## Can you create a new model for place value to show the power of 10?

### Investigation Brief

Place value is the foundation of our number system. The value of each place is 10 times bigger than the place to its right. The place tells us by what factor to multiply the digit in that place to get its value. People have created models to demonstrate the relationship between the places and the impact of multiplying by 10.

- Investigate some of the models that are being used in your school: place value blocks, sticks and bundles, place value abacus.
- Create a new model for place value that clearly demonstrates how each place is 10 times bigger than the one before.
- Extend your own model or an existing model, such as place value blocks, to demonstrate even larger place value places - such as 10 million or 1 billion.

### Resources

- Place value models like place value blocks, sticks and bundles, abacuses, place value houses - ask your teacher to help you find these.
- Materials to create your models, this could be paper, clay, or a computer.

### Prompts and Suggestions

Look at the models used in your school and make a strength and weakness list for each by analyzing the model and how it is supposed to help people understand place value.

Will 2-D or 3-D models be more effective?

Think about the reproduction of your model and how easily the materials could be produced.

Use what you know about the metric system to give you some fresh ideas.

Is your model interesting and engaging for people - will they want to use it?

How easy will it be to show the impact of multiplying by 10?

Can your model be used to show decimal place value?

If you extend the place value blocks to represent 1 million and a 1 is a cubic centimeter, what will the dimensions be? Can you build it? What about 1 billion?

Imagine that you extend your model to demonstrate large place value places - calculate the dimensions of each new piece in your model.

People have often chosen squares and cubes for place value models. Think about how you could use other shapes such as spheres or decagons.

## Extension

Consider what you would do to create a model for a place value system that was not based on 10. For example, think about a place value system that is binary (based on two digits: 0, 1)

## Links

An interactive learning object allowing you to explore place value blocks is available at http://www2.nzmaths.co.nz/LearningObjects/PVBlocks/index.html

A video showing how large a billion would be using place value blocks is available at http://www.schooltube.com/video/11702520c7e440a9916b/

An example of a response to this investigation is available at http://www.nzmaths.co.nz/sites/default/files/investigations/PlaceValue_example.pdf