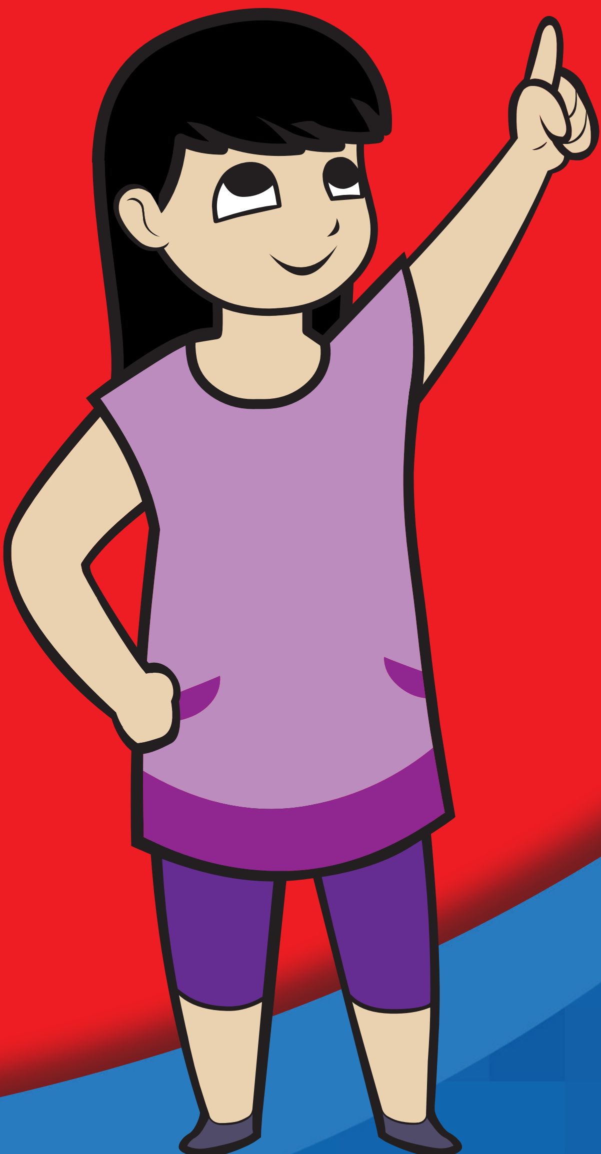
MATHLETICS

B SERIES

Student Book

Patterns and Relationships

$3 + 1 = 2 + 2$



Name ____________

Series B – Patterns and Relationships

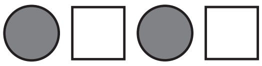
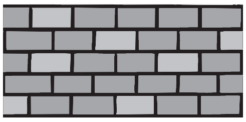
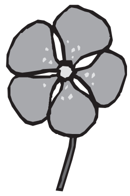
Contents

Series Author:

Rachel Flenley

Patterns and rules – continuing patterns

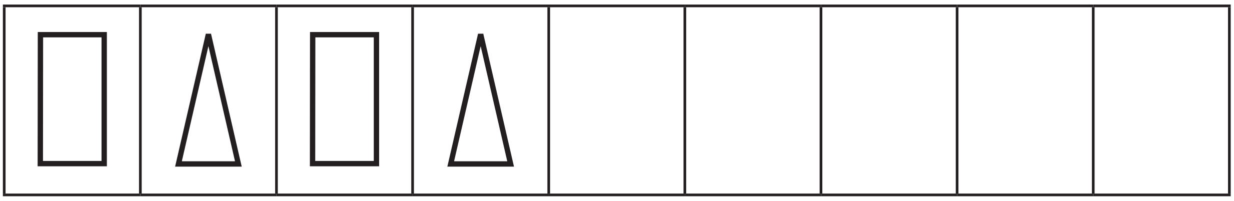
Patterns are all around us in life.

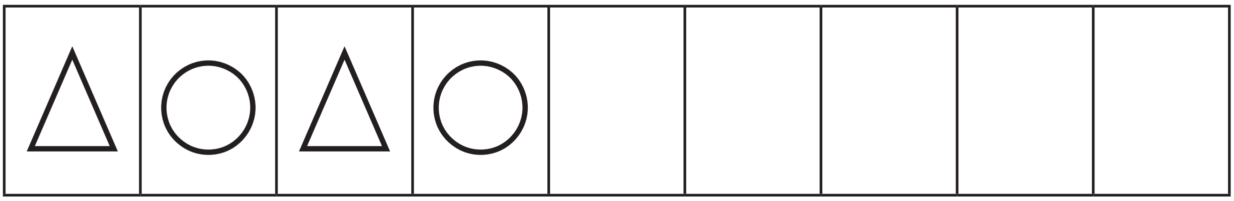
   

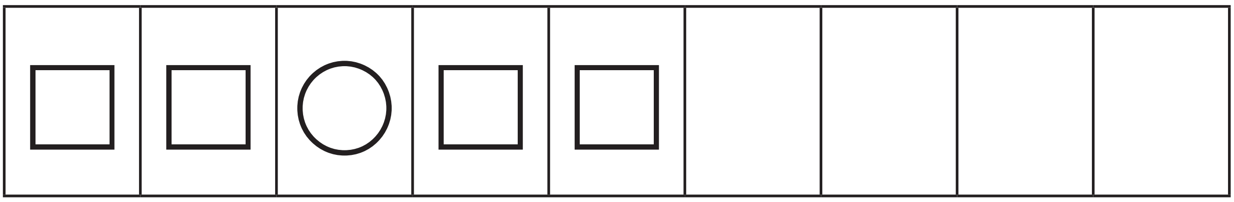
They are also a very important part of maths.

1 Tell someone what you think a pattern is. You might like to use pattern blocks to help you explain.

2 Look at these patterns. Say them out loud. Now continue them.

a 

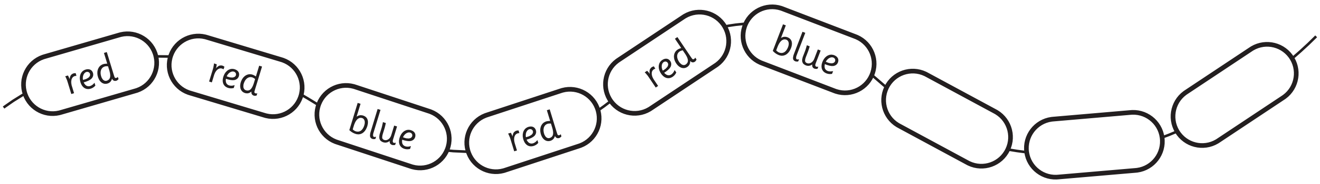
b 

c 

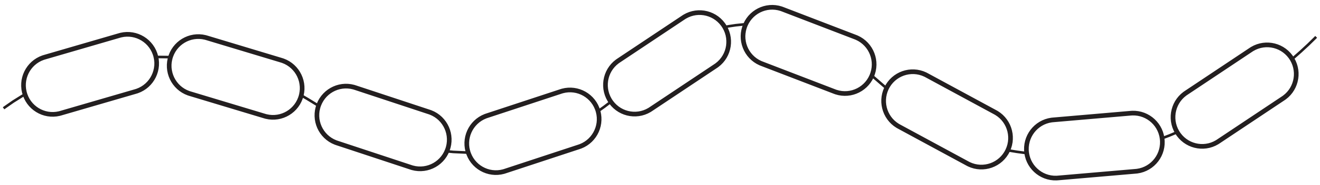
3 Make up your own pattern. Record it below.

