Government of **Western Australia**
School Curriculum and Standards Authority

Assessment task

Year level	7
Learning area	Mathematics
Subject	Patterns and Algebra
Title of task	Beach Huts

Task details

Description of task	To produce a poster, frieze or multimedia presentation of the patterns, diagrams, sequences, algebraic rules, graphs and predictions and justifications, arising from the different views (front, top, side) of a 3D object.
Type of assessment	An Investigation and Individual Student Presentation
Purpose of assessment	To inform moderation practices and gather evidence to ascertain student achievement in relation to the standard
Assessment strategy	Group investigation resulting in individual student presentation.
Evidence to be collected	• Anecdotal notes • Individual student presentation (e.g. PowerPoint, A3 poster, written report, photo board) • Record of level of support required by each student to complete the task
Suggested time	1 week

Content description

Content from the Western Australian Curriculum	• Draw different views of prisms and solids formed from combinations of prisms (ACMMG161) • Introduce the concept of variables as a way of representing numbers using letters (ACMNA175) • Create algebraic expressions and evaluate them by substituting a given value for each variable (ACMNA176) • Extend and apply the laws and properties of arithmetic to algebraic terms and expressions (ACMNA177) • Given coordinates, plot points on the Cartesian plane, and find coordinates for a given point (ACMNA178) • Solve simple linear equations (ACMNA179) • Investigate, interpret and analyse graphs from authentic data (ACMNA180)

Proficiencies	Understanding	Fluency	Problem Solving	Reasoning
	✓	✓	✓	✓

Task preparation

Examples of prior learning tasks	**First Steps in Mathematics Example Tasks** • Four Cube Houses – FSiM Space p 91 • Building – FSiM Space p 91 • Drawing a Cube – FSiM Space p 91 • Triangle Toothpick Design – FSiM Number Bk2 p218, 230 & 241 • Picture Frames – FSiM Number Bk2 p218 • Dot Patterns – FSiM Number Bk2 p238 • Areas of Squares – FSiM Number Bk2 p257 • Sticky Situations– FSiM Number Bk2 p239 • Different Rule, Same Pattern – FSiM Number Bk2 p230 • Graphs – FSiM Number Bk2 p240

	ReSolve Example Tasks
	• Real World Algebra: Chicken Box Patterns
	• Painted Cubes (https://resolve.edu.au/assessing-reasoning-year-6-exemplars?lesson=3798)
	Scootle Example Tasks
	• Circus Towers: Square Stacks
	• Number Patterns
	• Bridge Builder: Triangles 1
	Helpful YouTube Viewing Resources
	• [Viewing 3 Dimensional Shapes](). YouTube (4:43)
	• Making an algebraic rule from a simple pattern. YouTube (6:21)
	• Writing a formula from a sequence. YouTube (7:31)
Assessment differentiation	Teachers should differentiate their teaching and assessment to meet the specific learning needs of their students, based on their level of readiness to learn and their need to be challenged.
	Assessment differentiation is assisted by the judicious use of 'starting' and 'extending' prompts (see teacher instructions below the task)

Assessment task

Assessment conditions	• 'Small Group Exploration and Observations' using 'struts' (i.e. matches, popsticks, straws or other suitable manipulatives) to assist in formulating patterns. Discussion of ideas should be encouraged with the teacher using 'starting' and 'extending' prompts as required (approx. 1 lesson).
	• 'Individual Reasoning' of patterns, algebraic rules, graphs etc and task planning (approx. 1 lesson)
	• Preparation and delivery of 'Individual Presentation' using the resources listed below (approx. 3 lessons)
	• one to one interview may be used at any time in assessment process to record anecdotal evidence and to clarify student understanding
Resources	'Year 7 Mathematics Task – Beach Huts' task sheet
	Matches, toothpicks, pop-sticks, straws or similar items (defined as 'struts')
	A3 card for poster (Note: A3 is maximum size for students' presentations)
	Craft glue
	Camera/Ipad/phone for production of photographs
	Computers
	Grid paper
	Rulers
	Coloured pencils
	Scissors

Instructions for teachers

Inform students that the purpose of this task is to explore patterns, find algebraic rules, graph equations and explain reasoning.

