Currie Community High School

Numeracy across Learning

Working with numbers in everyday life

Decision Making

Problem Solving

Introduction

This booklet gives guidance to parents, pupils and staff on how certain Numeracy topics are taught and how they are used across the subject areas of the school. It is hoped that adopting a consistent approach will enable learners to more easily put into practice these skills in a range of subjects.

Contents

Numeracy across Learning

Subtraction

Pupils will be re-introduced to this topic during S1 - September

Pupils will be shown subtraction using **decomposition**.

Example Find 1234 – 542

```
    1 1
  1 2 3 4
-   5 4 2
  -------
    6 9 2
```

commentary a) 4 – 2 = 2

b) 3 take away 4, can not do this so take 1 hundred from the next column, leaving just 1 there, and change it for 10 tens – this gives us 10 tens + 3 tens = 13 tens. So 13 – 4 = 9.

11 – 5 =6 to finish.

Cautionary Note

a) pupils will not be shown "borrow and pay back"

A pupil working at first level should be able to use this approach.
A pupil working at second level should be able to choose this method to solve problems.
A pupil working at third level should be able to use this method to solve problems in a familiar context.
A pupil working at fourth level should be able to use this method to solve problems in an unfamiliar context.

Multiplication

Pupils will be re-introduced to this topic during S1 - November

- Multiplication by a single digit should be done without a calculator either mentally or on paper.

Example 2.34×0.6

$$\begin{array}{r} 2.34 \\ \times\ 0.6 \\ \hline 1.4^{2}0^{2}4 \end{array}$$

(stress multiplying by 6, so **6** times 4, **6** times 3, ….)

There are 2 digits after the decimal point in the first number, and 1 digit after the decimal point in the second number, therefore 3 numbers after the decimal point in the answer, 1.404.

- Multiplying by 10, 100 etc, the numbers move – not the decimal point.

Example 4.23×100, the numbers move 2 places to left to give 423.

- Note that the number of places which the numerals move to the left is the number of zeros in the multiplier
- Multiplying by multiples of 10, 100 eg by 30, multiply by 3 and then by 10

Caution

Do not "add zeros" when multiplying by 10,100 etc. This can cause confusion when multiplying decimals.

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A pupil working at fourth level should be able to use this method to solve problems in an unfamiliar context.

Numeracy across Learning

Division

Pupils will be re-introduced to this topic during S1 - November

- Dividing by a single digit, if the number does not divide evenly then pupils should be able to put zeros at end and keep dividing.

Example $15.3 \div 6$

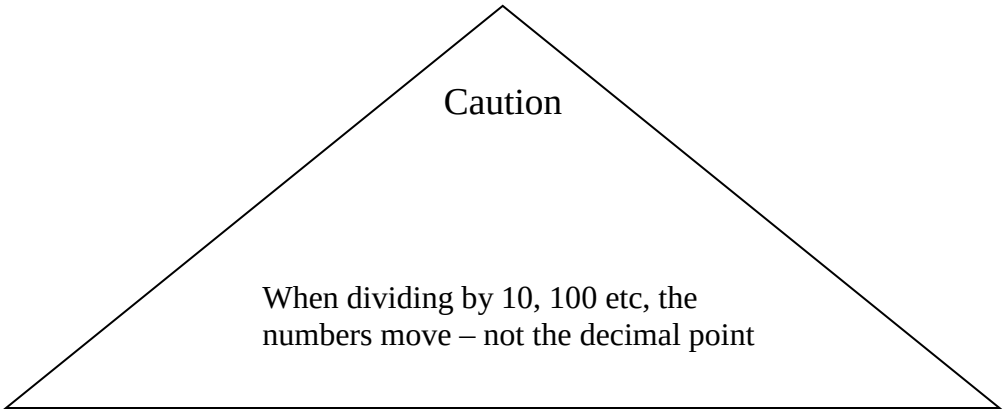
$$6\overline{)15.^{3}3} \quad 2.5 \text{ r } 3$$

not to be left like this.

