|  |  |
| --- | --- |
| INVESTIGATION | **MATHEMATICS** |
|  | **Level 1** |

# Making a dream mat

|  |  |
| --- | --- |
| **MCj03564830000[1]Strands** | **Topics** |
| **Number** | Addition and subtraction |
| **Measurement** | Length, area, mass and volume |
| **Space** | Shape and line |
| **Outcomes N 1.2, M 1.1, S 1.1** | |

## Investigation

This investigation is connected to The Arts sourcebook module, *The dream-maker*.

The class is going to create a ‘dream mat’ for everyone to sit on during sharing time. The mat must have the same number of pieces in it as there are students in the class, and be large enough for the whole class to sit on. Your job is to decide what shape and how big the pieces will be and to create the mat. You will also investigate ‘recipes’ for dreams, and design a personal ‘cloth of dreams’.

## Overview

The following table shows how this investigation is organised in phases associated with **thinking, reasoning and working mathematically.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Thinking, reasoning and working mathematically | | | | |
| 7 | | | | |
| 1. Identifying and describing |  | 2. Understanding and applying |  | 3. Communicating and justifying |
| Introducing the investigation  Students:  discuss what a dream mat is and what it might look like  discuss the possible uses for a dream mat in the classroom.  Looking at shapes  Students:  discuss the purpose of the mat  identify and describe  2D shapes  measure and compare the size of 2D shapes in the environment  discuss which shapes might be suitable for the dream mat  use non-standard units to measure shapes.  Measuring the area  Students:  investigate ways to measure the area of the dream mat.  Planning for dreams  Students:  explore volume and capacity  add quantities of ingredients. |  | Creating the dream mat  Students:  measure shapes for the mat  design the layout using different shapes  use addition and subtraction when working out how many rows and squares in the dream mat.  Examining the finished mat  Students:  identify area and length of boundaries.  Writing dreams — working with ingredients  Students:  create and follow recipes  measure and replace ingredients. |  | Designing a personal cloth of dreams  Students:  create and explain a design.  Presenting recipes and demonstrating dream making  Students:  explain and demonstrate recipes for dreams  measure and record quantities of ingredients. |

## Core learning outcomes

This investigation focuses on the following core learning outcomes from the *Years 1 to 10 Mathematics Syllabus*:

**N 1.2** Students identify and solve addition and subtraction problems involving small and whole numbers.

**M 1.1** Students select the appropriate attribute to compare and order the size of objects and measure with non-standard units.

**S 1.1** Students identify everyday shapes and objects using geometric names and make and describe simple representations of them.

Using this investigation

The sequence of activities suggested in this investigation provides opportunities for students to demonstrate learning described by core learning outcomes or aspects of core learning outcomes. The investigation may be modified to provide opportunities for students to demonstrate learning described by core learning outcomes at other levels.

Contribution to the attributes of a lifelong learner

|  |  |
| --- | --- |
| **Knowledgeable person with deep understanding** | Students participate in activities that relate to measurement and shape when applying their mathematical knowledge to solve problems. |
| **Complex thinker** | Students think and reason mathematically when designing the dream mat and their cloth of dreams. They analyse and synthesise information when taking the role of the dream factory supervisor. |
| **Responsive creator** | Students think creatively as they design a dream mat big enough for all students to sit on and develop recipes for the dream factory. |
| **Active investigator** | Students manipulate concrete materials when examining the concepts of length, mass, area and volume. They join smaller shapes together to create a dream mat and their cloth of dreams, and count discrete amounts of ingredients. |
| **Effective communicator** | Students take on various roles as described in The Arts module, *The dream-maker*. While they are in role, they communicate mathematical findings to other members of the class. |
| **Participant in an interdependent world** | Students work together to make a dream mat. They collaboratively decide on the most suitable size for each square within the cloth. Students work together to create recipes for the dream factory. |

|  |  |
| --- | --- |
| **Reflective and  self-directed learner** | Students apply appropriate mathematical knowledge to a variety of situations. For example, they may count discrete items to place in containers in the dream factory, or count the number of squares needed to make their personal cloth of dreams. |

