Investigation 1
Ripper rides

The iBoards Company is coming to the Australian market. iBoards is famous for making surfboards, skateboards and snowboards.

The company is looking for a talented young designer to create some exciting deck designs for its new Aussie iBoard range.

There are strict guidelines for design – each deck must have no more than $\frac{3}{4}$ of its surface covered by design and no less than $\frac{1}{4}$ of its surface covered by one solid colour. Investigate a way to prove that your pattern covers as close as possible to $\frac{3}{4}$ of the board.

The designs must be geometric and consist of a specific set of lines and shapes.

Get designing!

✓ Topics

Before you start the Investigation you need to know...

- ☐ **NA23** Equivalent fractions p76
- ☐ **NA33** Investigating patterns p96
- ☐ **MG12** Area p124
- ☐ **MG13** Area of irregular shapes p126
- ☐ **MG14** Angles p128
- ☐ **MG16** Tessellation p132

Understanding the Investigation

1 Read and plan.

Make sure you understand the meanings of:
Australian market, company, range, geometric, colour scheme, deck designs, regular, guidelines, patterned, enlarge, overlapped, represent, design elements and *solid colour.*

Read and discuss the rubric.

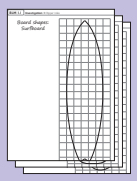
Download your Investigation plan. This will help you with the organisation and understanding of the Investigation.

Teacher note

- Comprehensive lesson notes, suggestions and resources are available in *iMaths 4 Teacher Book.*
- The BLMs and Investigation plan for this Investigation can be downloaded from **www.imathsteachers.com.au**.

Materials


Internet access


BLMs 1.1–1.3


Coloured pencils


Paints

Surf, skate or snowboard magazines


ruler

2 Look at other board designs.

Look at the size and shape of surfboards, skateboards and snowboards. Examine the deck patterns. Are there any with geometric patterns?

Choose your favourite board type and print out the appropriate template from **BLMs 1.1–1.3**. Keep in mind that only $\frac{3}{4}$ of the board will be patterned. You may need to enlarge the board template to A3 so you have a bigger design space.

Using maths

3 Calculate $\frac{3}{4}$ of the board.

Use the appropriate blank board shape (**BLMs 1.1–1.3**) to investigate a method to find $\frac{1}{4}$ of the area of your board .

Once you have $\frac{1}{4}$, it should be easy to find $\frac{3}{4}$. The area you find will be your design space.

4 Plan and draw your design.

Read the guidelines in the box to the right. Experiment with designs that meet the guidelines. Arrange the geometric pattern to cover $\frac{3}{4}$ of the board.

When you are happy with your design plan, carefully draw it onto the outline of your board.

Name your creation.

Reasoning and reporting

5 Find the most popular, accurate design.

Make a class display of all designs. Group the boards by type.

Explain how you have included all the geometric design elements that were required.

Prove that $\frac{1}{4}$ of your board has been left blank for the solid colour.

Choose the three boards you would select to submit to iBoards.

Give reasons for your choices.

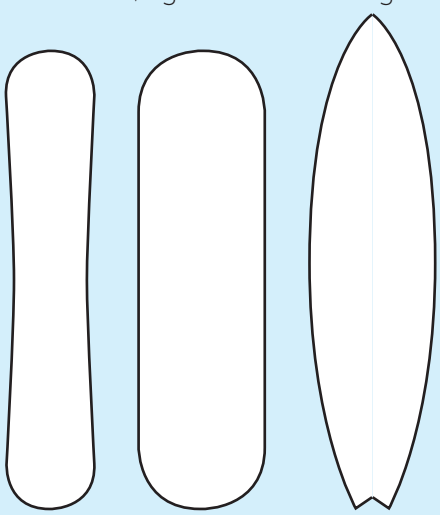
imathskids.com.au

Go to **imathskids.com.au** –
The Investigation 1 area contains the Investigation plan, websites and BLMs that you need to complete this Investigation.

Guidelines for board design

The board design must include:

- 2 small triangles
- 2 medium triangles
- 2 large triangles
- 6 horizontal lines
- 6 vertical lines
- 3 sets of parallel lines
- 4 intersecting lines
- An interesting shape that will tessellate at least 8 times
- An unusual shape that is flipped or reflected
- An acute, right and obtuse angle.

