Reasoning in the classroom

We love reading

Support materials for teachers

Year 2

Llywodraeth Cymru
Welsh Government

Year 2 Reasoning in the classroom – We love reading

These Year 2 activities are based on the theme of reading books.
They encourage learners to use and apply a wide range of numerical skills.

Activity 1

We love reading
Learners solve a range of problems, using the ideas of sponsorship and bringing books to school.

Includes:
- Teachers' script
- PowerPoint presentation
- We love reading questions
- Markscheme

Activity 2

Making books
They make their own book and consider number patterns in the number of pages.

Includes:
- Explain and question – instructions for teachers

Activity 3

Selling our books
They price and 'sell' their books, and consider simple combinations.

Includes:
- Explain and question – instructions for teachers

Activity 4

Right-angle police
They make their own right-angle measurer then consider the effect of banning all letters in the alphabet that do not include right angles.

Includes:
- Explain and question – instructions for teachers
- Teachers' sheet – Right-angle police
- Whiteboard – POLICE
- Whiteboard – POLICE right angles
- Resource sheet – Alphabet

Activity 5

Turning robot
They continue exploring right angles by becoming robots that turn according to the teacher's instructions.

Includes:
- Explain and question – instructions for teachers
- Teachers' sheet – Robot moves

Reasoning skills required

Identify

Learners choose what to do and how to do it.

Communicate

They use everyday and mathematical language to talk about their work.

Review

They consider whether their answers make sense within the context in which they are working.

Procedural skills

- Addition and subtraction
- Multiplication, including 2-, 5- and 10-times tables
- Use different combinations of money to pay for items up to £1
- Record information in a table
- Recognise half- and quarter-turns, clockwise and anticlockwise
- Recognise that a quarter-turn is a right angle

Numerical language

- Altogether
- More
- Half, double
- Pattern
- Table
- Even
- Right angle
- Quarter-turn, half-turn, three-quarters-turn
- Clockwise, anticlockwise

Activity 1

We love reading

Activity 1 – We love reading

or

Outline

This Year 2 activity is based on reading books. Learners engage with the stimulus presentation that explains the context of a sponsored read, then answer questions about bringing books to school and selling them.

You will need

Teachers' script

PowerPoint presentation

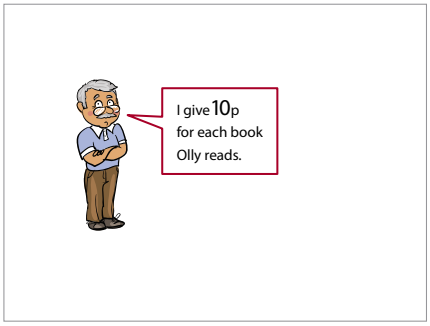
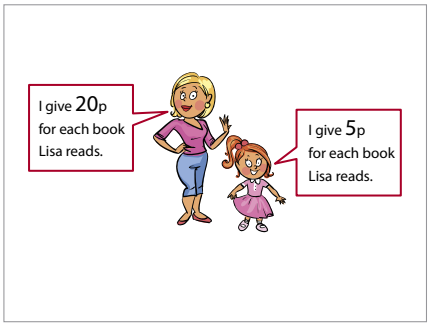
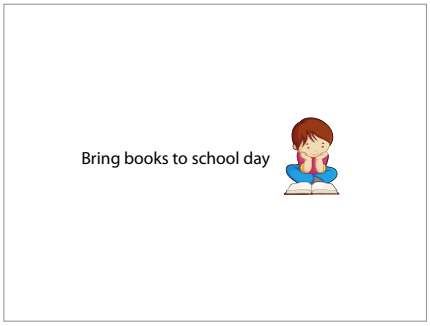
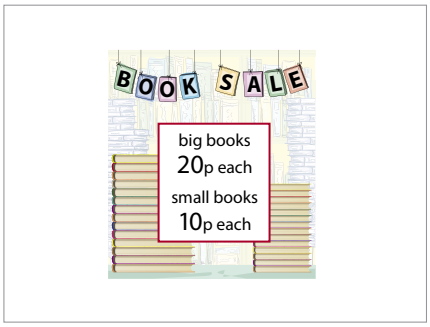
We love reading questions
Three pages for each learner,
pages 1 and 2 can be printed double-sided

Markscheme

Presentation to be shown to learners before they work on We love reading

The text in the right-hand boxes (but not italics) should be read to learners. You can use your own words, or provide additional explanation of contexts, if necessary. However, if you are using this as an assessment item, no help must be given with the numeracy that is to be assessed.

