STUART BATHURST CATHOLIC HIGH SCHOOL

CALCULATION POLICY

Policy Written November 2023

INTENT

The national curriculum for mathematics aims to ensure that all pupils:

- Become fluent in the fundamentals of Mathematics.
- Are able to reason mathematically.
- Can solve problems by applying their Mathematics.

At Stuart Bathurst Catholic High School, we recognise mathematics as being key to future life skills and we are committed to ensuring that the children can recognise the importance of maths in the wider world. We want them to know and understand that it is essential to everyday life, critical to science, technology and engineering, and necessary for financial literacy and most forms of employment.

AIM

This policy aims to demonstrate the approaches and methods taught in the mathematics department, that are also used in other curriculum subjects, so that children go through life as confident, enthusiastic and resilient mathematicians.

INTENDED OUTCOMES

Consistency: Ensure consistency in teaching methods and assessment practices across different classes and teachers. A calculation policy helps standardize the approach to mathematical calculations, promoting uniformity in instruction.

Understanding and Fluency: Promote a deep understanding of mathematical concepts along with fluency in basic calculation skills. The policy may specify strategies for teaching students not just how to perform calculations but also how to understand the underlying principles and apply them in different contexts.

Accessibility: Address the needs of students with varying levels of mathematical ability. The policy might provide guidance on how to vary instruction to support struggling students and challenge those who excel in mathematical skills.

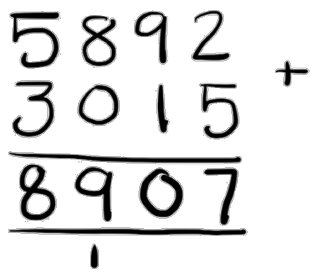
Use of Technology: Incorporate guidelines for the appropriate use of technology in teaching and learning calculations, including the integration of calculators, interactive software, and online resources to enhance students' mathematical skills.

Real-World Applications: Emphasise the application of mathematical calculations to real-world problems. Encourage teachers to provide examples and activities that demonstrate the relevance of mathematical skills in everyday life.

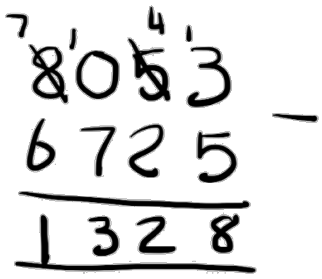
Written Methods of Calculation

The National Programme of study indicates that there is a larger emphasis on traditional methods of calculation in Mathematics and these skills will be assessed explicitly at all Key Stages and in specific at KS1 and KS2 in arithmetic papers. Traditional written methods of arithmetic should be used as a preferred method as shown below. Discourage informal methods such as the grid method, partitioning and similar, as these methods can lead to mistakes and can perpetuate misconceptions.

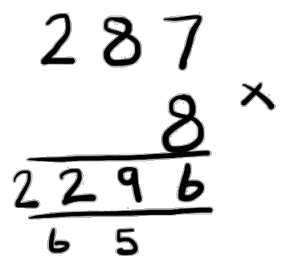
Addition:

Example	Vocabulary	Things To Note	Link to Video
Add together 5892 and 3015  	Sum Total Plus Combined with In addition to Totalling Increased by Added to Cumulative		

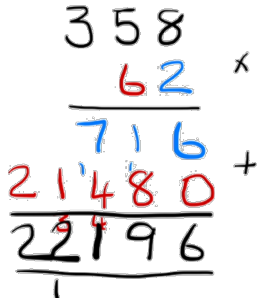
Subtraction:

Example	Vocabulary	Things To Note	Link to Video
Subtract 6725 from 8053  	Difference Minus Decrease Subtracting Deducting Take away Reduce Less Remove	A common misconception would be, in the example to the left, to subtract 3 from 5, rather than borrowing from the tens column.	

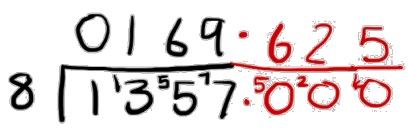
Multiplication:

Example	Vocabulary	Things To Note	Link to Video
8 multiplied by 287  	Product Times Multiplied by Repeated addition Scaling Duplicating Scaling up Enlargement		

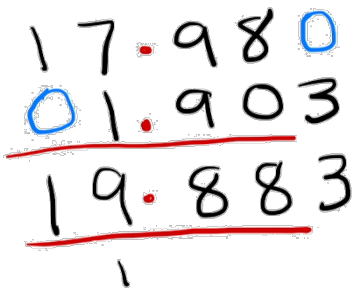
Long Multiplication:

Example	Vocabulary	Things To Note	Link to Video
358 multiplied by 62  		Each digit of the multiplier (eg 62) can be calculated individually. Remember that the 6 refers to 60, hence the inclusion of the 0 under the units.	LONG MULTIPLICATION letstea.ch/longmultiplication

