The Potentiality, Outcomes and Challenges of Some Language Awareness Activities in EMI Junior Secondary Classrooms

透過語文活動，促進初中英語教學的成效、挑戰和潛力

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Warm up first!

The following numbers are related to me. What do you think about them?

3 22 93

Role of a Math teacher when we are teaching Math in an EMI classroom

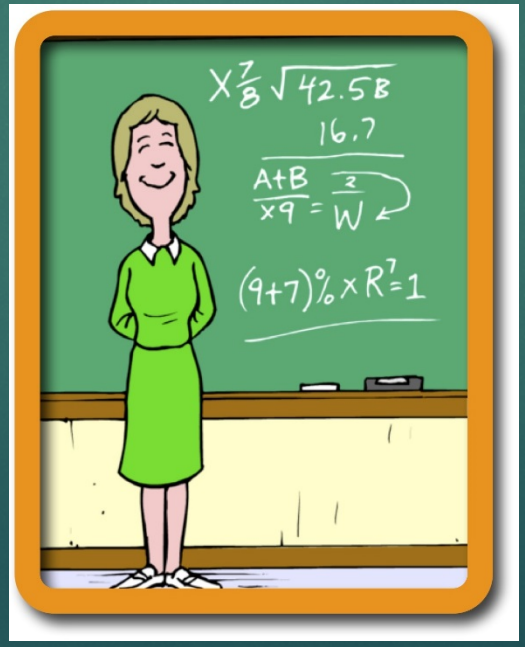
Reflection Questions:

1. As a math teacher, do we only teach math in English or teach English?
2. Is it necessary for us to be an English teacher as well ?
3. Comparing to other subjects at school, is math the least language dependent and therefore the easiest to teach in English?

Implications

As an EMI mathematics teacher, it is suggested that s/he has to be competent in

- the English language;
- the mathematics s/he is teaching;
- the mathematics language and
- the academic language associated with the teaching and learning of mathematics



Challenges:

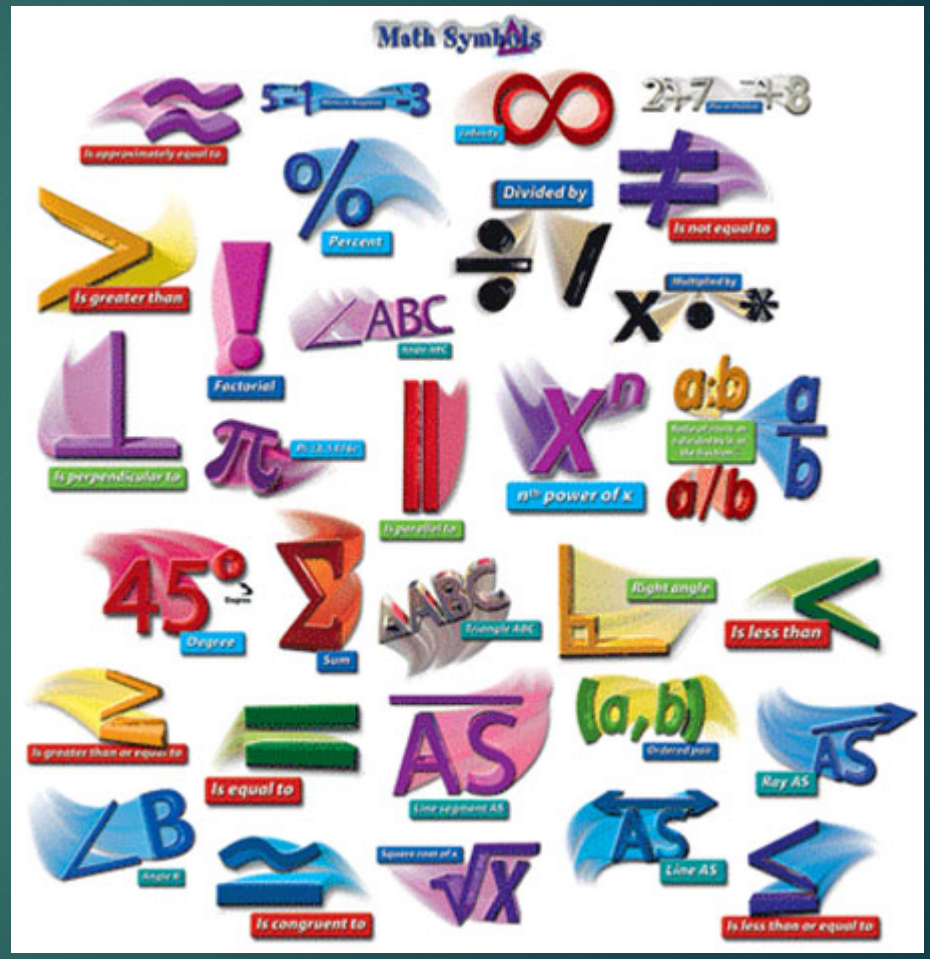
- How to present the meaning of the mathematical terms?
- How to say the mathematical expressions?
- How to let students grasp the meaning of the mathematical concepts?
- How to let students understand the meaning of questions?
- How to encourage students to present their thoughts?
- How to let students write the solutions clearly?

Challenge : Language used

Comparing math textbooks in HK with those in other foreign countries, what do you think about the level/difficulties of English language used in those math textbooks?

Challenge : Symbols

The mathematics language involves a lot of symbols, diagrams and graphs. As a result, the combination of symbols and special language use makes mathematics very abstract to students.



Challenge – Semantics

- Article:

e.g. “Five times a number is three more than six times the number.

- Translation of word problems into mathematical problems

e.g. “The sum of two numbers is 89. If the first number is 5 times the other, find the number.”

Activity 1:

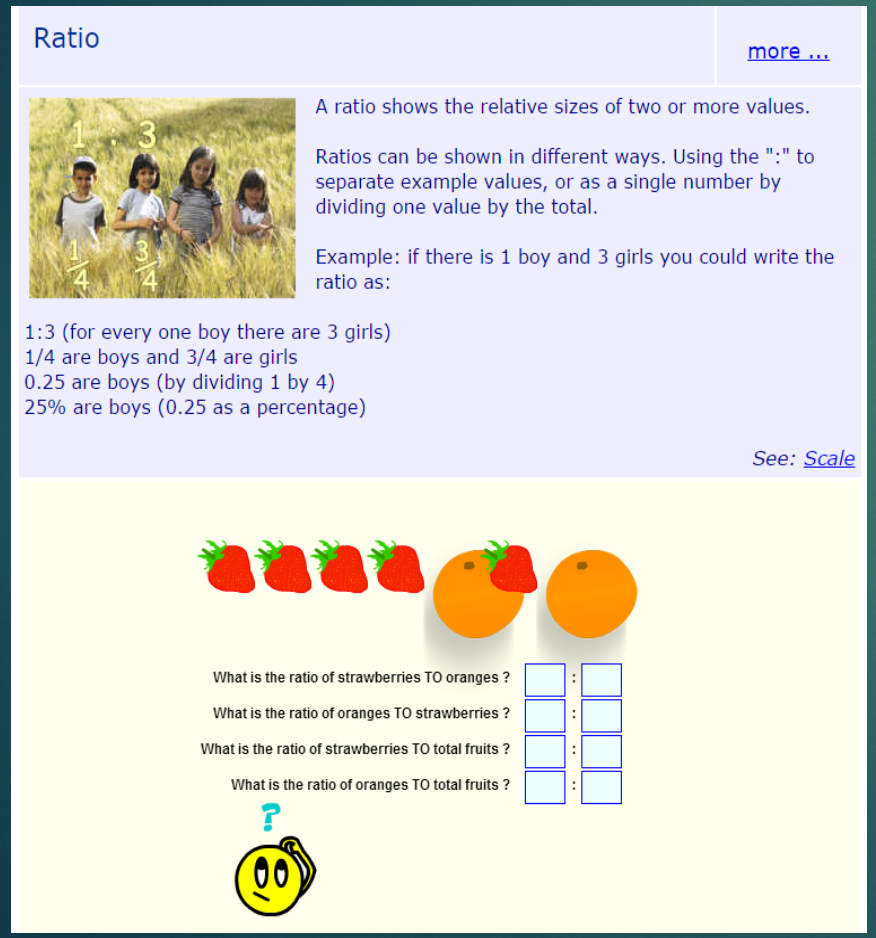
Try to draw a picture/symbol to represent the following mathematical terms