Patterns and rules – continuing patterns

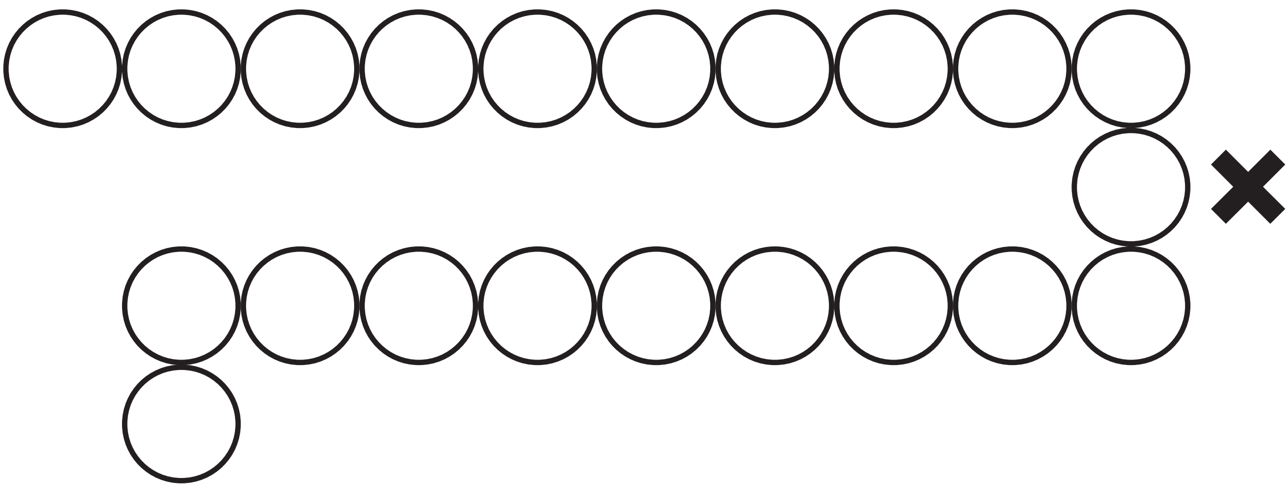
1 Say the pattern out loud. Colour and continue the pattern.



2 Make your own colour pattern.

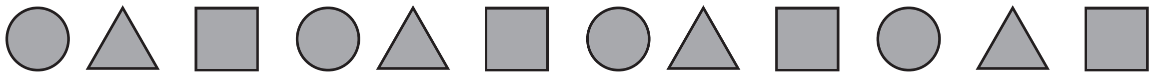


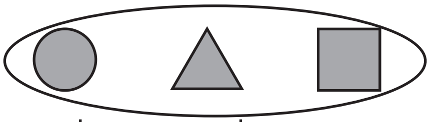
3 Colour the circles to make a pattern. Stop at the cross.
Ask a partner to continue your pattern.



Patterns and rules – repeating patterns

Patterns follow very strict rules. Say the shape pattern out loud.

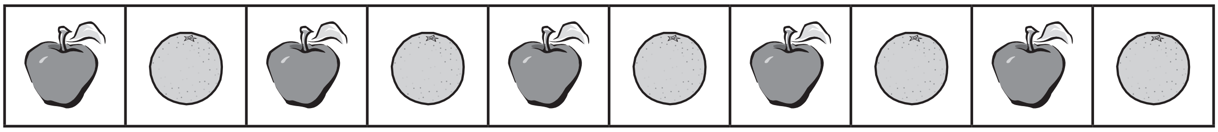


The rule is 

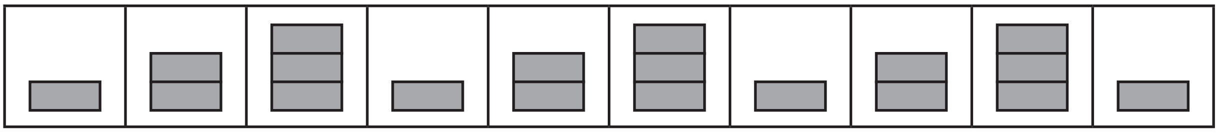
circle triangle square

The pattern repeats this rule over and over.

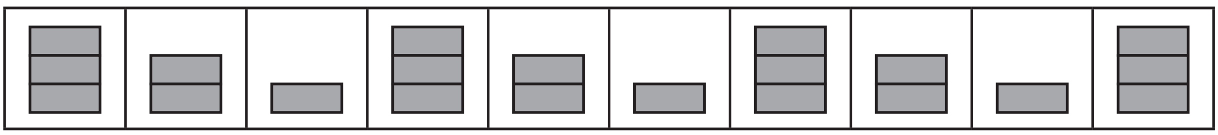
1 Say the pattern out loud. What is the rule?

a 

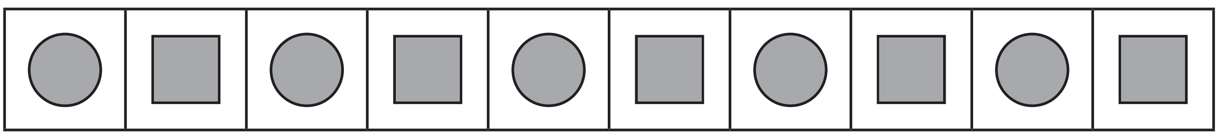
The rule is

b 

The rule is

c 

The rule is

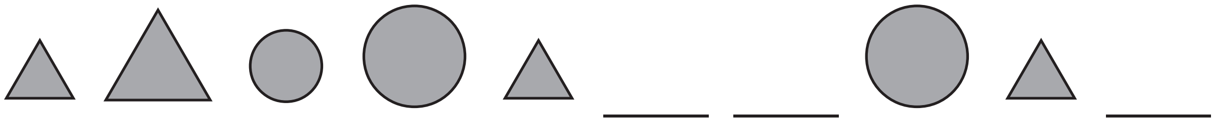
d 

The rule is

Patterns and rules – repeating patterns

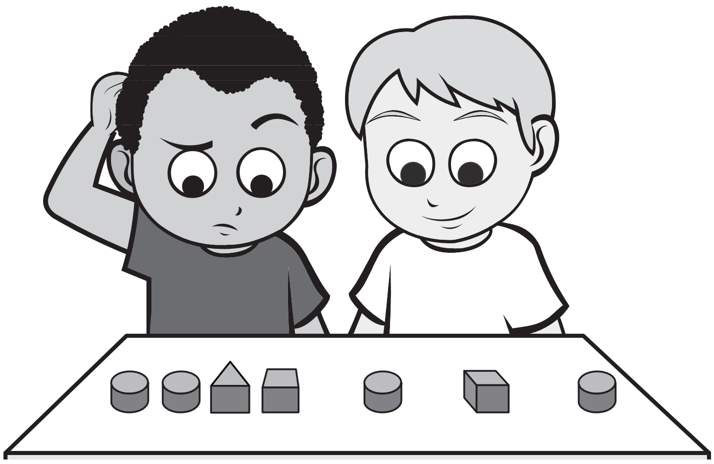
1 Parts of these patterns are missing. Draw the missing shapes.

a 

b 

c 

2 Use  pattern blocks and make up a repeating pattern across your table. Then take a few blocks out. Ask a partner to work out which blocks are missing and to put them back in.



3 Record your pattern rule below.

Patterns and rules – repeating patterns

You will need: 3 different pattern blocks such as 

What to do:

Using your 3 different pattern blocks, think of a rule and make a repeating pattern. Record it here.

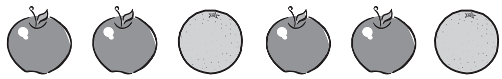
What to do next:

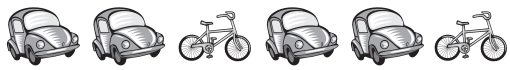
How many **different** repeating patterns with the blocks can you make? Each one will have a different rule. You don't have to use all 3 blocks in your pattern if you don't want to. Record them here.

Patterns and rules – translating patterns

We can make our patterns speak in different languages.

This pattern goes ☆ ☆ △ ☆ ☆ △ Say it out loud.

We can change it to  Say it out loud.

Or  Say it out loud.

When you say the patterns, does the rhythm stay the same?

1 **a** Colour the △s red and the □s blue.

△ □ △ □ △ □ △ □

b Now colour the △s yellow and the □s green.

△ □ △ □ △ □ △ □

Congratulations! You have made this pattern speak another language.

