WMS Numeracy Support Guide

Information for Parents

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Contents

Introduction

This booklet has been produced to show parents and teachers how some topics are taught within the Maths Department in West Monmouth School.

It is hoped that the information in this booklet will help you understand the way number topics are being taught to your child in WMS, making it easier for you to help them with their homework, and as a result improve their understanding.

Basics

Every pupil should know their multiplication tables. Their six, seven, eight, and nine times tables are very important and can be practised at home.

Primary School learning about place value is often forgotten and can be reinforced at home.

Remember:

Hundreds	Tens	Units	Decimal Point	Tenths	Hundredths
3	5	6	.	7	5

Reading and writing large numbers is a common difficulty that you can help with.

E.g. 3,678,023 reads as:
Three **million**, six hundred and seventy eight **thousand** and twenty three.

Pupils can be made aware at home of metric and imperial weights and measures and their own height and weight in both.

They can practice estimating sensibly, getting the feel of large and small weights, heights and distances and using money in a practical way.

The better your child knows the basics, the easier it will be for him or her to make progress.

Estimating

We expect pupils to:

- estimate height and length in cm, m, ½m. For example:
    - length of pencil = 10cm
    - width of desk = ½m
- estimate small weights, small areas, small volumes. For example:
    - bag of sugar = 1 kg
- estimate areas in square metres, lengths in mm and m. For example:
    - area of blackboard = 4m²
    - diameter of 1p = 15 mm

Rounding

We expect pupils to

- round 2 or 3 digit whole numbers to the nearest 10
- round any number to the nearest whole number, 10 or 100
- round any number to 1 decimal place
- round to any number of decimal places
- round to any number of significant figures

Note: We always round up for 5 or above

WORKED EXAMPLES:

- 74 (nearest 10) → 70
- 386 (nearest 10) → 390
- 347.5 (nearest whole number) → 348
- 347.5 (nearest 10) → 350
- 347.5 (nearest 100) → 300
- 7.51 (1 decimal place) → 7.5
- 8.96 (1 decimal place) → 9.0
- 3.14159 (3 decimal places) → 3.142
- 3.14159 (2 decimal places) → 3.14
- 3.14159 (3 significant figures) → 3.14
- 7684 (2 significant figures) → 7700

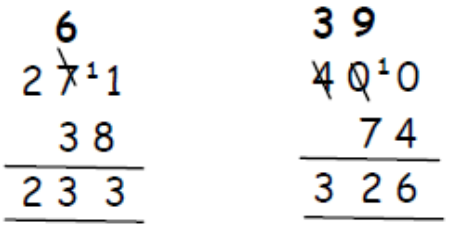
Subtraction

When subtracting we

- use decomposition (as a written method)
- check by addition
- promote alternative mental methods where appropriate

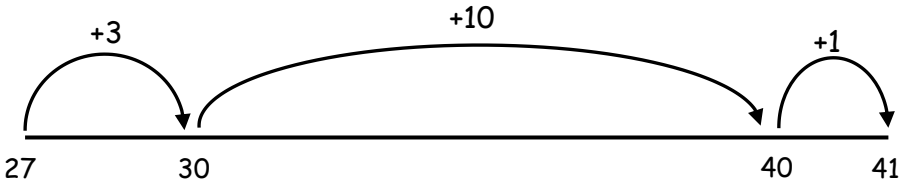
WORKED EXAMPLES

- Decomposition:



- Counting on:

  For example, to solve 41 – 27, count on from 27 until you reach 41



Answer is 3 + 10 + 1 = 14

- Breaking up the number being subtracted:
  - eg To solve 41 – 27, subtract 20 then subtract 7

WE DO NOT……

“borrow and pay back”

Multiplication

We expect pupils to

- know their multiplication tables up to 10 x 10
- be able to multiply by 10's, 100's and 1000's mentally
- be able to multiply a three digit number by a two digit number

When multiplying a more complicated problem we use one of two methods.