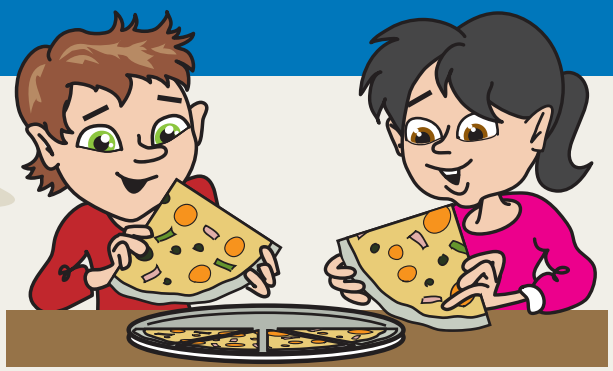


Inquiry

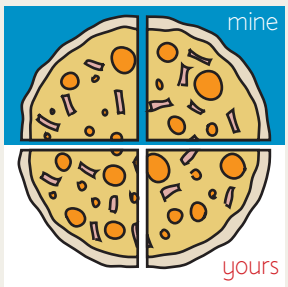
Investigate and list 5 reasons why boards come in so many different shapes, sizes, designs and materials.

NA23 Equivalent fractions

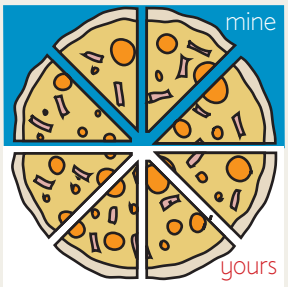
Each of us wants to eat exactly half a pizza, but we don't all like our pizzas cut the same. No matter how I cut these pizzas, each of us will receive the same amount.



$\frac{1}{2}$ pizza each =



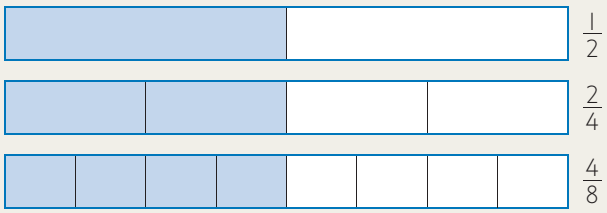
$\frac{2}{4}$ pizza each =



$\frac{4}{8}$ pizza each

These fractions have the same value.
We call them **equivalent fractions.**

Let's look at that again on a fraction wall.

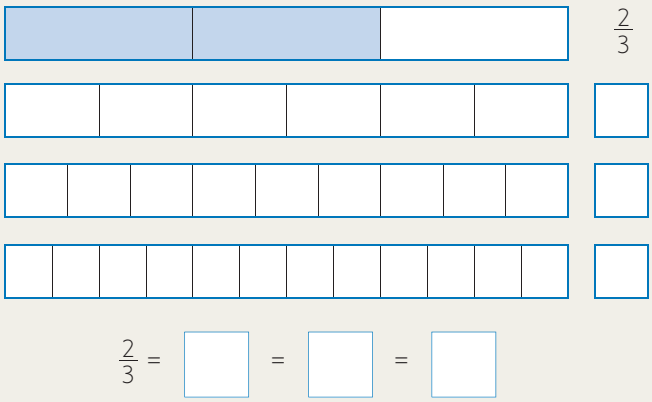


The shaded part of each row shows you that the same fraction can have different names.

$\frac{1}{2} = \frac{2}{4} = \frac{4}{8}$

Try this

1 Colour part of each row to show fractions equivalent to $\frac{2}{3}$.
Write the equivalent fraction symbols.



d $\frac{2}{3} =$ ☐ = ☐ = ☐

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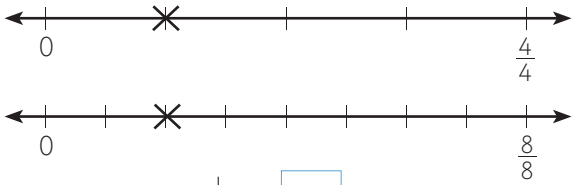
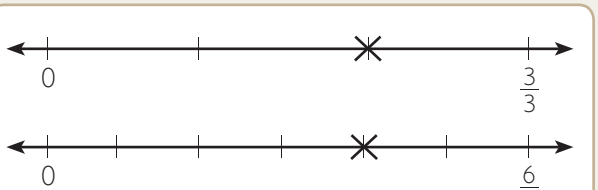
2 Equivalent fractions can also be shown on number lines. Complete each pair below.