2 This time change the shapes. Plan it.

I will change the △ to a ____

I will change the □ to a ____

△	□	△	□	△	□	△	□	△	□

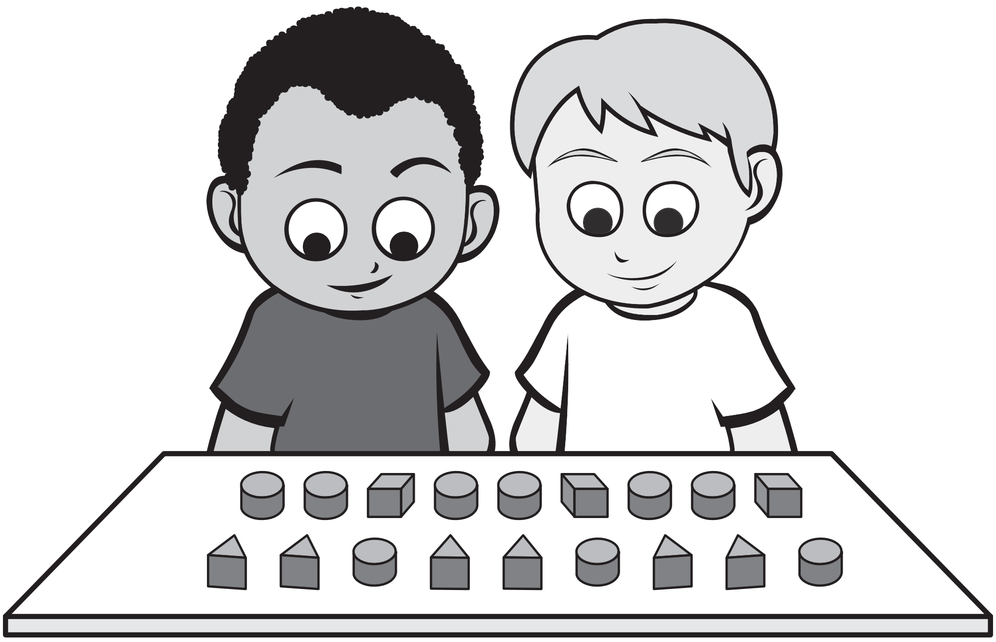
Patterns and rules – translating patterns (continued)

3 Make your own pattern, then make it speak another language.

You will need: a partner pattern blocks

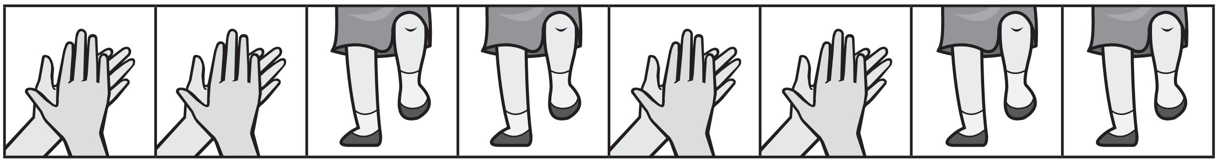
What to do:

Make a repeating pattern with blocks. Now ask your partner to make your pattern speak another language with different blocks.



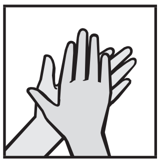
Patterns and rules – body patterns

We can also make patterns with our bodies or voices.
Can you follow this pattern with your hands and feet?



We could record this pattern like this.

✔ ✔ ✖ ✖ ✔ ✔ ✖ ✖

✔ means  ✖ means 

1 Work with a partner and design a body pattern using 2 moves.

....

2 Find a way to record your pattern.

means means

Patterns and rules – number patterns

Numbers can form patterns too. What pattern is this?

10 20 30 40 50 60 70 80 90 100

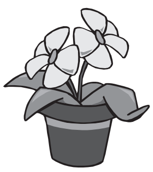
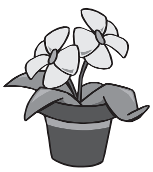
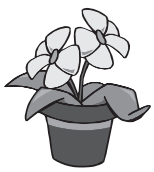
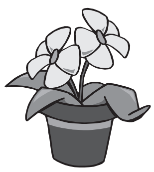
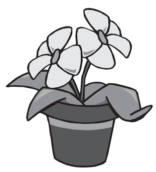
It is a 10s pattern.

1 Fill in the missing numbers. Say the numbers you write out loud as you go.

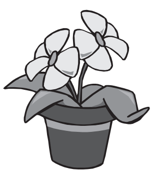
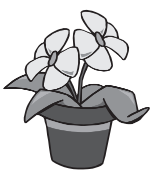
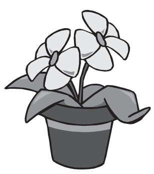
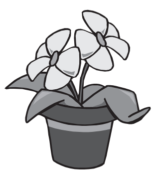
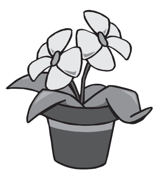
1	2	3	4		6	7	8	9	
11	12	13	14		16	17	18	19	
21	22	23	24		26	27	28	29	
31	32	33	34		36	37	38	39	
41	42	43	44		46	47	48	49	

What pattern is it? It is a ☐ s pattern.

2 Count and fill in the numbers.

2 4 6 ☐ ☐

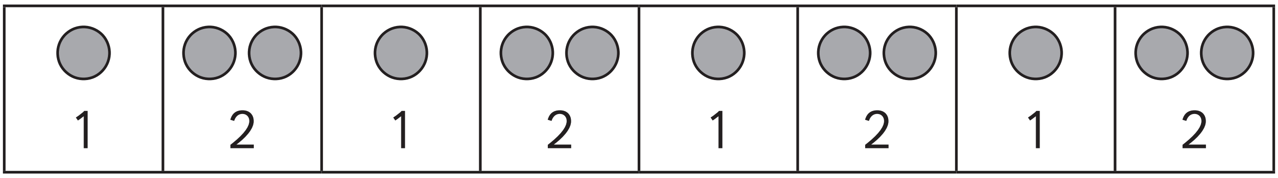
    

☐ 14 ☐ ☐ ☐

What pattern is it? It is a ☐ s pattern.

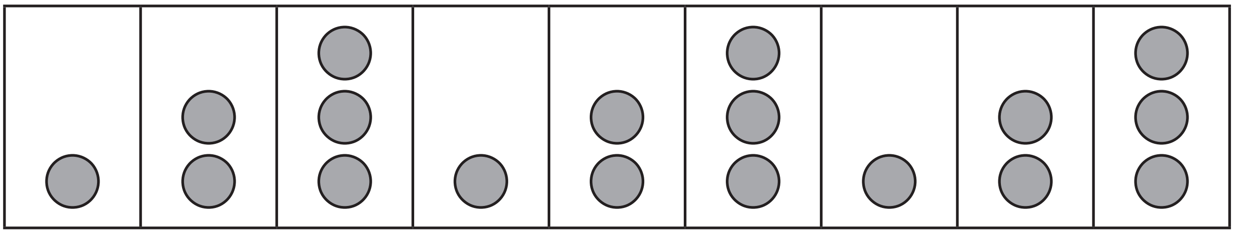
Patterns and rules – number patterns

We can show patterns using shapes and numbers.



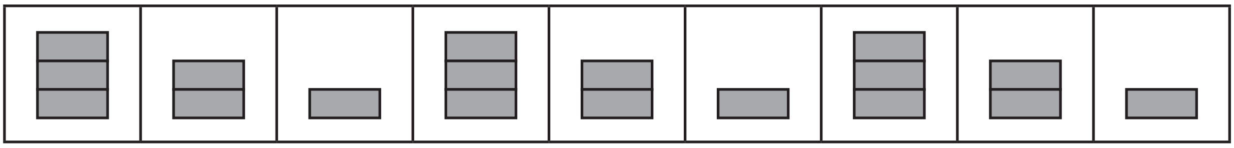
1 Write the numbers and say the patterns out loud.