Another zero can be put at the end and the division completed.

$$6\overline{)15.^{3}3^{3}0} \quad 2.55$$

- More zeros can be added if needed



A pupil working at first level should be able to use this approach.
A pupil working at second level should be able to choose this method to solve problems.
A pupil working at third level should be able to use this method to solve problems in a familiar context.
A pupil working at fourth level should be able to use this method to solve problems in an unfamiliar context.

Rounding

Pupils will be re-introduced to this topic during S1 - November

Rounding to nearest whole number/ten/hundred/ significant figures (to s.f.).

237.8 → 238 (to nearest whole number/ 3 s.f.))
237.8 → 240 (to nearest 10/ 2 s.f.)
237.8 → 200 (to nearest 100/ 1 s.f.)

Rounding to 1 decimal place (to 1 d.p.)

5.31 → 5.3 (to 1 d.p.)
11.97 → 12.0 (to 1 d.p.)

Rounding to more than 1 decimal place/to significant figures (to s.f.)

10.059 → 10.06 (to 2 d.p/ 4 s.f.)
10.059 → 10.1 (to 1 d.p./ 3 s.f.)
10.059 → 10 (to 2 s.f.)
10.059 → 10 (to 1 s.f.)

Cautionary Notes

a) Always round up for **5 or more**
b) Always encourage pupils to show un-rounded answer first before rounding

A pupil working at first level should be developing ways to use rounding to estimate an answer.
A pupil working at second level should be able to use rounding to estimate an answer and decide if it is reasonable.
A pupil working at third level should round their answer to an appropriate degree of accuracy, depending on the context of the question.

Numeracy across Learning

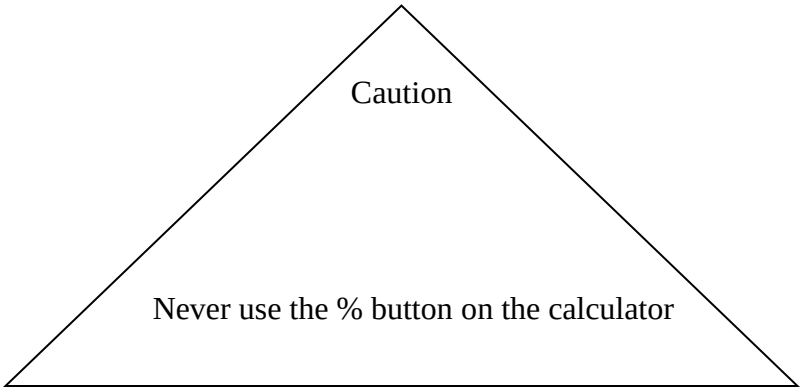
Percentages
(with a calculator)

Pupils will be re-introduced to this topic during S1

Pupils will be shown to set out examples in the following way:

32% of £564
= £ 564 ÷ 100 × 32
= £5.64 ×32
= £180.64

This keeps the working the same as calculations done without a calculator.



A pupil working at second level should be able to find simple percentages that are familiar from every day use.
A pupil working at third level should be able to find a wide range of percentages.
A pupil working at fourth level should be able to use this method to justify comparisons, decisions and choices.

Numeracy across Learning

Percentages
(without a calculator)

Pupils will be re-introduced to this topic during S1

Pupils will be shown how to calculate amounts using the following

25% = ¼	$33\frac{1}{3}\% = \frac{1}{3}$	$1\% = \frac{1}{100}$
50% = ½	$66\frac{2}{3}\% = \frac{2}{3}$	$10\% = \frac{1}{10}$
75% = ¾		5% = 10% ÷ 2
		2½% = 5% ÷ 2

Example

Find 4% of £220
1% of £220 = £2.20
4% of £220 = £2.20 × 4
= £8.80

Most percentages will be found using multiples of 10% and/or 1%
e.g. 30% = 3 × 10%

Caution

a) For 20% use either:
20% = $\frac{1}{5}$ or
20% = 2 x 10%.

b) To find 1% (divide by 100), move the numbers 2 places to the right. For 10%, move the numbers one place. The decimal point **does not move**.