Slide 1		*(Keep this slide on the screen until you are ready to start the presentation.)*
Slide 2		These Year 2 children love reading! They love it so much that they ask their teacher if they can have a 'We love reading' week at school. The teacher says yes, and that they can raise money to help buy even more books for the school. I wonder how they could raise money?
Slide 3		The first thing the children do is a sponsored read. Each child reads as many books as they can in one week and families and friends give a small amount of money for each book they read.

Slide 4		This is Olly's granddad *(point)*. How much will he give for each book Olly reads? That's right, 10p. So if Olly reads three books, how much will his granddad give? Yes, that's right, 30p. How did you work it out? *(Discuss, using the whiteboard if necessary.)* And how much will he give if Olly only reads two books? Yes, 20p. Well done.
Slide 5		This is Lisa's mum *(point)*. She gives 20p for each book Lisa reads. And this is Lisa's sister *(point)*. She gives 5p for each book Lisa reads. Lisa reads two books. Work with the person next to you. How much does Lisa get altogether? *(After discussion, agree that she gets 50p: 40p from Lisa's mum and 10p from her sister. Again, use the whiteboard if helpful but do not draw attention to the method of adding 20p and 5p, then doubling.)*
Slide 6		Year 2 also decide to have a 'Bring books to school' day. Each child will bring in any books from home that they have finished with. Then these books can be sold. Let's see how much they will sell the books for . . .
Slide 7		How much are big books? Yes, that's right, 20p each. And how much are small books? Yes, 10p each. Now you are going to answer some questions about Year 2's 'We love reading' week. Remember to show your working so that someone else can understand what you are doing and why. *(If you are using this item for assessment purposes, you may wish to limit the time available, e.g. 15 minutes.)*

1

I give 2p for each book Lisa reads.

Lisa gets 20p.

How many books does she read?

books

1m

2

I give 5p for each book Joe reads.

I give 10p for each book Joe reads.

Joe reads 4 books.

How much money does he get altogether?

p

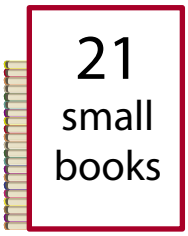
3m

Q

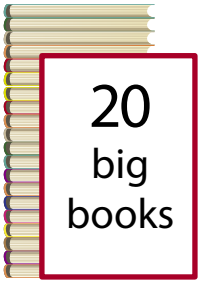
3

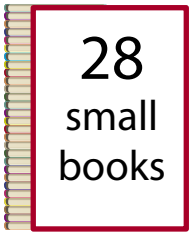
Bring books to school day

Year 2 bring these books.



Year 3 bring these books.





Year 3 bring **more** books than Year 2.

How many more?

more books

3m

4

Olly spends £1

He gets 6 books.

What did he buy? Work it out.

[ ] big and [ ] small books

3m

Activity 1 – We love reading – Markscheme

Q	Marks	Answer
1	1m	**10** books
2	3m	**60**p
	Or 2m	Shows or implies both **20** and **40** Or Shows or implies **4 lots of 15** (accept adding on)
	Or 1m	Shows or implies **20** or **40** Or Shows **15**
3	3m	**12** more books
	Or 2m	Shows or implies both **20 – 15 = 5** and **28 – 21 = 7** (accept counting on) Or Shows both **36** and **48**, and the intent to subtract (accept counting on) Or Shows a different method that would lead to 12 more books if calculated correctly, and contains not more than one numerical error
	Or 1m	Shows or implies **20 – 15 = 5** or **28 – 21 = 7** (accept counting on) Or Shows **36** or **48**

