Lowbrook Academy

We aim for all Lowbrook Children to be able to:

- ***Develop mathematical fluency***
- ***Reason mathematically***
- ***Problem solve***
- ***Make connections across mathematical ideas***
- ***Apply knowledge in other subject areas***

MATHS INFORMATION BOOKLET

YEAR 6

YEAR 6 STRATEGIES

Here are the strategies that you can use to help develop your child's addition, subtraction, multiplication and division skills.

MENTAL MATHS STRATEGIES

Together with 1-12 x multiplication and division facts and their basic addition facts, children in year 6 should be able to use the following strategies:

Addition and Subtraction of multiples of 10, 100 or 1000 and adjust

- Add 9, 19, 29 or 11, 21, 31…. By adding 10, 20, 30… then adjusting by 1.

- 458 + 71 = 529

Is the same as the sum of 458 + 70 and then add 1

- 583 – 71 = 512

Is the same as 583 -70 then take away 1

Double numbers by partitioning

Double 62 = 124
(double 60 = 120 double 2 = 4)
(60 + 4 = 124)

Quadruple (x4) numbers

By doubling numbers twice

Halves of any number up to 100, partition into place value and halve

Half of 22 = 20 + 2 = 10 + 1 = 11, half of 51 = 50 + 1= 25 + 0.5 = 25.5

Multiplying and dividing any number by 10 or 100

When multiplying by 10 move the digits 1 place to the left and use zero as a placeholder.
24 x 10 = 240
When multiplying by 100 move the digits 2 places to the left and use zeros as placeholders.
24 x 100 = 2400
When dividing by 100 move the digits 2 places to the right and use zeros as placeholders
45 ÷ 100 = 0.45
When multiplying a decimal number by 10 keep the decimal point where it is and move the digits one place to the left.
3.4 x 10 = 34

Multiplication of multiples of 10 and 100 based on known facts

40 x 40 = 4 x 4 = 16 so 40 x 40 = 1600

Squares of all numbers up to 20

5 x 5 = 25, 12 x 12 = 144, 19 x 19 = 361

Cube numbers of 2, 3, 4, 5, and 10

3 x 3 x 3 = 27, 10 x 10 x 10 = 1000

Recall Prime Numbers up to 50 and identify prime numbers up to 100

ADDITION

Add several numbers of increasing complexity

Adding several numbers with more than 4 digits
Longer lists of numbers could be separated into 2 or more calculations, with the subtotals added to give a final total.
e.g.

$$\begin{array}{r} 81059 \\ 3668 \\ 15301 \\ +\ 20551 \\ \hline 120579 \\ \hline 1\ 1\ 1\ 1 \end{array}$$

Adding several numbers with different numbers of decimal places (including money and measures):

- Tenths, hundredths and thousandths should be correctly aligned, with the decimal point lined up vertically, including in the answer row.
- Empty decimal places should be filled with zero to show the place value in each column.

e.g.

$$\begin{array}{r} 23.361 \\ 09.800 \\ 59.770 \\ 09.800 \\ 01.300 \\ \hline 104.031 \\ \hline 3\ 3\ 1 \end{array}$$

Problem Solving
Pupils have the opportunity to apply their knowledge in a variety of contexts and problems (exploring cross curricular links) to deepen their understanding.

Key vocabulary: add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, units, partition, plus, addition, column, tens boundary, hundreds boundary, increase, 'carry', expanded, compact, vertical, thousands, hundreds, digits, inverse, decimal places, decimal point, tenths, hundredths, thousandths

Key skills for addition at Year 6:
- Perform mental calculations, including with mixed operations and large numbers, using and practicing a range of mental strategies.
- Solve multi-step problems in context, deciding which operations and methods to use and why.
- Use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy.
- Read, write, order and compare numbers up to 10 million and determine the value of each digit.

• Round any whole number to a required degree of accuracy.
• Pupils understand how to add mentally with larger numbers and calculations of increasing complexity.
• Use negative numbers in context, and calculate intervals across zero.