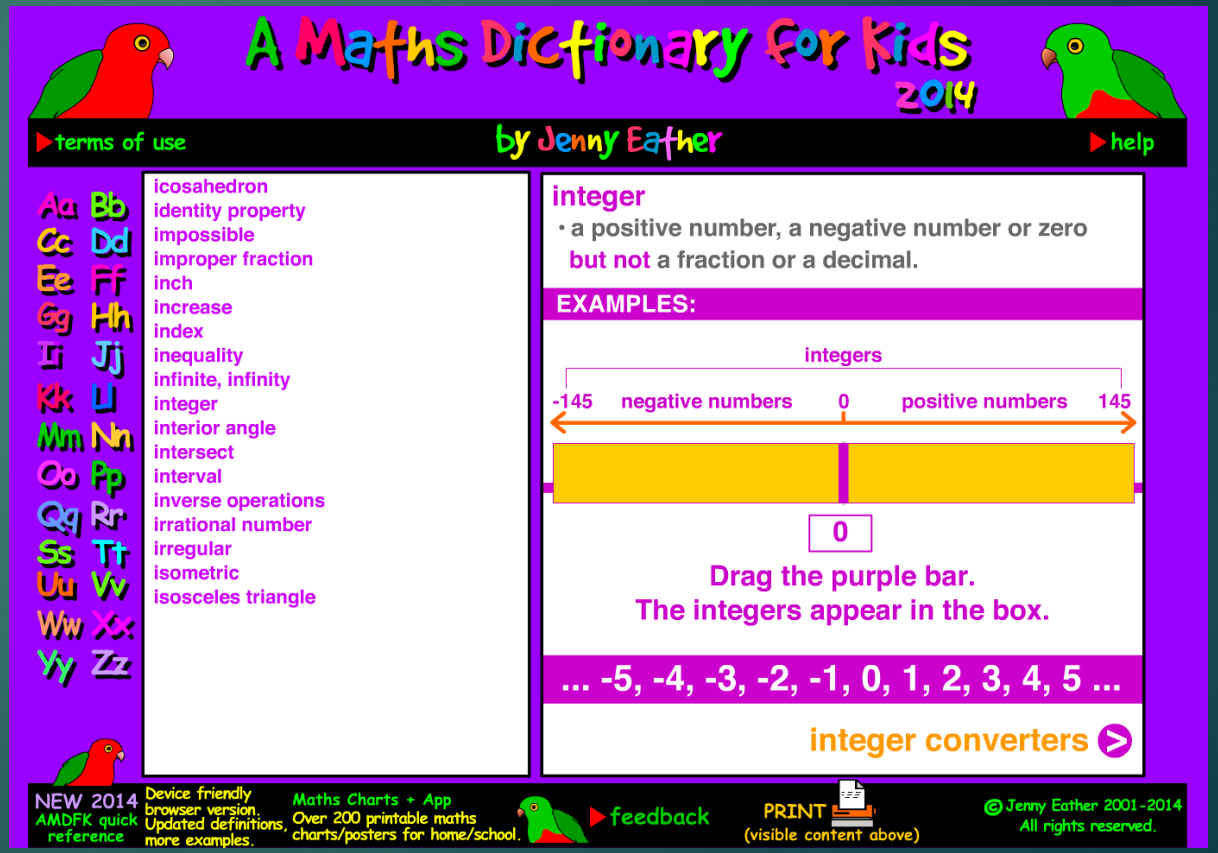
(a) Addition, Subtraction, Multiplication, Division
(b) Geometry, Integers, Approximation, Algebra
(c) Identity, Theorem, Ratio, Principal, Interest Rate

Suggestion for Activity 1:

http://www.mathsisfun.com/definitions/angle.html

http://www.amathsdictionaryforkids.com/

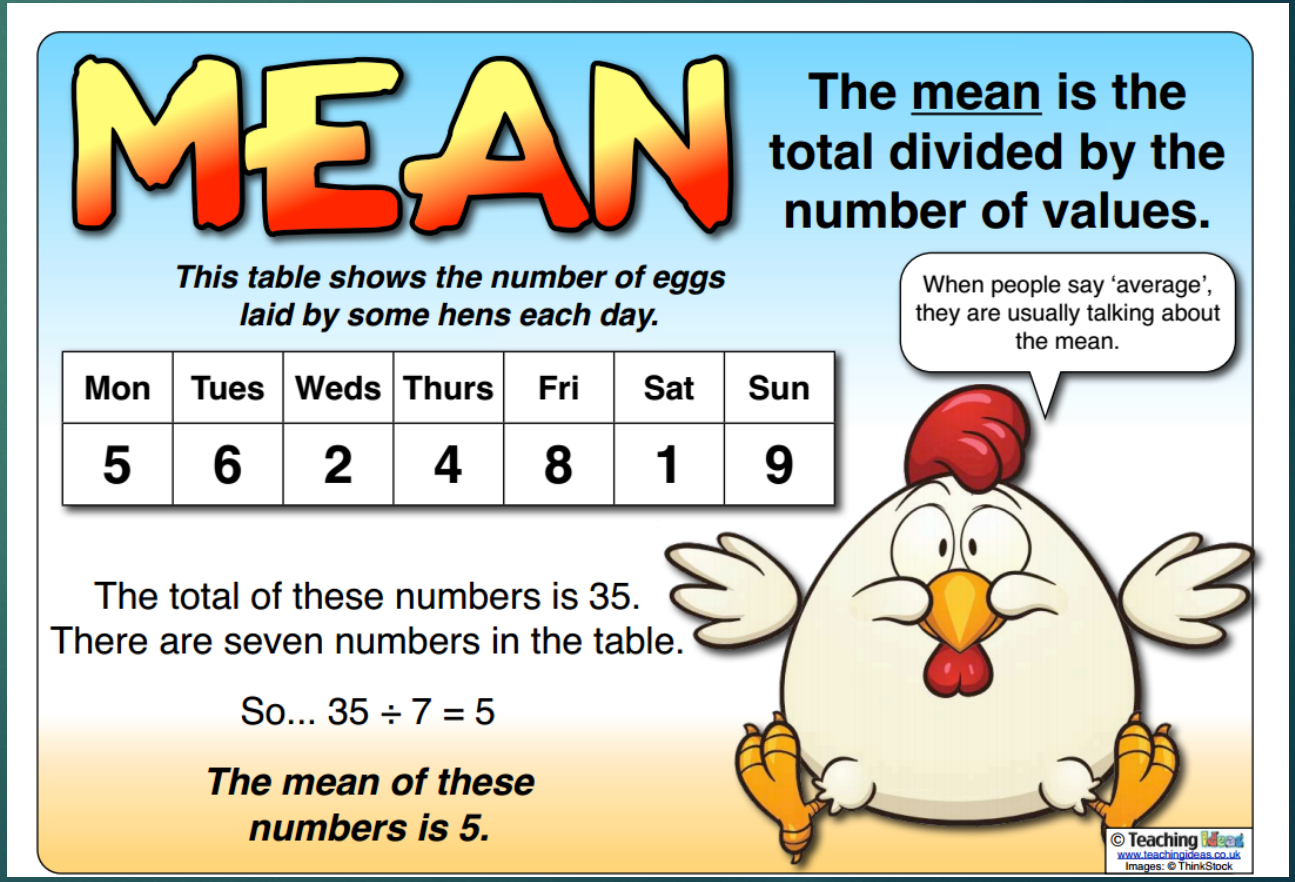




Suggestion for Activity 1:

http://www.teachingideas.co.uk/maths/contents_datahandling.htm?utm_content=bufferc0d24&utm_medium=social&utm_source=facebook.com&utm_campaign=buffer

Place a poster in classroom



Activity 2:

Please read the following algebraic expressions.

