



Investigation I

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

I 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.

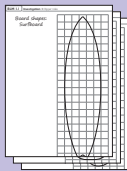
Teacher note

- 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



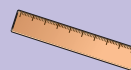
Coloured pencils



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

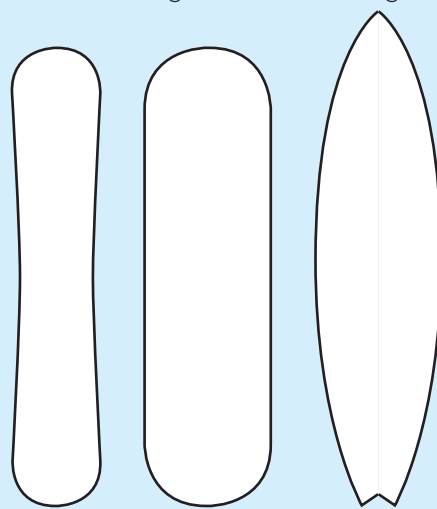


Go to **imathskids.com.au** – The Investigation 1 area contains the Investigation plan, websites and BLMs that you need to complete this Investigation.

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

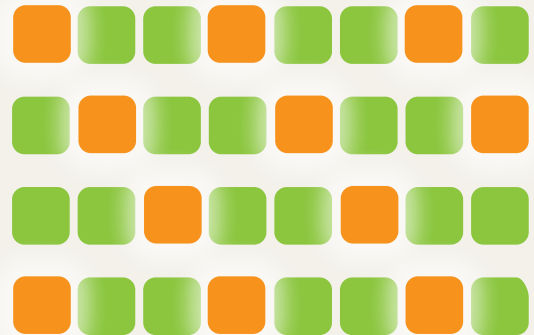
Investigate and list 5 reasons why boards come in so many different shapes, sizes, designs and materials.



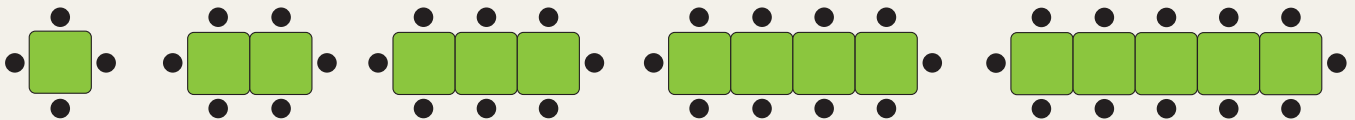
NA33 Investigating patterns

When investigating patterns, a table may be used to record information. The table, called a **table of values**, lists each term and helps to identify a growing pattern.

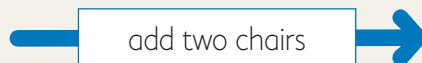
A growing pattern involves a change between one term and the next. This change can be described using a rule. The rule may then be used to predict further terms.



Look at the pattern of tables and chairs for a banquet below.



Term	1	2	3	4	5	6	7	8	9	10
Number of chairs	4	6	8	10	12					

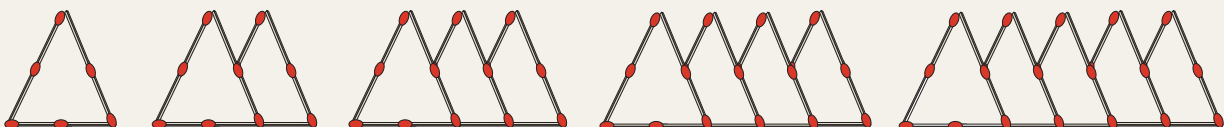


There are two more chairs used in each term so the rule is 'add two chairs'.

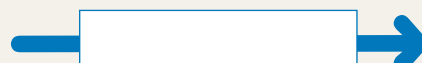
Using this rule, the next five terms are 14, 16, 18, 20, 22.

Try this

- 1 a Complete the table of values to the 5th term.
- b Describe the pattern using a rule.
- c Continue the table of values to the 10th term.

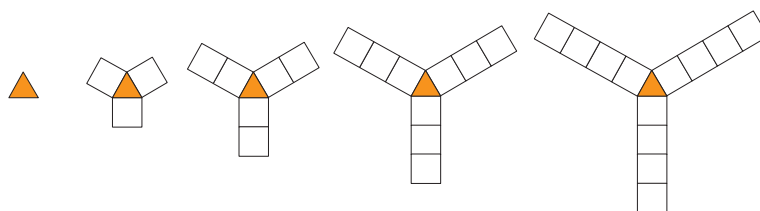


Term	1	2	3	4	5	6	7	8	9	10
Number of matchsticks										



For each pattern, complete the table of values to the 5th term, describe the change using a rule, then continue the table of values to the 10th term.

