ELEMENT 4.1

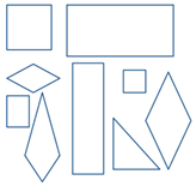
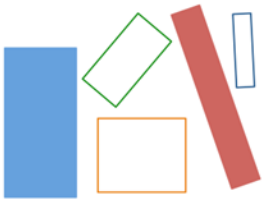
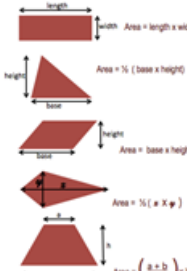
Domain 4 - Personalise and Connect Mathematics Learning

Element 4.1 - Build on learners' understandings

The following suggestions for practice are extracts from the 'Transforming Tasks' module on the Leading Learning resource:

Strategy From Information to Understanding

Technique **Compare and contrast:** Ask students to identify similarities and differences.

Level	Before	After
Primary	Rectangles can look different. Can you recognise different types of rectangles? Colour all 5 rectangles: 	These shapes are all rectangles. What's the same about all of the rectangles? What's different about them? Would it help if you cut the shapes out and moved them around? Do rectangles need to be long and thin? Do rectangles need to have sides that are horizontal/vertical? 
Secondary	A review of area calculations: Using these formulae, find the area of the shaded regions in the exercise below. 	**A review of area calculations:** 1. Label the dimensions that you might measure to calculate the area of each of these polygons and write the formula that you would use. 2. Check with a partner to see if you have the same/different ideas about: a. the dimensions that you would measure. b. how they would be used in the formula. 3. What's the same about each of the formulae? What's different about them? (Did you notice that all formulae involve multiplication of two lengths? The triangle and kite also involve a multiplication by ½. Why?) 4. What's the same about the dimensions that you have labelled? What's different about them? (Did you notice that the dimensions are always perpendicular to each other. Why?) 

How do you think the technique Compare and contrast might support *Element 4.1 - Build on learners' understandings?*

There are many ways to articulate this relationship. One response to this question has been provided on the next page.

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How does the technique Compare and contrast support *Element 4.1 - Build on learners' understandings?*

Asking students to identify similarities and differences is one way to support them to comapre and contrast.

In the Secondary Years example, as students identify similarities and differences between area formulae, they reveal the depth of their understanding about area calculation. Focusing the 'similarity and difference' questions on particular aspects, such as the dimension that are used in each area calculation, supports learners to build on their understanding about the area of each individual shape and move towards a more complete understanding of area calculation.

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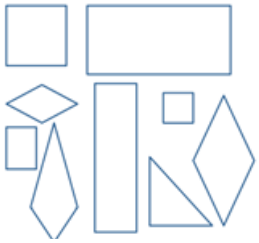
The following suggestions for practice are extracts from the 'Transforming Tasks' module on the Leading Learning resource:

Strategy From Information to Understanding

Technique **Make connections and find relationships:** Have students make meaning by asking them to connect pieces of information.

Level	Before	After
Primary	Shapes worksheet Colour the squares blue and the rectangles red 	I'm thinking of a shape and it has 4 sides. What might it look like? Share your ideas. • What if it has 4 straight sides? Does that make you think differently about what you could have drawn before or what the shape might be now? Share your ideas. • What if I it has four straight sides and it's a long thin shape. What do you think now? Could it be a square? This structure may help you to explain your thinking: • Because I know... I also know… • If … then...
Secondary	Scientific notation is a way of writing numbers when they are too big or too small to be written in decimal form. A number written in scientific notation is written as a number between 1 and 10 and multiplied by a power of 10. Eg: • $700 = 7 \times 10^2$ • $530\,000\,000 = 5.3 \times 10^8$ **Copy and complete:** a. $73\,000 = \ldots \times 10^4$ b. $25\,300\,000 = 2.53 \times \ldots$ c. etc	Use your smartphone calculator (or observe what happens on a shared device) when you calculate: 5,200,000 x 2,300,000. Now rotate your device. Can you see two different views? **Discuss** 1. What do you think happening here? 2. What connections can you see? 3. What do you think ' e+13' might mean? Test out your ideas on some other values. 4. If 'Screen 2' was showing '530 000 000', What might 'Screen 1' show? 5. If 'Screen 1' was showing '2.53e+7', What might 'Screen 2' show? Find out about 'Scientific notation'.  Screen 1  Screen 2 A smartphone calculator has been used for these screenshots. (In screen 2 the device has been rotated)

How do you think the technique Make connections and find relationships might support *Element 4.1 - Build on learners' understandings?*

There are many ways to articulate this relationship. One response to this question has been provided on the next page.

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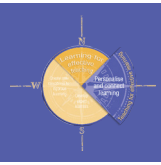

How does the technique **Make connections and find relationships** support *Element 4.1 - Build on learners' understandings?*

When students share the connections they see, the teacher can observe the extent of the student's understanding. The teacher can then support the student to build on that understanding.

In the Secondary Years 'after' task, students for whom this represents new learning are likely to recognise that:

- the two representations must be worth the same amount
- the digits are the same in both representations, therefore powers of ten could explain the difference between the two representations

When the teacher focuses the students attention on the similarities and differences between the two representations, the student is supported to build on from their initial understanding and establish a new connection.

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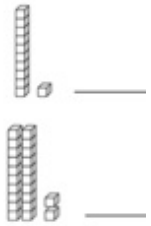
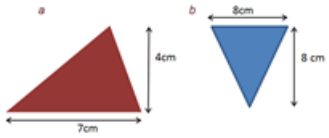
The following suggestions for practice are extracts from the 'Transforming Tasks' module on the Leading Learning resource:

Strategy From Information to Understanding

Technique Generalise: Ask students to construct general rules by identifying patterns.

Level	Before	After
Primary	Write each number and find it on your 100s chart:  Build each number using MAB blocks: 17 26	Choose one row (or part of a row) in your 100s chart, eg 23, 24, 25, 26. Make each of those numbers in that row using MAB blocks. Make sure that you have exchanged as many ones blocks as you can for 10s rods. 1. Explain how the number 24 relates to the blocks representation? Further support: How does the '2' part of the number 24 relate to the blocks that you have used? How does the '4' part of the number 24 relate to the blocks that you have used? 2. Repeat for 25, then 26 etc. Does this connection work for the next number (25) and the next number (26)? 3. Look at another number on this row. Do you know how many 10s and how many ones blocks you will need to represent that number? Explain to a partner how you know. 4. Would your rule (explanation) work on the next row and the next row? Would your rule always work?
Secondary	Find the area of each of the following triangles: 	Leigh thinks that each of these triangles cover half the area of the rectangle that is drawn around it. What do you think? (You can cut and rearrange the pieces of copied versions of these triangles to test.)  • Will a triangle always be half the area of the rectangle that's drawn around it, or do these pictures show special cases? • Could you describe a rule that would always work for calculating the area of a triangle? • How can the formula for the area of a rectangle be used to help you to write a formula for the area of a triangle?

How do you think the technique Generalise might support *Element 4.1 - Build on learners' understandings?*

There are many ways to articulate this relationship. One response to this question has been provided on the next page.

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How does the technique Generalise support *Element 4.1 - Build on learners' understandings?*

When teachers ask students:

- to identify a rule that always works
- if their rule will always work

they can observe the depth of the student's understanding. In situations where the student does not have complete understanding the teacher can then support the student to build on their understanding through supporting them to establish a general rule.