Numeracy at RFSS

Dear Parents and Guardians

The Oxford dictionary states that Numeracy is "the ability to understand and work with numbers". For the students at RFSS, it is the ability to work with numbers and to be able to utilise mathematical concepts in different situations. Numerical reasoning will become a big part of this.

Why do we need to improve numeracy with our students?

Numeracy is a life skill. Adults with low-level numeracy skills find employment difficult as well as functioning within society. At RFSS, we are determined to ensure all of our students leave school with the tools needed for the world of work. As a result, we have developed this booklet with some quick hints and methods that you could utilise with your child to support them with their work at home with any task that involves numeracy.

If you have any concerns with your child's development of numeracy within a particular subject, please get in touch with your child's subject teacher or their mathematics teacher. Their mathematics teacher will play a large part in their numerical growth and as such, the Mathematics Department have invested in resources to support everyone at home and in school. To help with some of the terminology that we now use there is a glossary at the end of this booklet. The main web based resources are:

https://corbettmaths.com/ This website has lots of practice, videos and worksheets (with answers). There is also a section called 5 a day with 5 questions to complete for every day of the year. There are different standards as well as primary resources (ideal for revision if your child is in year 7).

https://timestable.pixl.org.uk/Timestables.html (see your maths teacher for a username and password)

and

https://vle.mathswatch.co.uk/vle/ (your child will require a username and password for this website). This website has dedicated sections for GCSE and KS3, so please encourage your child to access the appropriate section for support.

If you would like to discuss any of the methods described in this booklet, please contact me at Philip.kerry@rugbyfreesecondary.co.uk

Kind regards

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Assistant Headteacher.

Contents

Four Operations

Addition:

We prefer students to utilise the column method for addition. All digits should be ordered in the column of their "value". If it helps students to place the decimal point in first, this should be encouraged. Students can then add up the digits from the right to left, inserting any carries as they go.

$example: 152.3 + 24.7$

	1	5	2	.	3	
+		2	4	.	7	
	1	7	7	.	0	
			1			

Subtraction:

Again, utilising the column method one method is to line the numbers up using the digits value. When doing the subtraction, we would like the students to go into negatives if needed, and then do a calculation at the end.

$example: 952 - 684$

	9	5	2
-	6	8	4
	3	-3	-2

This means $300 - 30 - 2$. This can be broken down as:

$300 - 30 = 0270$

$270 - 2 = 268$

This method stops the thinking that $2 - 4$ cannot be done which is a misconception that students hold on to for years if not addressed.

Multiplication:

Students will need to know multiplication facts up to and including 12×12. If this can become part of the student's memory then it will free up space within their mind to be able to work confidently on other parts of the problem they face. To support students the idea of repeated addition helps and we have often seen students write down a list of numbers or count on either in their head or using their fingers.

For longer multiplication calculations, we often find that students prefer the grid method. Students draw a grid and place the digit values along the top row and left hand side. The gaps in the table are filled in through multiplying the number at the top of the row and on the left hand side. The sum (add up the values) of these values are then taken.

$example: 54 \times 142$

x	100	40	2	
50	5000	2000	100	7100
4	400	160	8	+ 568
				7668

Division:

Division is the reverse function of multiplication. $3 \times 5 = 15$, $15 \div 5 = 3$.

Like multiplication, if students can easily recall their multiplication facts to 12×12 this will help students with division. Students writing down the divisors times table will help with division. We would expect the students to use the "bus stop" or division bracket method. The divisor goes on the outside of the bracket, the dividend on the inside. Students need to find out how many of the divisor can go into the first (left) digit of the dividend. If this cannot happen (as in the example), a zero should be placed on top of the division bracket and the remainder passed over to the next digit. This continues until all the digits in the dividend have been used.

$example: 624 \div 12$

$$\begin{array}{r|lll} & 0 & 5 & 2 \\ \hline 12 & 6 & {}^{6}2 & {}^{2}4 \end{array}$$

Answer is 52.

Estimating

Estimating is a major part of working with numbers. There are three main types of estimating:

- Rounding to a place value
- Rounding to a decimal place (dp)
- Rounding to a significant figure (sig fig)

All three methods have the same principle where you see identify the digit you are rounding, look at the next digit and see if this is a 5 or above. If it is, we say the number rounds up, by adding one to the digit you needed to round. If it is lower than a 5, the digit we are rounding stays the same. One way to think about rounding is to think of the two values that it could be and place them all on a number line.