SUBTRACTION

Subtracting with increasingly large and more complex numbers and decimal values

Using the compact column method to subtract more complex integers

e.g. 150669 – 89949 =

$$\begin{array}{r} {}^{0}\not{1}\,{}^{14}\not{5}\,{}^{9}\not{0}\,{}^{1}6\,9\,9 \\ -\ 8\,9\,9\,4\,9 \\ \hline 6\,0\,7\,5\,0 \end{array}$$

Using the compact column method to subtract money and measures, including decimals with different numbers of decimal places.

e.g. 105.419kg – 36.08kg =

$$\begin{array}{r} {}^{0}1\,{}^{9}\not{0}\,5.{}^{3}4\,{}^{1}1\,9\ \text{kg} \\ -\ 3\,6.0\,8\,0\ \text{kg} \\ \hline 6\,9.3\,3\,9\ \text{kg} \\ \hline \end{array}$$

Missing number/digit problems:

Make use of inverse operations.
e.g.
? - 8 = 24 so 24 + 8 = 32
343 - ? = 152 so 343 - 152 = 191

Pupils should be able to apply their knowledge of a range of mental strategies, mental recall skills, and informal and formal written methods when selecting the most appropriate method to work out subtraction problems.

Key vocabulary: equal to, take, take away, less, how many more, how many / less than, least, count back, how many left, how much less is, difference, count on, tens, ones, exchange, digit, inverse, tenths, hundredths, thousandths, decimal points, decimal, decimal place.

Key skills for subtraction at Year 6:
• Solve addition and subtraction multi-step problems in context, deciding which operations and methods to use and why.
• Read, write, order and compare numbers up to 10 million and determine the value of each digit.

• Round any whole number to a required degree of accuracy.
• Use negative numbers in context, and calculate intervals across zero.
• Children need to utilize and consider a range of mental subtraction strategies, jottings and written methods before choosing how to calculate.

MULTIPLICATION

Short Multiplication
In the ones column, 4 x 8 = 32. Write the 2 in the ones column and 'carry' the 3 into the tens.
In the tens column, 4 x 4 = 16 plus 3 tens carried in makes 19.
Write 9 in the tens column and 'carry' 1 into the hundreds column.
In the hundreds column, 4 x 1 = 4 plus the 1 hundred carried from the tens column makes 5.
e.g.

$$\begin{array}{r} {\scriptstyle 1\ 3}\ 1\,4\,8 \\ \times\ \ 4 \\ \hline 5\,9\,2 \end{array}$$

Long Multiplication.

64 x 8 on the first row
In the ones column, 8 x 4 = 32: write down the 2 and carry the 3.
In the tens column, 8 x 6 = 48 plus the 3 carried in makes 51.
64 x 40 on the second row
Multiply the answer by 10 first by putting a zero in the ones column which moves all the digits one place to the left.
In the tens column, 4 x 4 = 16; write down the 6 and carry the 1.
In the hundreds column, 4 x 6 = 24 plus the 1 carried in makes 25.
e.g.

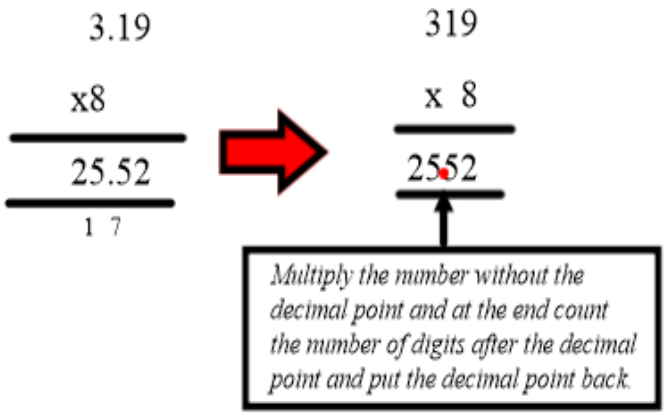
$$\begin{array}{r} {\scriptstyle 1}\ \ 64 \\ \times\ 48 \\ \hline {\scriptstyle 3}\ 512 \\ 2560 \\ \hline {\scriptstyle 1}\ 3072 \end{array}$$

Missing number problems
Continue using a range of equations with appropriate numbers
e.g. 4 x ? = 320 so 320 ÷ 4 = 80

Multiplying with decimal numbers

Remind children:
• Line up the decimal points in the question and the answer.
• The single digit belongs in the ones column.

e.g. 3.19 x 8



Children should be able to:
• Use rounding and place value to approximate and check answers.
• Use short multiplication to multiply numbers with more than 4 digits, Including numbers with up to 2 decimal places by a single digit.
• Use long multiplication to multiply numbers with at least 4 digits by 2 digits.