◀ **Total from each person, in pence**

◀ **4 × the total per book, in pence**

Efficient method

◀ **Number of additional big and small books**

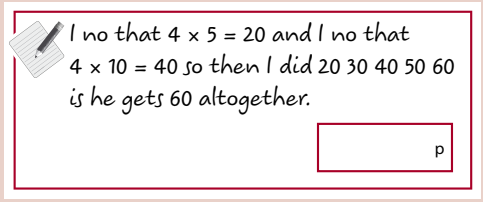
◀ **Totals for each year group**

Activity 1 – We love reading – Markscheme (continued)

Q	Marks	Answer	
4	3m	**4** big and **2** small books	
	Or 2m	Gives one of the following answers: **3** big and **4** small books **2** big and **6** small books **1** big and **8** small books Or Shows any of the following: **5** big and **1** small, with **110** (or 1.10) **3** big and **3** small, with **90** (or 0.90) **2** big and **4** small, with **80** (or 0.80) **1** big and **5** small, with **70** (or 0.70)	◀ **Sets of books that cost £1** ◀ **Sets of six books with their total cost in p or £**
	Or 1m	Gives one of the following answers: **5** big and **0** small books **0** big and **10** small books Or Shows any of the following: **6** big and **0** small, with **120** (or 1.10) **0** big and **6** small, with **60** (or 0.60)	◀ **Sets of books, using only big or only small, that cost £1** ◀ **Sets of six books, using only big or only small, with their total cost in p or £**

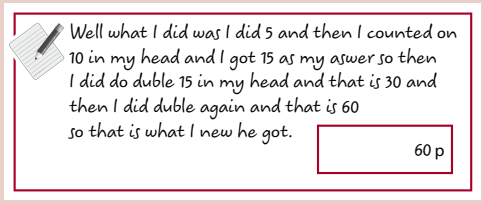
Activity 1 – We love reading – Exemplars

Question 2



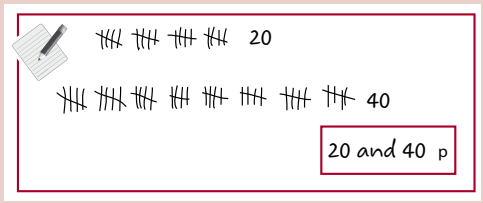
Correct; **3 marks**

- This learner shows confidence with multiplication. Their answer is clearly shown in the working.



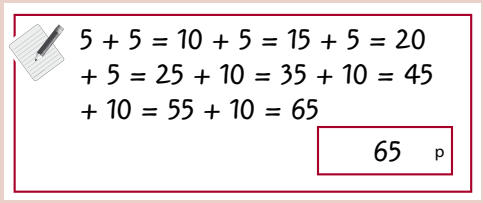
Correct; **3 marks**

- This learner shows understanding but needs support to work more concisely. Thinking that a 'mini-essay' is required is a common misconception.



Shows 20 and 40; **2 marks**

- This learner counts using a tally. The subtotals are correct, but the final step has been omitted.

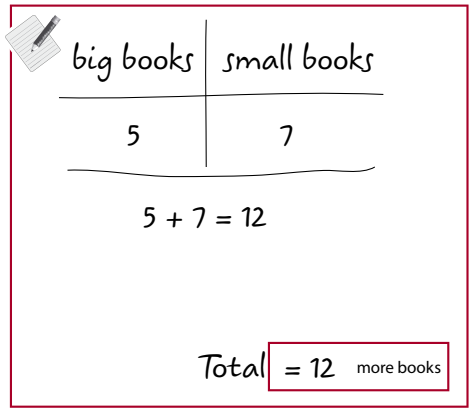


Implies 40; **1 mark**

- One additional 5p has been added in error. However, 40p is implied as four 10's have been added correctly.
- The repeated use of the = sign is common when learners use it to mean 'makes' rather than 'is the same as'. Where possible, this should be discouraged as it causes problems later on in numeracy.