a



1 2

b



3 2

2 Draw faces to match the number pattern.

1	3	1	3	1	3	1	3

Patterns and rules – number patterns

You will need: a partner   coloured pencils   counters   sticky notes or labels

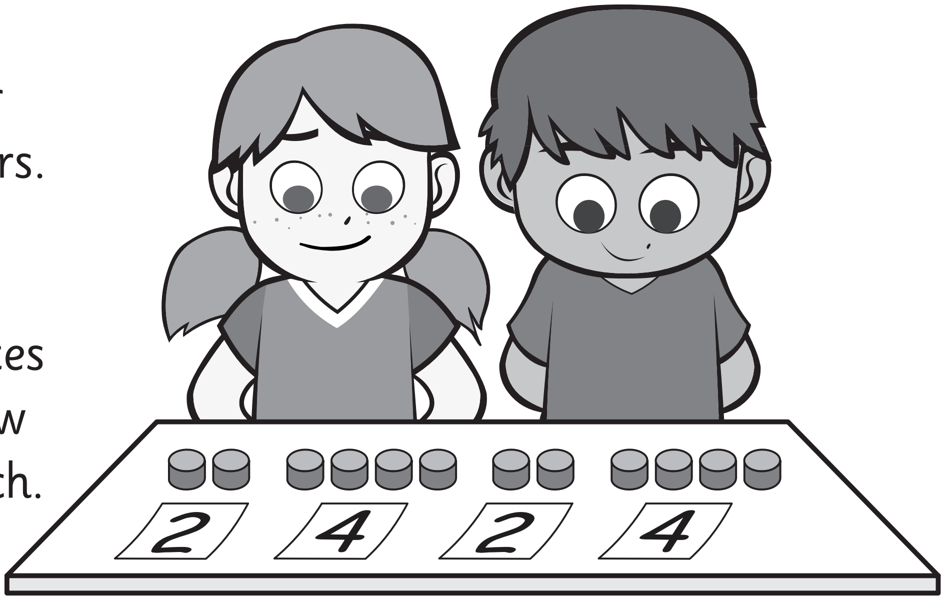
What to do:

Choose 2 numbers. Write each number on its own sticky note. Do this 4 times. Spread the sticky notes out in a pattern.

Ask your partner to make your number pattern using counters. Record some of the pattern below.

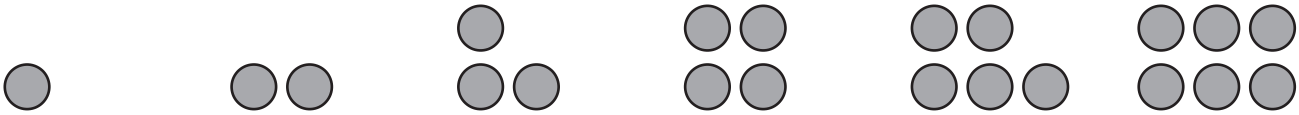
What to do next:

Now make a number pattern using counters. Ask your partner to write the number pattern on sticky notes and place them below your pattern to match.



Patterns and rules – growing patterns

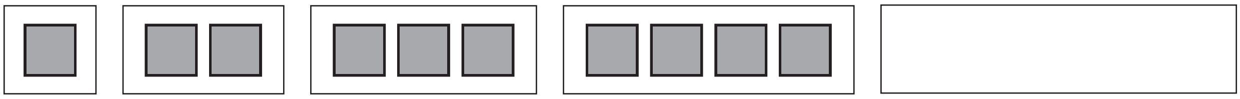
Patterns can grow. Look at this shape pattern.



It is getting bigger 1 at a time.

1 Draw the next part of each growing pattern.

a



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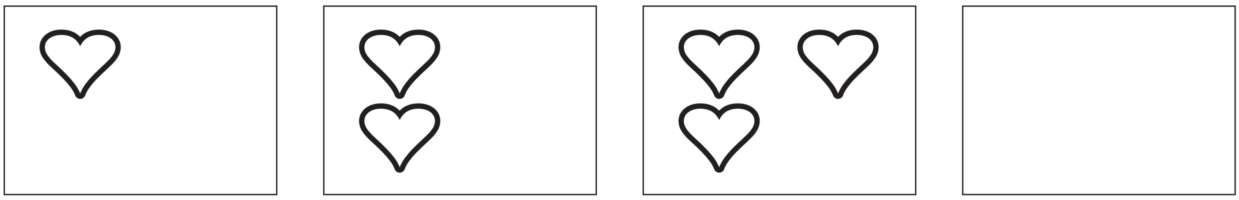

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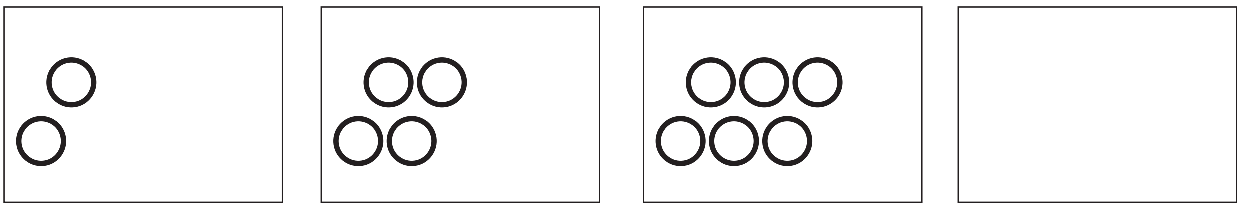
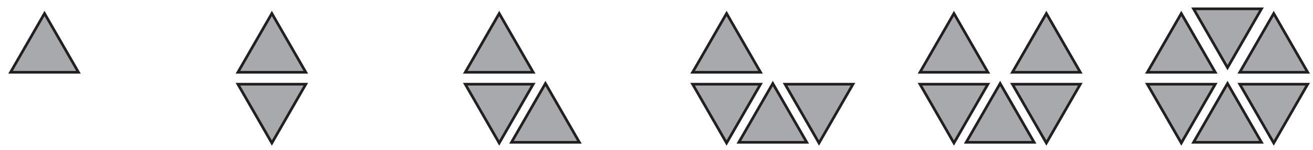


2 Make your own growing pattern with blocks. Record it here.

Patterns and rules – growing patterns

Growing patterns follow very strict rules.



The rule for this growing pattern is 'add 1 △'.

You will need: a partner counters

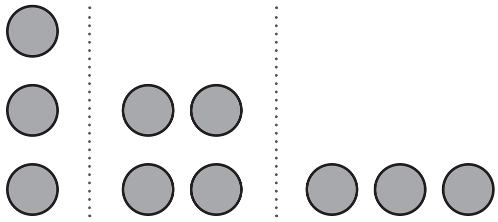
What to do:

Make your own 'add 1 ○' pattern using counters.

Put out 1 counter.

Then put out 2 counters.

Then put out 3 counters.



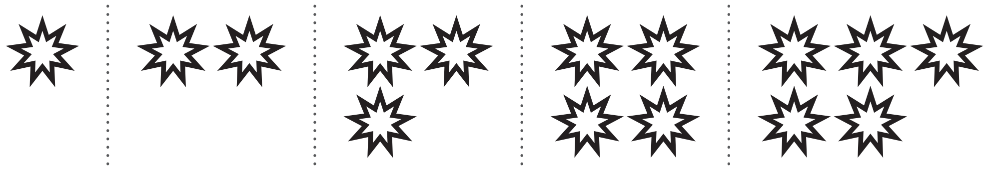
Keep going. How big can you make your pattern grow?

Count the number of counters in your last set and write it here.

What to do next:

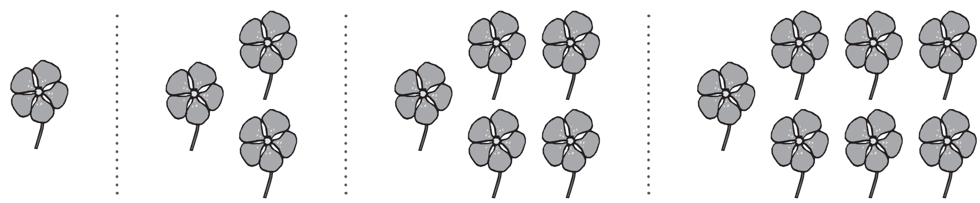
What is the rule?

a



The rule is add ______

b



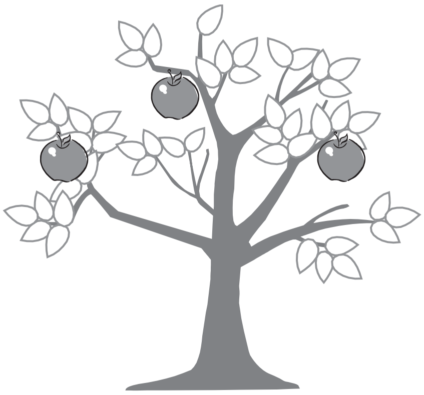
The rule is add ______

Patterns and rules – growing patterns

You will need: a partner coloured pencils

What to do:

