of English, but the Anglo-Saxons had borrowed a couple of words with that root during the Old English period thanks to the influence of the Church. The Latin Bible had been translated from Greek, so a few Greek words had entered Old English. And that included the words *Pentecost* and the word *pentapolis* which meant a group or federation of five cities. So that Greek root for 'five' entered English very early on.

Interestingly, that Indo-European root **penkwe* developed in a completely different direction within Latin. It produced the Latin word *quinque*, and that gave use the prefix *quin-* for five as in *quintuplets*. That root also entered English in the early 1300s in the Latin word *quinzaine*. It meant a period of 15 days, but it has largely disappeared from English over time.

That brings us to the number *six* which was *siex* in Old English. The Latin form of the word was very similar – *sex*. We have it in a word like *sextuplet*, and that prefix also started to enter English during the late 1300s. It first appeared in words like *sextary* and *sextula* which were specific Roman measurements. The Greek word for six was derived from the same Indo-European root, but Greek had a sound change that caused the original 's' sound to switch to an 'h' sound. So English has *six*, and Latin has *sex*, but Greek had *hex*. And that Greek version survives in words like *hexagram* and *hexagon*. But that Greek root isn't really found in English until later centuries.

For seven, Old English had *seofon* and Latin had *septem* – again from the same root. The Anglo-Saxons had borrowed that Latin root in the word *September* in the Old English period. And just as Latin as *sex*, where Greek had *hex*, Latin had *septem* and Greek had *hepta*. And in later centuries, English borrowed that Greek root in words like *heptagon* and *heptarchy*.

For eight, Old English had *eahta* where Latin and Greek had *octo* – all from the same root. English had borrowed the word *October* with that root during the Anglo-Saxon period. By the end of the 1300s, English had also borrowed the word *octave*. Words like *octopus* and *octogenarian* came during later centuries.

For nine, Old English had *nigon* where Latin had *novem* from the same root. Again, English had borrowed the word *November* with that root prior to the Norman Conquest, but that month name remains one of the few words borrowed with that Latin root.

For ten, Old English had *tien*.   The Indo-European root was **dekm* which produced Greek *deka* and Latin *decem*. So once again, we see the shift from the 'd' sound to the 't' sound under

Grimm's Law. The Latin and Greek words retained the original 'd' sound where English had **ten** with the 't' sound. English had borrowed that Latin root **decem** in the word **December** very early on. In the early 1300s, English also borrowed the word **decima** which meant a tenth part. We have a similar version of that word today in the word **decimal**. And in fact, the base-10 number system used by the Indo-Europeans and cultures is called a decimal system since it is based on units of 10. And some people who are very literal with their English will remind you that the word **decimate** means to kill one-tenth of an army or group. That was the original meaning of **decimate**, even though the word has acquired a broader sense over time. As I noted, **decima** was borrowed in the early 1300s, but **decimal** and **decimate** were borrowed in later centuries.

So that's our basic group of ten using the Base 10 system which we inherited from the Indo-Europeans. Generally speaking, after 10, we start over with a very simple formula. We take our basic numbers and add **-teen** to the end which is just another variation of the word **ten**. So **thirteen** is literally 'three-ten' or 'three plus ten.' **Fourteen** is 'four plus ten.' **Fifteen** if 'five plus ten,' and so one. Now I said we "generally" do that. But there are couple of obvious exceptions – **eleven** and **twelve**. So why do we say **eleven** and **twelve** and not 'one-teen' and 'two-teen'? Well, the short answer is that this was a development within the original Proto-Germanic language. The Indo-Europeans didn't have these words or words that followed this pattern.

In Old English, **eleven** was **enleofan** – literally 'one-left.' So **eleven** meant 'ten with one left over.' Meanwhile, **twelve** was **twelf** – from the Germanic **twa-lif** – again literally 'two left.' So **twelve** meant 'ten with two left over.' So why did these unique words exist for 11 and 12?

Well, the most common theory is that the early Germanic tribes sometimes broke from the Indo-European number system which used units of ten, and they sometimes used a system based on units of 12 like the ancient Sumerians and Babylonians. So English appears to have these remnants of a completely different number system which the Germanic tribes picked up from somewhere and which was incorporated into the original Proto-Germanic language.
And that's why each of our numbers up through twelve have unique names. And after twelve, we resort to the default system of adding 'teen' to each root number – 13, 14, 15, and so on.

If we look a little closer at Old English, we can actually find more evidence of a Base 12 number system. Today, when we run out of 'teens' at 19, we create a new unit of **twenty** which is two-tens. We do the same thing for **thirty**, **forty**, **fifty** and so on. But we stop after **ninety** and then go to a **hundred** which is 'ten 10s.' So all of this is consistent with a counting system based on units of ten. Old English used this same system, but it also had an alternate system which has disappeared. After **ninety**, instead of 100, people would often say **hund-teontig** – literally 'hund-tenty.' And for 110, they would say **hund-endleofantig** – literally 'hund-eleventy.' And for 120, they would say **hund twelftig** – literally 'hund-twelvety.' Other Germanic languages like Frisian had similar words based on the same formula.