A pupil working at second level should be able to find simple percentages that are familiar from every day use.
A pupil working at third level should be able to find a wide range of percentages.
A pupil working at fourth level should be able to use this method to justify comparisons, decisions and choices.

Numeracy across Learning

Time Conversion

Most pupils will be introduced to this topic during S2 - August

Converting hours and minutes to decimals

Pupils should already know:

- 30 mins = ½ hour = 0.5 hrs
- 15 mins = ¼ hour = 0.25 hrs
- 45 mins = ¾ hour = 0.75 hrs

Rule

converting minutes to decimal hours → divide by 60 (because there are 60 minutes in an hour)

e.g. 24 minutes = $\frac{24}{60}$ of an hour = $\frac{4}{10}$ of an hour = 0.4 hr

3 hours 13 mins = [3 + $\frac{13}{60}$]hrs = [3 + 0.22]hrs = 3.22hrs **(to 2 d.p.)**

Rule

Converting decimal hours to minutes → multiply decimal part by 60

e.g. 0.15 hr = (0.15 x 60) mins = 9 minutes.

3.4 hr = 3 + (0.4 x 60) mins = 3hrs + 24 mins = 3 hrs 24 mins.

Caution

a) A common mistake is to misinterpret time as a decimal calculation

e.g. 2.25 hours is <u>not</u> equal to 2 hours 25 minutes

A pupil working at first level should be able to using 12 and 24 hour clock.
A pupil working at second level should be able to calculate simple time intervals and understand there is a link between speed, distance and time.
A pupil working at third level should be able to use their knowledge of the link between speed, distance and time to calculate distance travelled, time taken or speed travelled at, for simple time intervals.
A pupil working at fourth level should be able to change time into and out of a decimal and use this in speed, distance and time calculations.

Numeracy across Learning

Time Intervals

Pupils will be re-introduced to this topic during S2 - August

Pupils will be shown how to work out time intervals by "counting on".

e.g. Calculate how long it is from 2250 to 0210

2250 —(10 mins)→ 2300 —(3 hours)→ 0200 —(10 mins)→ 0210

Total: 3 hours 20 mins

e.g. Calculate how long it is from 8.40am to 3.23pm

8.40am —(20 mins)→ 9.00am → 12 noon —(3 hours)→ 3.00pm —(3 hours)→ 6 hours —(23 mins)→ 3.23pm.

Total: 6 hours 43 mins

Caution

a) Do not subtract times
e.g. 8.40 – 3.23 = 5.17

b) Avoid the use of a calculator.

A pupil working at first level should be able to use 12 and 24 hour clock.
A pupil working at second level should be able to calculate simple time intervals and understand there is a link between speed, distance and time.
A pupil working at third level should be able to use their knowledge of the link between speed, distance and time to calculate distance travelled, time taken or speed travelled at, for simple time intervals.
A pupil working at fourth level should be able to change time into and out of a decimal and use this in speed, distance and time calculations.

Numeracy across Learning

Conversion of units
of length, mass & volume

Pupils will be re-introduced to this topic during S1 - January

Pupils need to know how to safely to convert between different units of length, mass & volume.

Length
1 kilometre = 1000 metres, 1 metre = 100 centimetres, 1 metre = 1000 millimetres

Mass
1 Tonne = 1000 kilograms, 1 kilogram = 1000 grams, 1 gram = 1000 milligrams

Volume
1 litre = 1000 millilitres = 1000 cm^3

Example: How many centimetres are there in 2.3 kilometres?

$$2.3 \text{ km} \xrightarrow{\times 1000} 2300 \text{ m} \xrightarrow{\times 100} 230\,000 \text{ cm}$$

Example: How many kilometres are there in 565 000 millimetres?

$$565\,000 \text{ mm} \xrightarrow{\div 10} 56\,500 \text{ cm} \xrightarrow{\div 100} 565 \text{ m} \xrightarrow{\div 1000} 0.565 \text{ km}$$

Caution

Make conversions using manageable steps as shown above, not in one operation.