Each day this apple tree grows more apples according to the secret rule. We have shown you the apples the tree has on Days 3, 4 and 5. Work out the secret rule and draw the apples that we would see on Days 6, 7 and 8.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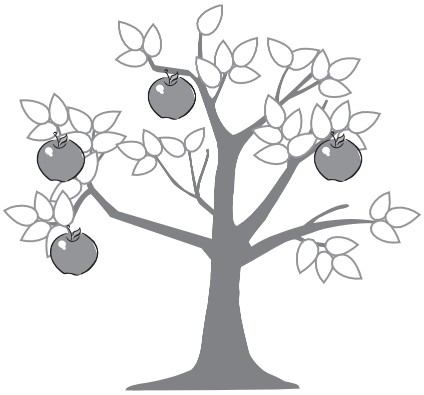
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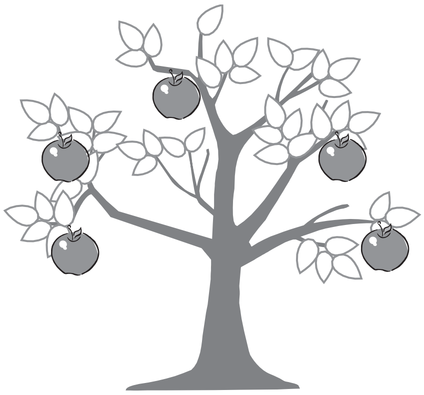
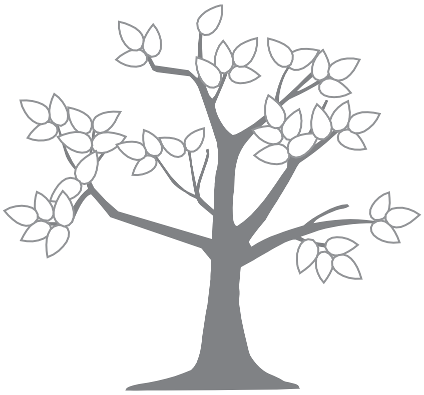
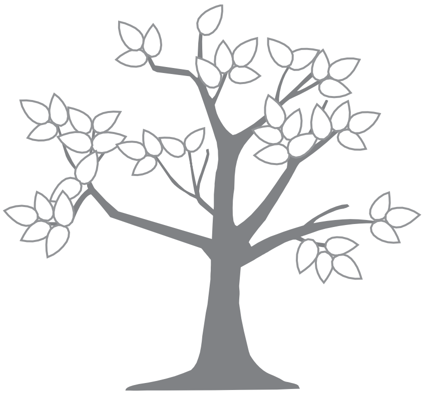
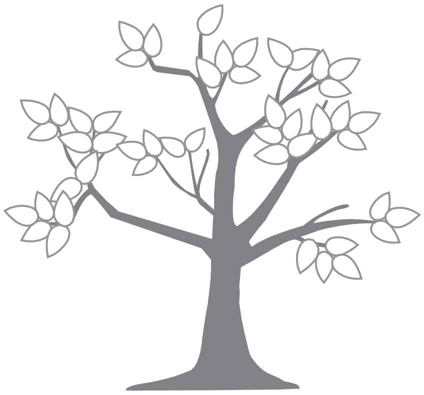

Day 5


Day 6


Day 7


Day 8

What to do next:

What is the secret rule?

Patterns and rules – growing number patterns

Number patterns can also grow. The rule for this pattern is + 1.

5 +1 6 +1 7 +1 8 +1 9

1 What is the rule?

a 2 +2 4 +2 +2 +2

The rule is + ____

b 5 +5 10 +5 +5 +5

The rule is + ____

c 2 +3 5 +3 +3 +3

The rule is + ____

2 The rule is +2. Write the numbers in the stars.

10 12

Patterns and rules – growing number patterns

You will need: a partner counters

What to do:

a Think of a rule for a growing number pattern. Write it down here and tell your teacher what it is. Don't let your partner see it!

The rule is $\boxed{}\boxed{}$

b Now start a counter pattern following your rule.

Ask your partner if they can work out your rule. They then build onto your pattern. Are they right? If not, give them some clues until they get it.

c Swap jobs.

What to do next:

Together, see if you can work out the rules of these patterns. You can use counters to help. A hundreds grid may also come in handy. Colour in the numbers on your grid and find the pattern.

a 3 5 7 9 11

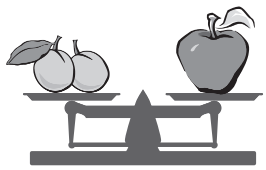
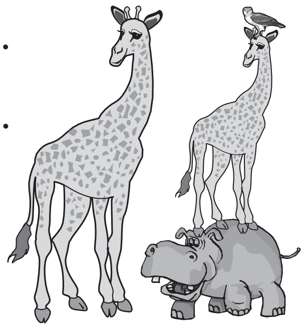
The rule is ______

b 6 11 16 21 26

The rule is ______

Number relationships – equivalence

This is the equals sign = It means the **same**.
Things can be the **same** or = in lots of ways.

| same length | same weight | same height |

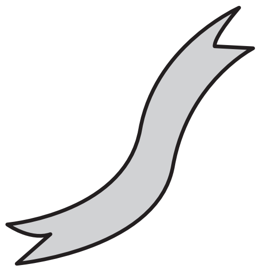
How else can things be the same?

1 Draw:

a A person who is the same height.


=

b A ribbon that is the same length.


=

2 Look at these lines. 3 black lines = 1 grey line.

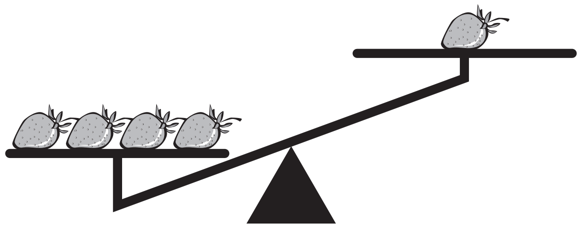
a Draw 2 lines to = this grey line.

b Draw 4 lines to = this black line

Help: equals = the same as

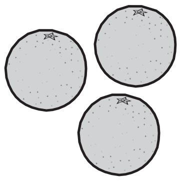
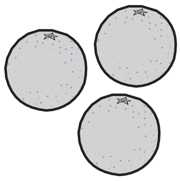
Number relationships – equivalence

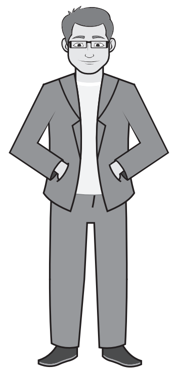
If things are not the same or equal, we use this sign. ≠

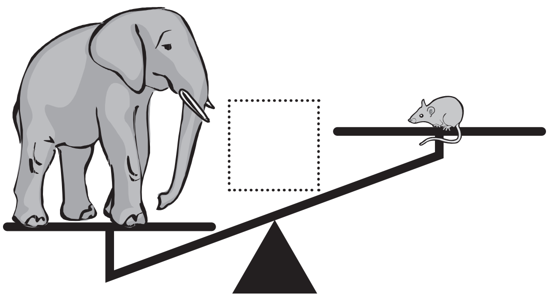


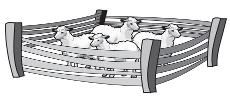
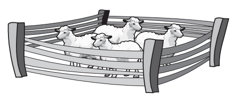
1 If they are the same write =

If they are not the same write ≠

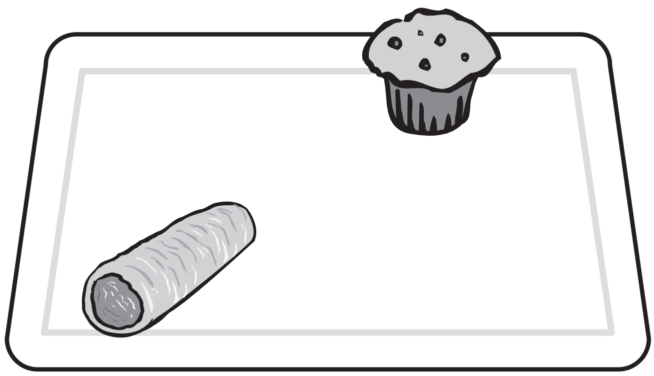
a  ☐ 

b  ☐ 

c  ☐

d  ☐ 

2 Your dad gave some party food to you and your brother.



This is your brother's plate. This is your plate.