Core content

Core content in black text only is included in this investigation.

|  |  |  |
| --- | --- | --- |
| Number — Addition and subtraction: Level 1 | Measurement — Length, mass, area and volume:  Level 1 | Space — Shape and line:  Level 1 |
| Addition   * totals to 10 * joining model * language of joining * two or more addends   Subtraction   * whole numbers to 10 * take away model * language of take away   Connections   * inverse * addition undoes subtraction * subtraction undoes addition   Mental computation strategies   * count on (in 1s, 2s) * count back (in 1s, 2s)   Computation methods   * mental computations * written recordings * words for addition (add) * words for subtraction (cover up, take away, left) * calculators, computers * symbols * addition (+) * subtraction (–) | Measurement terms and attributes   * attributes * length * mass * covering (area) * fill and pack (volume) * direct and indirect comparisons * descriptive and comparative terms associated with length, mass, area and volume   Units of measure   * non-standard units * measuring instruments * balance scales   Relationships | 3D shapes and objects and 2D shapes   * cubes, rectangular prisms, spheres, cylinders, cones, pyramids * everyday examples of 3D shapes (e.g. ice-cream cones, balls, dice) * circles, triangles, rectangles including squares   Geometric terms and properties   * open and closed figures * flat, straight, curved, round * 3D shapes (shapes of faces, function — ‘will roll’ ...) * 2D shapes (straight and curved lines, number of sides, number of corners)   Visualisations and representations   * ‘mind pictures’ of 3D and 2D shapes * 3D objects from different viewpoints * 2D shapes in different orientations * shapes within shapes * folding, cutting * joining halves * shapes within pictures, illustrations, puzzles   Lines and angles   * straight and curved lines * corners (angles) |

## Resources

* fabric for the dream mat
* liquid and solid substances for making dreams
* props for the dream factory
* a variety of containers
* *The dream-maker* — sourcebook module from The Arts key learning area

1. Identifying and describing

### Introducing the investigation

Students:

* brainstorm ideas about what a dream mat might look like
* share their ideas about the purpose of a dream mat.

**Note:** In the original story ‘The boy and the cloth of dreams’referred to in *The dream-maker*, a grandmother made a cloth for a boy to keep the dark night things away. When the boy tore a hole in the cloth, his sleep was disrupted by nightmares. He mended the hole and overcame his fears.

Students:

* listen as the teacher explains that they are going to create a dream mat for use in their classroom. The class could suggest other uses for the mat they will create (e.g. a story mat or an ideas mat).

### Looking at shapes

Students:

* identify the 2D shapes — for example, circles, triangles and rectangles including squares — in quilts or patchwork mats with geometric patterns that have been brought to school by class members, teachers, parents/carers.
* Focus questions could include:

How many different shapes can you see?

How are the shapes different?

How are the shapes similar?

What shapes can you see within other shapes?

Which patterns do you like? Why?

Are there shapes sewn onto other shapes? Why are they like that?

* list the properties of the shapes used in the quilts or mats such as the shapes of sides, number of sides, the number of corners.
* Focus questions could include:

What is a shape?

How do you recognise a shape?

What makes a square different from other rectangles?

In what ways are triangles different from other shapes?

* find everyday objects in or near the classroom that match the shapes used in the quilts or mats (e.g. match a rectangle to the table top, a circle to the clock face, a triangle to the side view of a traffic cone marker)
* participate in a ‘hunt’ to identify and describe other 2D shapes in the classroom or school grounds
* discuss the similarities and differences between the shapes found in the environment, especially those between squares and other rectangles, to identify that a square has four equal sides
* use non-standard units such as lengths of string or pencils to verify whether the shapes are squares or rectangles
* use classroom materials such as cloth and cardboard to copy the shapes found on quilts or mats then compare and order these shapes according to various attributes such as length of side or number of corners
* discuss which of the shapes investigated would be most suitable for the dream mat and why.
* Focus questions could include:

Could we make a quilt if we joined all the shapes together? How would this work?

