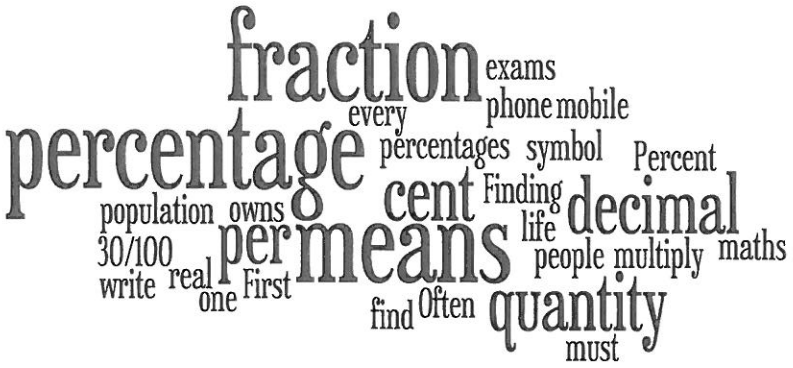
Maths



1. The language of maths

Mathematics, or maths, is often described as being a special language in itself. CLIL maths teachers are, therefore, teaching mathematical content as well as the two new 'languages' – that of maths and the target language. The language of maths consists of symbols, visual representations and specialised terminology. There is less textual input in maths than in most other subjects, and learners often spend time during lessons solving maths problems at their desks or listening to teachers explaining mathematical concepts. The challenges for the maths teacher, therefore, are to support learners in understanding mathematical concepts as well as to create opportunities for learners to use both the specific language of maths and the target language. In CLIL maths lessons, teachers can encourage learners to use spoken language to verbalise what they are learning, to talk about solutions to problems, to hypothesise and speculate about possibilities and to justify their answers. A further challenge for CLIL maths teachers is to create opportunities for writing. As they develop mathematical knowledge and understanding, CLIL learners can be taught how to think, talk and write like mathematicians.

Examples of input (spoken, written and visual information) in maths include the following:

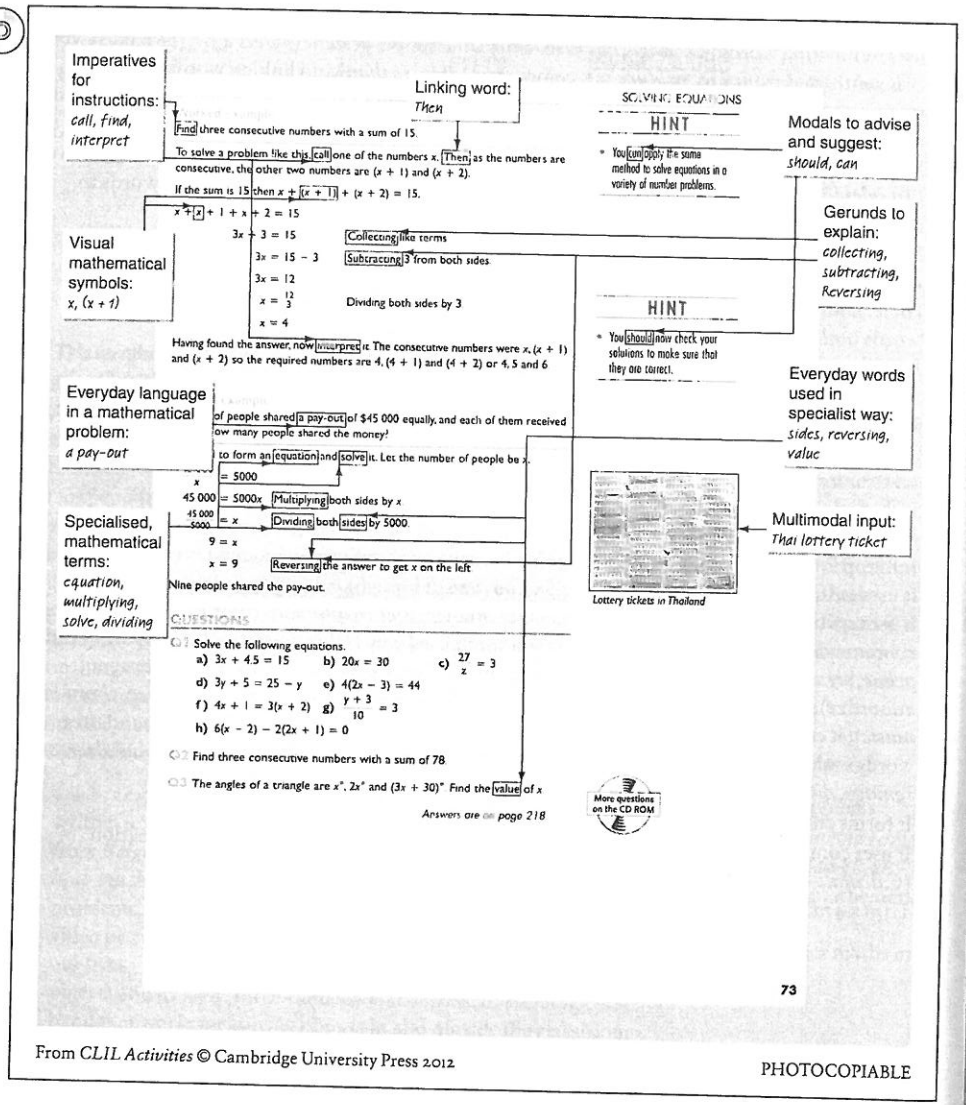
- teacher explanations, instructions and demonstrations for solving mathematical problems
- written texts: everyday situations described in terms of mathematical problems (*Francine comes from Belgium and is going to Wales on holiday soon. If the exchange rate is 10 euros to £8.38, how much money would Francine get for the 60 euros she wants to take to Wales?*), mathematical problems, facts, figures, numbers
- video or audio input: interactive games online, a video clip about where we encounter maths in our lives
- objects and models: three-dimensional objects, protractor, compass
- hands-on work: measuring objects in and outside the classroom
- visuals: visual information and symbols (numbers, charts, tables, graphs, formulas (e.g. $C = \pi \cdot d$), photographs).

