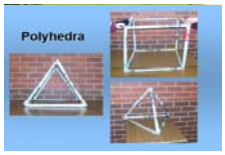
Let's take some Maths300 lessons:

- Garden Beds
- Algebra Walk
- Newspaper Shapes
- …and a few others.



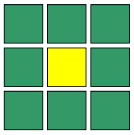
Visualisation **Questioning**

- Looking
- Searching
- Seeing
- Making sense
- Understanding

Learning

Garden Beds

- Surround a flower bed of one square with tiles like this:



How many tiles?

- Now build a border around a flower bed of two squares. How many tiles?

Garden Beds

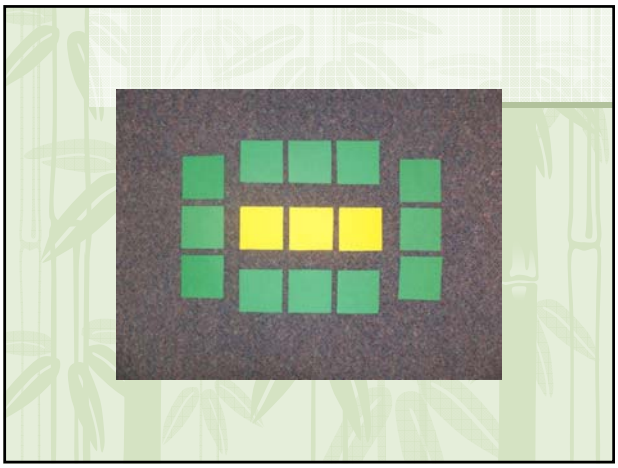
- Now try building borders around flower beds of 3, 4, 5 squares. Each time record the number of tiles you need in a table like this

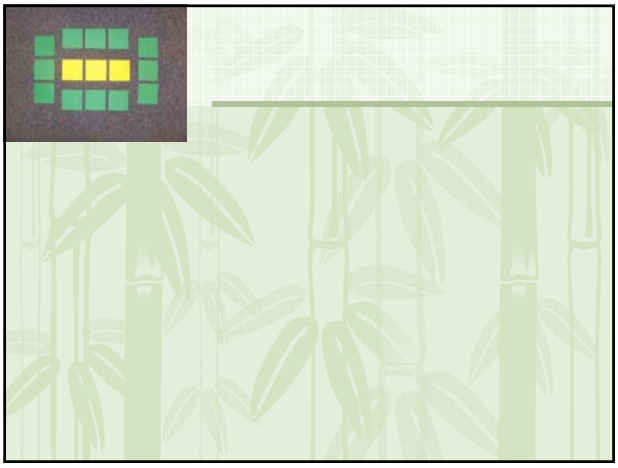
Size of bed	Number of tiles
1	8
2	
3	

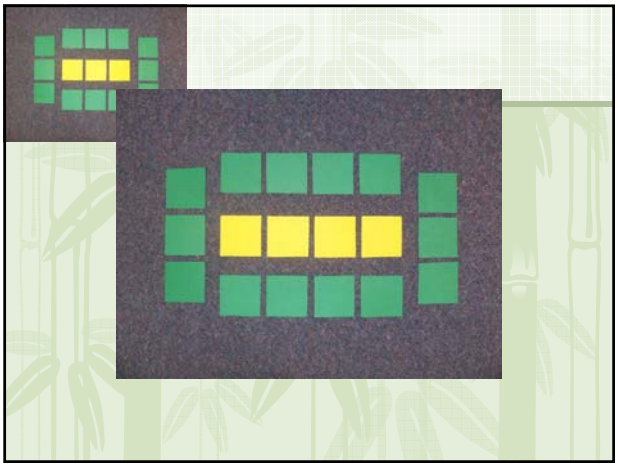
- Your challenge is to predict the number of tiles which would be needed for any size flower bed. Eg. What if the garden bed was 100 tiles long?

