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Subject: Mathematics News From Jim Hogan Feb 23
Date: 27 January 2023 at 2:11 PM
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Available from NZCER is Pip Arnold's book released SEP 2022. Understanding progressions in NZC and TM 0 A. More below.

Jim Hogan's Mathematics and Statistics Newsletter Term 1 2023

Welcome to Term 1, 2023
Just a reminder that all my newsletters are on my website along with a lot of other information. Just Google "Jim Hogan NZ"

In this part of NZ, Central North, the summer of 2023 will be remembered for NE wind, water and grass. The Central Plateau is still green and is about to get greener. Lake Taupo has been at capacity for months. Feb is coming and as students return to school we usually see an improvement in the weather with hot days. I cannot wait!

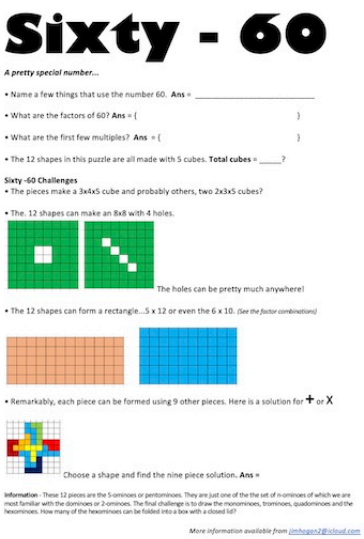
Today, Jan 27, is wet. The rain radar shows more coming. The atmospheric river. Time to write!

FIRST INTERACTIONS
A reminder from me to make your first interactions with new students and new classes an enjoyable experience. My approach was to work really hard to memorise new student

names in the first meeting and present some non-numeric math problem solving so that students could experience the essence of studying mathematics. Few will have a pencil or workbook yet and most kids are engaged with catching up with class mates.

A really good beginning problem is the Pentominoe Investigation. The link will take you to my “Beginning the Year “ Chapter in my online book. All the information is there. The only equipment needed for the groups of two in the class is a ruler, scissors and some thin card or paper. A selection of paper colours and some envelopes would be even better so students can save their progress for the next class. There is a lot of learning in this investigation.

Recently I have used TinkerCad and my Aquila V2 3d printer to make the pentomino shapes and a close fitting box to store them. The 12 pentomino shapes total 12x5= 60 little cubes. The number 60 has a lot of factors (and history). One set of factors is 3x4x5 which in cm is the measure of the box in this picture. I wrote a resource sheet as well which you can download from my website. Create some fun, some curiosity, opportunities for math talk and keep those little hands busy. Alternatively the pentominoes can be created using “interlock blocks” which everyone will have in the math resource room.



Sixty - 60

A pretty special number...

• Name a few things that use the number 60. **Ans** = _____

• What are the factors of 60? **Ans** = ( )

• What are the first few multiples? **Ans** = ( )

• The 12 shapes in this puzzle are all made with 5 cubes. **Total cubes** = ____?

Sixty -60 Challenges

• The pieces make a 3x4x5 cube and probably others, two 2x3x5 cubes?

• The. 12 shapes can make an 8x8 with 4 holes.

The holes can be pretty much anywhere!

• The 12 shapes can form a rectangle...5 x 12 or even the 6 x 10. *(See the factor combinations)*

• Remarkably, each piece can be formed using 9 other pieces. Here is a solution for + or X

Choose a shape and find the nine piece solution. **Ans** =

Information - These 12 pieces are the 5-ominoes or pentominoes. They are just one of the the set of n-ominoes of which we are most familiar with the dominoes or 2-ominoes. The final challenge is to draw the monominoes, trominoes, quadominoes and the hexominoes. How many of the hexominoes can be folded into a box with a closed lid?

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The NCEA Changes are Here

Driving home late last year to Taupo I pondered the latest **ACCORD Day Meeting** in Hastings at Lindisfarne where Francis Leslie , Sec NZAMT, presented and led discussion around the forthcoming Numeracy changes and the new NCEA L1 Standards. He did a sterling job with about 80 teachers.

Here are some thoughts and reflections of the day and where my thinking went.

Numeracy

• Let students sit the new online examination ONLY when you feel they have a really good chance at passing.