Rounding to a place value:

$example: round\ 346\ to\ the\ nearest\ 100.$

Look at the digit in the hundred's column, and move one place right- this is a 4. Since this is lower than a 5, the hundred's column will stay as being a 3, so the number is 300.

Check- is 346 closer to 300 or 400? 300.

$example: round\ 346\ to\ the\ nearest\ 10$

Look at the digit in the ten's column, and move one place right- this is a 6. Since this is higher than a 5, the ten's column will have one added to it, so the number is 350.

Check- is 346 closer to 340 or 350? 350.

Rounding to a decimal place:

$example: round\ 354.624\ to\ 1dp$

Look at the digit in the tenth's column, and move one place right- this is a 2. Since this is lower than a 5, the tenth's column will stay the same, so the number is 354.6

Check- is 354.624 closer to 354.6 or 354.7? 354.6

Rounding to a significant figure:

$example: round\ 354.624\ to\ 2\ sig\ fig$

Look at the digit in the tens column, and move one place right- this is a 4. Since this is lower than a 5, the tens column will stay the same, so the number is 350

Check- is 354.624 closer to 350 or 360? 350.

$example: round\ 0.005024\ to\ 3\ sig\ fig$

Look at the digit in the hundred-thousandth's column, and move one place right- this is a 4. Since this is lower than a 5, the hundred-thousandth's column will stay the same, so the number is 0.00502

Always be careful to ensure answers have the correct number of digits.

$example\ 9.98\ to\ 1\ dp$

9.98 will round to 10.0 not 10 as the question has stated that one decimal place needs to be visible.

Estimating calculations:

When estimating calculations, ensure that all answers are rounded to one sig fig **before** calculating the answer.

$example: Estimate \quad 154 \times 65$

$\approx 200 \times 70$

$= 14000$

Order of Operations

For some mathematical operations like add, the order in which you do the sum does not matter, $example\ 5 + 4 = 4 + 5$. However, for operations like division, the order of the calculation makes a big difference,

$example: 10 \div 2 = 5, 2 \div 10 = 0.2.$

Some operations are also deemed to have a higher priority than others when they are in the same calculation, $example: 2^3 + 3 \times 6.$

Because of this, in mathematics we have certain rules that everyone should follow. To help people remember we use the mnemonic BIDMAS.

Brackets

Indices

Division

Multiplication

Addition

Subtraction

The higher the operation on the list, the earlier we should do it. Therefore, in the example above we would do the cube first, followed by the multiplication and finally the addition.

$$2^3 + 3 \times 6 = 8 + 3 \times 6$$
$$= 8 + 18$$
$$= 26$$

$example: 8^2 - (5 + 1) \div 2$

$= 8^2 - 6 \div 2$

$= 64 - 6 \div 2$

$= 64 - 3$

$= 61$

Division and Multiplication have the same priority as each other, so we read from left to right. This also applies to Addition and Subtraction.

Percentages

Percentages are used in most aspects of the real world. The symbol for percentages is the number 100 written as a fraction to symbolise a percentage as being out of a hundred. This is also where the word percent originated- per (out of) cent (one hundred).

Some common percentages need to be quickly worked out. You can combine these common percentages to make other, more complicated calculations.

Percent	Method
50%	Halve the value $(100 \div 2 = 50)$
25%	Halve and halve again $(100 \div 4 = 25)$
10%	Divide by 10 $(100 \div 10 = 10)$
5%	Find 10% and then halve it
1%	Divide by 100 $(100 \div 100 = 1)$

Students often confuse finding 20% by dividing by 20.

$$Example: Find\ 15\%\ of\ £140$$

$$10\%\ of\ £140\ is\ £14$$

$$5\%\ of\ £140\ is\ £7$$

$$15\%\ of\ £140\ is\ £14 + £7 = £21$$

If you want to use a calculator, we can use the multiplier method. To do this change the percentage into a decimal (divide by 100). Then multiply the value you want by this decimal.

$$Example: Find\ 15\%\ of\ £140$$

$$15\% = 0.15$$

$$0.15 \times £140 = £21$$

To increase or decrease a quantity by a percentage, we add (increase) or subtract (decrease) the multiplier to 1 (this represents 100%). We can then multiply this new decimal by the amount.