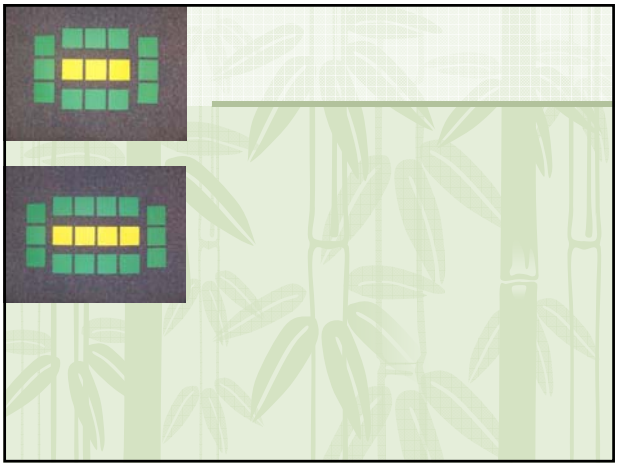
Expressing generality

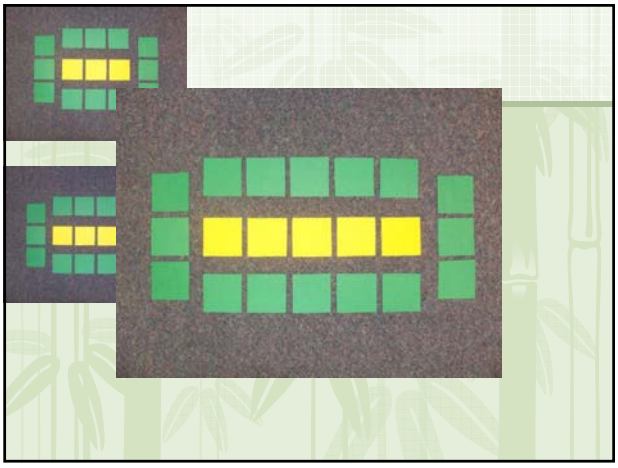
Visualising generality

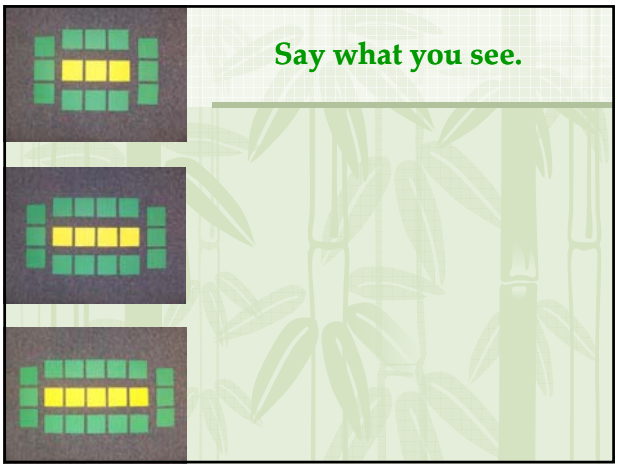


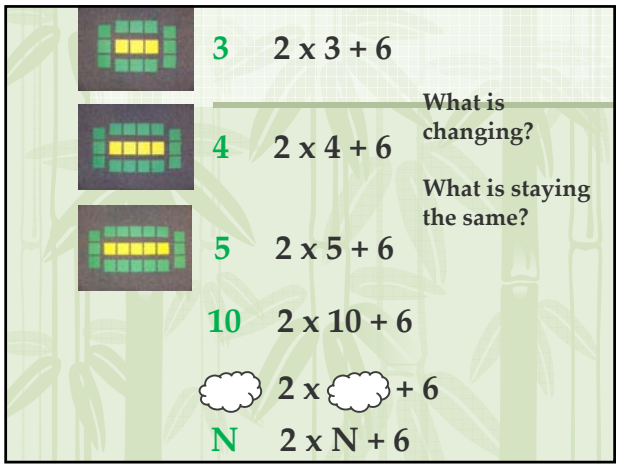


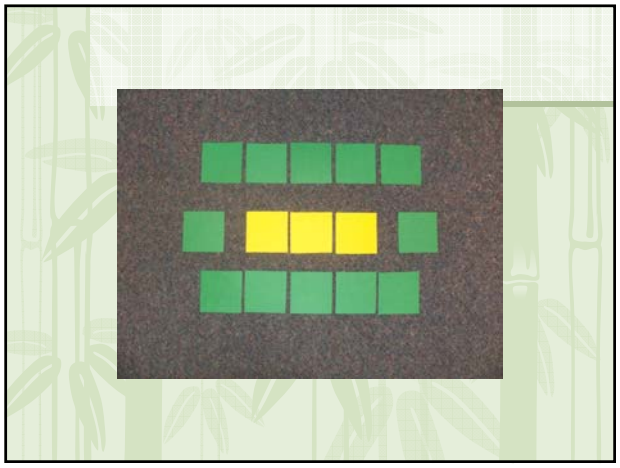


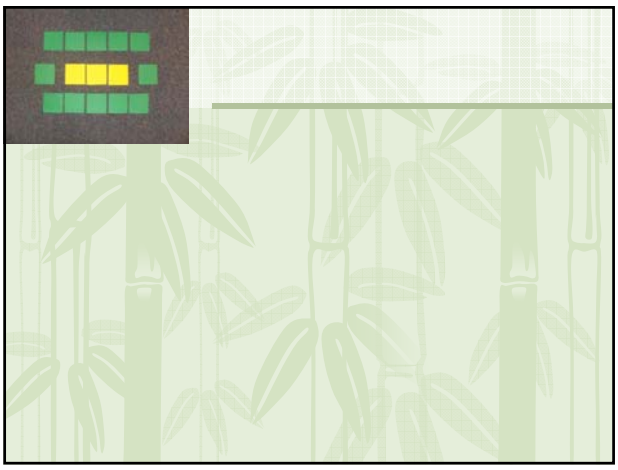


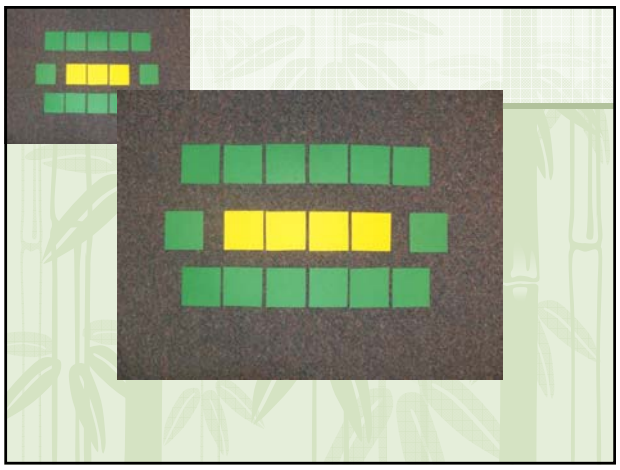