Did you get the same as your brother? If not, draw some more food to make the plates **equal**.

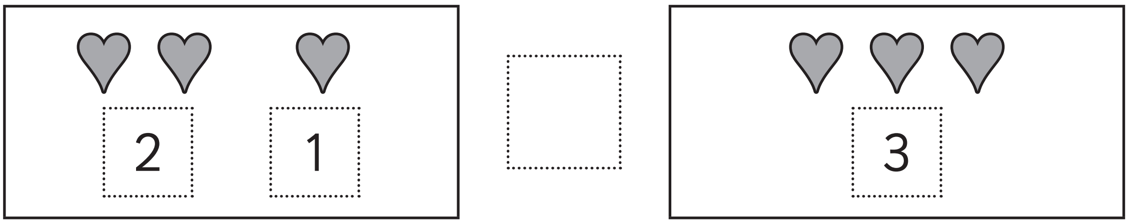
Number relationships – equivalent amounts

In maths we often use = when we are talking about the same **amount** of things.

Are the amounts on both sides the same?
Yes, they have the same amount. 2 and 2 are the same as 4.

1 Write the missing numbers and draw = if both boxes have the same amount. Draw ≠ if they don't have the same amount.

a



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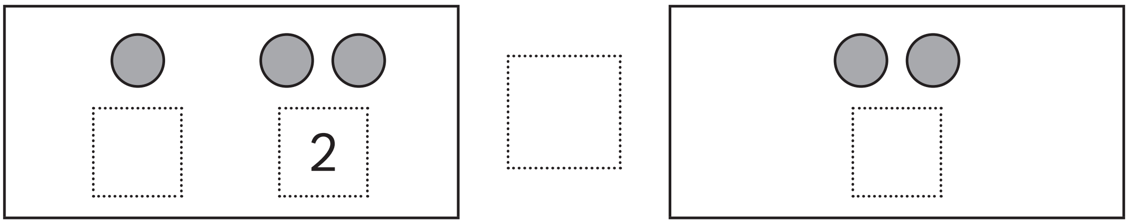

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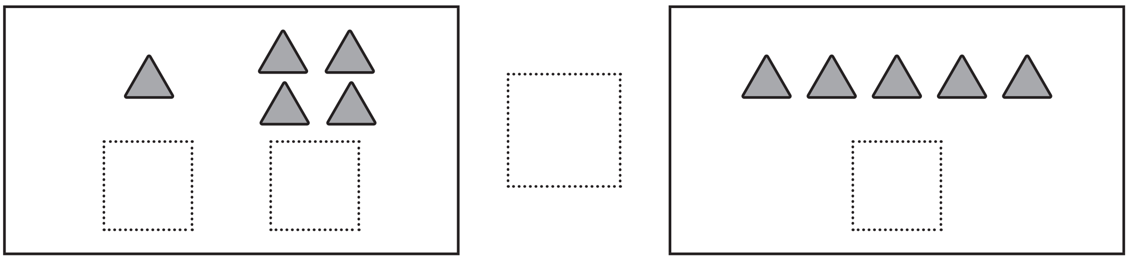
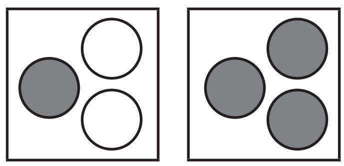


2 What about these boxes?
Do they have the same number of counters?



Write or tell someone what you think and why.

Number relationships – equivalent amounts

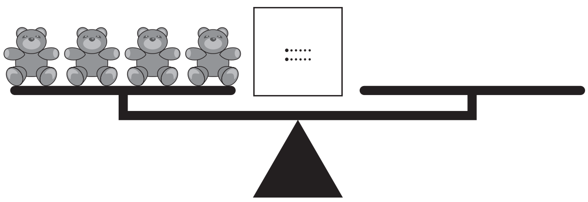
You will need: a partner, a balance scale, animal or teddy counters (same size)

What to do:

Put 4 blue teddies on one side of your scales. Now put 2 red and 2 yellow teddies on the other side.

a Do they balance the blue ones?

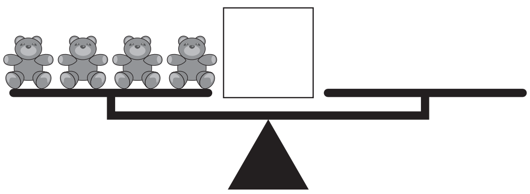
b If they do, draw them on the other side of the scale. This means they are the same or **=**. Write **=** in the middle.



What to do next:

Find some other amounts that are the same as 4. Record them on the scales with coloured crosses. Try 1 red and 3 green to start off with.

a



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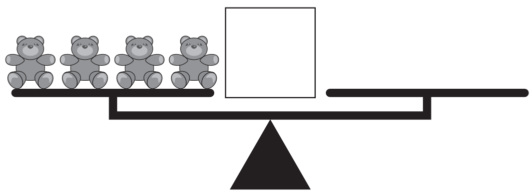

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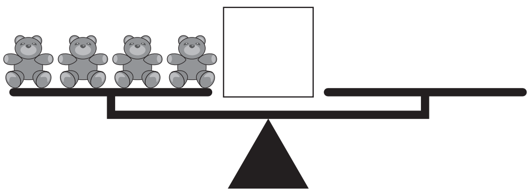

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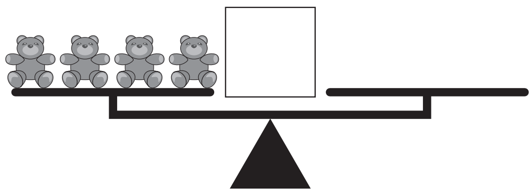

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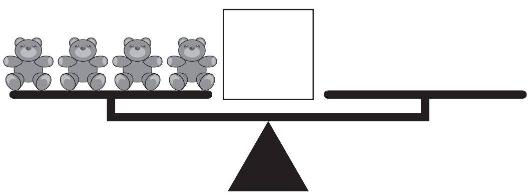

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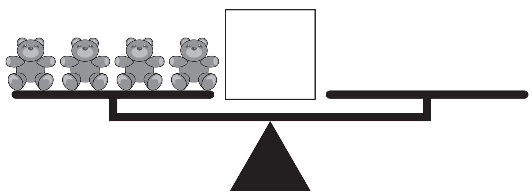
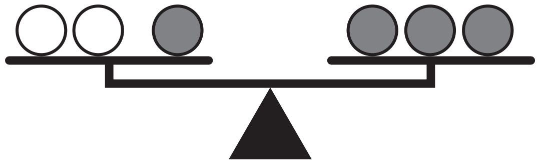


Number relationships – equivalent amounts

These sides are equal because they both have the **same amount**.

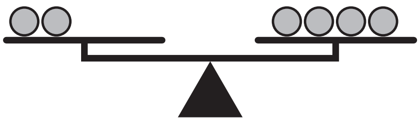
2 and 1 is the same as 3.
We can write this as:



2 + 1 = 3

1 Draw more counters on the **left** side to make the sides equal. Finish the problems.

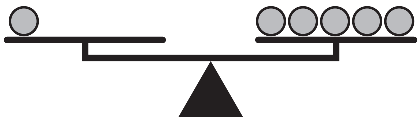
a



I drew 2

2 + ____ = 4

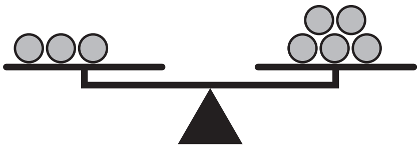
b



I drew

1 + ____ = 5

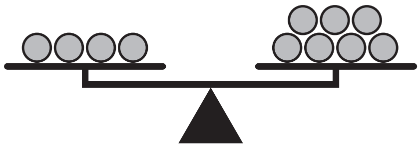
c



I drew

3 + ____ = 5

d

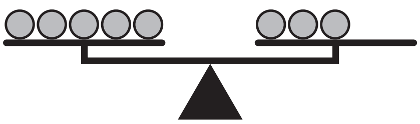


I drew

4 + ____ = ____

2 Draw more counters on the **right** side to make the sides equal. Do you notice anything? Tell a partner.

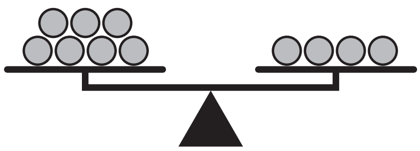
a



I drew

5 = 3 + ____

b



I drew

____ = 4 + ____

Number relationships – addition combinations

We can make amounts in different ways. Look at 3.