What would happen if we joined all the circles together?

What happens if we join the rectangles and triangles together?

Which shapes join together without leaving gaps or overlapping?

### Measuring the area

Students:

* experiment with ways of measuring the space required for one student to sit comfortably on the floor and use paper or cardboard to represent this space
* estimate the space required for all the students to sit comfortably on the floor
* brainstorm ways of determining the size of a dream mat on which all students can sit comfortably
* measure the perimeter of the space that will be occupied by the dream mat using non-standard units such as strides
* discuss whether there is room for a dream mat in the classroom and identify other areas of the school that might be large enough for the dream mat (e.g. the library).

### Planning for dreams

The teacher, in the role of Denki, the dream-maker’s assistant (refer to The Arts sourcebook module), explains to the students that dreams are made by collecting ‘dream ingredients’.

Students:

* share pleasant dreams they have experienced and suggest other things they would like to dream about
* make a list of the characteristics of pleasant dreams (e.g. being able to fly like a bird, being happy, feeling loved)
* suggest items that could be used to represent these characteristics and be used as the ‘ingredients’ for dreams. (To provide interesting measurement comparisons using solids and liquids, teachers can encourage their students to be creative with their ingredients — for example, feathers for flying, water for travel, rice for money.)
* gather a variety of containers and select ones to hold different ingredients for dreams. They give reasons for their choices.
* Fill containers with ingredients such as sand, rice or water and compare and order the containers according to their volume
* explore volume when experimenting with ingredients for dreams by pouring liquid and solid substances into containers similar in shape but of varying capacity, or identical in capacity but different in shape
* choose appropriately sized containers for each of the ingredients and fill them
* label containers with the name of the ingredient, the amount in it and the type of dream it could be used to create
* constructing a ‘dream factory’ in a corner of the classroom. This could enhance the drama   
  of *The dream-maker*. Students could take on the role of the dream-maker and write recipes for dreams.

|  |
| --- |
| Assessing learning |
| Sources of evidence could include:   * discussions about shapes * measuring squares with non-standard units * recording measurements of length using non-standard units * comparing and ordering shapes.   When making judgments, teachers consider whether the student has:   * identified different attributes of measurement * compared and ordered the size of objects using different attributes of measurement * measured with non-standard units * used addition to measure ingredients in containers * identified everyday shapes using geometric names. |

## 2. Understanding and applying

### Creating the dream mat

Students:

* use crayons, pencils or felt pens to sketch their ideas for a dream mat
* work in small groups and use rectangular, square and triangular pattern blocks to experiment with designs for a dream mat and to note difficulties when combining different shapes
* compare the sizes of the paper shapes they created earlier for an individual to sit on and identify a ‘one size fits all’ shape. Once consensus is reached, this shape will become the template for all to use
* determine the number of shapes that are needed for the whole class
* experiment with the layout of the total number of pieces required to determine the best shape for the class dream mat. For example, the mat may be made into a rectangle measuring five squares across and six squares down. It may be necessary to discuss how to manage the design where a prime number is involved.
* make their shape for the mat using fabric and decorate if necessary. Shapes could be sewn together or sewn or glued onto a backing fabric.

### Examining the finished mat

Students:

* identify the area covered by the mat in terms of the number of shapes used to construct the cloth
* identify the length of each boundary in terms of the number of shapes along each side of the mat.