WORKED EXAMPLE

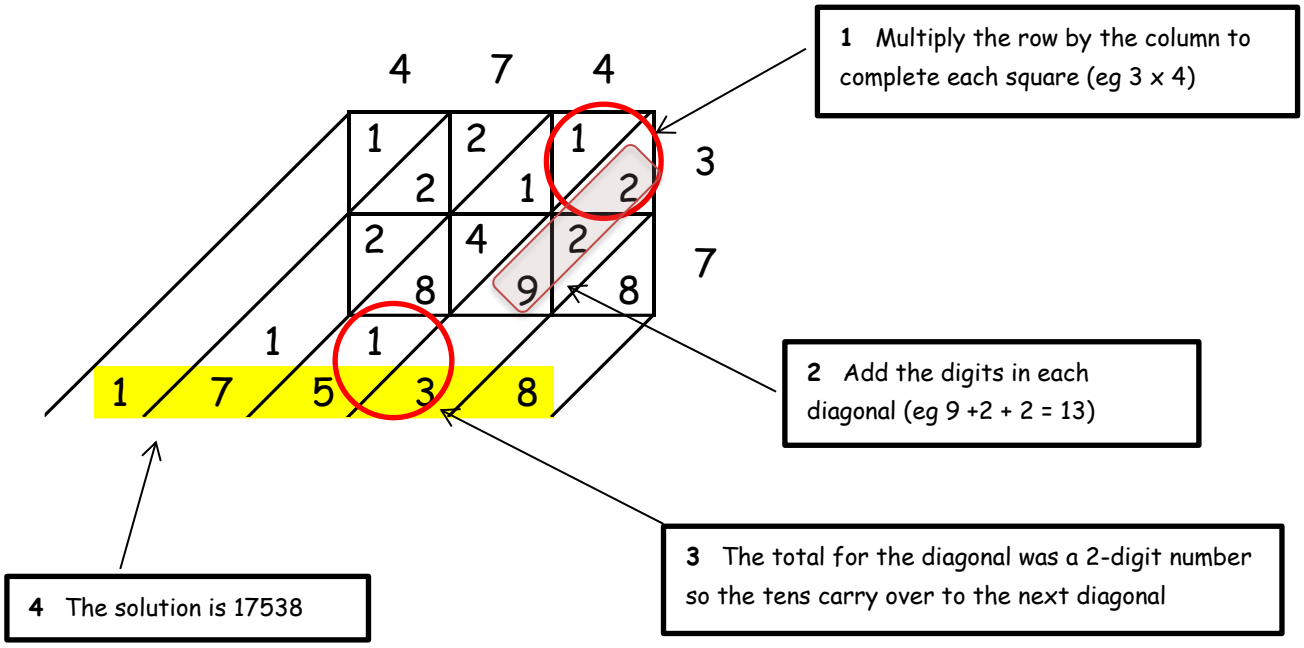
474 x 37

Method 1

X	400	70	4
30	12000	2100	120
7	2800	490	28

Answer = 12000 + 2100 + 120 + 2800 + 490 + 28 = 17538

Method 2



Division

We expect pupils to

- be able to divide problems such as 24 ÷ 6 mentally
- be able to divide by 10's, 100's and 1000's mentally
- to solve problems such as 160 ÷ 5 by short division or 'chunking'

By 'short' division

$$5\overline{)\,1\,{}^{1}6\,{}^{1}0}\quad 0\;3\;2$$

By Chunking

160 ÷ 5

Method 1

32	
5) 160	
50	10 × 5
110	
50	10 × 5
60	
50	10 × 5
10	
10	2 × 5
0	32 × 5

Method 2 (which is quicker)

32	
5) 160	
150	30 × 5
10	
10	2 × 5
0	32 × 5

WE DO NOT……

use 'long division' – pupils find it very difficult

Fractions

We expect pupils to:

- find fractions of single and double digit quantities

$\frac{1}{3}$ of 9 = 3 (9 ÷ 3); $\frac{1}{5}$ of 70 = 14 (70 ÷ 5)

- find fractions of up to 4 digit quantities

$\frac{3}{4}$ of 176 = 132 (176 ÷ 4 x 3)

- use equivalence of widely used fractions and decimals e.g. $\frac{3}{10} = 0.3$
- find fractions of a quantity with a calculator
- use equivalence of all fractions, decimals and percentages
- add, subtract, multiply and divide fractions with and without a calculator