We could use 3 grey counters and no white counters.

● ● ● 3 + 0 = 3

We could use 2 grey counters and 1 white counter.

● ● ○ 2 + 1 = 3

We could use 1 grey counter and 2 white counters.

● ○ ○ 1 + 2 = 3

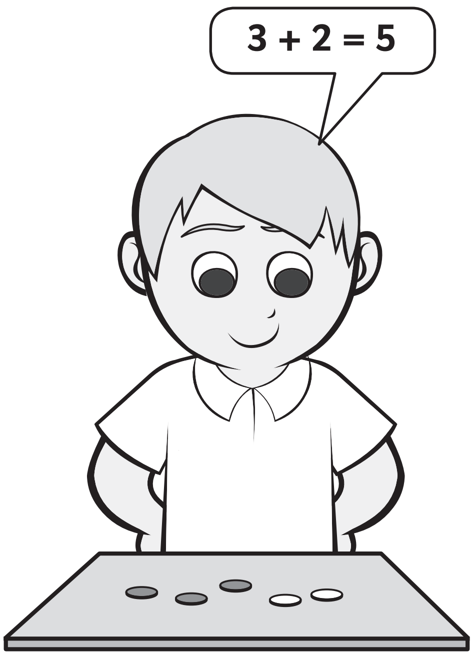
We could use 0 grey counters and 3 white counters.

○ ○ ○ 0 + 3 = 3

You will need: a partner counters in 2 colours

What to do:

How many different ways can you and your partner find to make 5? Record them here.



Number relationships – addition combinations

1 You will need a black pencil and a red pencil. Colour the counters to help you find the missing numbers in these sentences. The first one has been done for you.

B R

a 6 + 0 = 6 B B B B B B

b 5 + ____ = 6

c 4 + ____ = 6

d 3 + ____ = 6

e 2 + ____ = 6

f 1 + ____ = 6

g 0 + ____ = 6

h What patterns do you notice?

2 What about if you used **3** colours instead? How could you make 6 using green, red and black pencils? Show 2 different ways.

1st way ___ + ___ + ___ = ___

2nd way ___ + ___ + ___ = ___

Number relationships – ordered lists

You will need:  scissors

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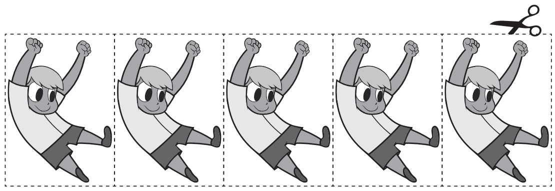
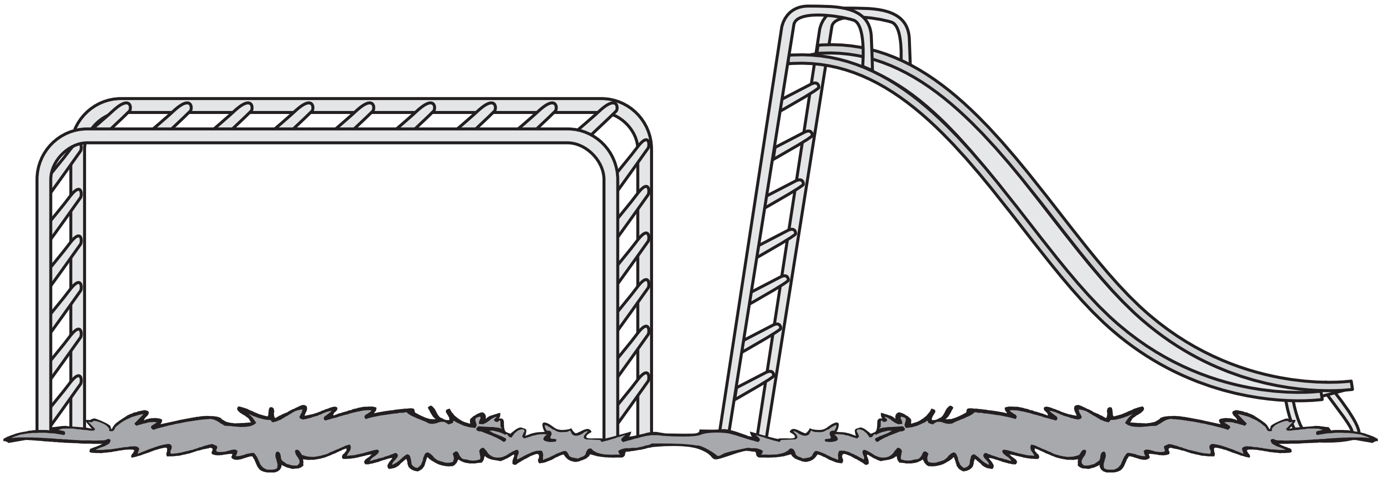
What to do:

Cut out the kids and put them all on the climbing frame.





We can record this in the table like this.

What to do next:

Now put 1 kid onto the slide. We can record it like this.

How many different ways can you arrange the kids? Record it in the table.

Monkey bars	Slide
5	0
4	1

Number relationships – ordered lists

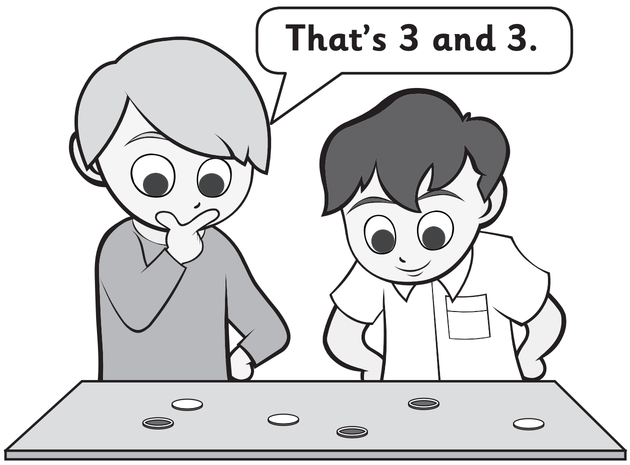
You will need: a partner 6 counters 6 stickers

What to do:

How many different ways can you make 6? Put stickers on one side of the counters. Throw the counters up in the air.

Sticker up	Sticker down

Each time you come up with a different combination, record it in the table. If you have it already, just toss again.



What to do next:

Write the different ways in order. Do you notice any patterns?

Sticker up	Sticker down

Number relationships – equivalent statements

Lucy has 3 lollipops in 1 hand and 2 lollipops in the other. She has 5 lollipops altogether.

3 + 2 = 5

Harry has 4 lollipops in 1 hand and 1 lollipop in the other. He also has 5 lollipops.

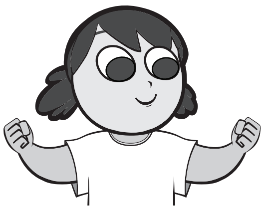
4 + 1 = 5

They both have 5 lollipops. They are the same or equal.

3 + 2 = 4 + 1

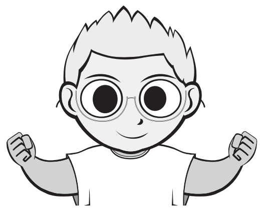
1 Draw the lollipops. Finish the number sentences.

a Stacey has **5** lollipops in one hand and **3** in the other hand.



5 + 3 = ____

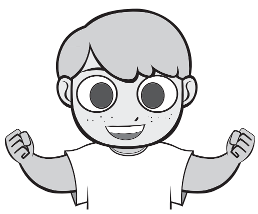
Dan has **4** lollipops in one hand and **4** in the other hand.



4 + 4 = ____

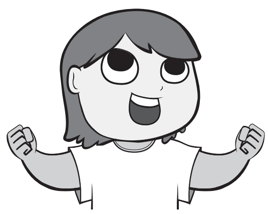
5 + 3 = 4 + 4	They both = ____

b Tyler has **2** lollipops in one hand and **2** in the other hand.