Reason

Failing an examination, just like being in the low streamed class, causes anxiety and puts students off mathematics. There are similar reasons for getting rid of streaming (topical at the moment).

A “Fail” or “Not Yet” can be seen as a reflection on the mathematics teachers for not having a robust measure of where students are at in the NZC. The level the questions are targeting

a robust measure of where students are at in the NZC. The level the questions are targeting is about NZCL4.5. There are plenty of ways to get reliable or useable measures:-

- OTJ, Teacher observation, questions noticing, looking and listening, on an every day basis. This is my favourite.
- AssTTLe, online and this gives an excellent breakdown of class, student strengths and weaknesses as well.
- PAT, good for gaps and strengths and weaknesses as well.
- the LOMAS test I use. http://schools.reap.org.nz/advisor/lomas.html
- AWS Level tests, Item Banks
- LPF, Learning Progression Framework comparison.
- your own tests

There may be other reasons for testing whole cohorts an/or letting students sit knowing they will probably fail but know you will cause harm. The harm is about damaging attitude to maths and student mindset.

• Establish a robust over time measuring and monitoring system for every student, class and cohort. So vital.

Reason
This is **how you will know** when students are ready to sit and **PASS** the new online Numeracy Assessment.

Robust means trusted. Trusted by the HOD, TIC Year 9/10, teachers, students and actually indicates NZC level reliably.
Over time means is a repeated event and not a "one-shot-wonder". Students can test “low", “at" or “high" and they do at any time. What they cannot do is fake it all the time. “You cannot fool all the people all the time!” One measure per term is enough to keep pace with learning. Learning is slow and messy.
Monitoring means “keep looking at the data”. What is the latest data saying? Where is the trend? Is the learning progressing?
Measure means “against the NZC”. ERO recommends this NZC comparison or yardstick. It means each teacher has to have a really good knowledge of what each level in the NZC is, in terms of mathematics and thinking, and, to be able to recognise it in daily class lessons. This knowledge informs an OTJ.

In my project schools I endeavour to set up a robust overtime measure and monitoring system and have that appreciated and used by all teachers. My experience from 60 or so schools over the last 20 years shows students increase their mathematics knowledge by at least 0.5 of an NZC level every year once they get to secondary school. Specialist mathematics teacher have an impact. Often a gain of 1 NZC level can evidenced. Anything above a gain of 2 is suspicious and needs explaining.

• Consider who actually needs the award of NCEA Level 1.

Reason.
There was an award once upon a time called School Certificate. I gained my "School C” across 6 subject areas and never referred to or used that qualification for any useful purpose thereafter. Why bother with all that testing, revision and workload worry? Learning must be a better use of class time. That said, be very aware, some students need the Award of NCEA Level 1 and some need to learn how to revise and study.

I suggest, with the support of a robust measuring and monitoring system, that students who would easily gain the NCEA Level 1 standards be given **an examination/assessment free year** and maximise learning time. This would help reduce workloads for teachers and cause less stress.

All students must do a Year 11 Math and Stats course and the more able students extended into more rich problems and explorations. I would expect Year 12 Algebra ideas to be developed along with more trigonometry in preparation for the following Year 12 Course. Those students could become quite valuable tutors from time to time as well. Be a creative teacher and a part of a creative department. Be a teacher and learn!

The barrier is of course the school policies and directives. Some schools like to show off NCEA L1 Pass Rates to promote and compare themselves with others. I like to think that a school is able to know how achievement is progressing in other ways and focus on the core strategies needed for themselves. The **"I am Better than You"** thinking has to be moved to the world of **"Once Upon a Time"** like telegrams, tape decks and postage stamps.

This **"I am Better than You"** thinking of course raises questions for me about awards in schools for 1st, 2nd, 3rd, Dux and so on. All of these awards just create an elitism and do more young minds harm than the few people it might do good. In a school I favour a standard of performance above which an award is granted for Achievement. This is more aligned to the NCEA thinking of a standard. CCCC's are more important!

• The 4 New NCEA Mathematics and Statistics Stands 2024.

These are still being trialled and are changing. They will be available in 2024 but will only be used in trial schools in 2023. Latest NCEA news is always here.

[A side note here on the new NUMERACY standard. This can be used this year and students may "double dip" as far as I know. Check it out with the PN.]