Activity 1 – We love reading – Exemplars (continued)

Question 3

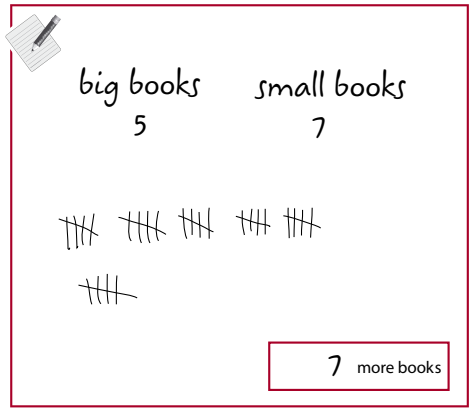


Correct; **3 marks**

- This learner works efficiently. Their communication skills are good.

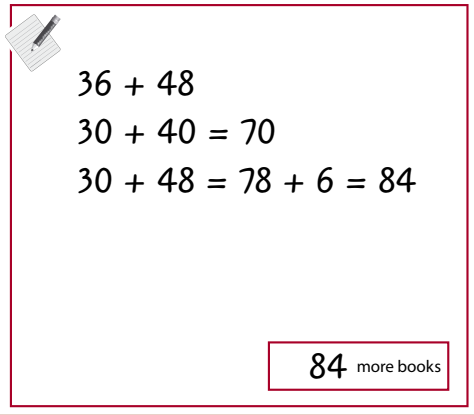
Correct; **3 marks**

- As the answer is correct, 3 marks are given. However, it is important for learners to understand that they should always show their method – had this learner made an error they would have scored 0 marks.



Implies 20 – 15 = 5 and 28 – 21 = 7; **2 marks**

- As 5 is linked to 'big books' and 7 is linked to 'small books', subtraction (or counting on) is implied.



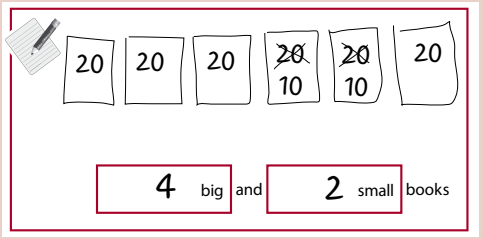
Shows 36 (or shows 48); **1 mark**

Common error

This learner has found the correct total number of books for each year group, but has then found the sum rather than the difference. This is a common error.

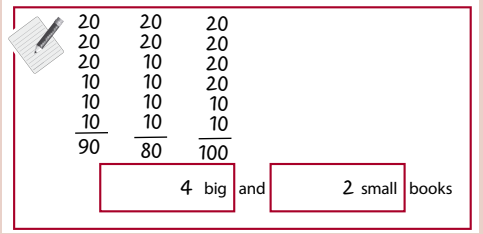
Activity 1 – We love reading – Exemplars (continued)

Question 4



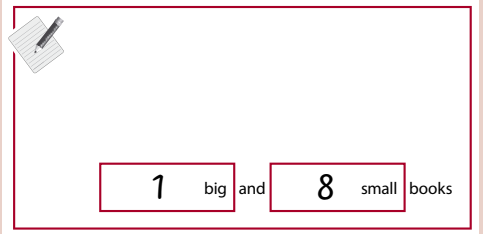
Correct; **3 marks**

- This learner has chosen an effective method, showing all six books. They started with each book at 20p, then adjusted the costs until the total is £1.



Correct; **3 marks**

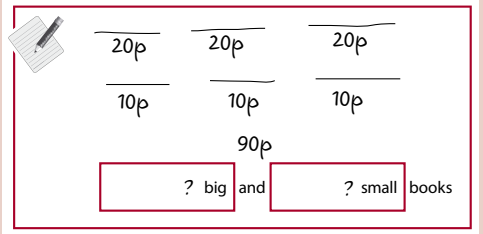
- This learner tries different combinations until they reach the correct total. The use of trial and improvement is an important numerical skill which should be encouraged.



1 big and 8 small; **2 marks**

Common error

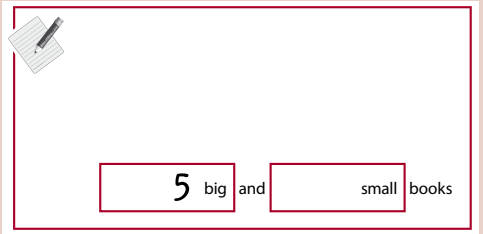
This learner has ignored one of the two conditions, i.e. that six books are bought. This is a common error.