$$Example: Increase\ £360\ by\ 20\%$$

$$20\% = 0.2$$

$$1 + 0.2 = 1.2$$

$$1.2 \times £360 = £432$$

$$Example: Decrease\ £360\ by\ 20\%$$

$$20\% = 0.2$$

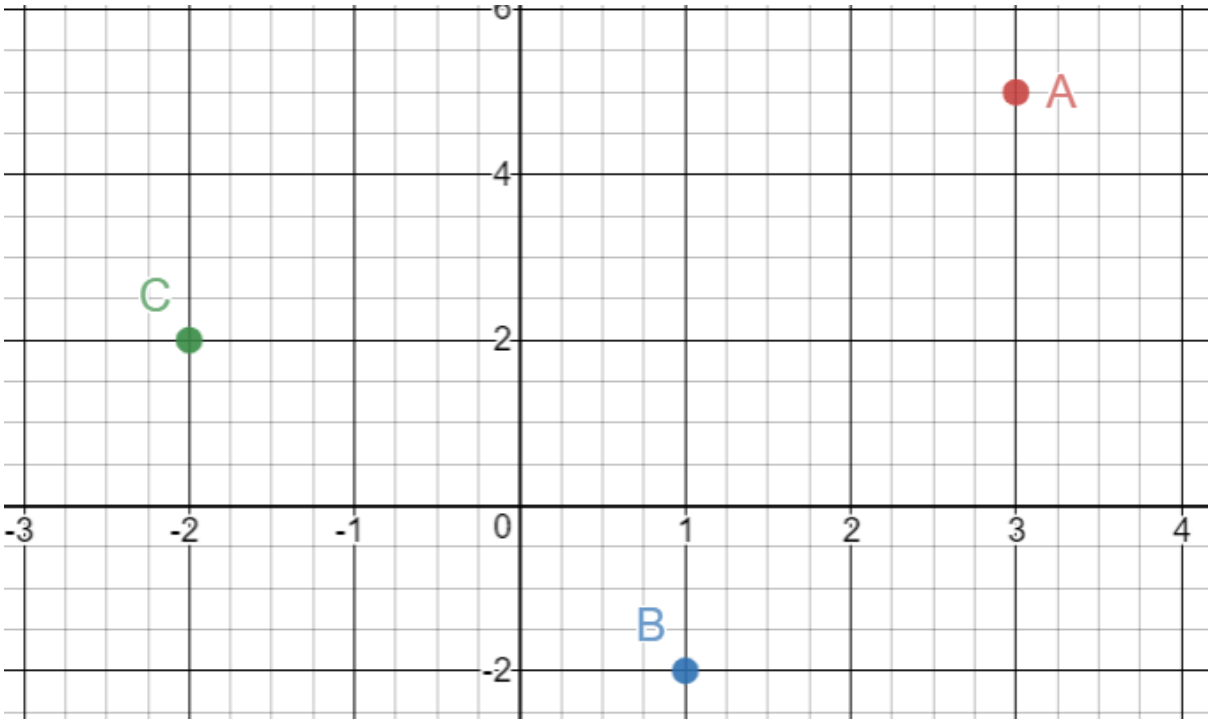
$$1 - 0.2 = 0.8$$

$$0.8 \times £360 = £288$$

Graphs

A coordinate is the location of a point in space. Usually in school, this is in a 2D space such as on a graph or map. All coordinates are written with brackets around them, with commas separating the first and last value for example (5,4). The first value is the x- coordinate or horizontal value. This measures how far horizontally along the scale the coordinate is from the origin (centre). The second value is the y-coordinate or vertical value. Again, this shows how far the point is vertically away from the origin. Positive values are right and up from the origin, negative values are left and down.

When drawing axes, numbers should be placed on the grid lines and should be equally spaced. The two axes can have a different scale as long as they are consistent along their lines.



In Science, the x-coordinates are often called the independent variable. The y- coordinate will become the dependent variable.

Statistics

Charts and diagrams

Statistics is the representation of data. Mostly we will use bar charts, scatter graphs and pie charts. Line graphs and pictograms could also be utilised in a variety of subjects. Bar charts and line graphs should use the same rules as plotting coordinates. For pie charts and pictograms it is important to know what one item is worth.

Averages

Averages give the user an idea of the way a data set looks so that it can be compared. Each average has its advantages and disadvantages. Mode gives the idea of where the most common values of the data in the set are. The Median gives the absolute middle of the data. Whilst the mean takes into account all the data (even if this is an extreme value).

