This week, I will address the third most popular request on our survey:

Mathematics

At JIS, will your child learn to add, subtract, divide, multiply, solve equations, tackle algebra, measure accurately, know how to tell the time and all those important mathematical skills they need for everyday life and for higher education?

Absolutely yes!

Our curriculum has been cross-referenced with the IB and National Curriculums from the UK, Australia and the US.

But, in addition, we also expect the students to:

- Understand what they are doing
- Apply their mathematical skills to authentic situations
- Develop a love of mathematics

This does not happen through rote-learning; it happens through a mixture of experiences designed to help students understand mathematics conceptually; problem solving challenges which require students use different strategies and stretch their thinking. Number sense is developed through activities that are fun and engaging: happy brains learn, bored brains switch off, scared brains are pretty much incapable of learning.

It is quite obvious when a child has learned mathematics by rote learning and by learning a set of strategies in a passive way (see my article on critical thinking a few weeks ago). This is an example which I have seen many times: you ask a child a series of facts: 3x4, 8x7, 2x8 etc. The answers come fast and accurate and you may think that this child has a good level of mathematics. Then you ask 18 x 9. A child who has not developed their understanding may say: "I haven't learned that one yet." (I have heard that exact phrase from students arriving at JIS). Or they will ask for pen and paper so that they can do the algorithm. A child who has got a conceptual understanding of how multiplication works may say. "Well, I don't know that fact but I can figure it out. I can split 18 into 9 and 9, so I'll do 9 X 9 which is 81 and then double it." Or…I know that 18 X 10 is 180, so 18 X 9 will be 18 less than 180. I'll take away 10, then I'll take away 8. Understanding has enabled them to manipulate numbers and extend their learning.

I like to think about developing mathematics, like baking a cake and icing it. If you ice the cake before it is baked, you will end up with a big gooey mess. If you push for speed before a child has understanding, it all falls apart later in their education.

This is backed up by countless reputable studies. I will put some links to some at the end of this article. In the meantime, here are a few snapshots of classroom practice which support understanding, application and a love of mathematics.

P3s read the book "The Little Centipede". Straight away the student are interested. An open-ended problem is presented:
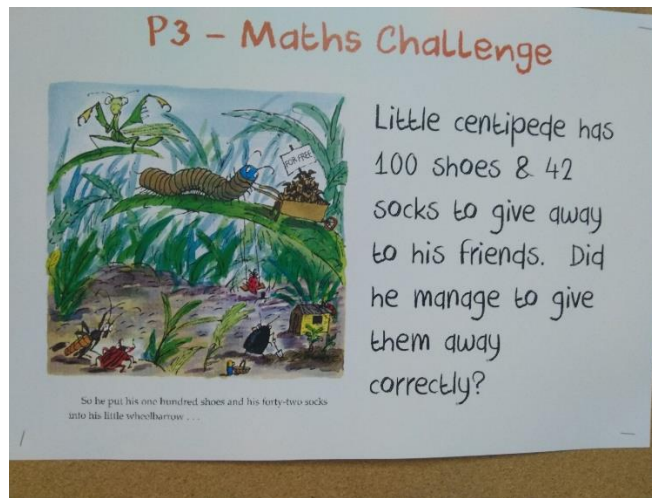