The language of mathematics uses a variety of language functions, genres and text-types. For example:

- It describes and informs – i.e. describes characteristics: it uses factual, informative, technical language with no storyline; it defines (*In a parallelogram the opposite sides are parallel and equal*), uses numbering words (*a triangle has three sides*), the simple present (*6 plus 4 is*), the passive voice (*x is subtracted from y to produce 13*), comparatives (*more than*) and linking words (*therefore*); it represents information in different kinds of graphs or in symbols instead of words (*0.75%*) and uses prepositions (*into, by*).
- It instructs – for example, how to solve mathematical problems: it uses infinitives and imperatives (*To calculate the surface of a square, multiply the length by the breadth*) and linking words to number steps (*first, then, finally*).
- It explains – for example, how or why a mathematical problem is worked out: it uses present tenses to explain symbols, visuals and data ($C = \prod \cdot d$ *means to calculate the circumference of a circle, multiply the diameter by pi*), uses linking words to order (*secondly*) and causal linking words (*unless*).
- It predicts and hypothesises: it uses future tenses (*The answer will be less than 4*), conditionals (*if ... then*), modals to predict (*will*), modals to recommend (*you should calculate y first*).
- It uses complex sentences or many words to give learners information (*You have just moved into a new house and want to retile the bathroom. It is 5 metres wide and 4 metres deep. The walls are 2.20 metres high and there is a shower area which is 90 cm square.*).
- It shows information with algebraic and graphic representations with few or no words.
- It uses mathematical symbols in different ways in different cultures (e.g. in the UK and the USA, a full stop is used to represent a decimal point – *3.1*, whereas in Europe a comma is used – *3,1*).
- It uses culturally specific symbols (*€20, £20.00, $20*).
- It uses specialist vocabulary used only in mathematics (*vector, quotient, congruent, highest common denominator*), everyday words in a specialised way (*table, round, volume, root, factor, prime, sign, similar, average, mean, plane*), Latin- or Greek-based words (*polygon, hexagon, kilometre*), everyday words used in other ways in different subjects (*solution in science, chord in music*); it combines everyday words to form specialist terms (*square root, set square*) and uses words with similar meanings in different grammatical ways (*subtract, take away, minus, decrease, remove, discount*).
- It forms compound nouns (*highest common factor*).
- It uses compact and concise language, i.e. uses very few words to give learners information (*Calculate how many 400 × 400 mm tiles are needed to tile a bathroom measuring 2,1 m × 4 m × 5 m (h)*).

2. Sample text and comments for maths

The main purpose of this text is to describe and explain. It describes the characteristics of algebraic equations and explains how to solve equations. The problems contain instructions.



3. Sample language and content aims for maths

Speaking

Learners' CEFR level	Sample aim
A1	Learners can name the two-dimensional mathematical shapes they see in a picture.
A2	Learners can explain how they calculated the surface area of a floor.
B1	Learners can explain a graph they have constructed in a presentation to the class.
B2	Learners can provide a voice-over commentary on a video recording for the class below them of a learner demonstrating how to approach a mathematical problem.

Writing

Learners' CEFR level	Sample aim
A1	Learners can label a graph using the correct terminology.
A2	Learners can write a maths problem about money for peers using everyday language.
B1	Learners can write a paragraph addressed to their school, explaining a pie graph in a report on sales of sweets in the school canteen.
B2	Learners can write a report for a safety committee, including visuals on an investigation into the average distance learners in their year travel to school every day.

Grammar

Learners understand the meaning of modal verbs to express probability (*will, may, might, could, should*).
Learners know how to use the present real conditional using *if* + present tense, + present (*if you decrease the value of y, the line on the graph falls*).
Learners can use modals to discuss possible solutions.

Vocabulary

Learners can match these names to shapes: *triangle, square, rectangle, circle, polygon, ellipse.*
Learners can use these specialist words accurately when they explain their graphs: *y-axis, x-axis, coordinates, row, column, intersect.*
Learners can distinguish words with similar but distinct meanings (*subtract, take away, minus, decrease, remove, discount*).
Learners know all the word forms and most common collocations for a word such as *triangle* (noun: *triangle*; verb: *to triangulate*; adjective: *triangular*; common collocations: *right-angled triangle, equilateral triangle*; key term: *hypotenuse*).