So at one time, English not only had **eleven** and **twelve**, it also had a form of 'eleventy' and 'twelvety,' which reinforces the idea that the early Germanic peoples sometimes thought of numbers in groups of 12.

In fact, the Old Norse word *hundrað* didn't mean 100 like it did in English. It actually meant 120. And the Norse word *þusend* didn't meant 1,000 like English, it actually meant 1,200. Again, that's more evidence that the early Germanic people used two different bases when counting – one method using units of 10 inherited from the Indo-Europeans and another method using units of 12 which they acquired from somewhere else.

In fact, older legal documents in some Germanic languages distinguish between a "common hundred" which meant 100 and a "great hundred" which meant 120. So if the Germanic tribes sometimes used a number system with a base of 12, where did they get that system from?

Well, no one really knows, but keep in mind that the original Proto-Germanic vocabulary had a lot of words in its core vocabulary that didn't come from the Indo-Europeans. And as I noted in the early episodes of the podcast, it appears that the Indo-European speakers who migrated into northern Europe encountered another tribe who spoke a different language. And over time, the two groups fused together, and the language which emerged as Proto-Germanic retained words from both languages. Well, if that is indeed what happened, it is possible that the other unknown tribe used a counting system based on units of 12. And as the two vocabularies mixed together, the resulting Germanic language retained aspects of both systems.

But I can add one more little piece of evidence to the story. A lot of you may be familiar with the various books by the linguist John McWhorter. He has written numerous books about the history of English – and the history of language in general.

Well in his book "Our Magnificent Bastard Tongue," he argues that the non-Indo-European words in the Proto-Germanic vocabulary show some striking similarities to words in the Semitic languages. And he argues that a group of Phoenician traders may have explored the interior of Europe, and may have established a settlement in northern Europe. And that may have been the tribe who mixed with the Indo-Europeans and provided the other part of the Proto-Germanic vocabulary. Of course, the Phoenicians were from the Near East and spoke a Semitic language, and they would have been familiar with the counting system of the Babylonians who were also a Semitic people. So perhaps this Base-12 counting system buried within the Germanic languages is more evidence to support McWhorter's theory. But to be clear, this is all speculation. None of these theories have been generally accepted by modern linguists.

Now not only does basic English show some evidence of a Base-12 counting system, it has also borrowed words to reinforce the approach of counting in units of 12. For example, English borrowed the word *dozen* from French in the mid-1300s. And by the early 1400s, English had even borrowed a word meaning 'a dozen dozen' – or 144. Of course, that is the word *gross*.

Now let me conclude my review of English numbers by pointing out that the word *thousand* is also an Old English word inherited from the Proto-Germanic language. Versions of this root are also found in some other Indo-European languages, but the word for the number 1000 varies greatly among the modern Indo-European languages which suggests that the original Indo-Europeans didn't normally count that high and didn't have a standard word for that number. For example, Latin used the word *mille* which entered Old English as the word *mile* meaning 'one

thousand double paces.' For 'a thousand thousands,' English uses a variation of that word *mille* which is of course *million*. That word first appeared in English in the late 1300s. Beyond a *million*, terms like *billion*, *trillion*, *quadrillion*, *quintillion*, and so on, are obviously based on the Latin roots we saw earlier. And they all proceed in increments based on units of 10.

So I have covered almost all of the numbers we use in Modern English with one important exception. Did you notice which one I left out? It's the number *zero* – the number that represents nothing at all. It's the only basic number word in English that isn't native to the Indo-European language family. It comes from Arabic. And it came into English with the arrival of the Hindu-Arabic numerals in the 1300s. I discussed the origin of the word *zero*, and the concept of the numeral zero, back in Episode 90. It was a key part of those new Hindu-Arabic numerals which I also introduced back in that episode.

Those new numerals were very different from the traditional Roman numerals. The value of each Hindu-Arabic numeral depended on where it was placed in the overall number. A 2 by itself, or a 2 located at the end of a larger number, just represented 2. But if it was moved over one position, it represent a unit of 20. If moved over one more position, it represented a unit of 200.

Of course, all of this is second nature to us today, but it was a revolutionary concept in the 1300s. In order for that system to work, it needed a zero to indicate when there were no units in a particular position. So in order to represent the number 320, there were three units of a hundred, two units of 10, and no individual units. Without the zero, you had the number 32. You had to have that zero to mark the empty position. So the zero was essential to those new numerals. But the zero wasn't just a place holder. It actually served as its own unique number, and you could do arithmetic with it. 5 plus 0 was 5. 5 times 0 was 0. It had its own numerical function. And that was what made arithmetic with these numerals so revolutionary.

Again, all of this was a completely foreign concept to most Europeans. Up until this point, Europeans used Roman numerals, and they continued to use Roman numerals for many centuries. Acceptance of the new Hindu-Arabic numerals was slow –VERY SLOW. Even though the new numerals started to appear in England in the 1300s, they didn't really start to replace the traditional Roman numerals until the mid-1500s.