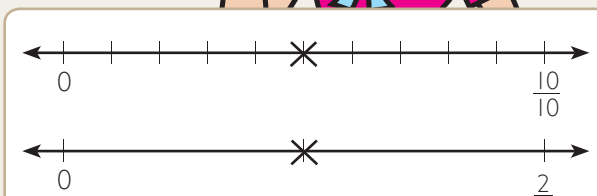
a



b

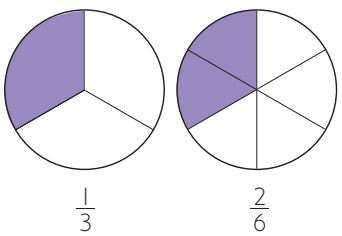


c

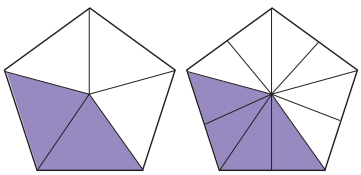


3 Write fractions below each pair of fraction models. The first one has been done for you.

a



b



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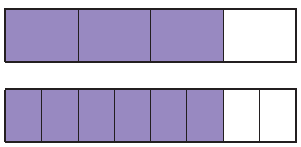

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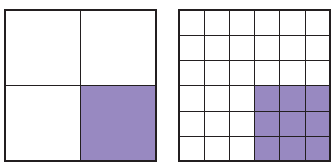
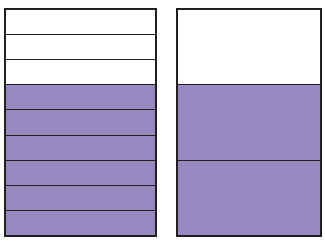


e



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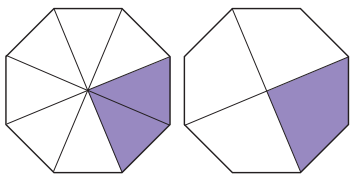

Problem solving task

Pizza toppings: List all of the two-topping pizzas that can be made with ham, pineapple, cheese and olives.
Use the space provided in *iMaths 4 Tracker Book* to work out your answer.

Challenge

Pieces of eight: How many halves in eight pizzas? How many quarters in eight oranges?
How many eighths in eight melons?

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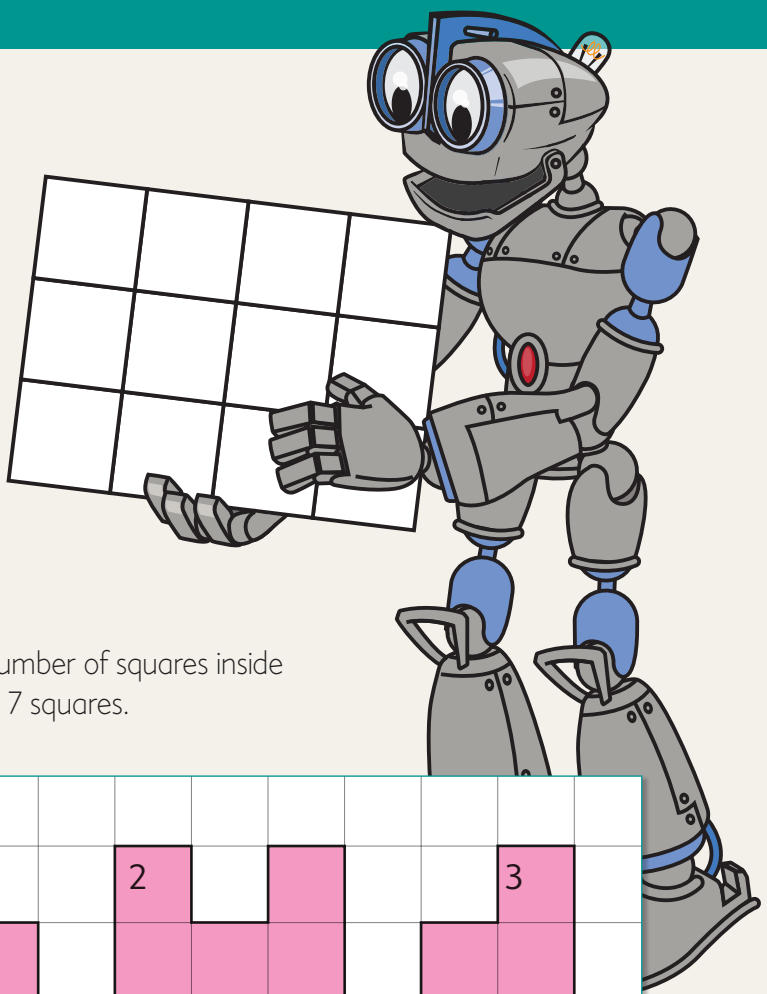
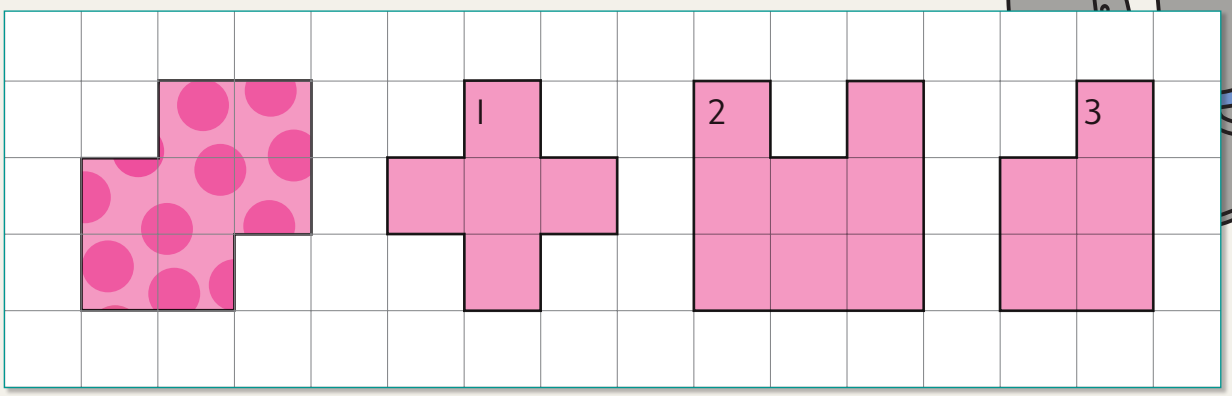
MG12 Area