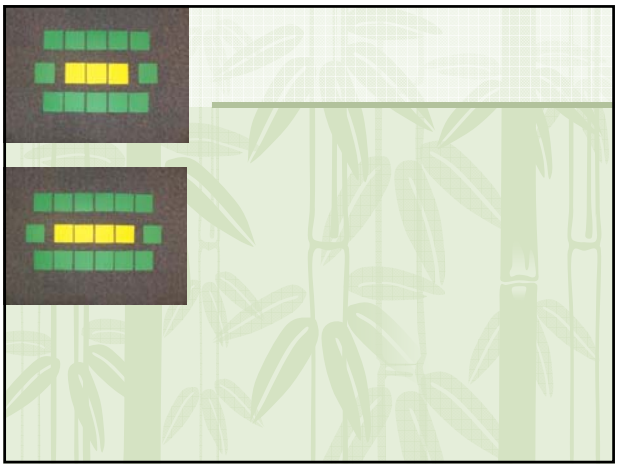

Say what you see.

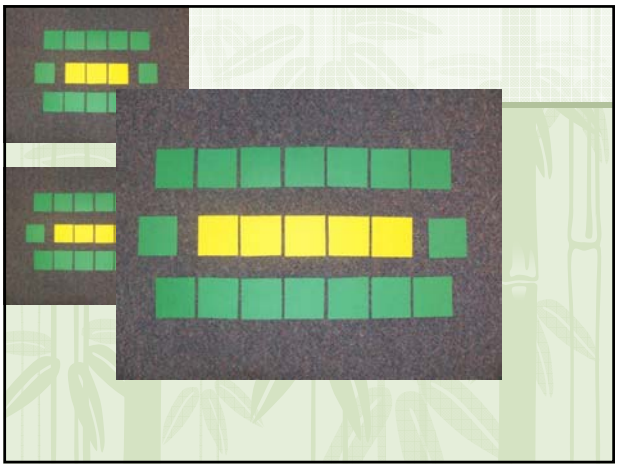

3 2 x 3 + 6
4 2 x 4 + 6
5 2 x 5 + 6
10 2 x 10 + 6
2 x + 6
N 2 x N + 6
What is changing?
What is staying the same?

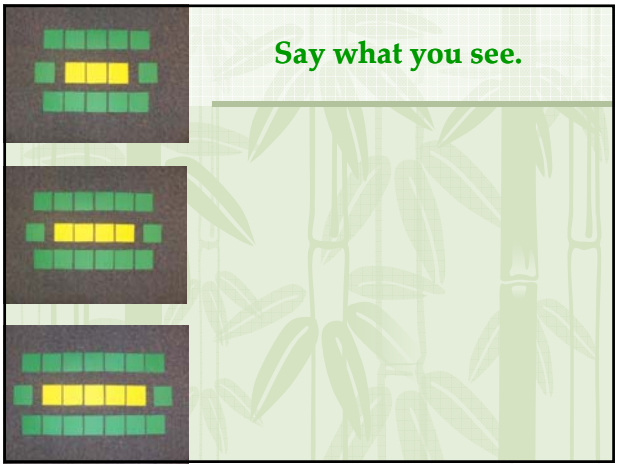




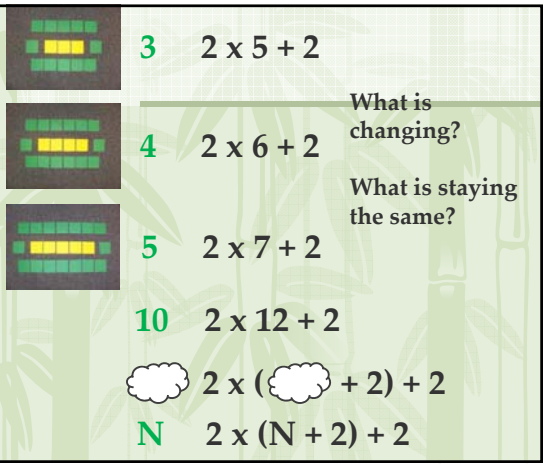








Say what you see.