WORKED EXAMPLES

Add and Subtract	Multiply	Divide
Make the denominators equal	Multiply top and multiply bottom	Invert the second fraction and multiply
$\frac{1}{2} + \frac{1}{3}$ $= \frac{3}{6} + \frac{2}{6}$ $= \frac{5}{6}$	$\frac{2}{3} \times \frac{3}{4}$ $= \frac{6}{12}$ $= \frac{1}{2}$	$\frac{3}{4} \div \frac{2}{5}$ $= \frac{3}{4} \times \frac{5}{2}$ $= \frac{15}{8}$ $= 1\frac{7}{8}$

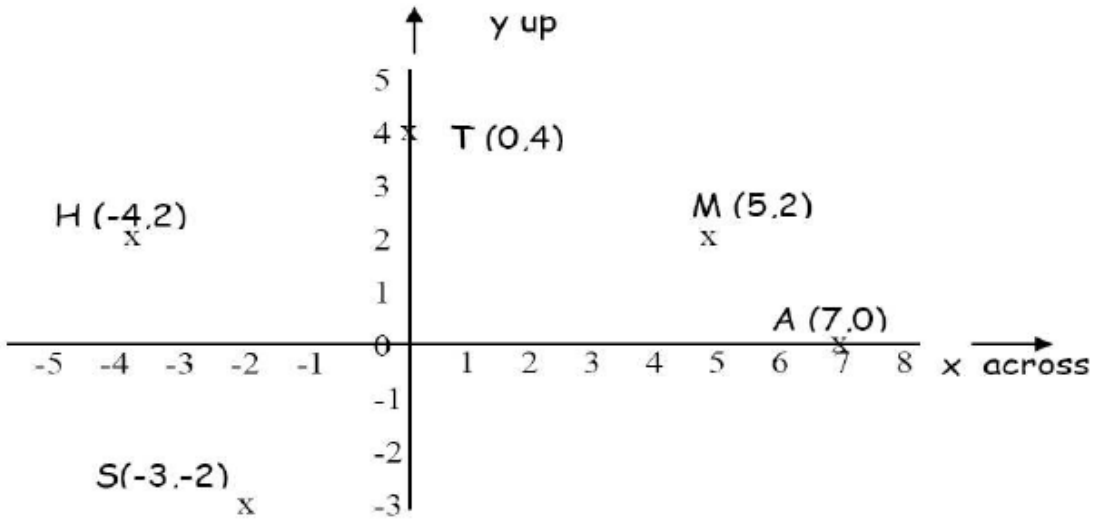
Coordinates

We expect pupils to:

- use a co-ordinate system to locate a point on a grid
- number the grid lines rather than the spaces
- use the terms across/back and up/down for the different directions
- use a comma to separate as follows : 3 across 4 up = (3,4)
- use co-ordinates in all four quadrants to plot positions

WORKED EXAMPLE:

Plot the following points: M (5,2), A (7,0), T (0,4), H (-4,2), S (-3,-2)



Percentages

We expect pupils to

- find 50%, 25%, 10% and 1% without a calculator and use addition to find other amounts. For example,

$50\% = \frac{1}{2}$ so ÷ by 2, $25\% = \frac{1}{4}$ so ÷ by 4,

$10\% = \frac{1}{10}$ so ÷ by10, $100\% = \frac{1}{100}$ so ÷ by 100

- find percentages with a calculator. For example, 23% of £300 is

  23 ÷ 100 x 300 = £69

- express a fraction as a percentage via the decimal equivalent

WORKED EXAMPLES

- Find 36% of £250

10% of £250 = £25

30% of £250 = £75 (10% x 3)

5% of £250 = £12.50 (half of 10%)

1% of £250 = £2.50 (10% ÷ 10) or (100% ÷ 100)

36% of £250 = £75 + £12.50 + £2.50 **(30% + 5% + 1%)**

= £90

- Express two fifths as a percentage

$$\frac{2}{5} \xrightarrow{\times 2} \frac{4}{10} \xrightarrow{\times 10} \frac{40}{100} = 40\%$$

- You buy a car for £5000 and sell it for £3500 what is the percentage loss?