Area is the amount of space inside the boundary of a 2D shape. A squared grid is useful for measuring area. All the squares are the same size and they fit together so that there are no gaps.



To find the area of each 2D shape, count the number of squares inside the boundary. The area of the spotted shape is 7 squares.



Try this

1 Find the area of each shape.

a The area of shape 1 is _____ squares.

b The area of shape 2 is _____.

c The area of shape 3 is _____.

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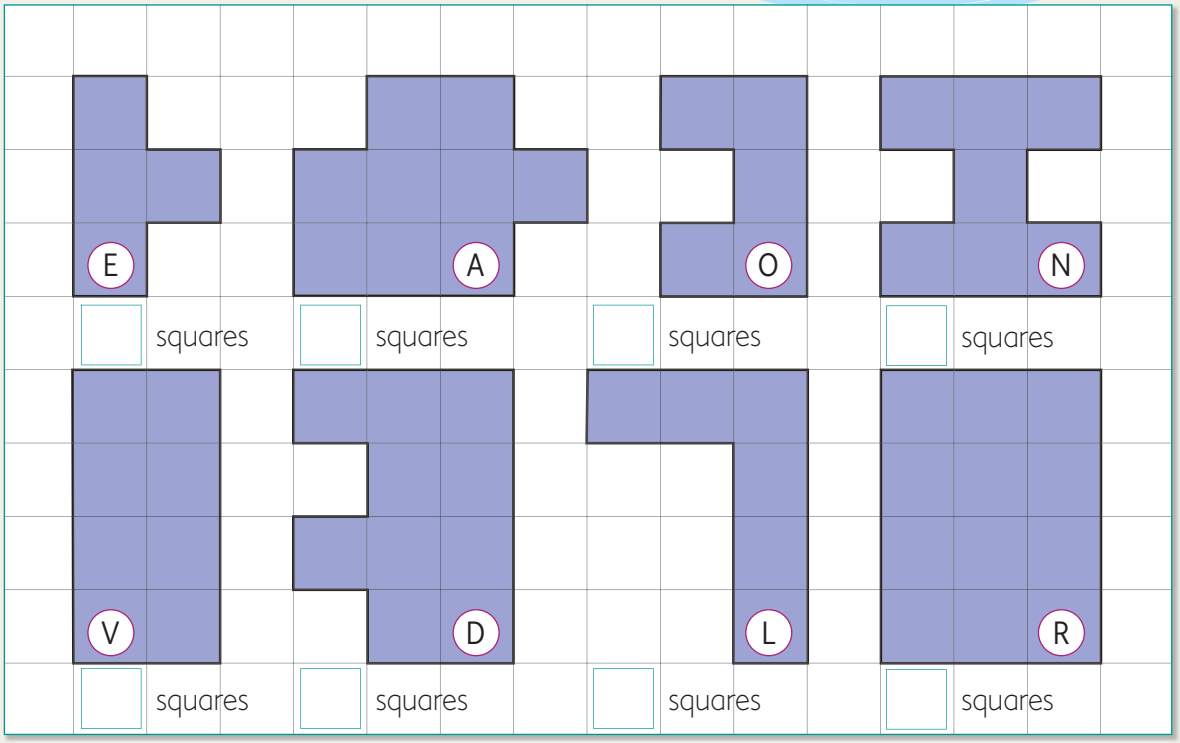
My dog can't swim. Do you know what I called him?