Key vocabulary: groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, commutative, sets of, equal groups, times as big as, once, twice, thrice, times... partition, total, multiple, product, inverse, square, factor, integer, decimal, short/ long multiplication, 'carry', tenths, hundredths, decimal place, decimal point.

Key skills for multiplication at Year 6:
• Recall multiplication facts for all times tables up to 12 x 12 (as Y4 and Y5).
• Multiply multi-digit numbers, up to 4-digit x 2-digit using long multiplication.
• Perform mental calculations with mixed operations and large numbers.
• Solve multi-step problems in a range of contexts, choosing appropriate combinations of operations and methods.
• Estimate answers using round and approximation and determine levels of accuracy.
• Use multiplication to identify common factors and multiples of given numbers.

DIVISION

Divide at least 4 digit numbers by both single digit and 2 digit numbers

Short division, for dividing by a single digit

Short division with remainders:

Children should continue to use this method, but with numbers up to at least 4 digits. They should understand how to express remainders as fractions, decimals, whole number remainders, or rounded numbers. Real life problem solving contexts need to be the starting point, where pupils have to consider the most appropriate way to express the remainder.

$$4\overline{)749} = 187 \text{ r } 1 \qquad 4\overline{)749} = 187\tfrac{1}{4} \qquad 4\overline{)749.00} = 187.25$$

Calculating a decimal remainder

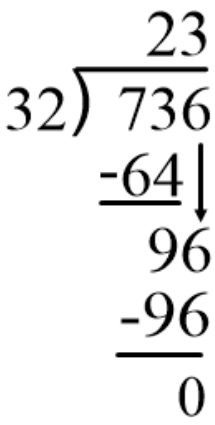
In the above example, rather than expressing the remainder as r1, a decimal point is added after the units because there is still a remainder, and the one remainder is carried on to zeros after the decimal point (to show there was no decimal value in the original number). Keep dividing to an appropriate degree of accuracy for the problem being solved.

Introduce long division for dividing by 2 digits using expanded method

Children are taught to work across the place value columns. In the example below the children need to find out: How many 32s are in 736. They can write a useful list by the side which will help them.
e.g. 1 x = 32
2 x = 64
5 x = 160
10 x = 320

Introduce the method. How many 32s are in 73? 2 x 32 = 64, subtract this from 73 which leaves 9, bring down the 6 to make 96, how many 32s are in 96 = 3

e.g. 736 ÷ 32 = 23



Key Vocabulary: share, share equally, one each, two each…, group, equal groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, inverse, short division, 'carry', remainder, multiple, divisible by, divisor, dividend, factor, inverse, quotient, prime number, prime factors, composite number (non-prime), common factor, divisibility.

Key number skills needed for division at Year 6:

- Recall and use multiplication and division facts for all numbers to 12 x 12 for more complex calculations.
- Divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context. Use short division where appropriate.
- Perform mental calculations, including with mixed operations and large numbers.
- Identify common factors, common multiples and prime numbers.
- Solve problems involving all 4 operations.
- Use estimation to check answers to calculations and determine accuracy, in the context of a problem.
- Use written division methods in cases where the answer has up to two decimal places.
- Solve problems, which require answers to be rounded to specified degrees of accuracy

FRACTIONS, DECIMALS AND PERCENTAGES

Finding a fraction of an amount

To find a fraction of an amount divide the number by the denominator and then multiply the answer by the numerator.
e.g.