### Writing dreams — working with ingredients

Students:

* observe how the teacher drafts a recipe using words and symbols for the ingredients and the quantities required for a dream
* write a recipe for a dream with the teacher using ingredients from the dream factory
* in small groups of dream-makers, create recipes for three different dreams   
  (e.g. dreams about being a pilot, riding on a magic carpet, being in the Olympics)
* record recipes using words for addition
* add the quantities of ingredients needed for their three dreams and record the amounts required using symbols for addition
* follow recipes created by other groups using balance scales where necessary to   
  measure ingredients
* use their knowledge of subtraction to calculate the quantity of ingredients remaining in containers after recipes have been made up
* in the role of ‘chemist’ or dream factory supervisor:

measure volumes of ingredients using non-standard units

dispense the ingredients to the dream-makers

decide which ingredients need to be replaced and in what quantities

replace ingredients by adding correct quantities to containers.

|  |
| --- |
| Assessing learning |
| Sources of evidence could include:   * construction of the shapes to sit on * comparisons of shapes * designs for the dream mat * observation of play and experimentation in the dream factory * written recipes * records of measurements using non-standard units.   When making judgments, teachers consider whether the student has:   * identified different attributes of measurement * solved addition problems involving small whole numbers * measured with non-standard units * understood that addition and subtraction are the inverse of each other. |

3. Communicating and justifying

### Designing a personal cloth of dreams

Students:

* use non-standard measurements to establish the perimeter for a personal cloth of dreams   
  — one that they can use to cover themselves when lying down
* create a design for a personal cloth of dreams using rectangles, squares, triangles or circles
* explain the properties of the chosen shapes.

### Presenting recipes and demonstrating dream making

Students:

* in small groups, select a dream recipe to illustrate and present to the class
* explain their choices of ingredients and demonstrate the making of their recipe including measuring procedures
* describe and record the changing volumes of ingredients using mathematical language, and symbols for addition and subtraction. For example, ‘The container holds four cups of icing sugar. I have used one cup for the dream, so there will be three cups left. Four take away one leaves three: 4 – 1 = 3’.

|  |
| --- |
| Assessing learning |
| Sources of evidence could include:   * designs for cloths of dreams * explanations of properties of shapes * written recipes * demonstrations of the measuring of ingredients * use of balance scales * recordings of measurements of volume using non-standard units.   When making judgments, teachers consider whether the student has:   * solved addition and subtraction problems * measured with non-standard units * understood that subtraction is taking one quantity away from another. |

Links

This investigation could be connected to the core learning outcomes from other strands in the Mathematics key learning area and to core learning outcomes from another key learning area   
— for example, The Arts.

### Mathematics

**Strand** Number

**N 1.1** Students identify, compare and order small whole numbers, make and match representations of these numbers and identify coins and their uses.

Students:

* use number names to count squares in the dream mat or their cloth of dreams
* quantify the items in collections — for example, the ingredients in recipes
* count from a given number using different representations of numbers
* label collections with numbers then order
* make different collections of a number using combinations of smaller numbers.

**Strand** Patterns and Algebra

**PA 1.2** Students compare and describe arrangements of objects and combinations of numbers to 10 using the language of equivalence.

Students:

* compare different arrangements of numbers that have the same value — for example, students can compare the ways 10 can be represented when listing the amounts of ingredients needed for their recipes
* compare and describe different arrangements of the same number of objects using the language of equivalence
* compare the value of collections of objects and describe as ‘equal to’, ‘same as’ or ‘different from’.

### The Arts

This mathematics investigation is designed to complement the learning experiences developed in The Arts sourcebook module, *The dream-maker.* Sourcebook modules are available online from the QSA website: www.qsa.qld.edu.au

**Strand** Drama

* **DR 1.1** Students create and accept roles while participating in dramatic play.
* **DR 1.2** Students share drama with others by participating, listening and watching.
* **DR 1.3** Students describe ideas and feelings experienced during the making and shaping   
  of their dramatic play.

|  |
| --- |
| For more information, refer to the elaborations in the *Years 1 to 10 Arts Sourcebook Guidelines,* which are available online from the QSA website: www.qsa.qld.edu.au |