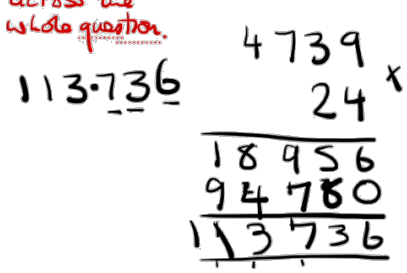
Division:

Example	Vocabulary	Things To Note	Link to Video
1357 ÷ 8  	Quotient Divide Repeated subtraction Sharing Splitting Divisibility	Do not accept answers with a remainder. Use decimals to either terminate the calculation, or reveal a recurring pattern.	DIVISION letstea.ch/division

Adding and Subtracting with Decimals:

Example	Vocabulary	Things To Note	Link to Video
17.98 plus 1.903  		The position of the decimal point is vital when performing these calculations, so it is worth writing out the grid before populating it with numbers.	ADDING DECIMALS letstea.ch/addingdecimals

Multiplying with Decimals:

Example	Vocabulary	Things To Note	Link to Video
3 decimals across the whole question. 47.39 times 2.4  			MULTIPLYING DECIMALS letstea.ch/multiplyingdecimals

Dividing with Decimals:

Example	Vocabulary	Things To Note	Link to Video
28.8 ÷ 0.6 $\frac{28.8}{0.6} = \frac{288}{6}$ $6\overline{)288}$ = 48 Ans: 48		To divide decimals, multiply each number by 10, 100, 1000 etc, until all the decimals have gone. The answer will be the same, so there is no need to adjust.	DIVIDING DECIMALS letstea.ch/dividingdecimals

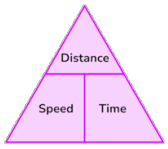
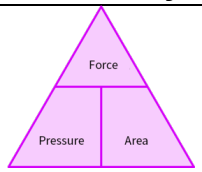
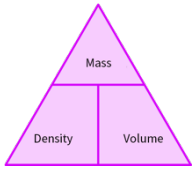
Working with Percentages:

Example	Vocabulary	Things To Note	Link to Video
	Multiplier Increase Decrease	When using a calculator, students will find the multiplier. Eg: 23% would need you to multiply by 0.23, which is 23/100.	PERCENTAGES letstea.ch/percentages

Working with Ratios:

Example	Vocabulary	Things To Note	Link to Video
Share 450 in the ratio 7:2 i) 7+2 = 9 ii) 450 ÷ 9 = 50 iii) 7 × 50 = 350 2 × 50 = 100 350 : 100		This is an example of a standard ratio problem. It can be remembered by: ADD DIVIDE MULTIPLY	RATIO letstea.ch/ratio

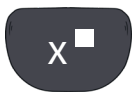
Formula Triangles:

Example	Vocabulary	Things To Note	Link to Video
 $S = \frac{D}{T}$ $T = \frac{D}{S}$ $D = S \times T$	 	There are various different formulae that can be shown as triangles. The attached method works the same for each specific method.	FORMULA TRIANGLE letstea.ch/formulatriangle

Using a Calculator

This page is based on the Casio fx85 GT, which is the expected calculator at Stuart Bathurst.

A scientific calculator is essential when studying maths and other subjects at secondary school. It is vital that you know how to use it properly and confidently. Being familiar with the layout of your own scientific calculator will help save time, allowing you to concentrate on the subject matter you're working on.

SHIFT	Pressing the Shift button means you will select the instruction written above the next button you press, rather than what is written on the button itself.
	The replay button allows you to direct your cursor on- screen. You can use the arrows to go back and insert or remove characters. Replay also allows you to move between the numerator and denominator within fractions, or to move out of a root or index.
	The SD button changes the form of your answer from a decimal or standard form to either a fraction, a surd or an answer in terms of π, depending on the result. Each time you press it, you'll get the answer in a different form. If you press shift then SD, fractions will be converted into mixed numbers and vice versa.
	This button allows you to enter fractions. If you press shift then the fraction button, you'll be able to enter a mixed number. Three boxes will appear onscreen. Use the replay button to move the cursor and input each part of your fraction. Before you continue entering your calculation, you must use the right arrow on the replay button to move out of the fraction. 
	This button allows you to square root numbers. Additionally, you can press shift followed by the $\sqrt{\blacksquare}$ button to enter cube roots. ($\sqrt[3]{\blacksquare}$). Before you continue entering your calculation, you must use the right arrow on the replay button to move out of the root symbol.
	This button lets you raise a number to any power, while pressing shift first will allow you to calculate any root. Use the replay button to move the cursor and input your index and base. Before you continue entering your calculation, you must use the right arrow on the replay button to move out of the index or root symbol.
	You can use this button to change a time in hours into a time in hours, minutes and seconds. For example, if you type 8.5 into your calculator, press the time button, then equals, the calculator will return the time in hours, minutes and seconds. You can also use this button to add and subtract time. For example, to find out what 2 hours and 7 minutes later than 18:17 would be, then input [1] [8] [° ' "] [1] [7] [° ' "] [+] [2] [° ' "] [7] [° ' "], then press equals, or more simply: 18°17° + 2°7° This will give the answer 20° 24', which tells you that the time is 20:24 or 8:24pm.
	The Ans button can be used to put an answer you have just found back into your next calculation.
Trigonometric Functions	On your calculator, there are three buttons which are labelled with sin, cos and tan. If you press the shift button followed by one of these buttons, it will allow you to use the inverse trigonometric ratios ($\sin^{-1}$), ($\cos^{-1}$), ($\tan^{-1}$).