A pupil working at first level should be able to estimate how long or heavy and object is, or what amount it holds, using every day items as a guide. They should be able to weigh or measure using appropriate units and working.
A pupil working at second level should be able to use common units of measurement and convert between them.
A pupil working at third level should be able to choose the most appropriate unit of measure and degree of accuracy, using a formula to calculate area or volume.
A pupil working at fourth level should be able to apply their knowledge of measure to solve everyday problem.

Numeracy across Learning

Common Unit Prefixes

Pupils should be familiar with some of the following commonly used unit prefixes.

Name	Abbrev'	Description	Relationship to basic unit	Engineering notation prefix
nano	n	1 billionth	$\div 1\,000\,000\,000$	$\times 10^{-9}$
micro	μ	1 millionth	$\div 1\,000\,000$	$\times 10^{-6}$
milli	m	1 thousandth	$\div 1\,000$	$\times 10^{-3}$
centi	c	1 hundredth	$\div 1\,00$	$\times 10^{-2}$
kilo	k	1 thousand times	$\times 1\,000$	$\times 10^{3}$
mega	M	1 million times	$\times 1\,000\,000$	$\times 10^{6}$
giga	G	1 billion times	$\times 1\,000\,000\,000$	$\times 10^{9}$

Caution

"centi" is generally only used with centimetres

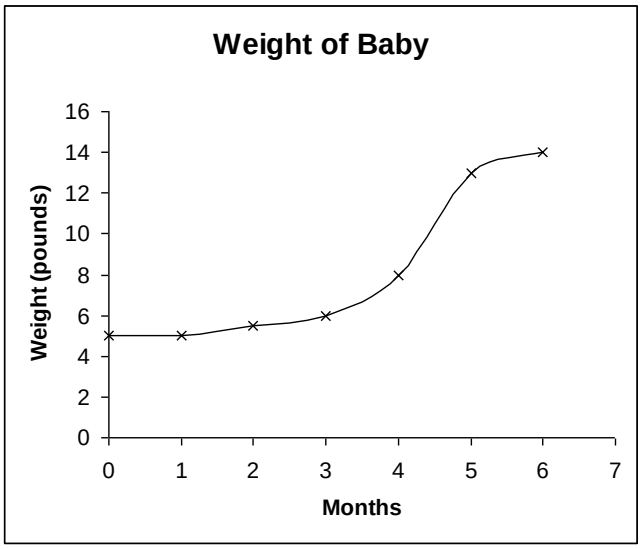
Numeracy across Learning

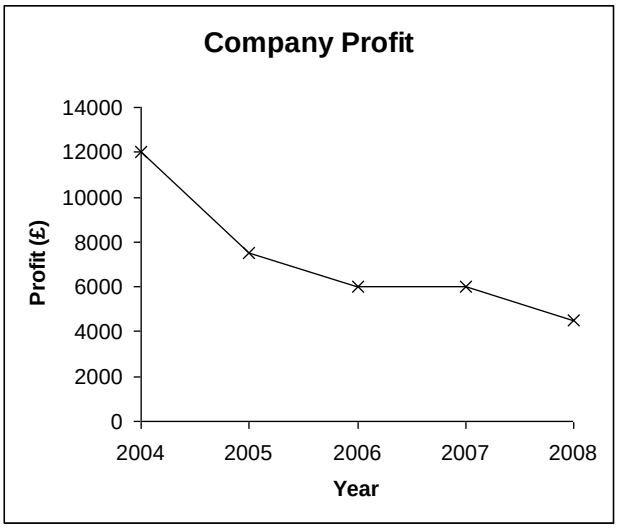
Line Graphs

Pupils will be re-introduced to this topic during S1 - August

A line graph compares 2 variables.
It must have:

- A title
- Appropriate labels on both axes
- A key if more than one line is on the graph
- Appropriate scales on the axis (need not start at zero)
- A zig-zag line may be used where the scale does not start at zero.
- Plotted points should be joined using a straight line or curve depending on the context.