• Use Internal Projects for assessing the new Internal Standards at NCEA L1

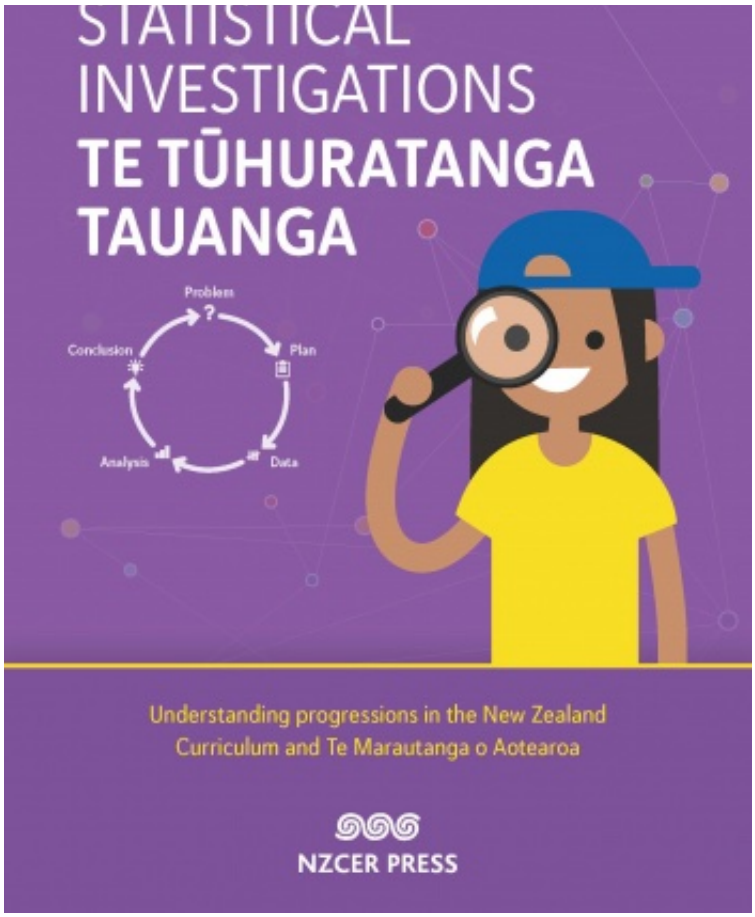
Back to the 4 new standards. Two internal, two external, all 5 credits.
The two external standards are basically **mathematics** and **statistical thinking**. The mathematics standard is more traditional and involves 3 or 4 strands N, M G and Algebra. Did you just hear the collective "sigh" from the NZ mathematics teachers? The statistics paper is evolving and should be a healthy summary of learning to Year 11 as well.

Of more interest are the two internal standards.

Reason.
I think they can be internally assessed with "over-time project " work. Students could choose a relevant context and explore this over Terms 1, 2 and maybe 3 linking learning at NZC Level 5 and 6 producing a report or reports, perhaps on a Google Classroom. One of my STEM schools had every student sorted in this way and teachers could monitor and comment as required and be very able to assess against success criteria. I would prefer this way of assessment. It is pretty easy to authenticate work by simple one to one questioning if any doubt arises about "Who wrote this?". Even Chat GPT cannot avoid being detected with a few direct questions to a student.

Students might choose contexts such as Fishing, Rugby, Netball, Sport, Cycling, Travel, Building, Skateboarding or Snowboarding. It really does not matter what they choose as long as good in-depth contextual knowledge is known and connected to the mathematics being taught.

• Pip's New Book - Statistical Investigations Te Tūhuratanga Tauranga



I read this book from cover to cover. The book is designed around the PPDAC Statistical Inquiry model. The level of information is from Year 1 to Year 11 and so becomes a pretty useful resource for all math/stat teachers across these years. I do not think there is an item left out. The book is written in plain language and is loaded with examples and activities that align with Census at Schools resources, NCEA expectations and NZAMT/AMA conference workshops. Pip must have enjoyed the long Covid lockdowns and kept herself busy writing.

Te Marautanga o Aotearoa is fully referenced as well. Inclusive and nice to see. Full **te reo** use and no trival or trite use of a few Māori words like “akonga” flipped in from time to time. [My attitude to this is like my attitude to the two versions of God Defend NZ we endure at every sporting event; let’s just choose one…please!]