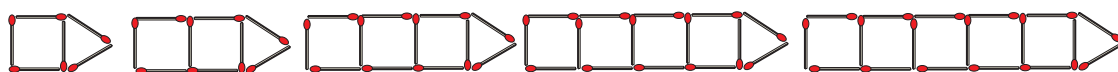
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Term	1	2	3	4	5	6	7	8	9	10
Number of shapes										

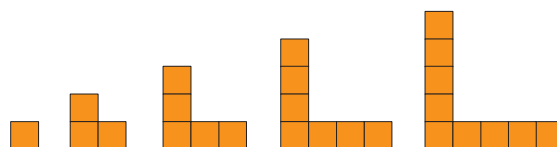


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4





Problem solving task

Town plan: Toy Town's town plan allows a 'one square' building to be surrounded by one square of yard in each direction. This gives 8 squares of yard. How many squares of yard is allowed for a building that is 10 squares long? Use the space provided in *iMaths 4 Tracker Book* to work out your answer.



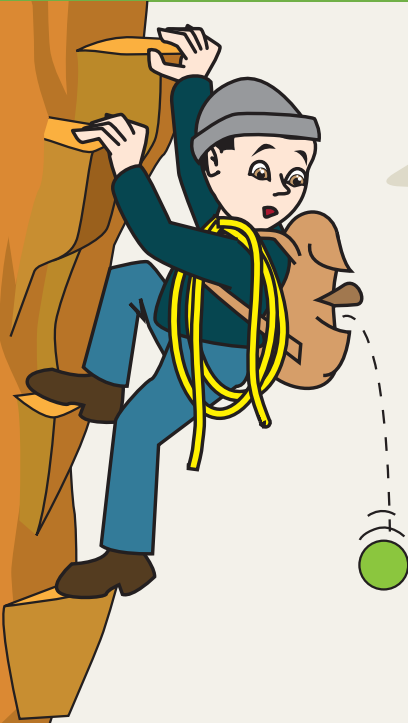
Challenge

What's the 15th term? Without writing the 11th, 12th, 13th and 14th terms, can you predict the 15th term for each of the growing patterns above?



Problem solving strategies

3 Draw a picture or diagram



The **draw a picture or diagram** strategy involves using a pencil and paper to help you see how the objects in a problem are related. You may need to draw objects, people, numbers, symbols or arrows to help you understand the problem.

Share this problem

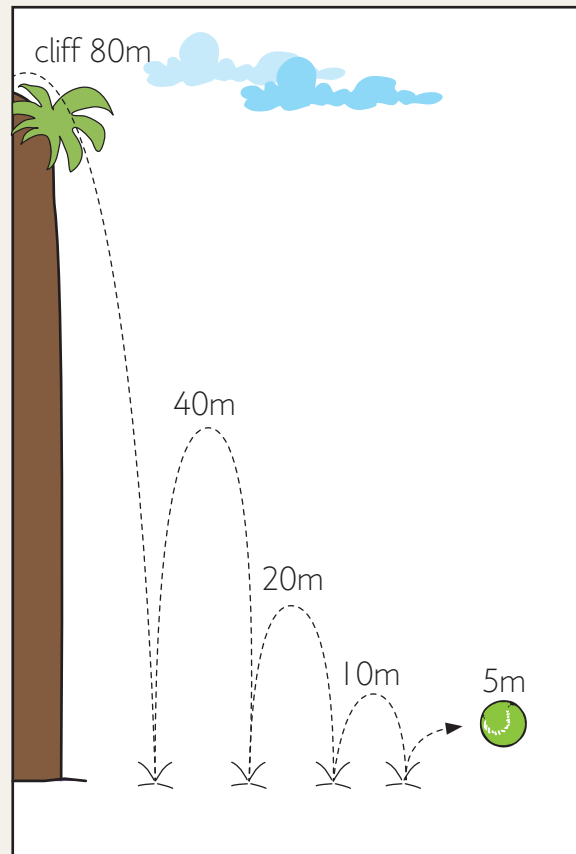
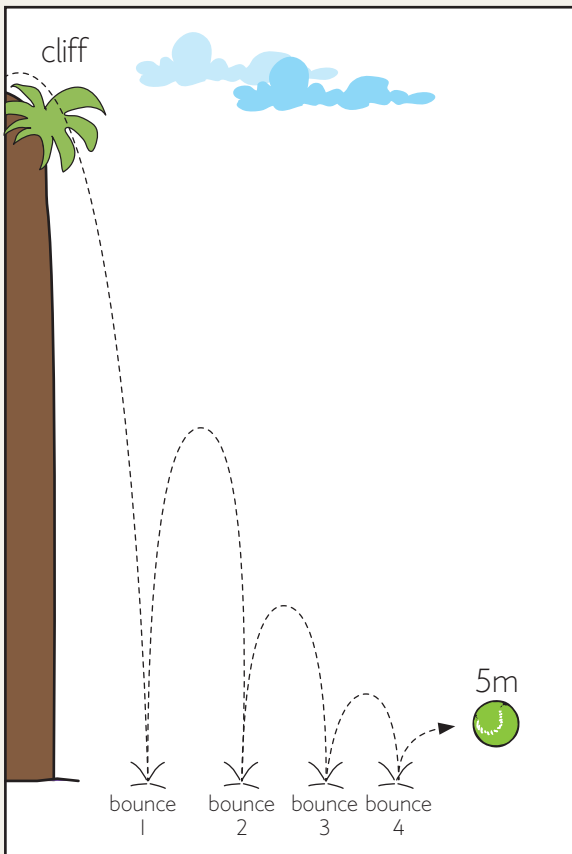
A climber dropped a tennis ball from a cliff. When it hit the ground it bounced back half of the height from which it fell. On the fourth bounce the ball bounced to a height of 5 metres. What was the height from which the ball fell?