A pupil working at first level should be able to read a line graph.
A pupil working at second level should be able to read and interpret a line graph.
A pupil working at third level should be able to read and interpret a line graph, discussing whether the information is robust, vague or misleading.
A pupil working at fourth level should be able to evaluate and interpret a line graph, commenting on the relationships observed.

Numeracy across Learning

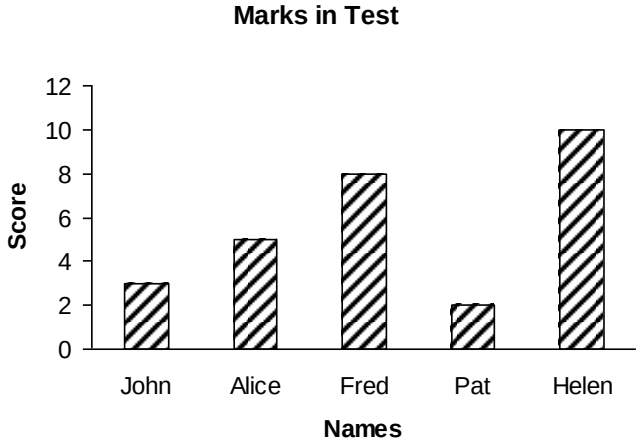
Bar Graph / chart

Pupils will be re-introduced to this topic during S1 - August

A way of displaying discrete or non-numerical data.
A bar graph should have

- A title
- Appropriate labels on both axis
- Even spaces between each bar
- Each bar should be of equal width
- A space between the vertical axis and the first bar.
- A suitable scale on the vertical axis

Bar can also be laid out horizontally.



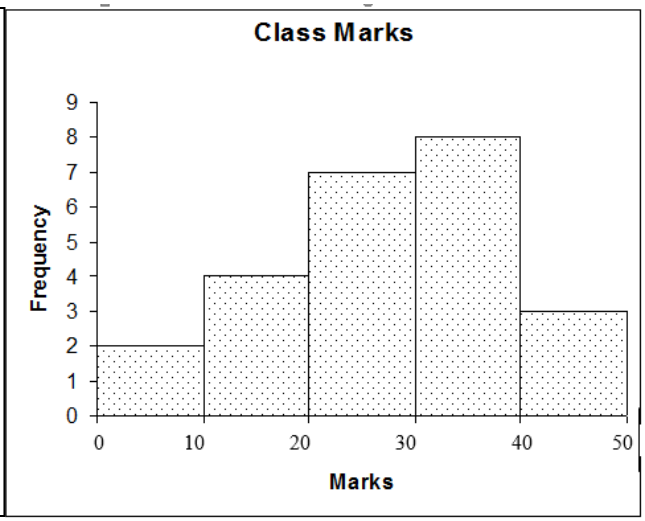
A pupil working at first level should be able to read a bar chart.
A pupil working at second level should be able to read and interpret a bar chart.
A pupil working at third level should be able to read and interpret a bar chart, discussing whether the information is robust, vague or misleading.
A pupil working at fourth level should be able to evaluate and interpret a bar chart, commenting on the relationships observed.

Histogram

Pupils will be re-introduced to this topic during S1 - August

A histogram should have the following:

- Bars of equal width should be used where possible (complications arise otherwise)
- A title
- Appropriate labels on both axes
- No spaces between bars



- Note – the divisions are 0 up to but not including 10, 10 up to but not including 20…

A pupil working at first level should be able to read a histogram.
A pupil working at second level should be able to read and interpret a histogram.
A pupil working at third level should be able to read and interpret a histogram, discussing whether the information is robust, vague or misleading.
A pupil working at fourth level should be able to evaluate and interpret a histogram, commenting on the relationships observed.