3 2 x 5 + 2

4 2 x 6 + 2

5 2 x 7 + 2

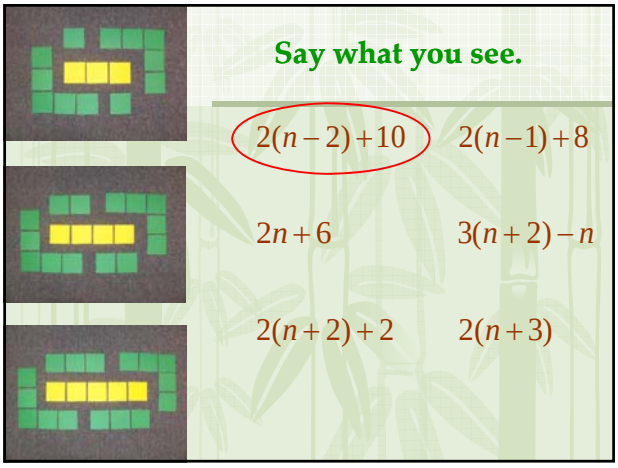
10 2 x 12 + 2

2 x (+ 2) + 2

N 2 x (N + 2) + 2

What is changing?

What is staying the same?

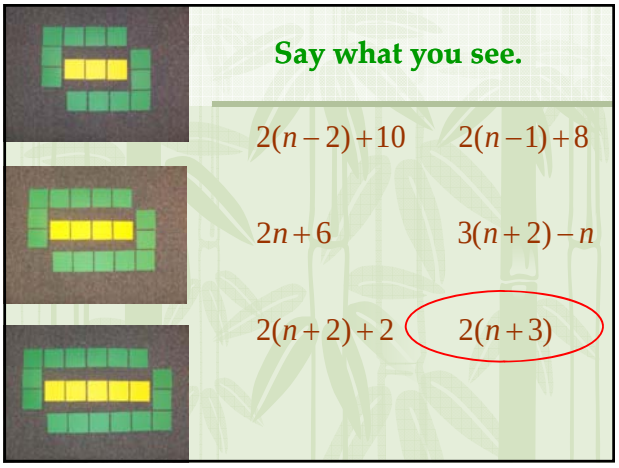


Say what you see.

$2(n-2)+10$ $2(n-1)+8$

$2n+6$ $3(n+2)-n$

$2(n+2)+2$ $2(n+3)$



Say what you see.

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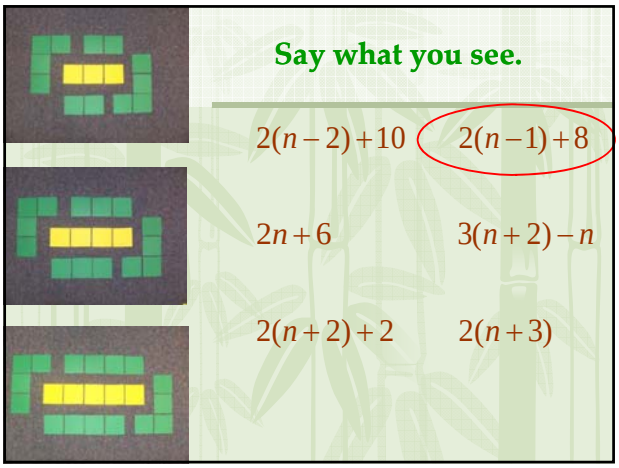
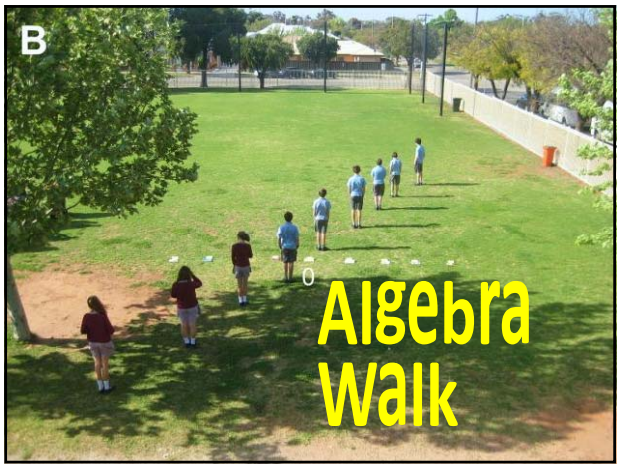


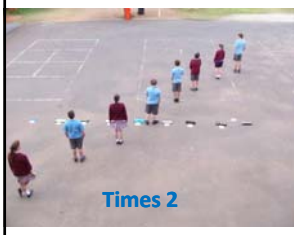


Spot the similarity?

Does everybody move?

Spot the difference?

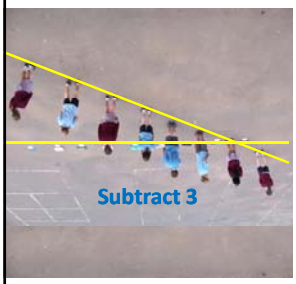
What is the same? What is different?