  Loss = £5000 – £3500 = £1500

$$\%\ \text{Loss} = \frac{\text{Loss}}{\text{Original}} \times 100 = \frac{1500}{5000} = \frac{15}{50} = \frac{30}{100} = 30\%$$

This rule is equivalent for % profit, increase or decrease

- Increase £350 by 15%

15% of 350 = 15 ÷ 100 x 350 = £52.50 (to find the increase)

£350 + £52.50 = £402.50 (then add on for the new total)

WE DO NOT……

use the % button on the calculator because of inconsistencies between models

Proportion

We expect pupils to

- identify direct and inverse proportion
- record appropriate “headings” with the unknown on the right
- use the unitary method (i.e. find the value of ‘one’ first then multiply by the required value)
- if rounding is required we do not round until the last stage

WORKED EXAMPLES:

A. Direct Unitary Method

If 5 bananas cost 80 pence, then what do 3 bananas cost?

Bananas		**Cost (p)**
5	→	80
1	→	80 ÷ 5 = 16
3	→	16 x 3 = 48

B. Inverse Unitary Method

The journey time at 60 km/h = 30 minutes, so what is the journey time at 50km/h?

Speed (km/h)		**Time (min)**
60	→	30
1	→	30 x 60 = 1800
50	→	1800 ÷ 50 = 36

Equations

We expect pupils to solve simple equations by:

- "Balancing"
- performing the same operation to each side of the equation
- doing "Undo" operations. For example
    - undo + with -, undo – with +
    - undo x with ÷, undo ÷ with x
- encouraging statements like:
    - "add something to both sides"
    - "multiply both sides by something"

We prefer

- the letter x to be written differently from a multiplication sign
- one equals sign per line
- equals signs beneath each other
- we discourage bad form such as 3 x 4 = 12 ÷ 2 = 6 x 3 = 18

WORKED EXAMPLES:

$2x + 3 = 9$ take away 3 from both sides
$2x = 6$ divide by 2 both sides
$x = 3$

$3x + 6 = 2x - 18$ subtract 6 from both sides
$3x - 2x = -18 - 6$ subtract $2x$ from both sides
$x = -24$

Line Graphs

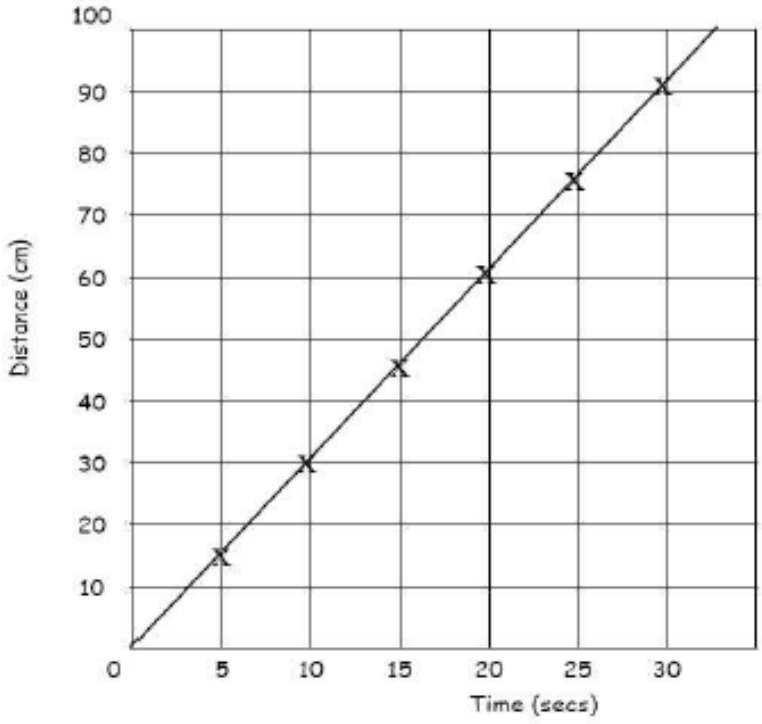
We expect pupils to

- use a sharpened pencil and a ruler
- choose an appropriate scale for the axes to fit the paper
- label the axes
- give the graph a title
- number the lines **not** the spaces
- plot the points neatly using a cross (x)
- fit a suitable line

WORKED EXAMPLES: The distance a gas travels over time has been recorded in the table below:

Time (s)	0	5	10	15	20	25	30
Distance (cm)	0	15	30	45	60	75	90

Distance travelled by a gas over time



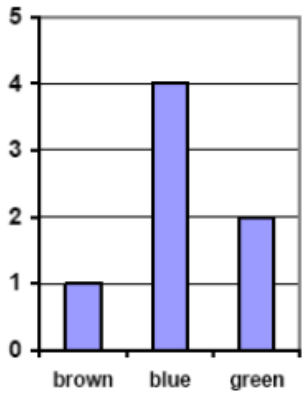
Bar Graphs

We expect pupils to

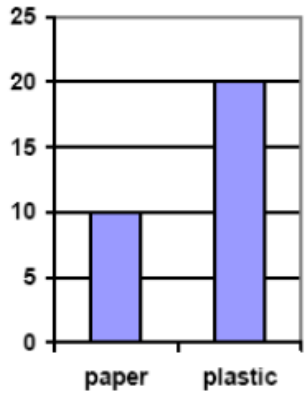
- use a pencil
- give the graph a title
- label the axes
- label the bars in the centre of the bar **(each bar has an equal width with an equal gap between bars)**
- label the frequency (up the side) on the lines not on the spaces
- make sure there are equal spaces between the bars
- construct bar graphs with frequency graduated in single units/multiple units
- construct bar graphs involving simple fractions or decimals

WORKED EXAMPLES:

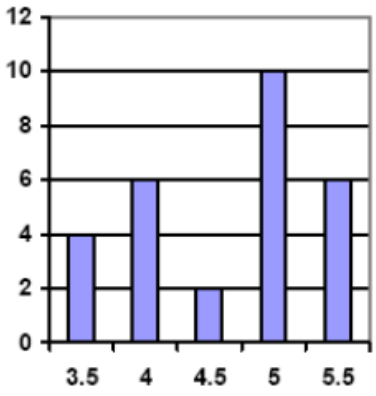
colour of eyes



quantities of litter



shoe size



Pie Charts

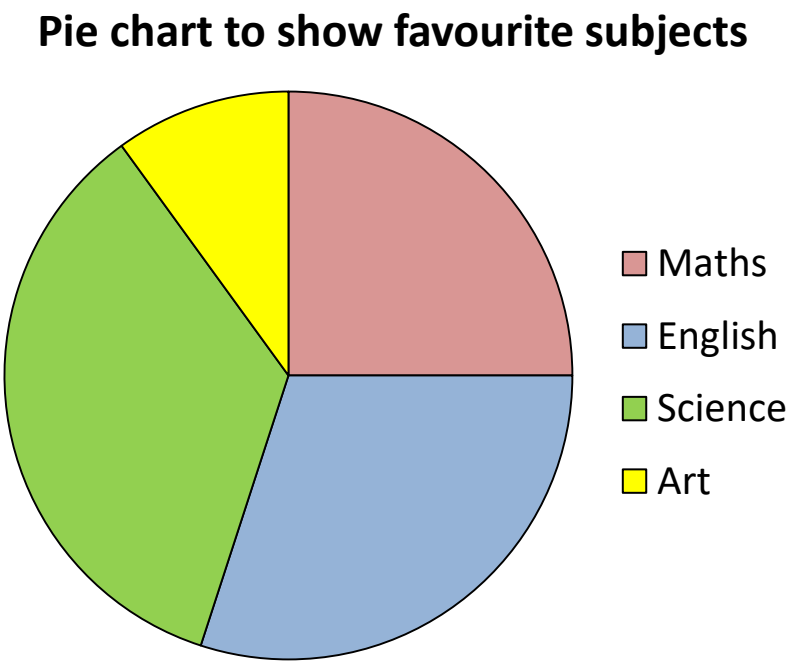
We expect pupils to

- use a pencil
- label all the slices or insert a key as required
- give the pie chart a title
- construct pie charts involving simple fractions, decimals or percentages
- construct pie charts of raw data

WORKED EXAMPLES

20 pupils were asked "What is your favourite subject?" The results are in the following table

Subject	Total	Angle
Maths	5	5 ÷ 20 x 360 = 90˚
English	6	6 ÷ 20 x 360 = 108˚
Science	7	7 ÷ 20 x 360 = 126˚
Art	2	2 ÷ 20 x 360 = 36˚
	20	



Time Calculations

We expect pupils to

- convert between the 12 and 24 hour clock (2327 = 11.27pm)
- calculate duration in hours and minutes by counting up to the next hour then on to the required time
- convert between hours and minute (multiply by 60 for hours into minutes)

WORKED EXAMPLES

- How long is it from 0755 to 0948?