SOCIAL MEDIA.
I want to add my tuppence here to the criticism of social media in recent news. Step on the negative! It is way to easy to send a message, text, snap, tweet in the spur of the moment . The author is often known but the damage is done. The action on the author is not followed up and the abuse continues. Social Media owners struggle to control this dilemma of positive and negative speech. They tried but have failed. I quite like the idea of careful discussions about truth, honesty, conspiracy, checking, ethics, abuse and all the associated ideas. Good fodder for tutor and informal class time.

Mathematics and STEM
STEM stands for Science, Technology , Engineering and Mathematics. Sometimes STEAM is used and the Arts make an entry as S, R, W, L or Speaking, Reading, Writing and Listening. Presentation, perseverance, CCCC and other competencies are all embedded. A STEM project can be a very rewarding experience for students and a lot of fun, albeit quite engaged and demanding teaching, for teachers. One of my project schools has “HUBS” each with a different theme. Similar and just as demanding. The Mathematics and Technology HUB is pretty much a STEM project.

Reason.
I mention STEM because bringing technology to the Mathematics classroom is very easy. The calculator and calculator investigations are well know to math teachers and used.

- TASK - Find a number than when multiplied by itself has the answer 8.
I did this with a class of Year 9 students who persevered and started to appreciate there must be a number but it was pretty hard to get an exact answer. The number 9 was easy, but 8 was a horror. This of course led to the discovery of the √ button and x^y button (my favourite).

- TASK - Use TinkerCAD to make a set of pentominoes that fit together.
This is pretty much illustrated in the picture above showing a box and some of the pentominoes (by the Sixty pic). The thinking around measurement and 3d is really pushed when the outcome is a practical model that fits together and perhaps fits inside a box with a lid. Tinker Cad is free and students can save their work, download their creations as .stl files and then use the “slicer” software, like CURA, that comes with a 3d printer to make the file the 3d printer needs. Technically a 3d printer lays down plastic layer by layer. A 3d solid is “sliced" to produce this information. The cubes in the pentomino picture above are not solid but filled with a hexagonal grid. There is a lot of mathematics in what I just described.

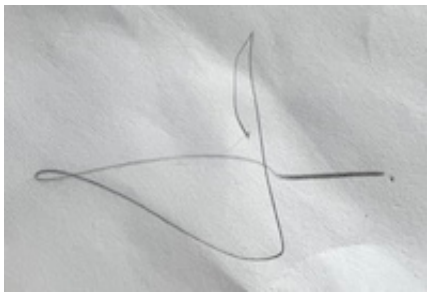
Aquila V2 3D printer. Jaycar and MakerSHOP have these printers and all the spare parts and plastic . The plastic I use is PLA which is actually corn starch. ABS is longer pasting plastic but is harder to manage. There are other materials. Read all about plastics here.

Last Words
Last year this time I had spent January and most of February laid up recovering from a heart bypass operation. I am just finishing a resource I developed around that and will publish it soon. Full marks to Waikato Hospital doctors and nurses for their excellent care and attention. My cardiologist surgeon explained how she stitched each join using a clock shaped pattern 12, 6, 9, 3 then 1,2, 4,5, 7,8 and lastly 10,11. Sealed she said, no leaks. The stitches will dissolve after a few months. I was a bit worried there might be leaks.

What a difference a year makes. I am now digging postholes, using my chainsaw, walking up hills, fishing, visiting schools and hitting golf balls further and more accurately than ever. Please look after yourselves and get that heart checked out. You only have to work out how old you are in seconds to realise the heart is a pretty magical organ. Your blood travels around at a surprising 1m/s or 3.6kph. Walking speed. Here is a website about numbers in your body.

Knowing my heart pumps 200litres per hour helps me appreciate the need to take care, rest and keep control. That is over 125,000,000 litres so far. Yeehaa. Some of the heart replaces itself unlike other parts of your body like your skin.

Look after your mind, control your workload, learn how to say “No”, delegate, collaborate, share a problem, believe little of what you read on the WWW internet, be a sceptic, do a cryptic crossword and when you meet me next time give me a hug. Breathe.



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Mathematics is Thinking and Thinking is Mathematics