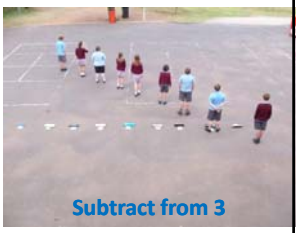


What is different?

What is the same?

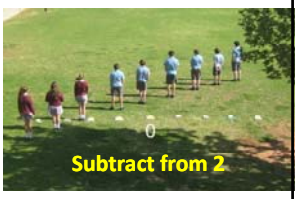
Say what you see.





Is there a relationship?

Say what you see.

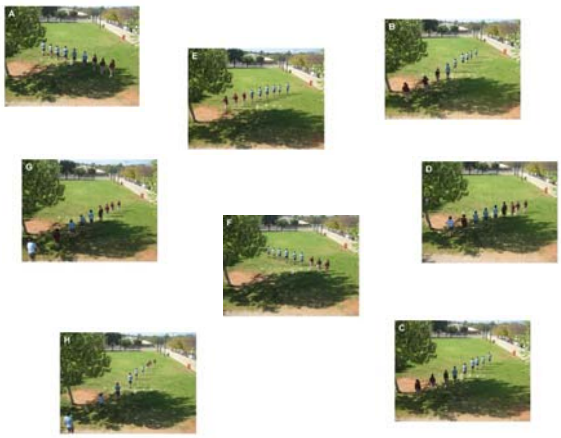


Say what you see.

Improving Learning in Mathematics: Challenges and Strategies

Malcolm Swan – 5 Lesson Genres to develop mathematical thinking:

- Classifying mathematical objects
- Interpreting multiple representations
- Evaluating mathematical statements
- Creating problems
- Analysing reasoning and solutions



W1 Subtract your number from 2	W2 Multiply your number by 2, then subtract 3
W3 Multiply your number by 3, then add 1.	W4 Subtract 3 from your number.
W5 Add 2 to your number.	W6 Multiply your number by -1, then subtract 2.
W7 Multiply your number by 2, then subtract 1.	W8

T1

Starting number	-2	-1	0	1	2
Distance walked			-1	1	3

T2

Starting number	-2	-1	0	1	2
Distance walked	-4	0	4		12

T3

Starting number	-3	-2	-1	0	1
Distance walked	1	0	-1	-2	-3

T4

Starting number	0	1	2	3	4
Distance walked		-1	1		5

T5

Starting number	-1	0	1	2	3
Distance walked	3	2	1	0	

T6

Starting number	-1	0	1	2	3
Distance walked	-4	-3	-2	-1	0

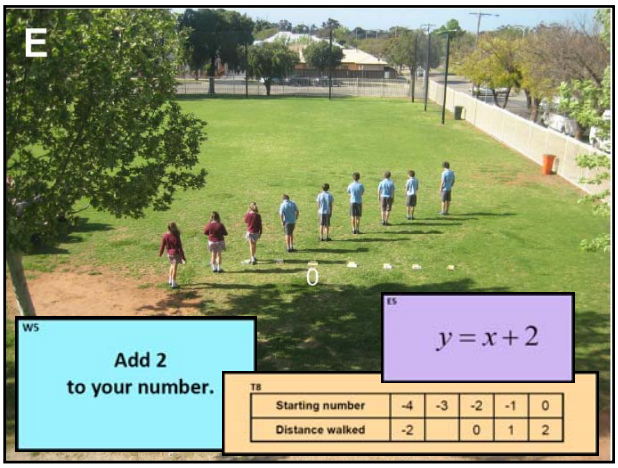
T7

Starting number	-4	-3	-2	-1	0
Distance walked	-11		-5		1

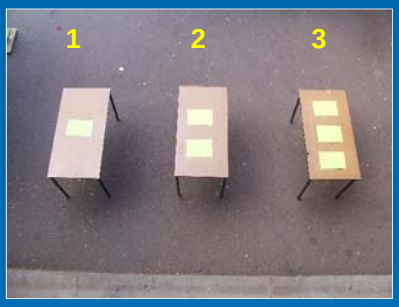
T8

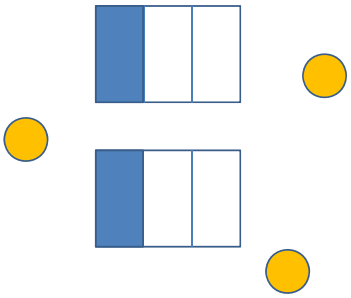
Starting number	-4	-3	-2	-1	0
Distance walked	-2		0	1	2