2 + ____ = ____

Ella has **3** lollipops in one hand and **1** in the other hand.



3 + ____ = ____

2 + ____ = 3 + ____	They both = ____

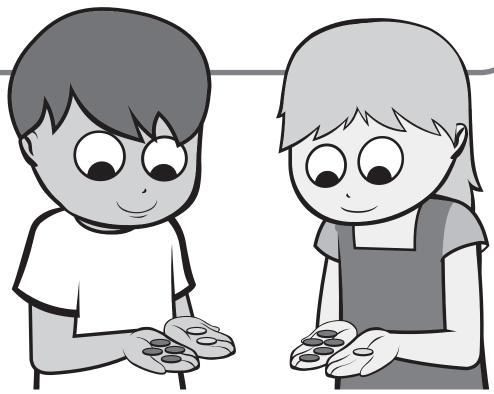
Number relationships – equivalent statements

What is one way to make 5? $4 + 1 = 5$

What is another way to make 5? $2 + 3 = 5$

They both make 5 so they are **the same as each other**. $4 + 1 = 2 + 3$

You will need: a partner counters



What to do:

Choose one way to make 6. Show your partner. Ask them to find a different way to make 6. Record them both here.

6	______ + ______ = ______ + ______

What to do next:

Find 2 ways to make these numbers. Record them both here.

a	8	______ + ______ = ______ + ______
b	10	______ + ______ = ______ + ______

Number relationships – turnarounds

Does it matter in which order we **add** numbers?

1 Finish these addition problems. Circle the pair if the answers are the same.

a 4 + 1 = 5
1 + 4 = 5

b 7 + 2 = ____
2 + 7 = ____

c 3 + 6 = ____
6 + 3 = ____

d 5 + 3 = ____
3 + 5 = ____

e 1 + 2 = ____
2 + 1 = ____

f 4 + 3 = ____
3 + 4 = ____

g What do you notice?

2 Fill in the missing numbers in these turnarounds.

a 2 + 3 = 5
3 + ____ = 5

b 6 + 2 = ____
2 + ____ = ____

c 4 + 2 = ____
____ + ____ = 6

d 1 + 3 = ____
____ + ____ = ____

Number relationships – turnarounds

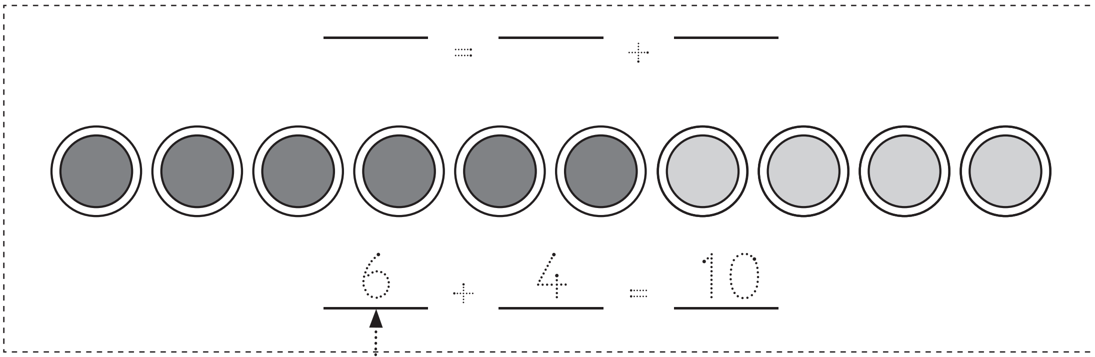
You will need: red and blue stickers or coloured pencils

a copy of page 30

What to do:

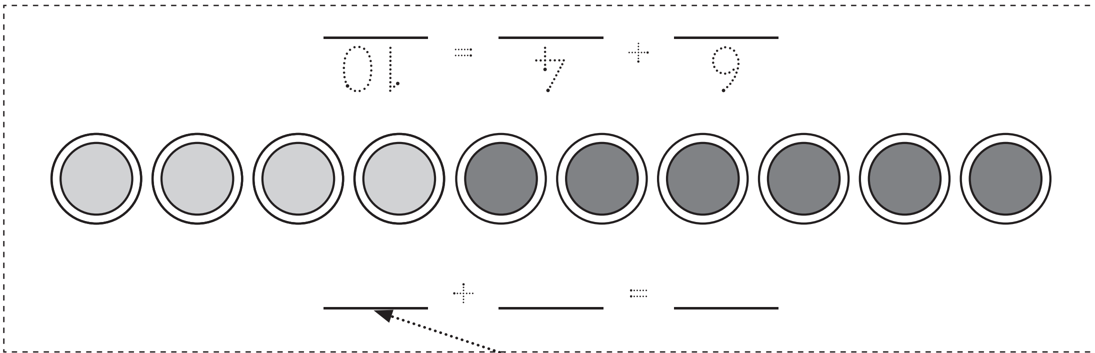
a Cut out the strips on the next page.

b Stick 6 red stickers and 4 blue stickers into place on one strip. It should look like this.



c Write the fact here.

d Now turn the strip around so it looks like this.



e Write the turnaround fact here.

What to do next:

Choose different combinations of stickers and make up your own turnarounds on the other strips.

Number relationships – turnarounds
(continued)

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_____ = _____ + _____

_____ + _____ = _____

_____ = _____ + _____

_____ + _____ = _____

_____ = _____ + _____

_____ + _____ = _____

_____ = _____ + _____

_____ + _____ = _____

Number relationships – zero

1 Do you know any other words for zero? Write them here.

2 What happens when we add zero to a number? Try these.

a $1 + 0 =$ ______ **b** $3 + 0 =$ ______ **c** $4 + 0 =$ ______

d $2 + 0 =$ ______ **e** $6 + 0 =$ ______ **f** $5 + 0 =$ ______

g What do you notice?

3 What about if we subtract zero from a number? Try these.

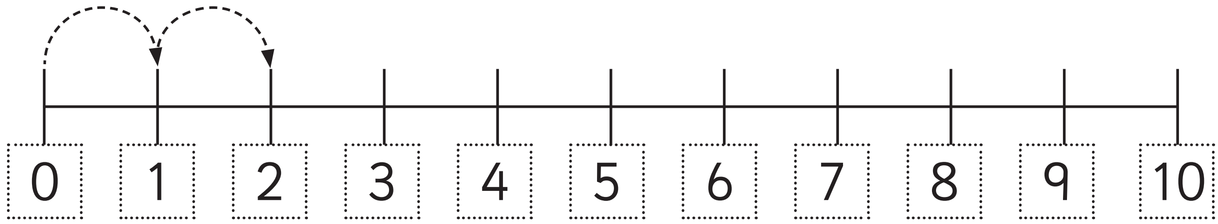
a $10 – 0 =$ ______ **b** $7 – 0 =$ ______ **c** $6 – 0 =$ ______

d $9 – 0 =$ ______ **e** $8 – 0 =$ ______ **f** $5 – 0 =$ ______

g What do you notice?

Number relationships – zero (continued)

4 Jump along from 0 to answer these.

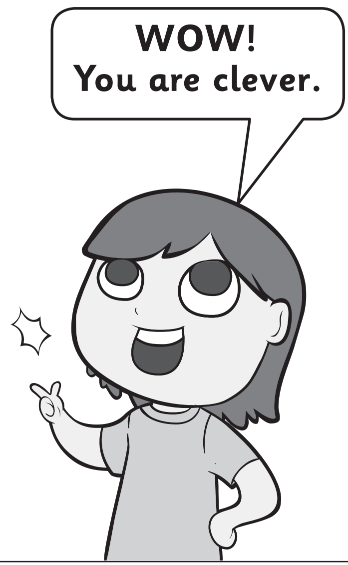


a 0 + 2 = 2 **b** 0 + 5 = ______ **c** 0 + 7 = ______

d 0 + 6 = ______ **e** 0 + 9 = ______ **f** 0 +10 = ______

g What do you notice?

5 Are you ready for some really, really hard sums? Are you sure? OK then clever-sticks, here they are!



a 250 + 0 = ______ **b** 0 + 500 = ______

c 0 + 725 = ______ **d** 0 + 999 = ______