Tally Charts, Bar Charts and Histograms

Tally Charts

A tally chart uses marks to represent frequencies (frequency is the number of times something happens). They are 'bunched' in fives to make them easier to count.

Each | represents one. Each time your frequency goes up by 1, add another line to the right of the previous. The fifth line goes across the previous 4 lines to make a group. This means 𝍸 represents 5.

Example

Tally for custard cream biscuits: 1 is represented by a single line, |

Frequency of rich tea biscuits: 𝍸 || is 5 + 2 = 7

Biscuit	Tally	Frequency
Chocolate Digestive	𝍸	5
Rich Tea	𝍸 ||	7
Custard Cream	|	1
Chocolate Chip Cookie	𝍸 |	6
Other	𝍸 𝍸 |	11
Total	30	30

Tally for other: 11 is the same as 5 + 5 + 1, so it is represented by 𝍸 𝍸 \|

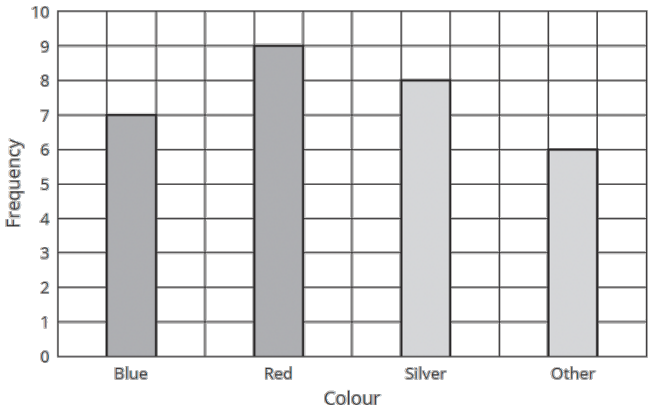
Total number of students asked: 5 + 7 + 1 + 6 + 11 = 30

Frequency of chocolate chip cookies: 𝍸 | is 5 + 1 = 6

Bar Charts

- Draw all bars using a pencil and a ruler.
- All bars should have the same width.
- There should be equal gaps between all of the bars. **Without the gaps, it is not a bar chart**.

Colour	Frequency
Blue	7
Red	**9**
Silver	**8**
Other	**6**
Total	30



Histograms

A histogram is a way of presenting data. At first glance, it might look similar to a bar chart, but a histogram uses the area of the bars, rather than the height, to represent the frequency of the data. This makes it particularly useful for presenting data with unequal group sizes.

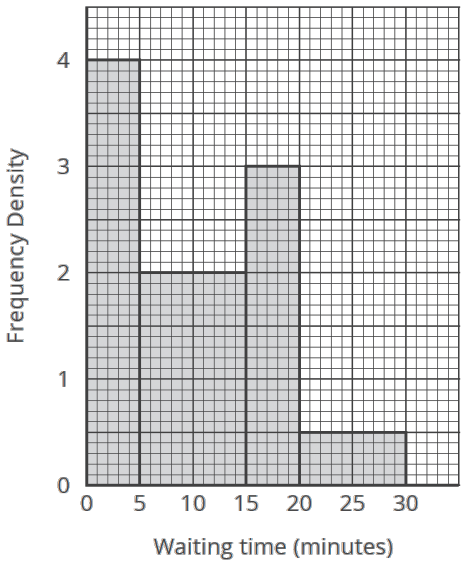
To draw a histogram, we first need to work out the height and width of each bar.

- The width is defined by the size of each class (the class width).
- To calculate the frequency density (height of bar) for each class:

$$\text{Frequency density} = \frac{\text{frequency}}{\text{class width}}$$

Waiting time, w (minutes)	Frequency	Class Width	Frequency Density
$0 < w \leq 5$	20	5	$20 \div 5 = 4$
$5 < w \leq 15$	20	10	$20 \div 10 = 2$
$15 < w \leq 20$	15	5	$15 \div 5 = 3$
$20 < w \leq 30$	5	10	$5 \div 10 = 0.5$

We plot frequency density, rather than frequency, to avoid distortions associated with larger class widths. If we just plotted the frequency then the wider classes would tend to have higher bars, simply because they include a greater range of possible data value.



Here, we can see that although the $0 < w \leq 5$ and $5 < w \leq 15$ groups have the same frequency, $0 < w \leq 5$ has a higher frequency density – the same frequency is packed into a smaller class.