$y = x - 3$	$y = 3x + 1$
$y = -2 - x$	$y = 4x + 4$
$y = x + 2$	$y = 2 - x$



Chocolate Cake



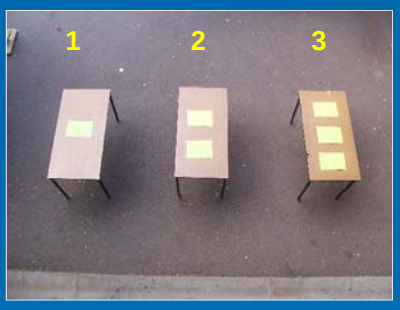


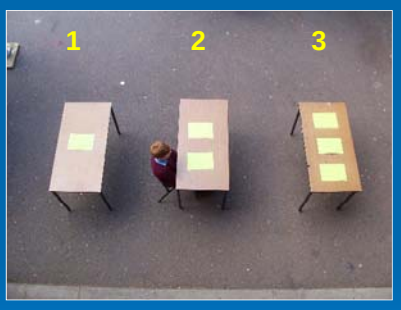
2 cakes

3 people

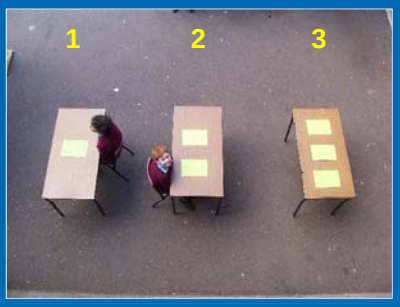
$\frac{2}{3}$ cake

	Table 1	Table 2	Table 3
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

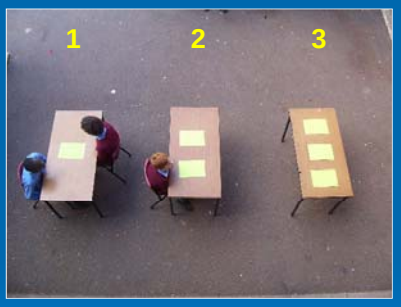




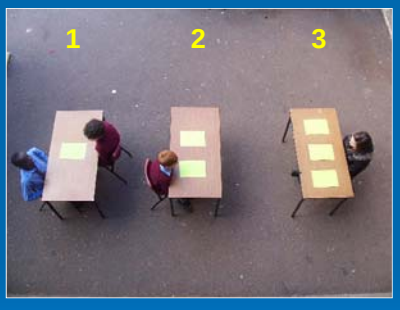
1 Guest



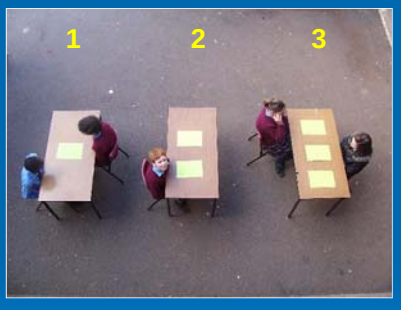
2 Guests



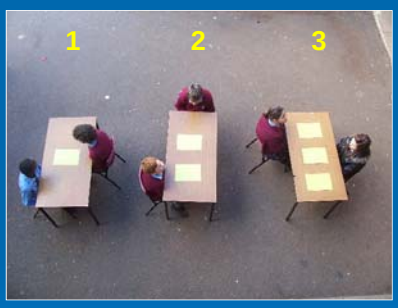
3 Guests



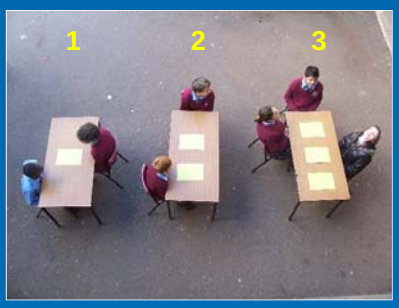
4 Guests



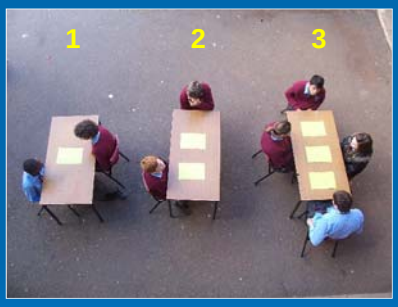
5 Guests



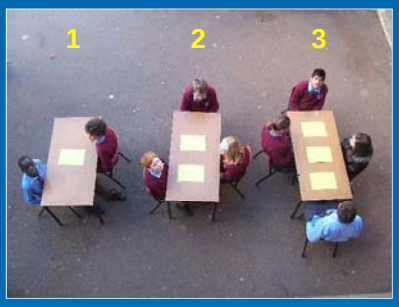
6 Guests



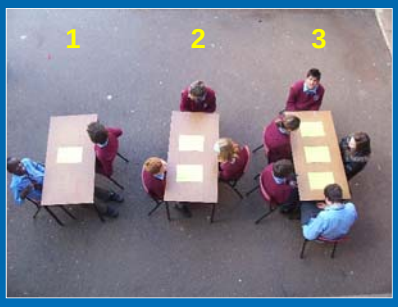
7 Guests



8 Guests



9 Guests



10 Guests

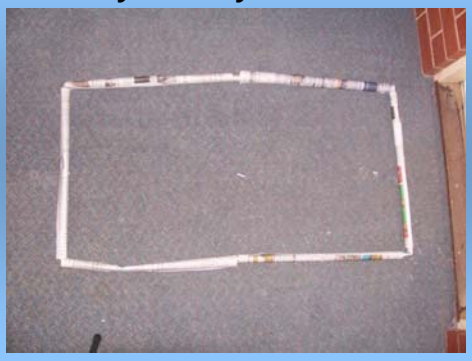
Questions Which Help Mathematicians Learn More

- How much cake does each person get?
- Is there a pattern?
- Who gets the most? How can it be shown?
- Who gets the least?
- What is the difference between each table?
- How do the shares compare to distributing all 6 cakes evenly amongst 10?
- Is this the fairest way of seating 10 people?
- Are there other ways of cutting the cakes?
- Could the best table have been predicted before the guests started arriving? How?

