St Ives School

MATHS AND ICT FACULTY

Calculations Policy

Our Mission Statement:

St Ives School is committed to raising the standards of numeracy of all of our students, so that they develop the ability to use numeracy skills effectively in all areas of the curriculum and the skills necessary to cope confidently with the demands of further education, employment and adult life.

Addition & Subtraction

Addition 3456 + 975

```
   3 456
+   975
  4 431
  1 1 1
```

Estimate
3 500 + 1 000 = 4 500

Subtraction by decomposition 8003 – 2569

```
      7 9 9 1
eg  8 0 0 3
   -2 5 6 9
    5 4 3 4
```

Estimate
8 000 – 3 000 = 5000

Addition and subtraction of decimals is completed in the same way but reminders may be needed to maintain place value by keeping decimal points in line underneath each other.

Multiplication

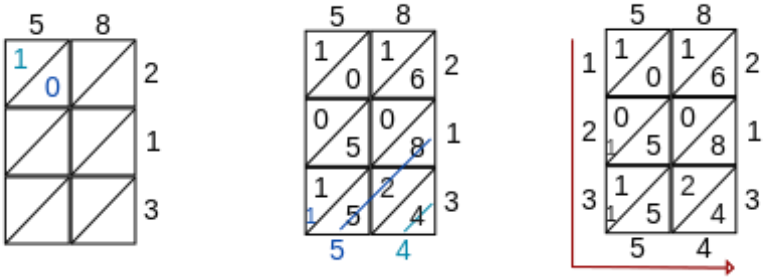
$$
\begin{array}{r}
327 \\
\times \quad 53 \\
\hline
9\,8_{2}\,1 \quad \leftarrow \quad 327 \times 3 \\
1\,6_{1}3_{3}\,5\,0 \quad \leftarrow \quad 327 \times 50 \\
\hline
17\,3\,3\,1
\end{array}
$$

Conventional multiplication as set out above may not suit all pupils and teachers should be aware that other methods may be employed by some pupils.

Example 1 - Partitioning 327 x 53 Estimate: 300 x 50 = 15 000

X	300	20	7	**Total**
50	15 000	1000	350	16 350
3	900	60	21	981
Total	15900	1060	371	**17331**

Example 2 – Lattice Multiplication 58 x 213



After all the cells are filled in this manner, the digits in each diagonal are summed, working from the bottom right diagonal to the top left. Each diagonal sum is written where the diagonal ends. If the sum contains more than one digit, the value of the tens place is carried into the next diagonal (see Step 2).

Numbers are filled to the left and to the bottom of the grid, and the answer is the numbers read off down (on the left) and across (on the bottom).

Division

Bus Shelter Method

7) 252

The first step is how many 7s in 2 - the answer is 0, with 2 left over, so we put the 0 above the bus stop and carry the 2

```
   0
7 )2²52
```

```
   0
7 )2²52
```

The next step is how many 7s in 25. We can see from our times table that 3x7=21, so the answer is 3, with 4 left over.

```
   0 3
7 )2²5⁴2
```

```
   0 3
7 )2²5⁴2
```

The final step is how many 7s in 42. Our times table says 6x7 = 42 so the answer is 6, with nothing left over.

```
   0 3 6
7 )2²5⁴2
```

So, 252 ÷ 7 = 36

Chunking

is a method for Long Division with which some pupils will be familiar and is based on recall of multiplication of numbers by 5,10, 20 etc. followed by continuous subtraction.

eg 351 ÷ 13

```
         2 7
 1 3 | 3 5 1 |
   - | 1 3 0 | 1 0
       2 2 1 |
   - | 1 3 0 | 1 0
         9 1 |
       - 5 2 |   4
         3 9 |
       - 3 9 |   3
           0 | 2 7
```

Any remainders in this type of calculation should be written as a fraction by dividing the remainder by the number by which the calculation has been divided.

Order of Operations

It is important that pupils follow the correct order of operations for arithmetic calculations. Most will be familiar with the mnemonic: **BODMAS.**

Brackets, power **O**f, **D**ivision, **M**ultiplication, **A**ddition, **S**ubtraction

This shows the order in which calculations should be completed. eg

5 + 3 x 4
means
5 + 12
= 17 ✓

NOT 5 + 3 x 4
means 8 x 4
= 32 **X**

The important facts to remember are that the **B**rackets are done first, then the **P**owers, **M**ultiplication and **D**ivision and finally, **A**ddition and **S**ubtraction.

Teaching for Depth and Understanding

At St Ives School we believe in developing a depth of understanding for pupils of all abilities, which requires teaching fewer topics but in much greater detail. This allows teachers to differentiate tasks with greater ease and success. Rather than accelerating high attaining students through topics, they are challenged to delve deeper into it and solve problems with very little structure. To support middle or lower attaining students, tasks can be scaffolded in different ways. This enables all students to access the same curriculum, working on the same concepts and skills at the same time.

The key to differentiating through depth of understanding is to plan carefully considered tasks and lessons. A good task should enable all students to access the content and to engage with it. It should be accessible to all students and open to a variety of problem solving approaches. A good task should encourage students to think deeply and to make connections to different areas of mathematics; it should inspire students to want to know more and to engage fully with the concepts being studied.

So how can we design learning tasks to meet the needs of all students?

In Year 7, we introduce students to the mean in the Autumn term. We do this as an application of division, enabling students to practice and apply their division skills in a new context.

Here are five tasks, with the same theme and content, but differentiated in different ways:

1. Find the mean of the following set of numbers: 2, 3, 6, 7, 8, 9
2. Create a data set with a mean of 6.

3. These numbers have a mean of 6: 3, 4, 6, 6, 8, 9. Change two numbers so that mean stays the same.
4. 2, 5, 5, 7, 9, and X have a mean of 6. Find X.
5. X, Y and Z have a mean of 6. I now add the number 4 to the data set. What is the new mean?

These tasks increase in complexity in order to deepen all students' understanding. They remove layers of structure and support as pupils move through the tasks and begin to offer open-ended problems around mean. In doing so, all students work with the same topic and are encouraged to extend their knowledge and understanding of the mean by developing a deeper appreciation of its properties and the underlying mathematics.

Differentiating for depth of understanding allows teachers the time to focus on a topic until all students have gained in competence. It allows students to access the entire curriculum and master the skills they meet, equipping them to face the challenges of future topics with greater confidence.

Problem Solving

The development of the skills of problem solving is considered as very important at St Ives School. Students learn problem solving skills not just by doing problems but by discussing how they are solved. They are given varied opportunities to tackle problems in mathematics. Students at St Ives School are to be taught the skills and strategies needed for successful problem solving.

Cross Curricular Links

The maths faculty works closely with the other faculties to ensure that our calculation strategies are common where topics overlap. For example we work together to ensure consistent teaching strategies on percentages, data handling and speed, distance, time problems in science.