They will be required to clearly demonstrate their **best** understanding of:

- drawing different skeletal views of prisms and solids formed from combinations of prisms

- using variables as a way of representing numbers using letters

- creating algebraic expressions and evaluating them using substitution

- extending and applying the laws and properties of arithmetic to algebraic terms and expressions

- plotting points on the Cartesian plane, and finding coordinates for a given point

- solving simple linear equations

- investigating, interpreting and analysing graphs from authentic data.

The task consists of a series of lessons involving:

- small group exploration and observations

- individual reasoning

- individual presentation.

Teachers may use 'starting' and 'extending' prompts if or when required and record the level of support provided.

Examples of 'starting' prompts:

- Encourage students to take a systematic approach in their explorations.
- Suggest they draw the different skeletal views (front, side, top) of one beach hut.
- Suggest they draw the different skeletal views (front, side, top) of a row of 2 beach huts, 3 beach huts, 4 beach huts etc.
- Encourage them to produce sequences and tables of values for the patterns they have found in prompts 2 and 3.
- Suggest they investigate and develop some rules for the numbers of 'struts' needed to represent each skeletal view and in total for a row of 2 beach huts, 3 beach huts, 4 beach huts etc and to justify and test their rules.
- Encourage them to predict the number of 'struts' for each view of and in total for a number of beach huts **beyond** what you have constructed or drawn.
- Predict the number of 'struts' for each view and in total for **any** number of beach huts.
- Can you use your rule to work backwards to find out how many adjoining huts there are if you are given the total number of 'struts' required for a particular view?
- Suggest they graph the patterns formed by looking at the different views of the beach huts and then compare, interpret and analyse these graphs. Ask, "How is your graph connected to your algebraic rule?"

Examples of 'extending' prompts:

- Suggest they try to find equivalent rules to the ones they have produced, and to justify their thinking.
- Ask, "What is the same and what is different about the patterns produced from the the different skeletal views of the beach huts?"
- Ask, "What is the same and what is different about the graphs produced from the the different skeletal views of the beach huts?"
- Ask, "If 'struts' come in boxes of 50, what is the maximum number of huts that could be shown in each of the skeletal views for 2 boxes? 3 boxes? 4 boxes?"

Teachers are encouraged to expose students to the language in the task prior to administering it.

Year 7 Mathematics Task – Beach Huts

Pretend that the adjoining beach huts shown in the above photo have been built with common walls between the huts.

There are many patterns to be found in adjoining beach huts.

For this task, you will use 'struts' (sticks), such as those shown below, to make skeletal models and find rules for the patterns within the 2D skeletal shapes formed by the different views of adjoining beach huts.

You must then produce your own poster, frieze or multimedia presentation to show your findings.
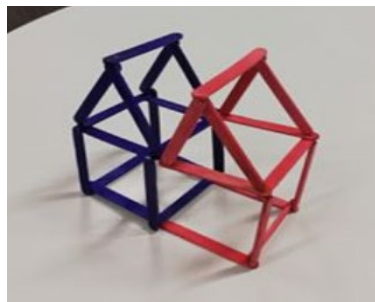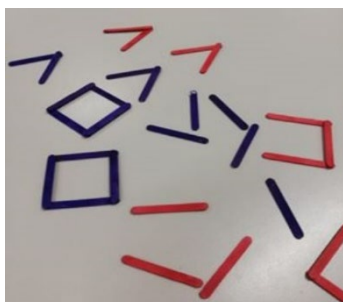
You will need to include the diagrams, photos, sequences, tables, rules, graphs, descriptions and justifications used to model the patterns you find in the different 2D skeletal views (front, top and side) as well as the total numbers of 'struts' used in the skeletal models of the beach huts.

Small Group Exploration and Observations

With your group, use the materials provided to construct the different skeletal views (front, top and side) of varying numbers of adjoining beach huts.

Explore, discuss and make drawings and notes of any patterns you find in your constructions.

Consider:

- the number of 'struts' needed for each view of increasing numbers of adjoining beach huts

- the total number of 'struts' needed for increasing numbers of adjoining beach huts.

Discuss and make drawings and jottings of any patterns that you discover.

Individual Reasoning

Working on your own, reflect on the Beach Huts task and plan your presentation on paper. Investigate and develop algebraic rules and graphs based on the patterns discussed in your Small Group Exploration.