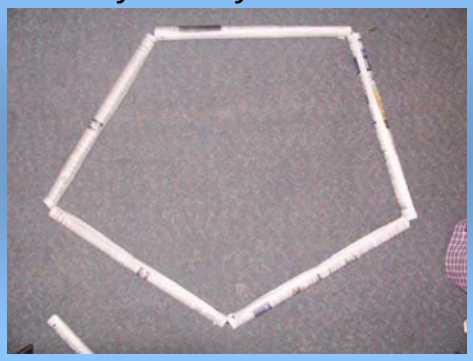
Newspaper Shapes

Polygons & Polyhedra

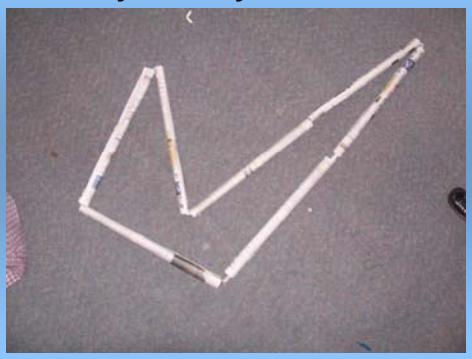
Say what you see…

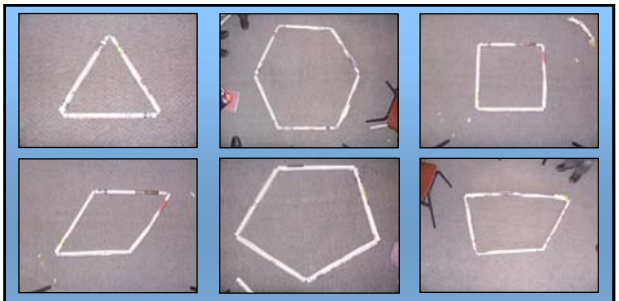


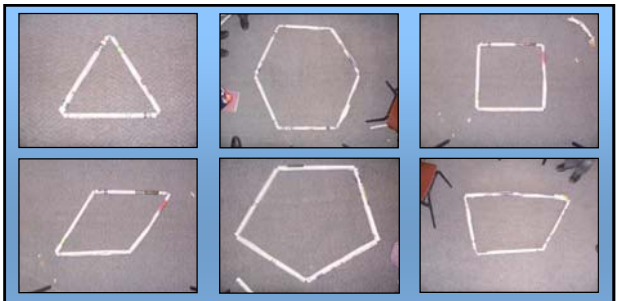
Say what you see…



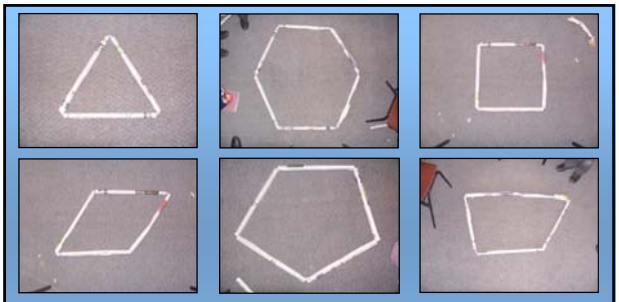
Say what you see…



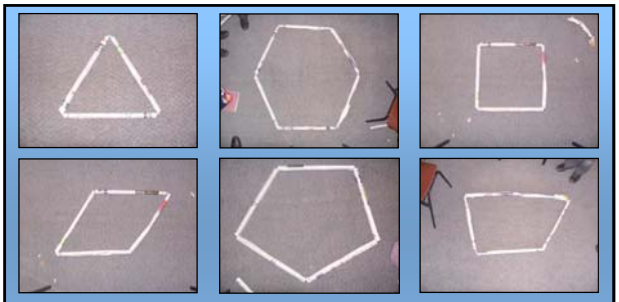




What is the same about all these shapes?

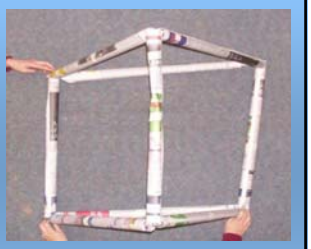


What is different about these shapes?

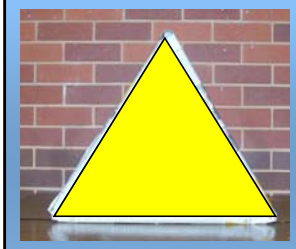


In what ways could you separate these shapes into two groups?