Discuss the solution

Draw a picture or diagram to help you solve this problem.

Draw the path of the ball as it bounced 4 times to a height of 5 metres.

Working backwards, doubling each height, shows that the ball fell from a height of 80 metres.



YOUR TURN

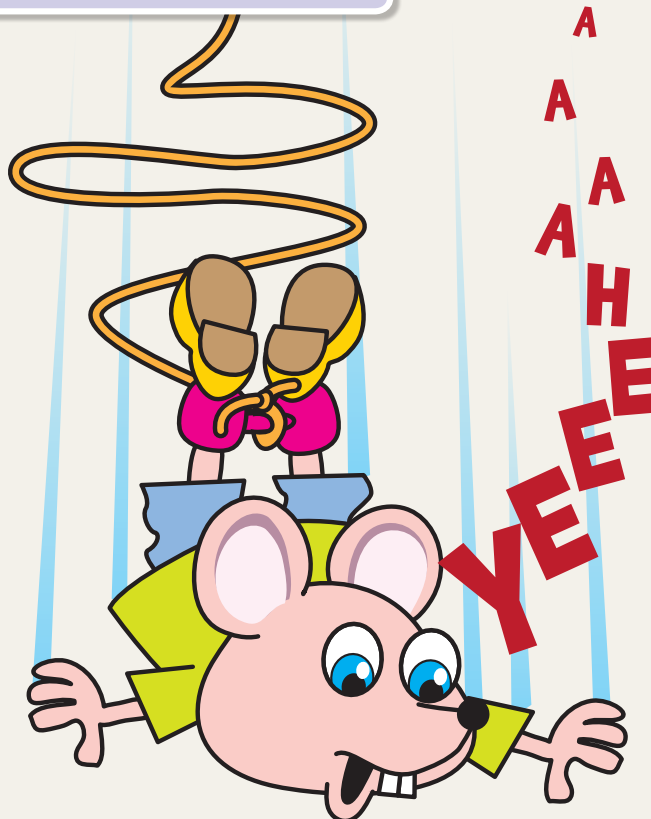
A bungee jumper leapt from a bungee tower and rebounded half of the drop.

He continued to rebound half of the previous rebounds.

The fifth rebound was to a height of 3 metres.

How high was the bungee tower?

Use the **draw a picture** or **diagram** strategy to help 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



Mental computation strategies

+ Addition strategies

- A Friendly chunks
- B Friendly balance
- C Friendly and fix
- D Friendly pairs
- E Place value

A Friendly chunks

Question

Strategy: Count on in friendly chunks.

Answer

1 $240 + 80$		320
2 $\$132 + \26		\$158
3 $794 + 67$		861

B Friendly balance

Question

Strategy: Move amounts from one number to another to make easy additions.

Answer

1 $97 + 86$		183
2 $143 + 28$		171
3 $590 + 74$		664



C Friendly and fix

Question	Strategy: Make numbers friendly then fix the change.	Answer
1 $59 + 26$	$60 + 26 = 86$, -1 (friendly) (fix)	85
2 $135 + 48$	$135 + 50 = 185$, -2 (friendly) (fix)	183
3 $\$1.95 + \3.95	$\$2.00 + \$4.00 = \$6.00$, $-10c$ (friendly) (friendly) (fix)	\$5.90

D Friendly pairs

Question	Strategy: Look for compatible pairs that are easy to add.	Answer
1 $6 + 5 + 2 + 4 + 5$	$\underbrace{6 + 4}_{10} + \underbrace{5 + 5}_{10} + 2$	22
2 $16 + 37 + 3 + 4$	$\underbrace{16 + 4}_{20} + \underbrace{37 + 3}_{40}$	60
3 $427 + 51 + 13 + 5 + 9$	$\underbrace{427 + 13}_{440} + \underbrace{51 + 9}_{60} + 5$	505

E Place value

Question	Strategy: Add each place in turn.	Answer
1 $442 + 35$	$400 + (40 + 30) + (2 + 5)$	477
2 $84 + 81$	$(80 + 80) + (4 + 1)$	165
3 $256 + 712$	$(200 + 700) + (50 + 10) + (6 + 2)$	968