  0755 → 0800 → 0900 → 0948

  (5min) (1hr) (48min)

  Total time 1 hour 53 minutes

- Change 27 minutes into hours

  27 min = 27 ÷ 60 = 0.45 hours

WE DO NOT……

Teach time as a subtraction calculation

Using Formulae

We expect pupils to use simple formulae by:

- writing down the formula first
- rewriting the formula replacing the letters by the appropriate numbers (substitution)
- solving the equation
- interpreting the answer and putting the appropriate units back into context

WORKED EXAMPLES

The length of a string S mm for the weight of W grams is given by the formula:

$$S = 16 + 3W$$

(a) Find S when W = 3 grams

S = 16 + 3W	(write formula)
S = 16 + 3(3)	(replace letters by numbers)
S = 16 + 9	(solve the equation)
S = 25	

Length of string is 25 mm (interpret result in context)

(b) Find W when S = 20.5 mm

S = 16 + 3W	(write formula)
20.5 = 16 + 3W	(replace letters by numbers)
20.5 – 16 = 3W	(solve the equation)
4.5 = 3W	
1.5 = W	

The weight is 1.5 g interpret result in context

WE DO NOT……..

- **State the answer only. Working must be shown**

Data Analysis

We expect pupils to

- analyse ungrouped data using a tally table and frequency column or an ordered list
- calculate the range of a data set. In maths this is taught as the difference between the highest and lowest values of the data set. (NB range is expressed differently in biology)
- calculate the mean (average) of a set of data
- calculate the mean (average), median (central value of an ordered list) and mode (most common value) of a data set
- obtain these values from an ungrouped frequency table
- compare data sets using these averages and range

WORKED EXAMPLE

The results of a survey of the number of pets pupils owned were 3,3,4,4,4,5,6,6,7,8

$$\text{Mean} = \frac{\text{Sum of Scores}}{\text{No. of Scores}} = \frac{3+3+4+4+4+5+6+6+7+8}{10} = 50 \div 10 = 5$$

Median = the middle of an ordered set of data = (4 + 5) ÷ 2 = 4.5

Mode = most common = 4

Range = highest – lowest = 8 – 3 = 5

Scientific Notation or Standard Form

In maths we teach this at level 8. We teach that a number in scientific notation consists of a number between one and ten multiplied by a power of 10.

For example

- $2400000000 = 2.4 \times 10^{9}$
- $0.00004 = 4 \times 10^{-5}$

We introduce the terms:

- Kilo meaning one thousand
- Milli meaning one thousandth

Pupils should be able to use powers and square roots

Order of Operations or BIDMAS

BIDMAS is the mnemonic which we teach in Maths to enable pupils to know exactly the right sequence for carrying out mathematical operations.

Scientific calculators use this rule to know which answer to calculate when given a string of numbers to add, subtract, multiply, divide etc.

For example

What do you think is the answer to 2 + 3 x 5?

Is it (2 + 3) x 5 = 5 x 5 = 25 ? or 2 + (3 x 5) = 2 + 15 = 17?

We use BIDMAS to give the correct answer:

(B)rackets (I)ndices (D)ivision (M)ultiply (A)ddition (S)ubtraction

According to BIDMAS, multiplication should always be done before addition, therefore 17 is the correct answer according to BIDMAS and should also be the answer which your calculator will give if you type in 2 + 3 x 5 =

Indices are simply numbers raised to a power such as 2^2 or $(-3)^2$.

WORKED EXAMPLE

Calculate $4 + 70 \div 10 \times (1 + 2)^2 - 1$ according to BIDMAS rules

Brackets give	$4 + 70 \div 10 \times (3)^2 - 1$
Indices gives	$4 + 70 \div 10 \times 9 - 1$
Division gives	$4 + 7 \times 9 - 1$
Multiplication gives	$4 + 63 - 1$
Addition gives	$67 - 1$
Subtraction gives	66

Answer is 66