Example Find the mode, median, mean and range for the set of data

10, 5, 2, 2, 8, 6, 10, 12, 2, 3, 10, 1

Mode: 2 and 10 appear three times, all the other pieces of data appear once.

The mode is 2 and 10.

Median: Put the numbers in order first…

1, 2, 2, 2, 3, 5, 6, 8, 10, 10, 10, 12

There are two middle numbers – 5 and 6 – so the median is halfway between these so the median is 5.5.

Mean: Add the numbers together first

10 + 5 + 2 + 2 + 8 + 6 + 10 + 12 + 2 + 3 + 10 + 1 = 71

There are 12 pieces of data so divide by 12

Mean = 71 ÷ 12 = 5.9

Range: The largest piece of data is 12, the smallest is 1

Range = 12 – 1 = 11

Units

Since the 1990's, we now work almost exclusively in metric units. These are all powers of 10. There are still occasions when we will use imperial measurements, but these are becoming less common as more countries are trading in metric. Imperial measures were introduced in the 1800's to simplify trade. There are examples of imperial lengths set into the wall of the Greenwich Observatory. These were used to standardise other measuring instruments for the trade ships.

Length:

Metric

1 centimetre (cm) = 10 millimetres (mm)

1 metre (m) = 100 cm

1 kilometre = 1000m

Imperial	Imperial/Metric
1 foot = 12 inches	1 inch ≈ 2.54cm
1 yard = 3 feet	5 miles ≈ 8 km
1 mile = 1760 yards	

Mass:

Metric

1 gram (g) = 1000 milligrams (mg)

1 kilograms (kg) = 1000g

1 tonne = 1000 kilograms

Imperial	Metric/Imperial
1 pound (lb) = 16 ounces (oz)	1kg ≈ 2.2 lb
1 stone = 14 lb	
1 ton = 2240 lb	

Capacity:

Metric

1 litre = 1000 millilitre (ml)

1 litre = 100 centilitres (cl)

1 centilitre = 10 millilitres

Imperial

1 gallon = 8 pints

Metric/Imperial

1 litre ≈ 1.75 pints

Glossary

Coefficient- A number that multiplies (or divides) a variable.

Constant- something that stays the same.

Difference- The result of subtracting two numbers.

Dividend- the number being divided

Divisor- the number that you are dividing by

Equation- very similar to an expression, but with an equals sign. The name is often swapped with Formula.

Expand- Multiply out brackets of an equation

Expression- A collection of letters and numbers with no equals sign. Example $x + 2y$

Factor- A number, which can divide into a dividend without leaving a remainder.

Factorise- To take out common factors to make the expression or value simpler.

Formula- like an equation, but will start with just a single letter followed by an equals sign. Example $\mathrm{F=ma}$

Integer- Whole number

Highest common factor- The HCF is the largest number that is a factor of more than one number. Example- the HCF of 15 and 20 is 5. 1 could be a HCF if the numbers have no other numbers in common.

Lowest common multiple- The LCM is the smallest number which is in the times table of more than one number. Example- the LCM of 3 and 4 is 12.

Mean- The sum of all the data divided by the total frequency (the number of items being measured).

Median- The middle value of a data set **after** the data has been put in numerical order.

Mode- The most common piece of data.

Multiple- A number in another times table. Example 35 is a multiple of 5

Product- to multiply

Quotient- The result of a division.

Significant figure- is the value of the digit within a number. Most of the time a digit is significant if it is non-zero; however, the zeros in 100 are significant, whereas the zeros in 0.0002 are not. The zero after the 5 in 0.0025063 is said to be significant.

Square number- a number that has been multiplied by itself.

Square root- the reverse of squaring.

Sum- to add

Variable- something that can vary. This is usual displayed as a letter within an expression or equation.

≈ Means approximately equal to.

Spelling numbers

1	One	11	Eleven	30	Thirty
2	Two	12	Twelve	40	Forty
3	Three	13	Thirteen	50	Fifty
4	Four	14	Fourteen	60	Sixty
5	Five	15	Fifteen	70	Seventy
6	Six	16	Sixteen	80	Eighty
7	Seven	17	Seventeen	90	Ninety
8	Eight	18	Eighteen	100	One hundred
9	Nine	19	Nineteen	1000	One thousand
10	Ten	20	Twenty	1 000 000	One million

0	Zero or nought	0.01	One Hundredth
0.1	One tenth	0.001	One Thousandth
0.2	Two tenths	0.000 1	One Ten Thousandth