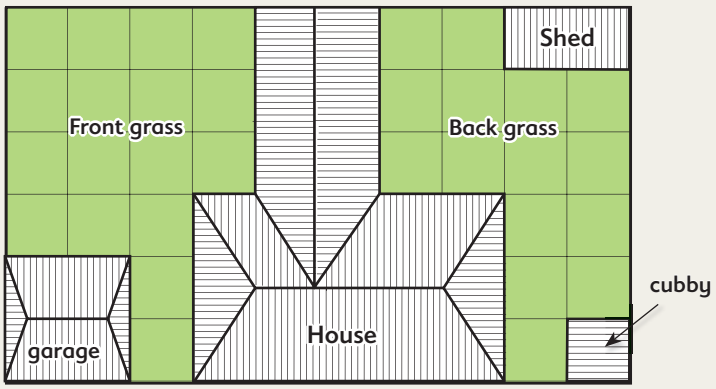
2 Work out the area of each shape, then write the letter that matches the answer in the boxes below.



6	9	7	10	12	5	8	4	12

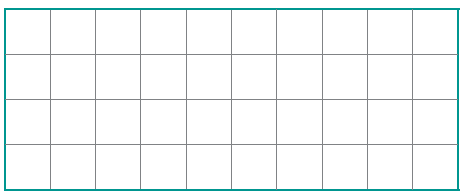
3 Find the area of grass at the front of the house and at the back of the house.
Work out both areas of grass.
Give your answer in number of squares.

Front grass	Back grass



Challenge

Tetrominoes: Draw all the shapes that have an area of four squares. If you flip or turn a shape, it does not count as another shape. There are five to draw.



Topic MG12

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Problem solving strategies
8 Make an organised list

The **make an organised list** strategy involves writing a careful list of every possible answer. You may need to work through the information slowly to make sure you don't miss any possible answers.

Share this problem

Four netball teams have signed up for this season's competition – **Angels**, **Mermaids**, **Pixies** and **Rainbows**.

Every team must play the others once in the first round. List the games to be played in Round 1 of the competition.

Discuss the solution

Make an organised list will be a useful strategy here to ensure that you have accounted for all possibilities.

List the first team and pair it with all the other teams, one by one, in turn.

Angels **V** Mermaids	Angels **V** Pixies	Angels **V** Rainbows

List the second team and pair it with the remaining teams, one by one, in turn.
(No need to write Mermaids V Angels because Angels V Mermaids is already done.)

Mermaids **V** Pixies	Mermaids **V** Rainbows

And so on, until all teams have been paired.

Pixies **V** Rainbows

The completed Round 1 draw has six games listed above.

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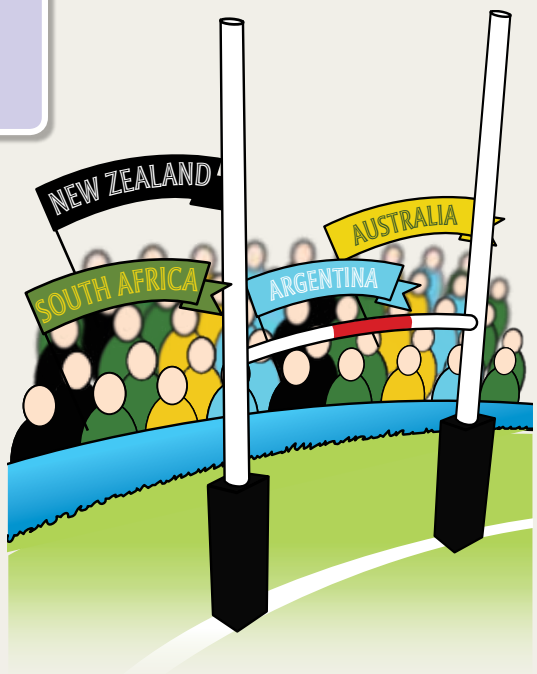
YOUR TURN

The Four-Nations Rugby competition is on again. This tournament is played between the rugby nations of Australia, New Zealand, South Africa and Argentina.

Write a list of games to be played if each team must play all the others once.



Use the **make an organised list** strategy to solve this problem.

1	Guess and check	6	Check for relevant or irrelevant information
2	Make a table or chart	7	Find smaller parts of a large problem
3	Draw a picture or diagram	8	Make an organised list
4	Act out the problem	9	Solve a simpler problem
5	Find a pattern or use a rule	10	Work backwards

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