Warm up

• Race to ...
Making connections between different ideas in mathematics is a feature of a highly efficient maths teachers (Askew, M. 2008).

• What does this mean?
• How can teachers use this information to assist planning?
• How will making connections support students to learn?
• This workshop is a brief introduction to the big ideas thinking along with practical ways teachers can use each of these approaches in their planning to further enhance student learning.
Liping Ma described a profound understanding of mathematics:

- ‘... not in terms of knowledge of facts, skills and procedures, but rather in terms of four key features: connectedness, multiple perspectives, recurring basic ideas, and longitudinal coherence’. (Ma, 2003)

Askew et al, (1997)
- 'having a rich network of connections between different mathematical ideas.'

Deans for Impact
‘Big ideas’ and the Australian Curriculum

A similar view is expressed in the rationale for the Australian Curriculum: Mathematics:

• “Mathematics is composed of multiple but interrelated and interdependent concepts and systems which students apply beyond the mathematics classroom”.

• The intent is to maintain attention on “developing increasingly sophisticated and refined mathematical understanding, fluency, reasoning, and problem-solving skills”.

• ‘... students of this age also need an understanding of the connections between mathematical concepts and their application in their world as a motivation to learn. This means using contexts directly related to topics of relevance and interest to this age group.’
Rocks, pebbles and sand

https://www.youtube.com/watch?v=gXdsF4xk2f8
Top approaches

- Top down
- Bottom up
Top down

• Thinking in of an issue, object, theme using real world perspective
• Brainstorm all of the possibilities.
• An inquiry model could be used
• Create connections
• Reduce!
Building a playground
Bottoms up

• Connect the dots to form bigger ideas.
Compare and order snippets in the Victorian Curriculum

- Number & Algebra Level 4: Recognise, represent and order numbers to at least tens of thousands
- Measurement & Geometry Level 4: Use scaled instruments to measure and compare lengths, masses, capacities and temperatures
- Measurement & Geometry Level 5: Compare 12- and 24-hour time systems and convert between them
- Statistics & Probability Level 4: Describe possible everyday events and order their chances of occurring
- Statistics & Probability Level 6: Compare observed frequencies across experiments with expected frequencies
Why make connections

• Research (Tout, D., et al 2015) indicates that students learn best when they make connections with ideas and transfer these ideas into long term memory.
PISA

Challenge in real world context

Mathematical content categories: Quantity; Uncertainty & data; Change & relationships; Space & shape
Real world context categories: Personal; Societal; Occupational; Scientific

Mathematical thought and action
Mathematical concepts, knowledge and skills
Fundamental mathematical capabilities: Communication; Representation; Devising strategies; Mathematisation; Reasoning and argument; Using symbolic, formal and technical language and operations; Using mathematical tools
Processes: Formulate, Employ, Interpret/Evaluate

Looking for Connections – a top-down view from a real-world perspective
The Gotemba walking trail up Mount Fuji is about 9 kilometres (km) long.

Walkers need to return from the 18 km walk by 8 pm.

Toshi estimates that he can walk up the mountain at 1.5 kilometres per hour on average, and down at twice that speed. These speeds take into account meal breaks and rest times.

Using Toshi’s estimated speeds, what is the latest time he can begin his walk so that he can return by 8 pm?
Tout planning model

1. Negotiate a theme or context
2. Brainstorm
3. Identify starting question/task
4. Identify mathematics content
5. Map against curriculum
6. Identify resources needed
7. Plan assessment
8. Do it—teach/facilitate
9. Find a theme or context of interest to the students such as a current popular topic, or an issue of concern or interest.
10. Investigate the possible areas and topics that could arise out of the context/issue.
11. Decide on the starting point and initial question(s) to initiate the student investigation or task—thin out ideas from brainstorm.
12. Investigate the mathematics that is embedded within the chosen topic/theme and the particular starting question. Refine task.
13. Map the mathematics identified against any curriculum outcomes that have to be met. Identify any gaps and refine the question/task.
14. Identify the resources needed for the students to undertake the task/investigation and for teaching the mathematics content and skills.
15. Include decisions about how the students will be assessed. Use ongoing, formative assessment, not just summative assessment.
16. Students undertake the investigation, while the teacher is facilitator/resource person. Intervene to teach the mathematics and problem solving.
Questions