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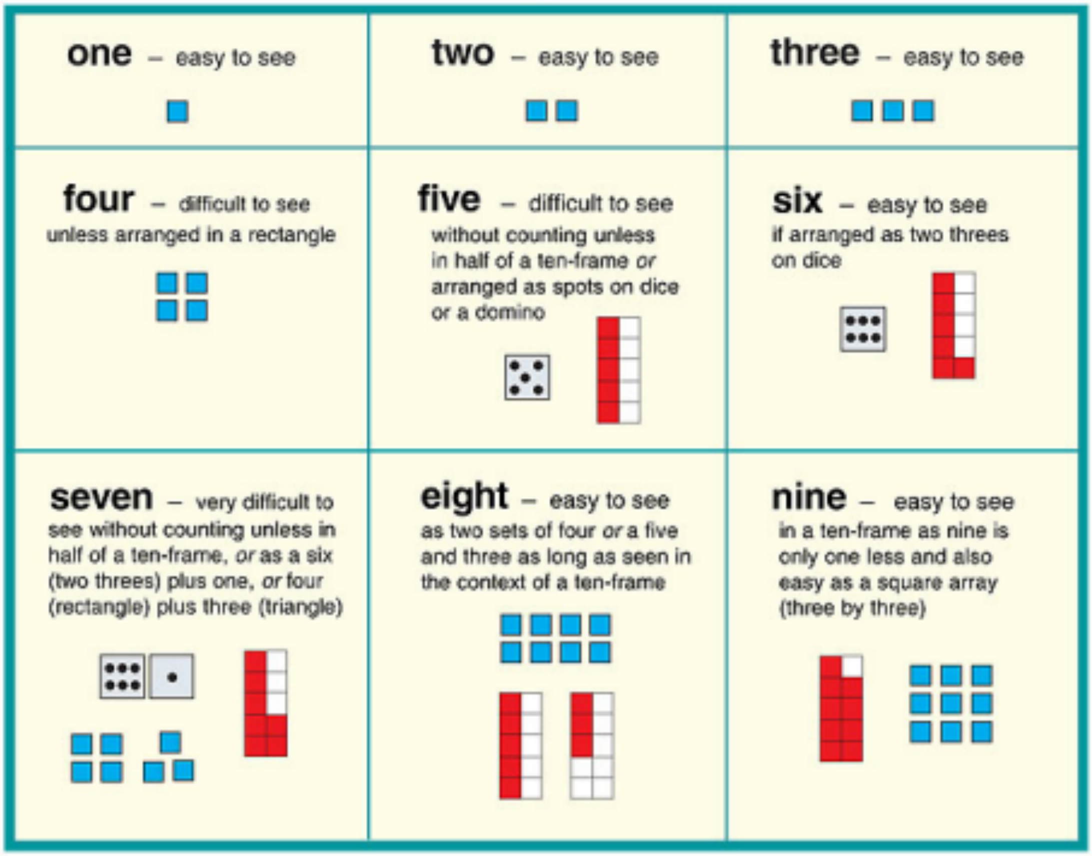
The Power of Ten Visual System

The **Power of Ten System** is a set of visual tools (ten-frame cards, place value cards and ten-frame egg cartons) designed to help students develop the fundamental underpinnings of number sense and is based on the premise that over 80% of learning is visual (unless the student is severely visually disabled).

Students need to be able to look at a set of objects and know how many there are without counting.



When students can see 'the number' without counting, numbers are easier to work with when adding, subtracting, multiplying, and dividing.

Another key premise of the **Power of Ten System** is that games involving 'number' shapes make the numbers much easier to learn. Games and puzzles, like stories, seem inherently interesting to the brain as long as the other player(s) have approximately the same skill level. If teachers arrange the 'Games' part of each day (or week) in such a way that students of similar skill play together, instructional groups are created like those teachers use in "guided reading".

A third premise of the **Power of Ten System** is that 'number sense' is developed in ways not dissimilar to learning language. WE know the brain is attracted to complexity, or how would we even learn to speak and read where the rules are moslty unknown to speakers and readers? Mathematics actually has patterns so should be easier to learn than language. Sometimes we take away the complexity of games, stories, or problems in order to make the steps simpler but this removes the meaning. When students do not know why they are learning they quit trying!

The language of numbers. All languages have ten 'nonsene' words for the first ten numbers. English (and most other European langauges) also have nonsense words for the numbers 'eleven' and 'twelve'. 'Thirteen' is three and ten but does not sound like it. 'Fourteen' is clearly four and ten but we use "teen" instead of ten. It is almost as if we decided to be confusing; and when we say 'fifteen' instead of 'fiveteen' it is almost certainty! After 'sixteen' the next three numbers make sense. Now we introduce a new word 'twenty' which logically we should have called "twoty" – but we didn't! Now we change the order and say the big part of the number first – we say 'twenty one'. The Germans say one and twenty "einundzwanzig" making it simple because they keep the same order.

The Chinese (Japanese and most Asian languages) do not have any of this foolishness. When they get to eleven they say "ten and one". Twelve is ten and two and forty eight is four tens and eight. In Chinese, students only need to know ten words (one to ten) to say all the numbers to one hundred. English speaking people need twenty-seven words (one to ten, alle the decade words, and all the teen numbers).

Imagine how difficult it is to learn your numbers in French. For 'seventy-one' the French say sixty and eleven as 'soizante et onze' (60+11); 'ninety-three' as 'quatre-vingt-treize' (4x20+13). The **Power of Ten**© cards, the place value cards, and the **Power of Ten**© card games are all designed to have students visualize the numbers to one hundred the same way the Asian speakers learn them.

Grade One students in Victoria, B.C.

$$159 \div 159 + 20 + 50 + 50 - 100 - 1 = 20$$

$$400 - 353 - 27 = 20$$

$$\frac{3}{4} + \frac{3}{4} + \frac{2}{4} + 14 + \frac{4}{4} + \frac{4}{4} + \frac{4}{4} + \frac{4}{4} + 5 = 25$$

Another major premise of the **Power of Ten System** is that 'choice' should be built into the activities. Students choose the order for doing their **All the Facts** sheets. When students write their own story problems they choose the context – the research shows that if children tell a story or write a problem, for example 7 + 6, they are more likely to find the solution. Students doing the **How Many Ways activity** choose different ways to 'make a number' such as the date, or the number of days spent in school. They learn to play with the number by breaking it up and recombining its parts in new and interesting ways.

The above examples are of primary students making a goal number. Notice how they are playing with 'number' using fancy ways to make one and zero and delighting in their use of big numbers.