1. $\frac{n+6}{2}$

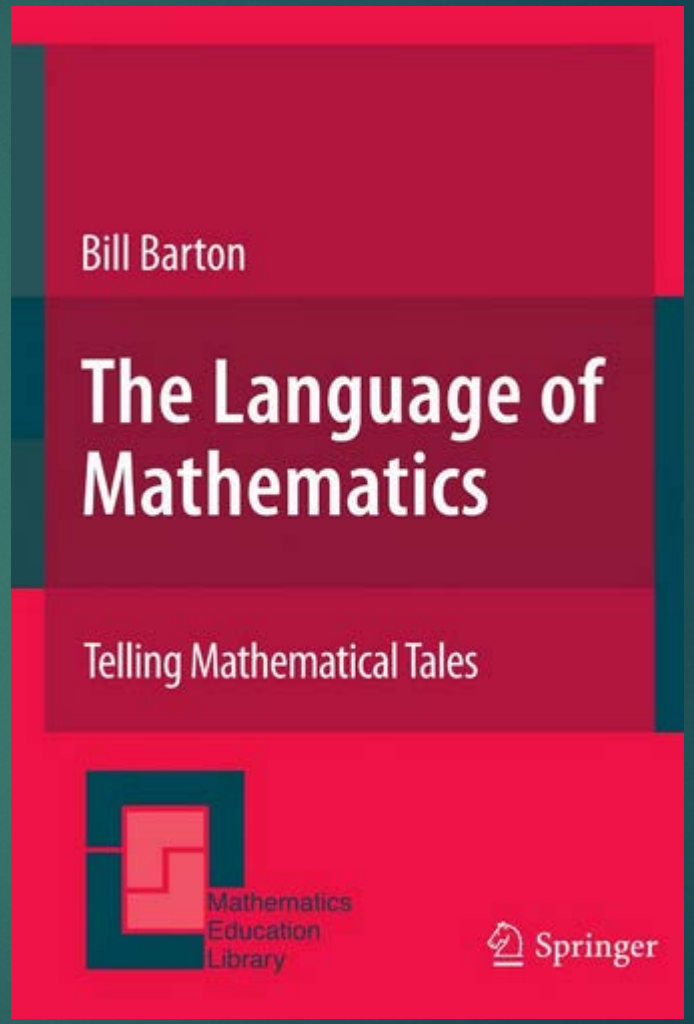
2. $(3n)^2$

3. n^2+12n+36

Challenge:

Barton & Barton (2005):

For Chinese students learning mathematics in English, the biggest problem is not with vocabulary, but with the syntax of English such as preposition, word order and so on.



Prepositions used in EMI math lessons

- at...
- from... to...
- between... and...
- increased to, increased by, multiply by, divided by, divided into....
- ahead of , behind ...

Prefixes and Suffixes

Prefixes

- Examples:
  - tri- triangle, tripod
  - iso- isosceles triangles, isometric drawing
  - poly- polygons, polynomials
  - equi- equilateral, equiangular
  - dia- diameter, diagonal

Prefixes and Suffixes

Suffixes

- Examples:
  - or - divisor, numerator, factor, angle bisector
  - tion - addition, subtraction, multiplication, fraction, equation , factorization

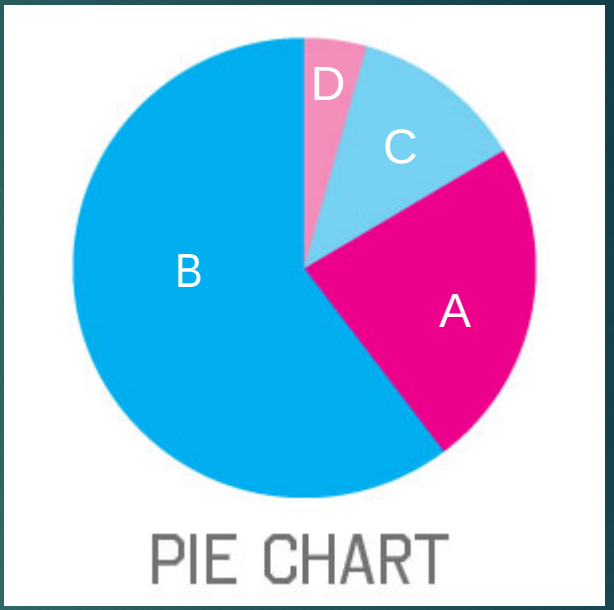
Relationship

- Greater than/Less than
- Amy is as old as Stephen
- Joseph is 5 years older than Tom
- Dick earns 6 times as much as Sam
- By what percent is 15 increased to make 25?

Active and Passive voice

e.g. The pie chart on the right shows the grades obtained by 144 students in a composition.

How about now ?



144 students have obtained different grades in a composition and now pie chart shows their grades.

Phrasal structures

e.g. Johnny's walking speed is 0.8 m/s. If this measured value has a percentage error of 2%, write down one possible actual walking speed satisfying this requirement.

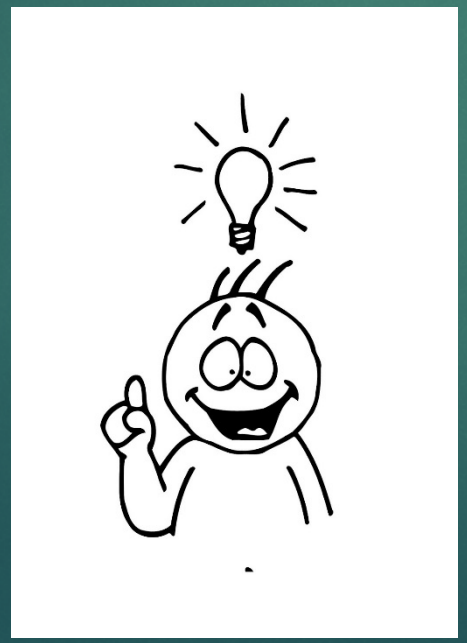
How about now ?

Johnny's walking speed is 0.8 m/s. If this measured value has a percentage error of 2%, write down one possible actual walking speed so that the possible actual walking speed satisfies the percentage error of 2%.

Clausal structures

If an e-mail is sent from Japan at 3 p.m. local time to Germany, what is the local time in Germany when the e-mail is received immediately?

Hope students get the meaning of the question easier?



Suggestions for keeping our language accessible in math lessons

- Simple verbs!
- Simplify difficult words
- Use shorter, simpler sentences
- Avoid embedded clauses
- Paraphrase high performers' answers
- Invite average/low performers to explain
- Avoid/consolidate new/special terms
- Use symbols, visuals and body language
- Give (more) examples
- Pace your speech and pause
- Allow time for students to ask questions
- Let students' voices be heard

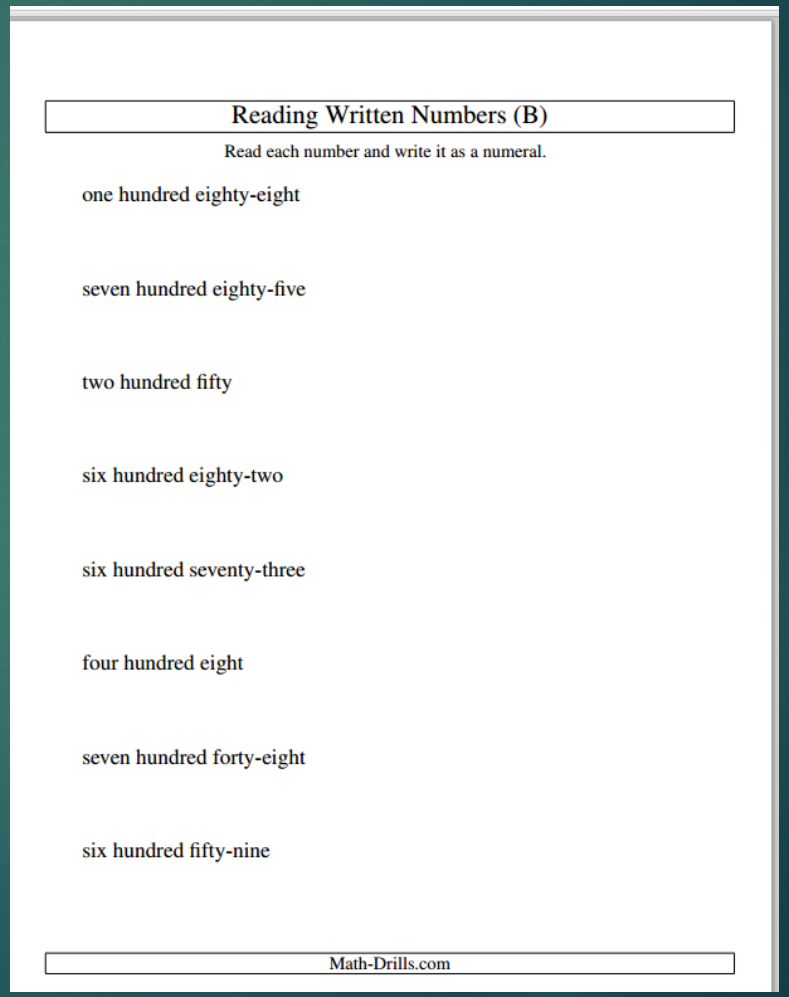
Suggestions for promoting interaction and providing feedback

- Using sentence stems such as “The answer to the question is… This is because… “
- Giving students options such as “Which is correct? A)… or B)…?”
- Narrowing down the responses such as “Do you all agree that the answer is “A”? and Why?
- Inviting elaborations such as “This is an equilateral triangle because it has three _____ angles and three equal _____. “
- Citing examples such as “Can you give us an example to explain why the answer is correct? “

Give students a handout to list out all of the questions that they would always meet in math lessons.