3 big and 3 small, with 90; **2 marks**

Common error

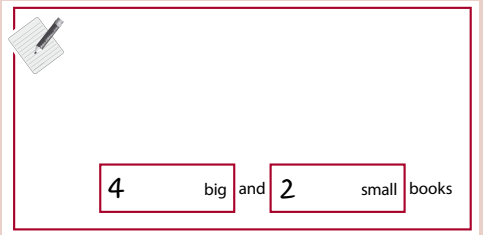
The use of lines to represent the six books is an effective method, but this learner lacks the confidence to try more than one combination.



5 big and 0 small; **1 mark**

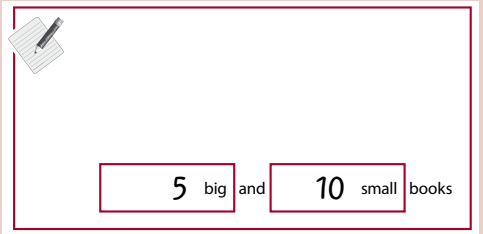
Common error

This learner has also ignored one of the two conditions, and has worked with only big books.



Incorrect; **0 marks**

- This learner may have transposed big and small books, but as there is no working we cannot be sure so no marks can be given.



Incorrect; **0 marks**

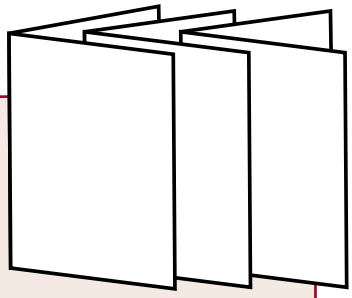
Common error

5 is the number of big books that can be bought with £1, and 10 is the number of small books that can be bought with £1, so the total cost would be £2. This is a common error.

Activity 2

Making books

Activity 2 – Making books

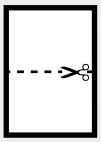


Outline

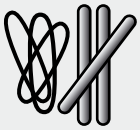
This activity continues the theme of books introduced in **Activity 1 – We love reading**. Learners make their own simple books, and consider the number of pages that can be in each.

Because of the practical nature of this task, and the importance of teacher questioning, it is recommended that at any one time you work with only a small group of learners.

You will need



A4 pages of paper (one side blank), cut into two

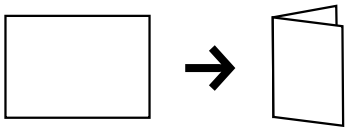


Elastic bands and sticks for binding (optional)

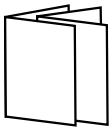
Activity 2 – Making books

Explain

Tell learners that they are going to make their own books from recycled paper. Have lots of papers of half A4 on the table, and ask learners to fold as shown below.



Fold each paper in half like this – this makes four pages of a book.



Papers can be placed inside the other, so two papers, for example, make a book with eight pages.

Put papers together to make a 4-page book, an 8-page book and a 12-page book. Ask learners to number the pages in each book sequentially, including the front and back pages. Then ask the questions below.

(Note that papers can be 'bound' together: instructions for a simple 'stick and elastic' binding can be found at www.makingbooks.com/elastic.shtml Once the activity is complete, learners could make their own numeracy book. On each left-hand page, they write a number sentence, e.g. 10 – 7 = 3. On the page facing, they write a story to match their number sentence, e.g. Sam had 10 sweets. He ate 7. He had 3 sweets left. Choosing stories to match multiplication and division supports their understanding of these operations.)