Students solve the problem in multiple ways. Some use algorithms, some use pictures and diagrams. No strategy is superior to another. Students compare and learn from each other's strategies.
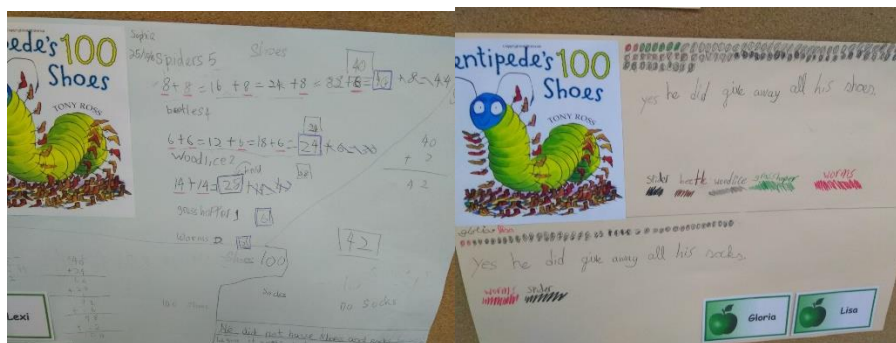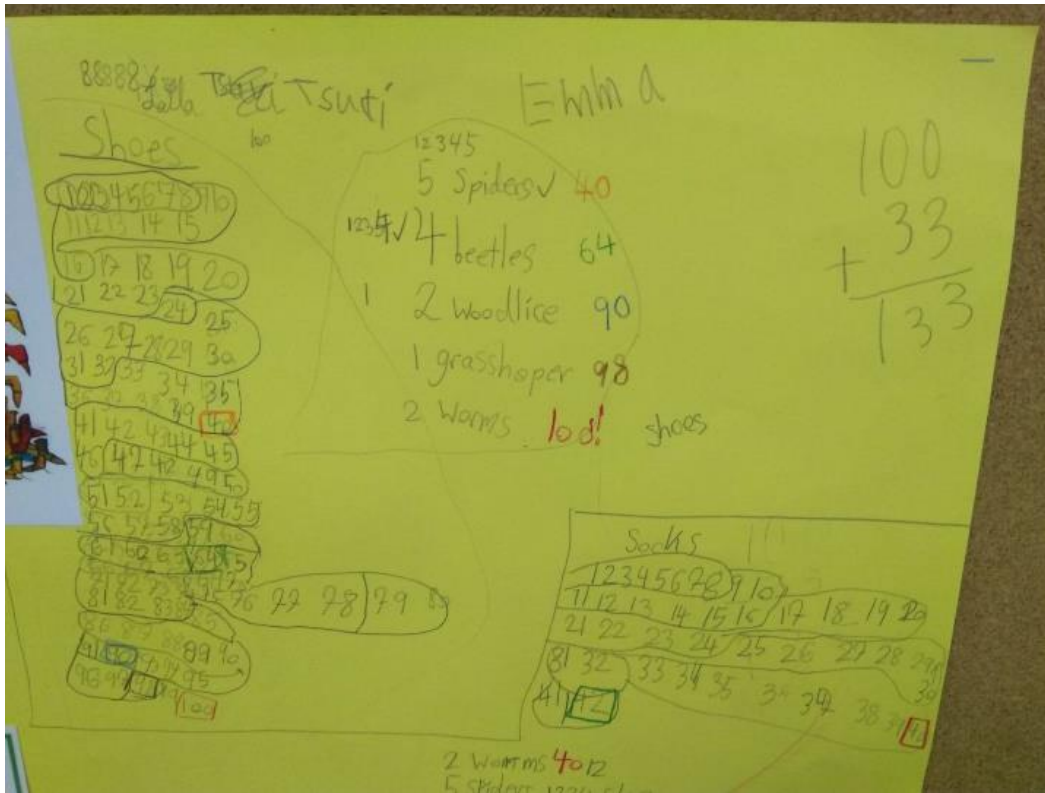
P5 are exploring angles. They work together to produce shapes with set criteria – ie. a shape with one right angle, 1 acute and 1 obtuse angle. They then go on an angle hunt around the school. Because of the hands- on nature of these tasks, rich discussion ensues. Some children notice that the clock hands make different angles as they go around - is there a pattern to these? Another child wonders whether all right-angled triangles also need to have 2 acute angles. This is set as an optional challenge. A student comes up to me in the playground the next morning. Not only has she figured out the challenge but has thought deeply enough to provide me with an explanation about why this must always be true. Mr. C is a big fan of the 'convince me' game which means his students are used to explaining their thinking and proving that they are right!
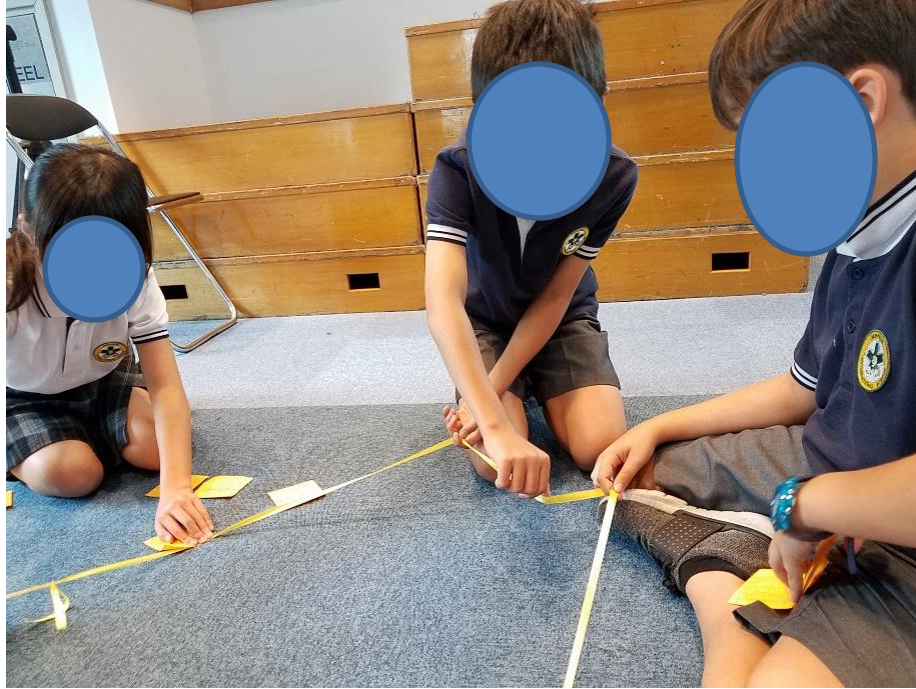
How can we support the development of number sense?

Students still need to practice mathematics regularly. How we practice can result in 'happy learning brain' or 'scared/ bored switched off brain'. Last year, as a staff we compiled a list of fun games which develop number sense that can be played at home with little or no preparation. You should have received this as a handout during Meet the Teacher Night. If you did not, please let me know and I'll send you a copy.

Learning and teaching of mathematics is a huge subject and it is hard to summarize it in a short newsletter. If you have any specific questions, please do email me and I'll do my best to answer. Or you may want to have a look at some of the links below for further reading:

Research led by Dr. Jo Boaler, Professor of Mathematics, Stanford University (there is a great paper called "Fluency without Fear" on this site): https://www.youcubed.org/evidence/

Research from Dr. Constance Kami, professor of Early Childhood Education: https://sites.google.com/site/constancekamii/articles-available-for-printing

Dr, Raj Shah. A free guide for parents on how to help children with their mathematics: https://medium.com/inspired-ideas-prek-12/math-growth-at-home-helping-parents-to-support-students-8bca8ecf7ab1