Vocabulary-building Activities

http://www.math-drills.com/



Reading Written Numbers (B)

Read each number and write it as a numeral.

one hundred eighty-eight

seven hundred eighty-five

two hundred fifty

six hundred eighty-two

six hundred seventy-three

four hundred eight

seven hundred forty-eight

six hundred fifty-nine

Math-Drills.com

Vocabulary-building Activities

St. Peter's Secondary School

S.1 Mathematics

Fun learning of Math in English

Name: [redacted]
Class:
Teacher: Mr. Kwan

Mr. Kwan Online 1C Math Classroom: https://edmo.do/j/b9qwjs

Password: [redacted]

Word Problems.

1) Lee has 11 pens. Lee gives his sister 7 pens. How many pens does Lee have left?

Pens Lee has left = 11-7=4 ✓

2) Scot is 4 years old. John is 3 years younger than Scot. How old is John?

John's age = 4-3=1 ✓

3) Paul has 8 pencils. His brother takes away 4 of his pencils. How many pencils does Paul have left?

The Pencils Paul has left = 8-4=4 ✓

4) Jeff has 8 pencils. Paul has 9 pencils. How many pencils do they have altogether?

The Pencils they have altogether: 8+9=17 ✓

5) There are 4 boys and 3 girls in a library. How many kids are there altogether?

The Kids are there altogether: 4+3=7 ✓

6) Tom has 6 books. His brother takes away 4 of his books. How many books does Tom have left?

The Books Tom has left: 6-4=2 ✓

7) Sidd has 7 blocks. He buys 9 more blocks. How many blocks does he have in all?

The Blocks Sidd have in all = 7+9=16 ✓

8) Paul has 9 cups. Paul gives his sister 2 cups. How many cups does Paul have left?

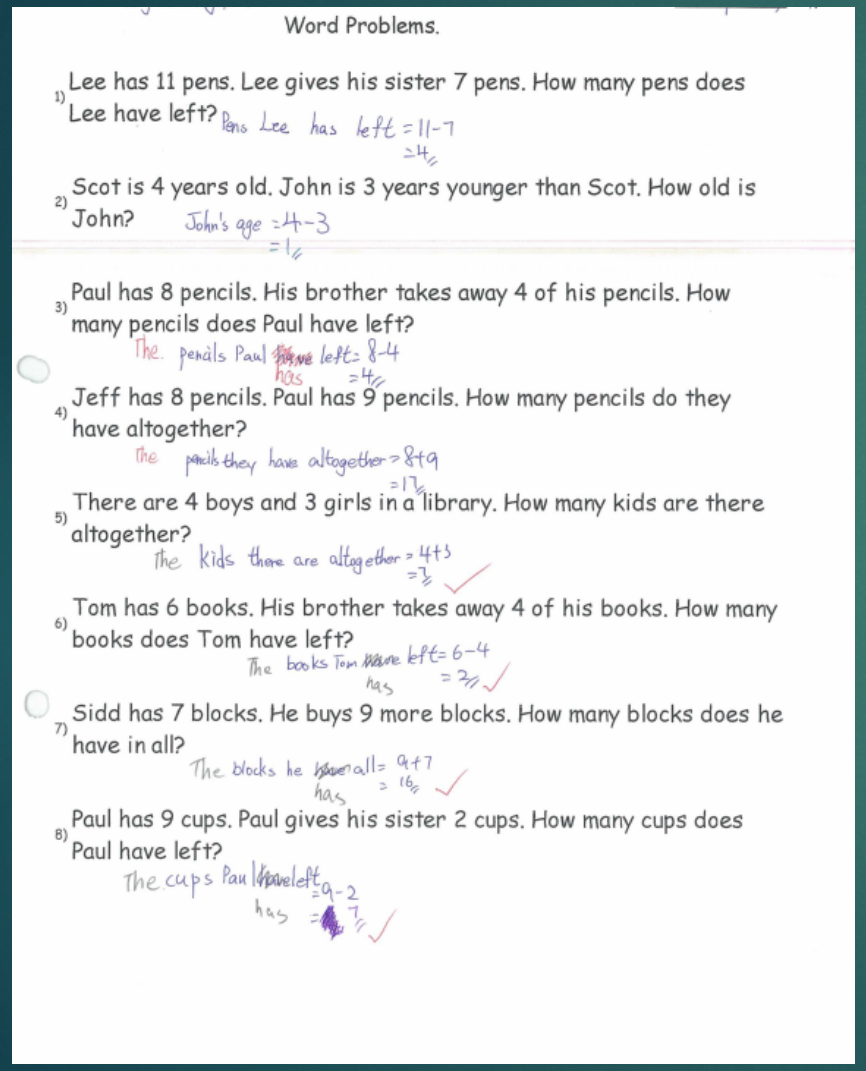
The Cups Paul have left = 9-2=7 ✓

Name: Fung Hau Tung 1C (11) Date: 5th sept, 14

Translate each statement to mathematical terms.

1) 12 times a number, x, decreased by 6 — 12x-6
2) 10 less than 10 times a number, x — 10-10x ✓
3) One third as many books, x — $\frac{1}{3}x$ ✓
4) Earns $13 per hour for x hours — $13x ✓
5) 9 more than the product of 2 and a number, m — 9+2m
6) Earns $8 per hour for x hours — $8x ✓
7) A number, x, divided by 9, increased by 4 — $\frac{x}{9}+4$ ✓
8) Sarah's age, x, decreased by 2 — x-2 ✓
9) Two third as many books, x — $\frac{2}{3}x$ ✓
10) Thrice a number, x, increased by 3 — x-3 + 3a+3
11) 2 less than 7 times a number, x — 2-7x ✓
12) 5 times a number, x, decreased by 3 — 5x-3 ✓
13) 9 less than the product of 15 and a number, x — 9-15x ✓
14) 2 less than the product of 6 and a number, x — 2-6x ✓
15) 6 more than the product of 6 and a number, x — 6+6x ✓
16) Sarah's age, y, decreased by 4 — y-4 ✓
17) Earns $6 per hour for b hours — $6b ✓
18) 3 more than the product of 4 and a number, x — 3+4x ✓
19) The number of students, y, in 7 classes — 7y ✓
20) 6 less than 7 times a number, c — 6-7c ✓

Vocabulary-building Activities



Word Problems.