Numeracy across Learning

Numeracy Glossary

Add/Addition	To combine two or more numbers to get one number called the sum or the total.
a.m.	ante meridian. any time before midday
Approximate	An estimate for an answer, obtained by rounding an exact answer or an approximate answer obtained by using easier-to-handle numbers in a calculation.
Calculate	To work out the answer to a question, not necessarily by using a calculator!
Cubing a number	To cube a number multiple it by itself and then again by itself. e.g. $4^3 = 4 \times 4 \times 4 = 64$
Data	A collection of information, usually used in statistics work.
Denominator	The bottom number in a fraction. This is the number of parts into which the whole is being split.
Difference	The answer when you subtract one number from another.
Divisible	When a number can be divided by another number without leaving a remainder.
Division	Splitting a number into equal parts.
Double	Multiply by 2.
Equals	Has the same value as.
Equivalent fractions	Fractions which have the same value. e.g. $\frac{2}{4} = \frac{1}{2}$
Evaluate	Work out the value of.
Even Number	A number that is divisible by 2. All even numbers end with 0, 2, 4, 6 or 8.
Factor	A number which can divide another number without leaving a remainder e.g. 3 is a factor of 12.
Frequency	How often something happens or how many times something is recorded in statistics.
Integer	All positive and negative "whole numbers" and zero.
Maximum	The largest (highest) number in a group.
Mean	A type of average found by adding the data values then dividing the sum by the number of data values.
Median	A type of average. The middle value of an ordered list of numbers.

Minimum	The smallest (lowest) number in a group.
Minus	To subtract.
Mixed Number	A number which is a combination of a whole number and a fraction. e.g. $2\frac{2}{7}$
Mode	A type of average. The most frequent number or category. Always a data value. Can also be a word, e.g. a day of the week.
Multiple	A number which can be divided by a particular number exactly, that is, with no remainder. e.g. the answers in a times table are all multiples of that number.
Multiply	A calculation where you add numbers a particular number of times. e.g. $6 \times 4 = 6 + 6 + 6 + 6 = 24$.
Negative Number	A number less than zero. Identified by using a negative sign, e.g. -5.
Numerator	The top number in a fraction.
Odd Number	A whole number which is not divisible by 2. All odd numbers end with 1, 3, 5, 7 or 9.
Operations	The four basic arithmetic operations are addition, subtraction, multiplication and division.
Order of Operations	If there are multiple operations within a calculation they must be performed in a specific order. BODMAS is an acronym used to help to remember the correct order.
Place value	The value of a digit within a number. Units, tens, hundreds etc.
p.m.	Post meridian. Any time after noon.
Prime Number	A number with exactly two distinct factors, the number itself and 1.
Product	The answer to a multiplication of two or more numbers.
Quotient	The answer to a division calculation.
Remainder	A whole number left over when dividing a whole number by a whole number.
Square of a number	When you square a number you multiply it by itself. e.g. $(-3)^2 = -3 \times (-3) = 9$
Square Root	The square root of a number is a number which multiplied by itself, gives you the original number. e.g. $\sqrt{25} = 5$ since $5 \times 5 = 25$. Note that $\sqrt{25}$ is also -5 since $-5 \times (-5) = 25$.
Sum	The answer to an addition of numbers.
Whole Number	Counting numbers including zero ie 0,1,2,3,

Numeracy across Learning

Curriculum for Excellence & Numeracy Links:

For more information on CfE and Numeracy across Learning, please refer to the Education Scotland website.

More information:

http://www.educationscotland.gov.uk/learningandteaching/learningacrossthecurriculum/responsibilityofall/numeracy/index.asp

http://www.educationscotland.gov.uk/learningandteaching/thecurriculum/whatiscurriculumforexcellence/index.asp