You will need to:

- Describe the algebraic rules and graphs developed from the beach hut patterns.
- Explain and justify how your rules work by providing supporting examples.
- Explain how these rules or graphs can be used to predict the number of 'struts' needed for different views and in total for a **greater number** of adjoining beach huts than shown in your constructions or drawings.
- Explain how these rules can be used to predict the number of 'struts' needed for different views and in total for **any number** of adjoining beach huts.
- Explain how you could calculate the number of adjoining beach hut that could be constructed from a given number of 'struts'.
- Find equivalent, alternative rules to the ones you have formulated and justify your thinking.

Individual Presentation

Create your own poster, frieze or multimedia presentation to show all your findings.

- Show both the patterns arising from the different views of the adjoining beach huts and the total number of 'struts' used to create the beach huts.
- Include diagrams, photos, tables, rules and graphs to illustrate your findings.
- Explain the patterns and reasoning behind your algebraic rules, including your graphs.
- Justify how your algebraic rules can be used to determine the number of 'struts' needed for **any number** of adjoining beach huts.
- Explain and justify how your algebraic rules and graphs can be used to determine the number of adjoining beach huts that can be built from a given number of struts.
- You may include extra information from the 'extending prompts' provided by your teacher.

Note: you may be required to explain your presentation to your teacher, class or group.

Marking key for Individual Presentation

Description	Marks
Drawing different views (front, top and side) of solids formed from a combination of prisms	
Correctly interprets and draws all orthogonal views of at least 3 adjoining beach huts	3
Correctly interprets and draws some orthogonal views of at least 3 adjoining beach huts	2
Correctly interprets and draws all orthogonal views of one beach hut	1
Subtotal	**3**
Recognising and recording patterns	
Defines parameters and uses correct tables of values to describe and compare the different sequences	5
Defines parameters and uses tables of values to correctly represent all sequences	4
Uses tables of values to correctly represent all sequences	3
Uses tables of values to correctly represent some sequences	2
Correctly completes sequences to model the information	1
Subtotal	**5**
Use of variables and determining rules	
Represents parameters using variables to correctly formulate all general rules and explain and determine some equivalent forms	7
Represents parameters using variables to correctly formulate and explain all general algebraic rules	6
Represents parameters using variables to correctly formulate algebraic rules for each view and the total number of 'struts'	5
Represents parameters using variables to correctly formulate some general algebraic rules	4
Represents parameters using variables and attempts to formulate some general algebraic rules	3
Represents parameters using words and formulates recursive rules with reference to the starting term	2
Represents parameters using words and formulates recursive rules without reference to the starting term	1
Subtotal	**7**
Graphing the Results	
Plots ordered pairs to correctly represent table values on the Cartesian Plane for all rules and explains and justifies similarities, differences and connections between the graphed and algebraic rules	4
Plots ordered pairs to correctly represent table values on the Cartesian Plane for all rules and explains and justifies similarities and differences between the graphed rules	3
Plots ordered pairs to correctly represent table values on the Cartesian Plane for all rules	2
Plots ordered pairs to correctly represent table values on the Cartesian Plane for some rules	1
Additionally: Plots ordered pairs as **discrete points** to correctly model an authentic situation in addition to any of the above	1
Subtotal	**5**
Justifying the Rules Algebraically or Graphically	

Uses algebraic techniques to correctly predict the number of huts given a large number of 'struts'	4
Uses algebraic or graphical techniques or both to justify the number of huts given a small number of 'struts'	3
Uses algebraic techniques to correctly predict the total number of 'struts', or number of 'struts' for different views, in a large row of adjoining huts	2
Uses algebraic or graphical techniques or both to justify the total number of 'struts', or number of 'struts' for different views, in a small row of huts	1
Subtotal	**4**
Communication	
Uses correct mathematical terminology and notation to produce a presentation containing clear, organised, unambiguous, descriptions and explanations and includes appropriate and complete diagrams, tables and graphs.	4
Uses correct mathematical terminology and notation to produce a presentation containing some descriptions and explanations and includes appropriate and complete diagrams, tables and graphs.	3
Uses some mathematical terminology and notation to produce a presentation containing appropriate diagrams, tables and graphs related to the task	2
Produces a presentation containing diagrams, tables and graphs related to the task	1
Subtotal	**4**
Total Marks	**28**

Record of level of support required by each student to complete the Year 7 Beach Huts Task

Student completed all elements of the task (✓)				
Name	Independently	With prompting	With guidance	With support