1) Lee has 11 pens. Lee gives his sister 7 pens. How many pens does Lee have left?
Pens Lee has left = 11 − 7 = 4

2) Scot is 4 years old. John is 3 years younger than Scot. How old is John?
John's age = 4 − 3 = 1

3) Paul has 8 pencils. His brother takes away 4 of his pencils. How many pencils does Paul have left?
The pencils Paul has left = 8 − 4 = 4

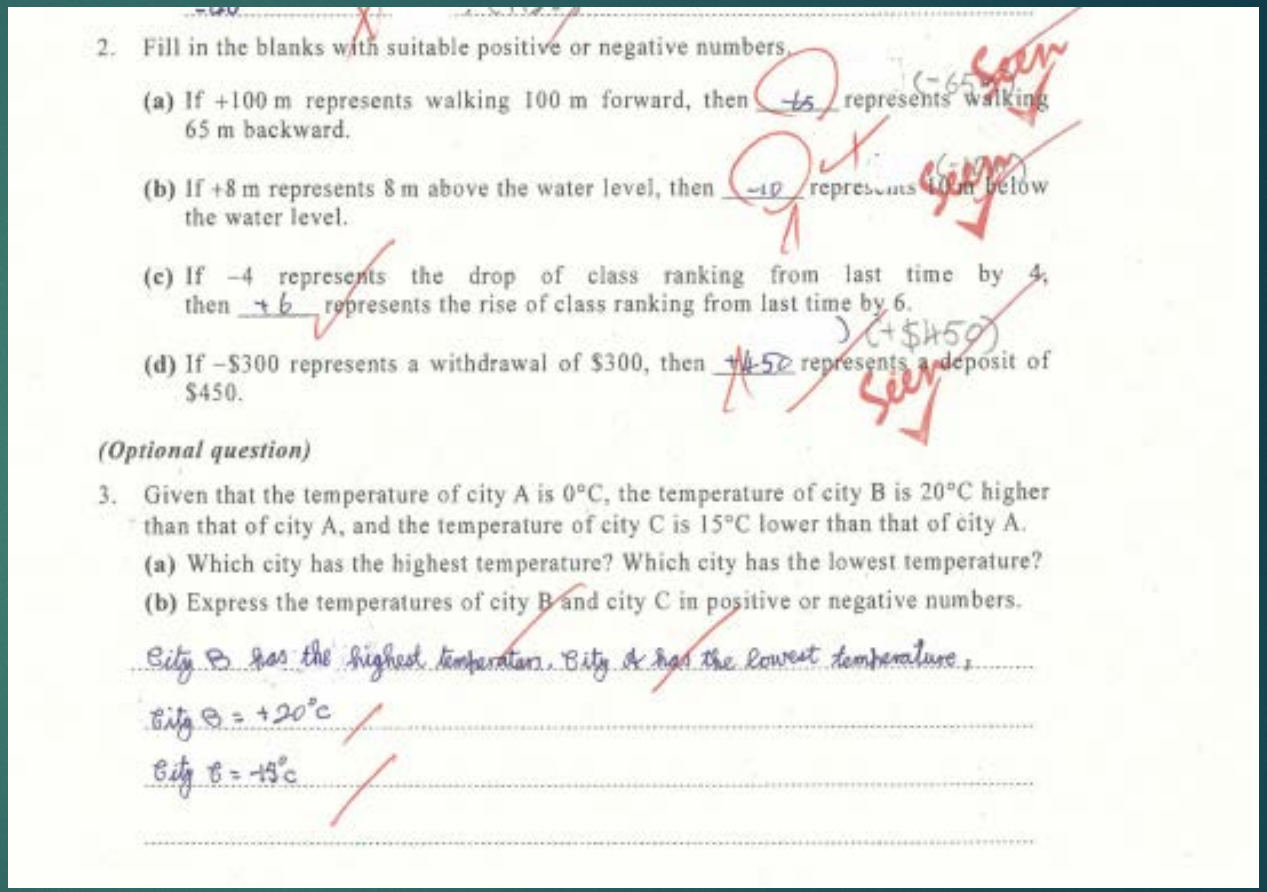
4) Jeff has 8 pencils. Paul has 9 pencils. How many pencils do they have altogether?
The pencils they have altogether = 8 + 9 = 17

5) There are 4 boys and 3 girls in a library. How many kids are there altogether?
The kids there are altogether = 4 + 3 = 7

6) Tom has 6 books. His brother takes away 4 of his books. How many books does Tom have left?
The books Tom has left = 6 − 4 = 2

7) Sidd has 7 blocks. He buys 9 more blocks. How many blocks does he have in all?
The blocks he has all = 9 + 7 = 16

8) Paul has 9 cups. Paul gives his sister 2 cups. How many cups does Paul have left?
The cups Paul has left = 9 − 2 = 7



2. Fill in the blanks with suitable positive or negative numbers.

(a) If +100 m represents walking 100 m forward, then −65 represents walking 65 m backward.

(b) If +8 m represents 8 m above the water level, then −10 represents 10 m below the water level.

(c) If −4 represents the drop of class ranking from last time by 4, then +6 represents the rise of class ranking from last time by 6.

(d) If −$300 represents a withdrawal of $300, then +$450 represents a deposit of $450.

(Optional question)

3. Given that the temperature of city A is 0°C, the temperature of city B is 20°C higher than that of city A, and the temperature of city C is 15°C lower than that of city A.

(a) Which city has the highest temperature? Which city has the lowest temperature?

(b) Express the temperatures of city B and city C in positive or negative numbers.

City B has the highest temperature. City A has the lowest temperature.

City B = +20°C

City C = −15°C

How to interpret a question easier?

65 m backward.

(b) If +8 m represents 8 m above the water level, then -10m represents 10 m below the water level.

(c) If −4 represents the drop of class ranking from last time by 4, then +6 represents the rise of class ranking from last time by 6.

(d) If −$300 represents a withdrawal of $300, then +$450 represents a deposit of $450.

Great for you to underline the key words

(Optional question)

3. Given that the temperature of city A is 0°C, the temperature of city B is 20°C higher than that of city A, and the temperature of city C is 15°C lower than that of city A.

(a) Which city has the highest temperature? Which city has the lowest temperature?

Solution

(a) According to the graph, the sales volume of coffee increased steadily from January to March, but started decreasing after March. As for green tea, its sales volume increased steadily throughout the first half of the year and even exceeded that of coffee from May onwards.

(b) According to the graph, it is predicted that the sales volume of coffee will keep decreasing while the sales volume of green tea will keep increasing in the second half of the year.

Table 6.3

Use the horizontal axis to represent the time and the vertical axis to represent the number of vehicles, mark on a graph paper the number of vehicles parked in the carpark at different times yesterday. A broken-line graph can then be obtained by joining the points as follows.

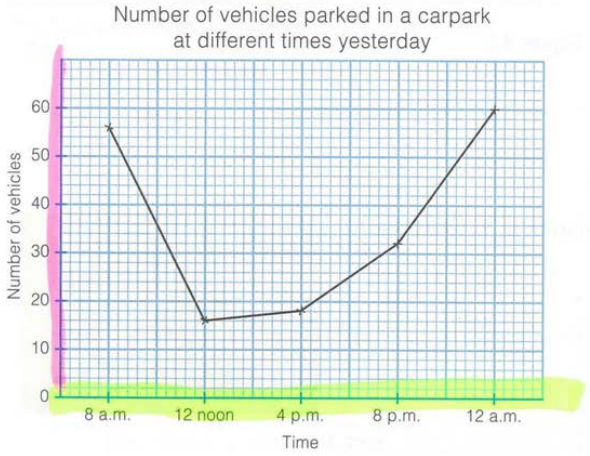


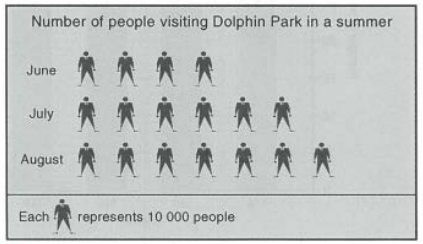
Figure 6.4

I.T. [Refer to page 6.51]

From the above broken-line graph, we can clearly see the changes in the

How to write answers correctly in English by students?

1. The following pictogram shows the number of people visiting Dolphin Park in a summer.



There were

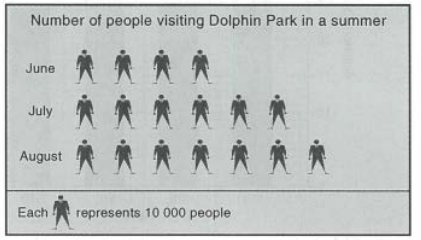
(a) In which month were there the fewest people visiting the park?

In June were there the fewest people visting the park.

(b) How many people visited the park in July?

60000 = 6 × 10000 people visited the park in July.

1. The following pictogram shows the number of people visiting Dolphin Park in a summer.



There

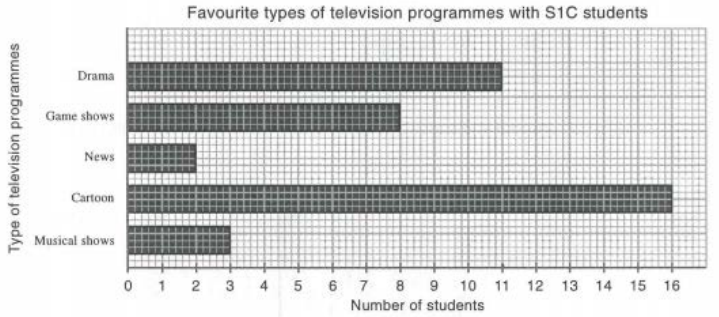
(a) In which month were there the fewest people visiting the park?