During that intervening period, English scholars studied those new numbers, and they gradually came to understand the mathematical advantages afforded by those numerals. And that was the context for the creation of that manuscript I mentioned at the beginning of this episode entitled "The Crafte of Nombrynge."

That manuscript was really a translation and explanation of an earlier Latin work which was itself a commentary on al-Khwarizimi's original Arabic work on the numerals. You might remember from Episode 90 that the Muslim scholar al-Khwarizmi wrote an extensive manuscript about mathematics and the use of these Hindu-Arabic numerals. His name gave us the word *algorithm* – or *algorism* as it was originally called in English. The word originally meant the use of the new Hindu-Arabic numerals. If you did arithmetic with those numerals, you were said to

be engaged in the craft of algorism. That word actually appeared for the first time in the Ancrene Wisse, but most Englishmen didn't really know where the word came from. And this particular manuscript called "The Craft of Nombrynge" actually begins with an attempt to explain the meaning of that word. Unfortunately, the manuscript got it wrong. It suggests that the name was derived from a king of India who invented the whole numbering system. Here are the opening lines of the manuscript – first in Modern English and then in the original Middle English:

This book is called the book of algorism, or Augrym after common use. And this book analyzes the craft of numbering, which craft is also called algorism. There was a king of India, named Algor, and he made this craft. And after his name he called it algorism; or perhaps there is another reason why it is called algorism for that is the Latin word for it.

This boke is called þe boke of algorym, or Augrym after lewder vse. And þis boke tretys þe Craft of Nombryng, þe quych crafte is called also Algorym. Ther was a kyng of Inde, þe quich heyth Algor, & he made þis craft. And after his name he called hit algorym; or els anoþer cause is quy it is called Algorym, for þe latyn word of hit.

The manuscript then introduces the symbols for the ten figures used in the new numeral system. After introducing those new symbols, the manuscript contains a series of passages which explain the concept of positional numbers – where the position of the numeral determines its overall value.

The manuscript then illustrates this concept further with an example. It uses the numbers 9-6-3-4 in that order, and it explains how the respective positions mean that 9 represents 9 thousand, 6 represents six hundred, 3 represents thirty, and 4 represents four individual units of four. The text concludes this example with the following passage:

The whole number is nine thousand six hundred and four and thirty. Furthermore, when you read a number of figures, you should begin with the figure on the left side and read so forth to the right side as here – 9-6-3-4. You should begin to read at the figure of 9 and read forth thus – nine thousand six hundred thirty and four.

Al þe hole nombur is 9 (niȝen) thousande sex hundryth & foure & thretty. fforthermore, when þou schalt rede a nombur of figure, þou schalt begyne at þe last figure in the lyft side, & rede so forth to þe riȝt side as here 9 (niȝen). 6 (sex). 3 (Þre). 4 (foure). Thou schal begyn to rede at þe figure of 9 (niȝen) & rede forth þus. 9 (niȝen) thousand sex hundryth thritty & foure.

Now this is actually a fascinating passage because it points to a basic change in the way the numbers were read in English. The first time the author wrote out the number with words, he did so in the traditional manner going back to Old English. He wrote "nine thousand six hundred and four and thirty" instead of 'thirty four." But then he wrote the same number again at the end of the passage, and he wrote that it should be read as "nine thousand six hundred thirty and four." So he switched to the more modern phrase 'thirty-four" rather than the older and more traditional "four and thirty." We still see remnants of that old system form time to time. For example, in the nursery rhyme "Sing a Song of Sixpense," a well-known verse reads:

Sing a song of sixpence,
A pocket full of rye.
Four and twenty blackbirds,
Baked in a pie.

So instead of 'twenty-four,' the line reads 'four and twenty.' But during the Middle English and early Modern English periods, people stopped saying 'four and twenty' and they started saying 'twenty-four.' And presumably, they did that in part because people were taught to read out the names of the numerals from left to right when working with this new numbering system. And that meant that the word for the units of ten – like *twenty*, *thirty* or *forty* – started to precede the final number at the end. There certainly may have been other factors at work as well, but this linguistic change took place at the same time that the new numerals were starting to be fully accepted in England in the 1500s and 1600s.

The Craft of Numbering manuscript goes on to explain that the new numerals use a symbol called *sifr* – or zero – which represents nothing. It then explains how to do addition, subtraction and multiplication with the new numerals one column at a time. This new system made arithmetic quicker and simpler, and it brought about a mathematical revolution. Some scholars compare the overall impact of that new numbering system to the literary revolution that took place when the alphabet was introduced. In fact, the upcoming scientific revolution was largely dependent on the mathematical equations and calculations that could be easily rendered with this new numbering system.

In this episode, we explored where our number words came from. Next time, in what is really the second part of this overall discussion, I'm going to explore how people used those numbers. In other words, I'm going to examine the words we use for measurements. For example, you can probably figure out why we measure certain things in feet, but where did inches and yards come from? And why do we sometimes refer to 13 items as baker's dozen? And why is 1/60 of a minute called a second? Shouldn't it be called a sixtieth? Well, I'll try to answer all of those questions and more next time – when we look at the history of English measurements.

So until then, thanks for listening to the History of English Podcast.