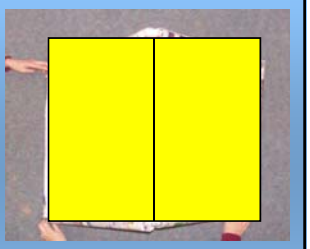
Front View



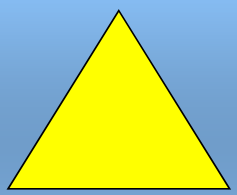
Top View



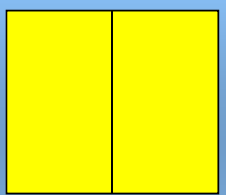
Front View



Top View

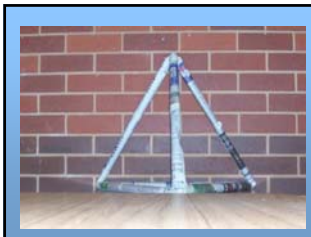


Front View

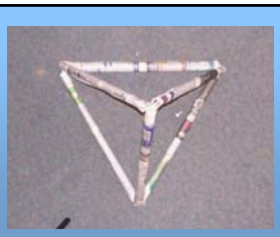


Top View

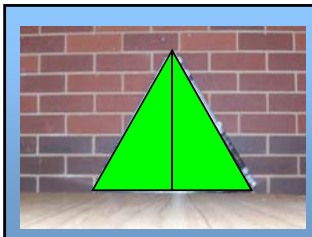
Make 4 triangles with only 6 rods



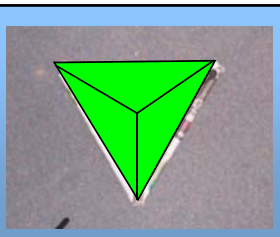
Front View



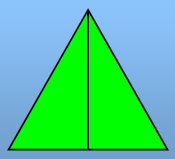
Top View



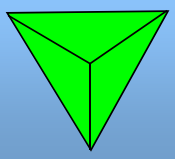
Front View



Top View



Front View

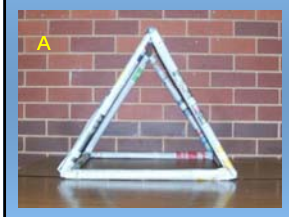


Top View

What is the same about all of these?

Which is the odd one out?

A



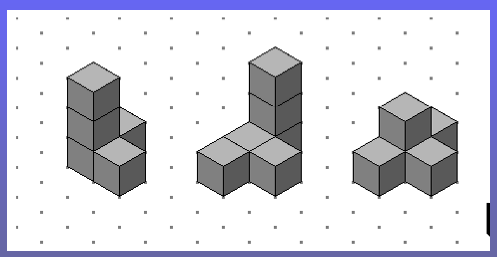
B

C

1

Which is the odd one out?

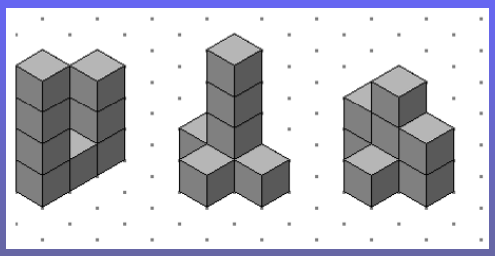
A B C



3

Which is the odd one out?

A B C



Which is the odd one out?

A B C

Which is the odd one out?

A

x	-3	-2	-1	0	1	2	3
y	-3	0	3	6	9	12	15

B

x	-3	-2	-1	0	1	2	3
y	-2	0	2	4	6	8	10

C

x	-3	-2	-1	0	1	2	3
y	-5	-2	1	4	7	10	13

Which is the odd one out?

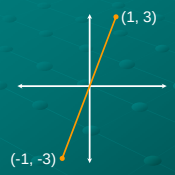
$y = 3x + 7$ $y - 3x + 5 = 0$ $y = -2x - 5$

A B C

Which is the odd one out?

A

x	-3	-2	-1	0	1	2	3
y	-7	-4	-1	2	5	8	11



$y = 2x$

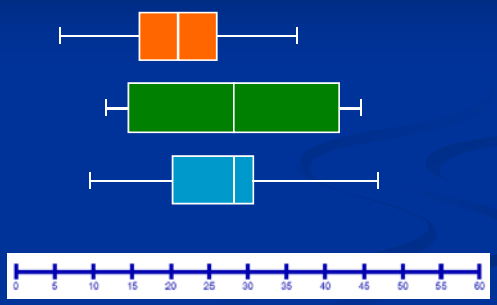
B C

Which is the odd one out?

A

B

C



Visualisation **Questioning**

- Recapturing the moment
- Slowing down time (and thinking)
- Engaging learners
- Creating opportunities to make connections

Learning

- **Garden Beds**
- **Algebra Walk**
- **Chocolate Cake**
- **Newspaper Shapes**
- **Mushroom Hunt**

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- **Garden Beds**
- **Mushroom Hunt**
- **Building Views**

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