June were fewest people visiting the park. In June.

(b) How many people visited the park in July?

60000 ? visited the park in July.

2. The following bar chart shows the favourite types of television programmes with S1C students.



(a) Which type of television programmes do S1C students like the most?

S1C students like Cartoon the most.

(b) How many S1C students like drama the most?

11 students in S1C like drama the most.

There are

(c) How many students are there in S1C?

The students are there in S1C.:

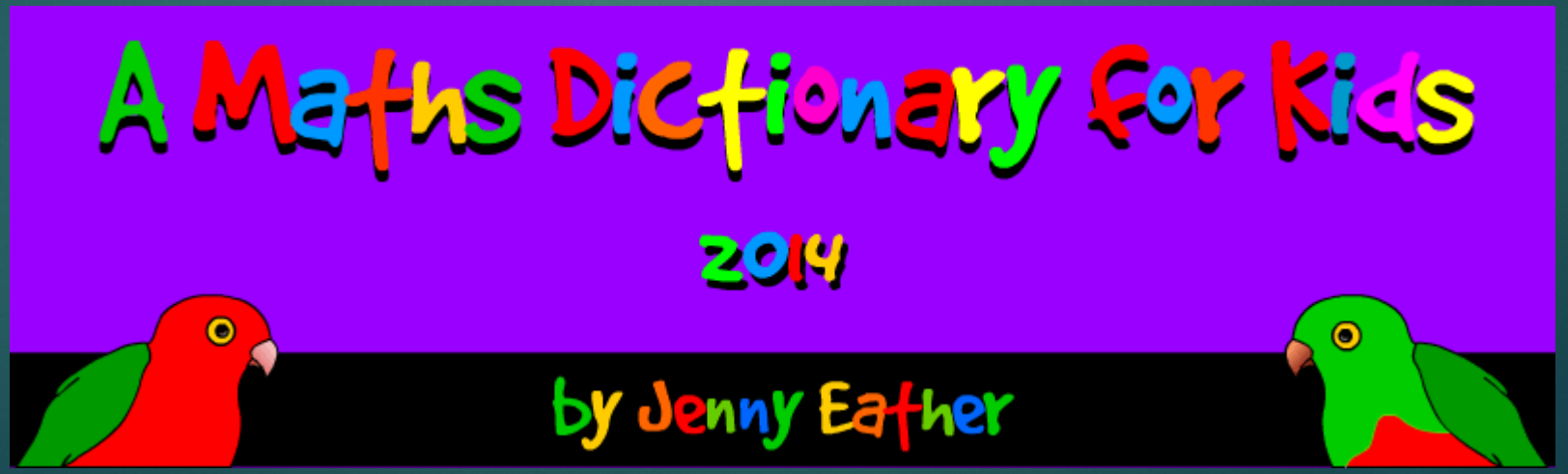
11+8+2+16+3=40 (students)

Instructional Strategies

- Post symbols with written definitions and examples to clarify the meaning
- Present more examples for teaching some abstract concepts
- Suggest students keep a personal notebook that includes the key words for each lesson
- Guide students to read the texts such as examples, questions and answers

Instructional Strategies (Visual)

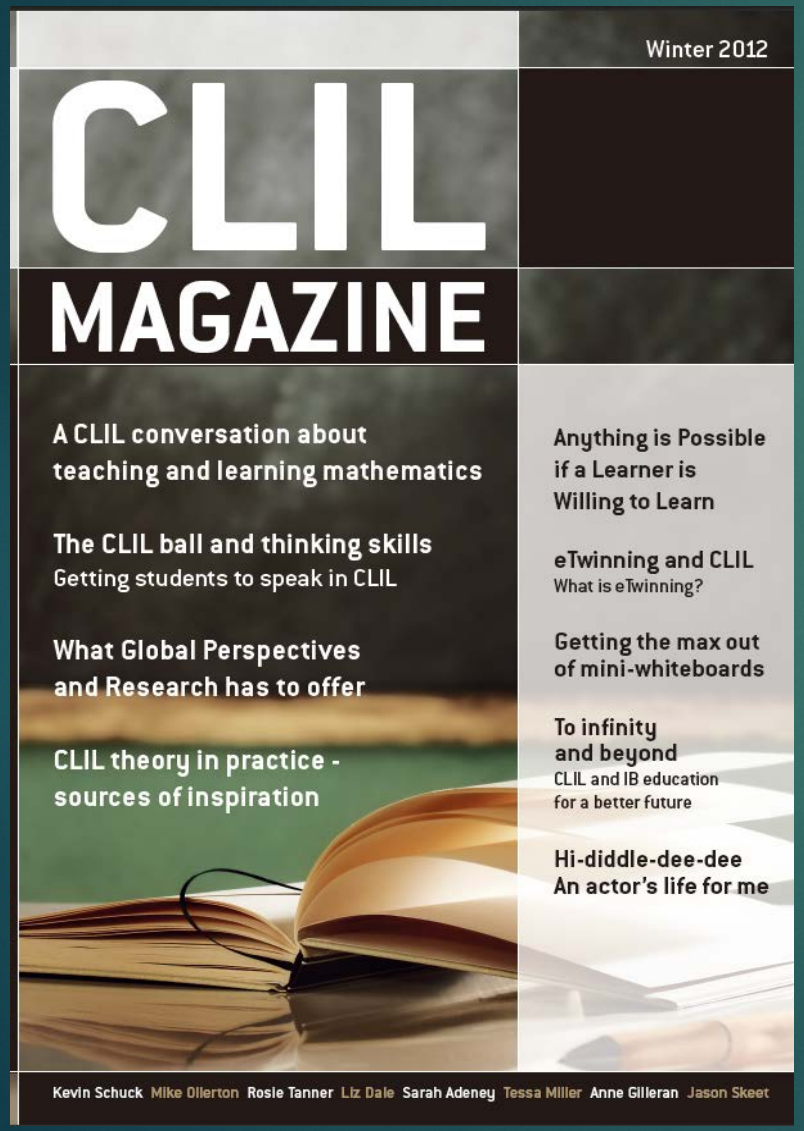
- Write key words on the blackboard while discussing them
- Use verbal, written or pictorial representation of the same word if necessary
- Distinguish the different meanings of the same words in daily life and math contexts such as create a table….
- Provide full language support to students in math lessons such as posters, dictionaries, charts and so on

