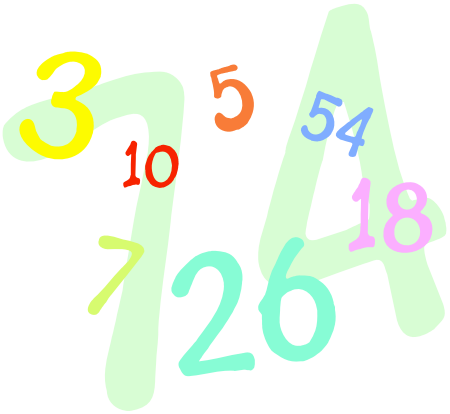

The Mathematics of Bell Ringing

The only maths you need to become a ringer is to be able to count, but maths is everywhere, just ask your teacher!

The biggest challenge in change ringing is to ring what is called a '**Peal'**. A group of experienced ringers ring a sequence of 5000 or more changes without a repeat in the order the bells are rung and this usually takes around three hours to ring.

Phew!

So if change ringing is about ringing combinations of bells, how many combinations are possible?

When describing how many possible combinations of the order of a group of things, mathematicians use the word ***Permutation***. For example, the group of letters abc can be rearranged a number of ways such as acb, bac etc.

Mathematicians have also worked out how many combinations or *permutations* such a group of things can produce. This done by multiplying all the numbers up to the number of things in the group. For example with our group of letters abc, containing 3 letters, the number of combinations would be 1x2x3=6, so 6 possible combinations.
See if you can work out all 6 combinations of the letters abc.

The total number of combinations can also be described as the number (of the set of things) ***Factorial***, and mathematicians have come with a shorthand way of writing this. In our abc example, the number of combinations is 1x2x3 or '3 factorial' written as 3 with an exclamation mark or 3! which is equal to 6.
Let's look at 4 factorial. It is written as 4! and is equal to 24 (1x2x3x4)
Easy.
Now you try calculating 5! You can use your calculator to speed it up if you want.

The longest peal ever on tower bells was rung in England in 1963, consisting of all 40,320 changes possible on eight bells, in just under 18 hours! Double phew!!

Here at the Swan Bells we have 16 bells that can be rung at one time. Just think how many possible permutations there are for this group of bells and how long it might take!

Link to Curriculum Framework
Learning Area: Mathematics

Strand: Number
Substrand: Reason About Number Patterns
N4.4 The student recognises, describes and uses patterns involving operations on whole and fractional numbers, and follows, compares and explains rules for linking successive terms in a sequence or paired quantities using one or more operations.

Substrand: Calculate
N4.3 The student calculates with whole numbers, money and measures (at least multipliers and divisors to 10), drawing mostly on mental on mental strategies to add and subtract two-digit numbers and for multiplications and divisions related to basic facts.