$\frac{3}{8}$ of 24 = 9
24 ÷ 8 = 3
3 x 3 = 9

Changing an improper fraction to a mixed fraction

An improper fraction is a top-heavy fraction (the numerator is larger than the denominator)
e.g. $\frac{15}{7}$

If a fraction is top heavy it means it is more than one whole. If the numerator is the same as the denominator then the fraction is whole.

$$\frac{15}{7} = \frac{7}{7} + \frac{7}{7} + \frac{1}{7} = 2\frac{1}{7}$$

To change this into a mixed fraction divide the numerator by the denominator and turn the remainder into a fraction. E.g. 15 ÷ 7 = 2 r1 = $2\frac{1}{7}$

Changing a mixed fraction to an improper fraction

A mixed fraction contains some whole numbers and fractions.
e.g.

$$1\frac{2}{5}$$

To change this into an improper fraction multiply the denominator by the whole number and add the answer to the numerator.

$$1\frac{2}{5} = 1 \text{ x } 5 = 5 + 2 = 7$$

$$1\frac{2}{5} = \frac{7}{5}$$

Finding equivalent fractions

(Hint! Whatever you do to the numerator you <u>must</u> do to the denominator)

Equivalent fractions are fractions which have the same value. They are **equal**.

You can make equivalent fractions by multiplying or dividing **both the numerator and the denominator** by the same amount. You only multiply or divide, **never add or subtract**, to get an equivalent fraction. Remember to only divide when the numerator and denominator would still be whole numbers.

e.g.

$$\frac{1}{2} \overset{(x2)}{=} \frac{2}{4} \overset{(x2)}{=} \frac{4}{8}$$

OR

$$\frac{18}{36} \overset{(\div 3)}{=} \frac{6}{12} \overset{(\div 6)}{=} \frac{1}{2}$$

Simplifying fractions

Simplifying fractions means to make the fraction as simple as possible.
There are 2 methods for simplifying fractions.

Method 1:
Divide the numerator and denominator by the greatest common factor. This is the largest number that goes exactly into the numerator and denominator.
e.g.

$$\frac{16}{24} \overset{(\div 8)}{=} \frac{2}{3}$$ (Remember these fractions are equivalent!)

In this example the greatest common factor is 8. Divide both the numerator and denominator by 8 to get the fraction in its simplest form.

Method 2:
Divide the numerator and the denominator by a number that will go into both of them exactly and repeat the step until the fraction is in its simplest form. (A good starting point would be your easy times tables - 2, 3, 5, 10)

e.g.

$$\frac{10}{20} \overset{(\div 5)}{=} \frac{2}{4} \overset{(\div 2)}{=} \frac{1}{2}$$

OR

$$\frac{24}{108} \overset{(\div 2)}{=} \frac{12}{54} \overset{(\div 2)}{=} \frac{6}{27} \overset{(\div 3)}{=} \frac{2}{9}$$

Finding a common denominator

When ordering fractions or adding them, find a common denominator. Common Denominator means that the denominators in two (or more) fractions are common, or **the same.**
There are two methods for this.

Method 1: Look at a set of fractions

$\frac{1}{2}$ $\frac{1}{4}$ $\frac{3}{8}$

Find a common denominator for these fractions.

Look at the highest denominator which (in this example) is 8.
Find out if the other denominators divide into 8 without any remainders.
In this example they do!
Change the other two fractions so that they have 8 as a common denominator.

Remember the rule: Whatever you do to the denominator you must do to the numerator!

$$\underset{}{\overset{(x4)}{\frac{1}{2}}} = \overset{(x4)}{\frac{4}{8}} \qquad \underset{}{\overset{(x2)}{\frac{1}{4}}} = \overset{(x2)}{\frac{2}{8}}$$

The fractions, with the common denominator would be

$\frac{4}{8}$ $\frac{2}{8}$ $\frac{3}{8}$

Remember that these fractions still have the same value and are equivalent because both denominator and numerator were multiplied by the same number, therefore their value does not change.

Method 2: Look at a set of fractions

$\frac{2}{5}$ $\frac{1}{3}$ $\frac{3}{6}$

In this example the biggest denominator is 6. However, the other denominators will not go into 6 without any remainders. So a different method is needed.
This time, still use the biggest denominator which is 6, but count up in 6 x table until a number is found that the other denominators will also go into without remainders.

The number will be 30. Change all of the fractions so that their denominators are 30.

$$\underset{}{\overset{(x6)}{\frac{2}{5}}} = \overset{(x6)}{\frac{12}{30}} \qquad \underset{}{\overset{(x10)}{\frac{1}{3}}} = \overset{(x10)}{\frac{10}{30}} \qquad \underset{}{\overset{(x5)}{\frac{3}{6}}} = \overset{(x5)}{\frac{15}{30}}$$

Answer

$\frac{12}{30}$ $\frac{10}{30}$ $\frac{15}{30}$

Ordering fractions

Once a common denominator is found from a set of fractions, they can be ordered.

e.g.
To place these fractions into ascending order.