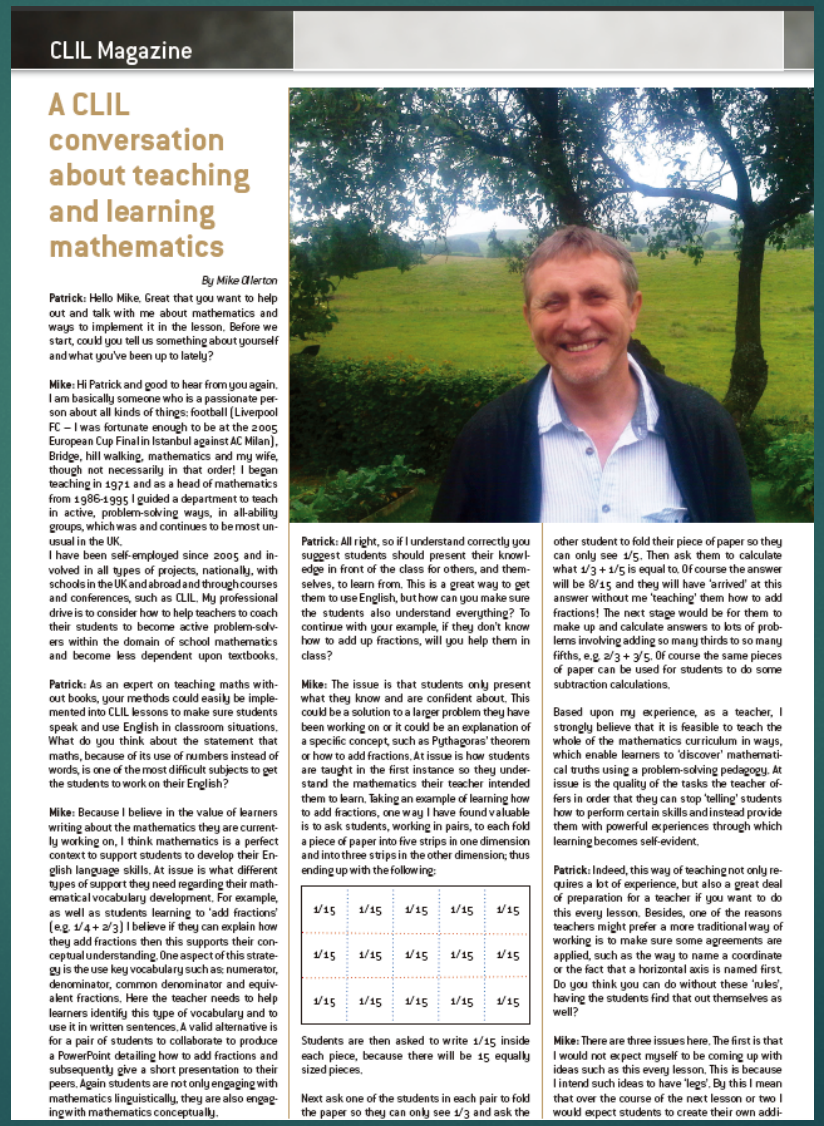


Instructional Strategies (Oral)

- Simplify the sentence structures and provide clear and direct instructions
- Use less jargons or figurative language to explain the meaning
- Provide opportunities for students to practise speaking mathematics vocabulary
- Provide more verbal discussion of mathematics between teachers & students and among students in English
- Before asking the students to explain/present some difficult ideas, allow them to discuss in small groups first

Online Resources





CLIL Magazine

A CLIL conversation about teaching and learning mathematics

By Mike Ollerton

Patrick: Hello Mike. Great that you want to help out and talk with me about mathematics and ways to implement it in the lesson. Before we start, could you tell us something about yourself and what you've been up to lately?

Mike: Hi Patrick and good to hear from you again. I am basically someone who is a passionate person about all kinds of things: football (Liverpool FC – I was fortunate enough to be at the 2005 European Cup Final in Istanbul against AC Milan), Bridge, hill walking, mathematics and my wife, though not necessarily in that order! I began teaching in 1971 and as a head of mathematics from 1986-1995 I guided a department to teach in active, problem-solving ways, in all-ability groups, which was and continues to be most unusual in the UK.
I have been self-employed since 2005 and involved in all types of projects, nationally, with schools in the UK and abroad and through courses and conferences, such as CLIL. My professional drive is to consider how to help teachers to coach their students to become active problem-solvers within the domain of school mathematics and become less dependent upon textbooks.

Patrick: As an expert on teaching maths without books, your methods could easily be implemented into CLIL lessons to make sure students speak and use English in classroom situations. What do you think about the statement that maths, because of its use of numbers instead of words, is one of the most difficult subjects to get the students to work on their English?

Mike: Because I believe in the value of learners writing about the mathematics they are currently working on, I think mathematics is a perfect context to support students to develop their English language skills. At issue is what different types of support they need regarding their mathematical vocabulary development. For example, as well as students learning to 'add fractions' (e.g. 1/4 + 2/3) I believe if they can explain how they add fractions then this supports their conceptual understanding. One aspect of this strategy is the use key vocabulary such as: numerator, denominator, common denominator and equivalent fractions. Here the teacher needs to help learners identify this type of vocabulary and to use it in written sentences. A valid alternative is for a pair of students to collaborate to produce a PowerPoint detailing how to add fractions and subsequently give a short presentation to their peers. Again students are not only engaging with mathematics linguistically, they are also engaging with mathematics conceptually.

Patrick: All right, so if I understand correctly you suggest students should present their knowledge in front of the class for others, and themselves, to learn from. This is a great way to get them to use English, but how can you make sure the students also understand everything? To continue with your example, if they don't know how to add up fractions, will you help them in class?

Mike: The issue is that students only present what they know and are confident about. This could be a solution to a larger problem they have been working on or it could be an explanation of a specific concept, such as Pythagoras' theorem or how to add fractions. At issue is how students are taught in the first instance so they understand the mathematics their teacher intended them to learn. Taking an example of learning how to add fractions, one way I have found valuable is to ask students, working in pairs, to each fold a piece of paper into five strips in one dimension and into three strips in the other dimension; thus ending up with the following:

1/15	1/15	1/15	1/15	1/15
1/15	1/15	1/15	1/15	1/15
1/15	1/15	1/15	1/15	1/15

Students are then asked to write 1/15 inside each piece, because there will be 15 equally sized pieces.

Next ask one of the students in each pair to fold the paper so they can only see 1/3 and ask the other student to fold their piece of paper so they can only see 1/5. Then ask them to calculate what 1/3 + 1/5 is equal to. Of course the answer will be 8/15 and they will have 'arrived' at this answer without me 'teaching' them how to add fractions! The next stage would be for them to make up and calculate answers to lots of problems involving adding so many thirds to so many fifths, e.g. 2/3 + 3/5. Of course the same pieces of paper can be used for students to do some subtraction calculations.

Based upon my experience, as a teacher, I strongly believe that it is feasible to teach the whole of the mathematics curriculum in ways, which enable learners to 'discover' mathematical truths using a problem-solving pedagogy. At issue is the quality of the tasks the teacher offers in order that they can stop 'telling' students how to perform certain skills and instead provide them with powerful experiences through which learning becomes self-evident.

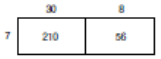
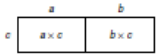
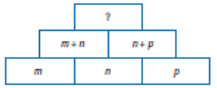
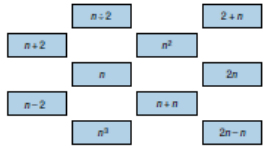
Patrick: Indeed, this way of teaching not only requires a lot of experience, but also a great deal of preparation for a teacher if you want to do this every lesson. Besides, one of the reasons teachers might prefer a more traditional way of working is to make sure some agreements are applied, such as the way to name a coordinate or the fact that a horizontal axis is named first. Do you think you can do without these 'rules', having the students find that out themselves as well?

Mike: There are three issues here. The first is that I would not expect myself to be coming up with ideas such as this every lesson. This is because I intend such ideas to have 'legs'. By this I mean that over the course of the next lesson or two I would expect students to create their own addi-

