

## NUMERACY TASK: WORKING WITH SCALE

Note: This is a year 7 mandatory technology lesson. Students are completing a “engineering systems” unit where they design, produce and evaluate a model of a “Tiny home” structure, and learn to communicate and implement design strategies, incorporate renewable technology and investigate sustainable building materials.

### Literacy/Numeracy Skills and Knowledge

#### *ACARA Numeracy General Capabilities*

- Estimate and Calculate*: solve complex problems by estimating and calculating using efficient mental, written, and digital strategies
- Interpret proportional reasoning*: visualise and describe the proportions of percentages, ratios and rates
- Apply proportional reasoning*: solve problems using simple percentages, ratios, and rates

#### *ACARA Numeracy Learning Progressions*

- PoL5* Interpreting maps and plans: Interprets the scale as a ratio used to create plans, drawings, or maps. Interprets plans involving scale.
- UuM8* Converting units: Converts between formal units of measurement. Recognises the relationship between metric units of measurement and the base-ten place value system.

### Task Goal/Learning intentions:

- Build and understanding of scale and its importance in everyday scenarios
- Apply mathematical equations to scale objects up and down
- Effectively explain to peers and teacher how to scale objects and the steps taken to do so

#### *Technology mandatory syllabus*

- TE4-1DP designs, communicates and evaluates innovative ideas and creative solutions to authentic problems and opportunities.

### Task Overview:

Within this task, students are grasping an understanding on scale and why it is important for the design development of their tiny home. Students are to use numeric equations to scale up and down objects to contextualise this concept so that they can consider and incorporate the scale of items when they begin creating a floorplan of their tiny homes.

In the task, students will focus on:

- Understanding the concept of scale
- Applying numeric equations to effectively scale objects
- Demonstrating understanding by drawing objects to scale

Resources	Task teachers notes	Differentiation of activities
		+ Role of speaking and listening

<p>“What is scale and how it works” PowerPoint presentation  <a href="#">yr 7 scale powerpoint.pdf</a></p> <p>Scale YouTube video:  <a href="https://youtu.be/V4sBiFyk544?feature=shared">https://youtu.be/V4sBiFyk544?feature=shared</a></p> <p>1cm A4 grid paper</p> <p>Pencils and rulers</p>	<ol style="list-style-type: none"> <li>1. Introduce topic of scale by asking students if they know what it is.</li> <li>2. Provide a brief explanation of scale in simple terms to students.</li> <li>3. Watch video clip of what scale is.</li> <li>4. Read more detailed explanation of scale that is on the PowerPoint.</li> <li>5. Provide students with example of where scale would be applied in an everyday scenario. E.g. when designing a floor plan, understanding maps, making recipe adjustment etc.</li> <li>6. Model how to scale down a simple object (in this instance a car) and show how and why we make the calculations on the board. Allow for question throughout this process.</li> <li>7. Model another example of scaling DOWN an object (elephant) on the board. Prompt students to help you along the way.</li> <li>8. Model an example of scaling UP an object (ant) on the board. Ensuring to remind them that when scaling down you divide and when scaling up you multiple.</li> <li>9. Now its their turn. Provide students with a simple item to scale down (tabletop), and in pairs they complete equations to scale down.</li> <li>10. Ask student to share how they got to their answer on the board.</li> <li>11. Students are then to draw their scaled down tabletop onto grid paper to visualise the concept.</li> <li>12. Students then attempt to scale UP an object (a paper clip) individually and draw their scaled paperclip on the grid paper. Teacher will ask students to share their equation method on the board.</li> <li>13. Conclude activity by linking how scale is important when students begin to design their tiny homes and that they must consider scale to ensure all furniture fits comfortable within their designs.</li> </ol>	<ul style="list-style-type: none"> <li>Students are to listen to topic subject of scale through teachers’ descriptions and through video.</li> <li>Uses the method of modelling and listening to teacher, pairing with a peer to assist in understanding and then individually completing an example to show personal understand. This allows students in a variety different ability level to understanding concept as they can practice both individually and in a group situation.</li> <li>Students are encouraged to ask questions through the modelling process</li> <li>Activities relate to real life scenarios so students can grasp concept easier</li> <li>Invites high achieving students to explain their method of how they scaled objects to the class</li> <li>Can replace the grid paper with ordinary paper for high achieving students so they need to measure with ruler more accurately rather than relying on the gridded paper provided</li> <li>Gridded paper for lower achieving students so they can count the squared when scaling objects to assist when using the ruler</li> <li>Uses visual images of the objects (elephant, ant, car, tabletop, paperclip) so students that may have difficult reading can have a visual representation of the scaled object</li> <li>Students listen to teacher explain how this relates to their project</li> </ul>
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#### References:

How to Draw to Scale | Making a Scaled Drawing Explained. (n.d.). Wwww.youtube.com. <https://www.youtube.com/watch?v=V4sBiFyk544>

NESA. (2022). Technology Mandatory 7–8 | NSW Education Standards. Nsw.edu.au. <https://educationstandards.nsw.edu.au/wps/portal/nesa/k-10/learning-areas/tas/technology-mandatory-7-8-new-syllabus>

ACARA. (2020). *National Numeracy Learning Progression*. Wwww.australiancurriculum.edu.au. <https://www.australiancurriculum.edu.au/resources/national-literacy-and-numeracy-learning-progressions/national-numeracy-learning-progression/>

## Resources

### What is scale?

<https://youtu.be/V4sBiFyk544?feature=shared>

Scale refers to the size or proportion of something compared to another. It helps us understand how things relate to each other in terms of magnitude or dimensions.

Scale is constantly used in everyday life. This could be in maps, blueprints, or models to illustrate how these drawings represent larger or smaller objects or spaces.



### Scale when drawing models

Scale in the context of drawings is the ratio of the drawing's size to the actual size of the object.

Let's say you're creating a scale drawing of a car. If the scale is 1:10, it means that 1 unit on the drawing represents 10 units in real life.



For instance, if the actual car is 3 meters long, to draw it to a 1:10 scale:

Measure the Length: 3 meters (real-life length of the car).

Convert to Scale: Divide the real length by the scale factor (1:10).

$3 \text{ meters} \div 10 = 0.3 \text{ meters}$

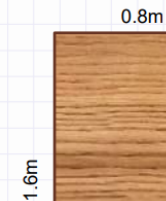
So, on the drawing, 0.3 meters (30 cm) represents the actual 3 meters of the car.

#### Scale:



If an elephant is 3m long and we want to scale **DOWN** to a 1:5, what would we need to do?

If an ant is 2cm long and we want to scale **UP** to a 10:1 so we can draw it on paper, what would we need to do?



This is a bird's eye view of a dining room table. We want to scale it **DOWN** to a 1:10 ratio so we can add it to our drawing in our tiny house.

What would we need to do to find the new scaled measurements and how would we draw this?