$\frac{5}{6} \quad \frac{3}{4} \quad \frac{2}{8} \quad \frac{1}{2}$

Find the common denominator, which is 24. Change the fractions so all have 24 as a denominator.

$$\underset{(x4)}{\frac{5}{6}} = \frac{20}{24} \qquad \underset{(x6)}{\frac{3}{4}} = \frac{18}{24} \qquad \underset{(x3)}{\frac{2}{8}} = \frac{6}{24} \qquad \underset{(x12)}{\frac{1}{2}} = \frac{12}{24}$$

Remember as these fractions are equivalent (the same value) they can now be ordered in ascending order. However, the answer needs to be written with the fractions that were in the original question.

Answer $\frac{2}{8} \quad \frac{1}{2} \quad \frac{3}{4} \quad \frac{5}{6}$ and **NOT** $\frac{6}{24} \quad \frac{12}{24} \quad \frac{18}{24} \quad \frac{20}{24}$

Adding fractions

Once a common denominator has been found from a set of fractions, they can be added.
e.g.

$\frac{1}{6} + \frac{3}{4} + \frac{1}{3}$

The common denominator in this example is 12 and all the fractions will have 12 as a denominator.

$$\underset{(x2)}{\frac{1}{6}} = \frac{2}{12} \qquad \underset{(x3)}{\frac{3}{4}} = \frac{9}{12} \qquad \underset{(x4)}{\frac{1}{3}} = \frac{4}{12}$$

Add the fractions as the denominators are the same.

$$\frac{2}{12} + \frac{9}{12} + \frac{4}{12} = \frac{15}{12} \text{ or } 1\frac{3}{12}$$

So

$$\frac{1}{6} + \frac{3}{4} + \frac{1}{3} = \frac{15}{12} \text{ or } 1\frac{3}{12}$$

Multiplication and Division of Fractions

Multiply simple pairs of proper fractions, writing answer in simplest form:
e.g.

$$\frac{1}{4} \text{ x } \frac{1}{2} = \frac{1}{8}$$

Know that when you multiply by a whole number you place it over 1
e.g.

$$3 \text{ x } \frac{3}{8} = \frac{3}{1} \text{ x } \frac{3}{8} = \frac{9}{8} = 1\frac{1}{8}$$

When dividing fractions use KFC as a strategy (Keep the first fraction the same, Flip the second fraction and Change the operation sign from ÷ to x) and solve by multiplying the fractions.
e.g.

$$3 \div \frac{3}{8} = \frac{3}{1} \div \frac{3}{8} = \frac{3}{1} \text{ x } \frac{8}{3} = \frac{24}{3} = 8$$

Conversion

Fractions, decimals and percentages are all closely linked and can be converted (changed) to be each other. So a **fraction** can be converted into a percentage and decimal, a **percentage** can be converted into a fraction or a decimal and a **decimal** can be converted into a percentage or fraction.

Conversion Facts

Fraction	Decimal	Percentage
$\frac{1}{2}$	0.5	50%
$\frac{1}{4}$	0.25	25%
$\frac{3}{4}$	0.75	75%
$\frac{1}{5}$	0.2	20%
$\frac{1}{10}$	0.1	10%

Converting a fraction to a percentage

All percentage is out of 100. Find a number that the denominator can be multiplied by to make 100.

For example $\frac{4}{25}$

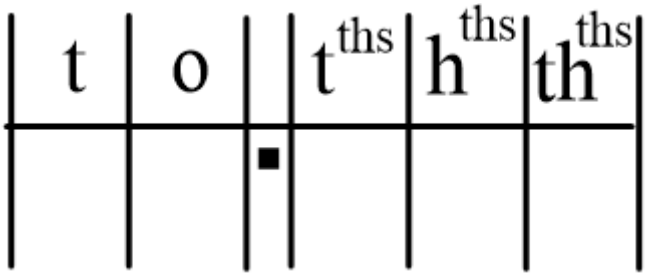
Multiply 25 by 4 to equal 100,
Multiply the numerator by the **same** number (25)

$$\text{So, } \frac{4}{25} \overset{(x4)}{=} \frac{16}{100} = 16\%$$

Converting a fraction to a decimal

To convert a fraction to a decimal use knowledge of place value.