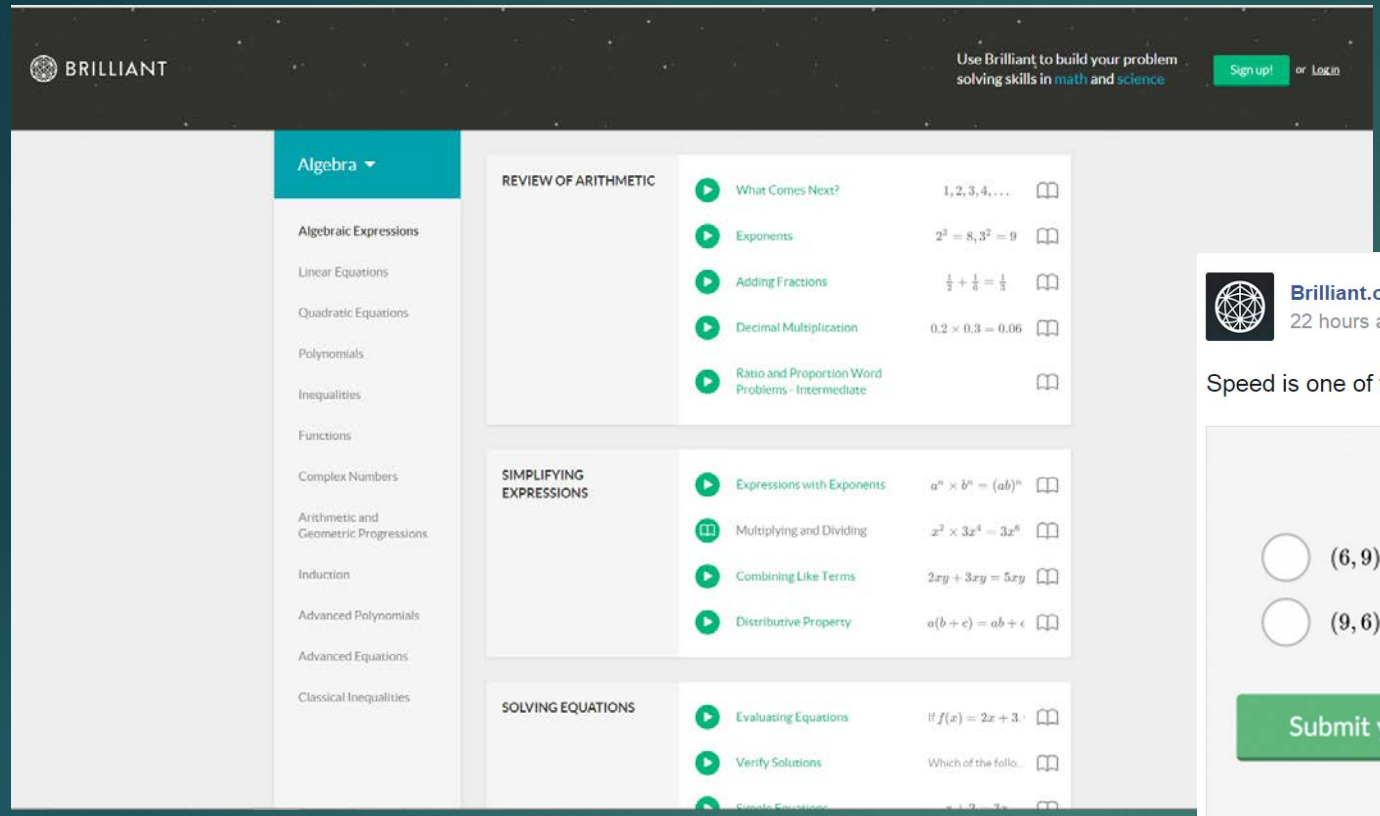
ALGEBRA — **Equations, formulae, expressions and identities**

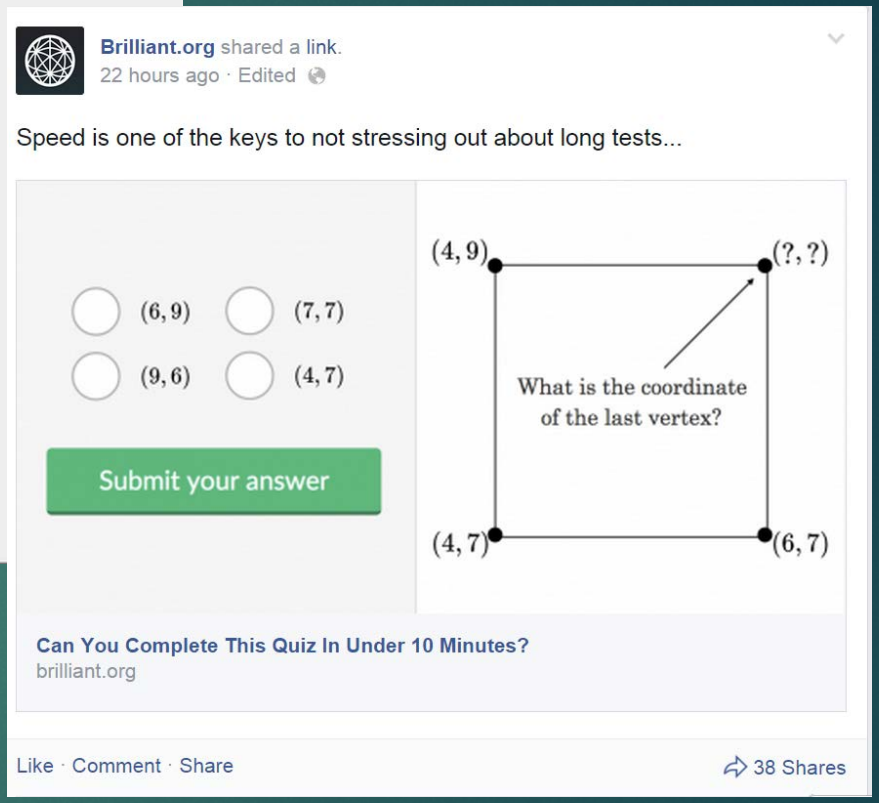
Pupils should learn to:	As outcomes, Year 7 pupils should, for example:
Use letter symbols and distinguish their different roles in algebra	Use, read and write, spelling correctly: *algebra, unknown, symbol, variable… equals… brackets… evaluate, simplify, substitute, solve… term, expression, equation… squared… commutative…* Reinforce the idea of an **unknown**. Answer questions such as: • $5 + \square = 17$ • $3 \times \square - 5 = 7$ • $\blacktriangledown + \blacklozenge = 4$. What numbers could $\blacktriangledown$ and $\blacklozenge$ be? • The product of two numbers is 24. What could they be? **Know that letters are used to stand for numbers** in algebra. Begin to distinguish between different uses of letters. For example: • In the equation $3n + 2 = 11$, n is a particular unknown number, but in the equation $a + b = 12$, a and b can take many different values. **Recognise algebraic conventions**, such as: • $3 \times n$ or $n \times 3$ can be thought of as '3 lots of n', or $n + n + n$, and can be shortened to $3n$. • In the expression $3n$, n can take any value, but when the value of an expression is known, an equation is formed, i.e. if $3n$ is 18, the equation is written as $3n = 18$. Understand the meaning of and begin to **use simple expressions with brackets**, e.g. $3(n + 2)$ meaning $3 \times (n + 2)$, where the addition operation is to be performed first and the result of this is then multiplied by 3. **Use the equals sign** appropriately and correctly. • Recognise that if $a = b$ then $b = a$, and that $a + b = c$ can also be written as $c = a + b$. • Avoid errors arising from misuse of the sign when setting out the steps in a calculation, e.g. incorrectly writing $38 + 29 = 38 + 30 = 68 - 1 = 67$ **Use letter symbols** to write expressions in meaningful contexts. For example: add 7 to a number — $n + 7$ subtract 4 from a number — $n - 4$ 4 minus a number — $4 - n$ a number multiplied by 2 and then 5 added — $(n \times 2) + 5$ or $2n + 5$ a number divided by 2 — $n \div 2$ or $n/2$ a number plus 7 and then multiplied by 10 — $(n + 7) \times 10$ or $10(n + 7)$ a number multiplied by itself — $n \times n$ or n^2 Understand the difference between expressions such as: $2n$ and $n + 2$ — $3(c + 5)$ and $3c + 5$ n^2 and $2n$ — $2n^2$ and $(2n)^2$ **Link to formulating expressions and formulae (pages 122–5).**

ALGEBRA — **Equations, formulae, expressions and identities**

Pupils should learn to:	As outcomes, Year 7 pupils should, for example:
Simplify or transform algebraic expressions	**Simplify linear expressions by collecting like terms; begin to multiply a single term over a bracket.** Understand that partitioning a number helps to break a multiplication into a series of steps. For example: • By partitioning 38, 38×7 becomes $(30 + 8) \times 7 = 30 \times 7 + 8 \times 7$  Generalise, from this and similar examples, to: $(a + b) \times c = (a \times c) + (b \times c)$ or $ac + bc$  **Link to written methods for multiplication (pages 104–5).** Recognise that letters stand for numbers in problems. For example: • Simplify expressions such as: a. $a + a + a = 3a$ b. $b + 2b + b = 4b$ c. $x + 6 + 2x = 3x + 6$ d. $3n + 2n = 5n$ e. $3(n + 2) = 3n + 6$ and $a/a = 1$, $2a/a = 2$, … and $4a/2 = 2a$, $6a/2 = 3a$, etc. • The number in each cell is the result of adding the numbers in the two cells beneath it.  Write an expression for the number in the top cell. Write your expression as simply as possible. • Here are some algebra cards.  a. Which card will always give the same answer as $n/2$? b. Which card will always give the same answer as $n \times n$? c. Two cards will always give the same answer as $2 \times n$. Which cards are they? d. When the expressions on three of the cards are added together they will always have the same answer as $5n$. Which cards are they? e. Write a new card that will always give the same answer as $3n + 2n$. • Draw some shapes that have a perimeter of $6x + 12$. • The answer is $2a + 5b$. What was the question?

https://brilliant.org/math/algebra/algebraic-expressions/





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