Think of this:



If a denominator is 10, 100, or 1000, knowledge of place value needs to be applied.

e.g.

$\frac{3}{10}$ is 3 10th's and (from using the place value chart) your child will know that 0.3 is the decimal equivalent.

Similarly, to converting a fraction to a percentage, if the denominator was not 10, 100 or 1000 find a number that can be multiplied by the denominator to make 100, and multiply the numerator by the **same** number.
e.g.

$$\frac{4}{25} \overset{(x4)}{=} \frac{16}{100} = 0.16$$

Converting a percentage into a decimal

To convert a percentage to a decimal you divide the percentage by 100.

e.g. 68% = 68 ÷ 100 = 0.68

Converting a percentage into a fraction

To convert a percentage into a fraction, put the number over 100 (as it is that amount out of 100) and then simplify the fraction if you can.

e.g. $65\% = \frac{65}{100} \overset{(\div 5)}{=} \frac{13}{20}$

Converting a decimal into a fraction

To convert a decimal again use place value as an aid.

Firstly: look at the decimal.
If the numbers in the decimal goes up to the 10th's column then the answer is going to be that number over 10.

e.g. 0.8 = $\frac{8}{10}$

If the numbers in the decimal goes up to the 100th's column then the answer is going to be that number over 100.

e.g. $0.85 = \frac{85}{100} \overset{(\div 5)}{=} \frac{17}{20}$

If the numbers in the decimal goes up to the 1000th's column the answer will be that number over 1000.

e.g. $0.848 = \frac{848}{1000} \overset{(\div 2)}{=} \frac{424}{500} \overset{(\div 2)}{=} \frac{212}{250} \overset{(\div 2)}{=} \frac{106}{125}$

Converting a decimal into a percentage

To convert a decimal into a percentage, multiply the number by 100.
Example 1

0.32 = 0.32 x 100 = 32 = 32%

Example 2

0.625 = 0.625 x 100 = 62.5 = 62.5%

Find a percentage of an amount

Quick tips to find percentages of amounts.

To find 10%, divide the number by 10. This is because 100% is the whole and to find 10% divide the number into 10 parts.
e.g.

Find 10% of 650
650 ÷ 10 = 65
So, 10% of 650 = 65

To find 1% you divide the number by 100. This is because 100% is the whole and to find just 1% you divide the number into 100 parts.
e.g.

Find 1% of 73
73 ÷ 100 = 0.73
So, 1% of 73 = 0.73

Known facts to learn

25% is the same as working out $\frac{1}{4}$ (one quarter)
50% is the same as working out $\frac{1}{2}$ (one half)
75% is the same as working out $\frac{3}{4}$ (three quarters)

Applying these facts a percentage of any amount can be calculated.

To find 5%, find 10% and then halve it
To find 20% find 10% and double it
To find 30% find 10% and multiply it by 3
To find 40% find 10% and multiply it by 4
To find 60% find 50% and 10% and add the answers together
To find 3% find 1% and multiply it by 3
To find 0.5% find 1% and half it.

At Lowbrook we aim to equip the children with a range of techniques and various methods of problem solving to enable them to choose which strategies they prefer to use. Our aim is for all our children to develop resilience and independence and to have confidence in their own abilities.

You may like to access the Holylowbrook You Tube channel where you can see many of the methods we use in class demonstrated by our own staff.

Using Mymaths (mymaths.co.uk) for homework has made it possible for you to watch all methods of calculation we use in year 6, before your child attempts the task set.

Games to help mathematical understanding:

Scrabble	adding multiplying (doubling trebling) good for vocabulary development and spelling.
Yahtzee	adding multiplication and probability.
Chess/draughts	strategy and logical thinking.
Darts	addition and subtraction.
Rummikub	numbers strategy game..
Monopoly	monetary transactions (financial literacy) probability.

Useful Websites.
https://www.topmarks.co.uk/
https://www.bbc.co.uk/bitesize/subjects/z6vg9j6
https://www.theschoolrun.com/