Question

- 1 paper makes this book of 4 pages, 2 papers make this book of 8 pages, 3 papers make this book of 12 pages. How many pages would there be if we use 4 papers? *(16)* How do you know? *(Add 4 each time.)*
- I would like a 20-page book. How many papers do I need? *(5)* How do you know? Is it possible to have a book that has 22 pages? *(No, the next one would be 24 pages.)*
- What numbers are on the middle pages of our books? *(2 and 3; 4 and 5; 6 and 7)* What numbers would be on the middle pages of a 16-page book? *(8 and 9)* How do you know? *(Halve the number of pages, then add 1.)*

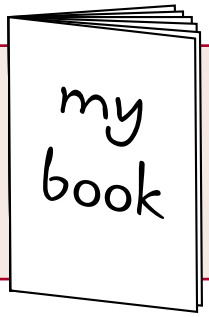
Extension

- Separate the pages of the 4-page book. Look at the numbers on each pair. What do you notice? *(Each pair sums to 5.)* Do the same with the 8-page book. What do you notice? *(Each pair sums to 9.)* We are going to separate the pages on a 12-page book. What do you think each pair will sum to? Why? *(13, because it is one more than the total number of pages.)*

Activity 3

Selling our books

Activity 3 – Selling our books



Outline

This activity focuses upon simple combinations, as did question 4 in **Activity 1 – We love reading**. Learners price and 'sell' the books that they made in **Activity 2 – Making books**, or they price and 'sell' items of their choice.

You will need

Things to 'sell'
e.g. their books

Coins (optional)

Activity 3 – Selling our books

Explain

Show learners an 8-page book. Say that they are going to 'sell' this book for 5p. Now show a 16-page book. How much should we sell this book for? Why? *(10p, as there are double the number of pages.)* Write this information on the whiteboard.

(Alternatively, use two items of your choice.)

Then write 'Monday 20p' on the whiteboard and tell learners that this is how much they got when they sold their books on Monday. Which books might they have sold? Discuss, then write the solutions in an ordered table on the whiteboard:

Monday 20p

5p books	10p books
4	0
2	1
0	2

Now give each group/pair 'their' total takings, using multiples of 10p and differentiating by ability. *(The higher the total, the more combinations there are.)*

Ask learners to find all possible combinations then write their findings in an ordered table as above. What patterns can they see? *(The number of 5p books decreases by 2 each time, while the number of 10p books increases by 1 each time.)*

Finally, bring together all the results. Now what patterns can they see? *(The number of solutions is always 1 more than the number of 10p's, e.g. 50p has 6 solutions, 60p has 7 solutions, and so on.)*

Question

- Are you sure that you have found all the different ways? How?
- Why is it a good idea to put the different ways in a table? How does putting them in order help you to see patterns?
- Have you noticed anything else about the number of 5p books that you can buy? *(It is always an even number.)*
- Look at the first entry in your table. Is there a quick way of working out the number of 5p books that you can buy? *(It is half the total takings.)*

Extension

- Suppose we sold the books for 10p and 20p. What patterns can you find for the numbers of different ways for these totals: 10p, 20p, 30p, 40p, 50p, 60p, 70p, 80p, 90p and £1?

Activity 4

Right-angle police

Activity 4 – Right-angle police

Outline

This activity continues the theme of books. Learners make their own right-angle measurer. Then they consider which capital letters in the alphabet have right angles, and the effect of removing all letters without right angles as directed by the 'right-angle police'.

You will need

Teachers' sheet – Right-angle police
These should be printed on card and cut into strips before the activity. Each learner will need one strip.
(Alternatively, these can be pre-prepared by an adult.)

Whiteboard – POLICE

Whiteboard – POLICE right angles

Resource sheet – Alphabet

Scissors

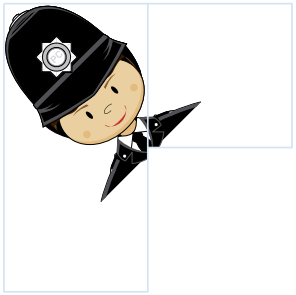
Glue

Activity 4 – Right-angle police

Explain

Ask learners to work in pairs to write, in capital letters, the title of a book that they have read or would like to read (for example, ALICE IN WONDERLAND). Tell them to keep this title safe as they will need it later on.

Now give each learner a **Right-angle police** strip of card. Ask them to cut down the dashed line and glue as shown here, as carefully as possible.



Show learners the right angle between the two strips of card and demonstrate how to use it to check for right angles.

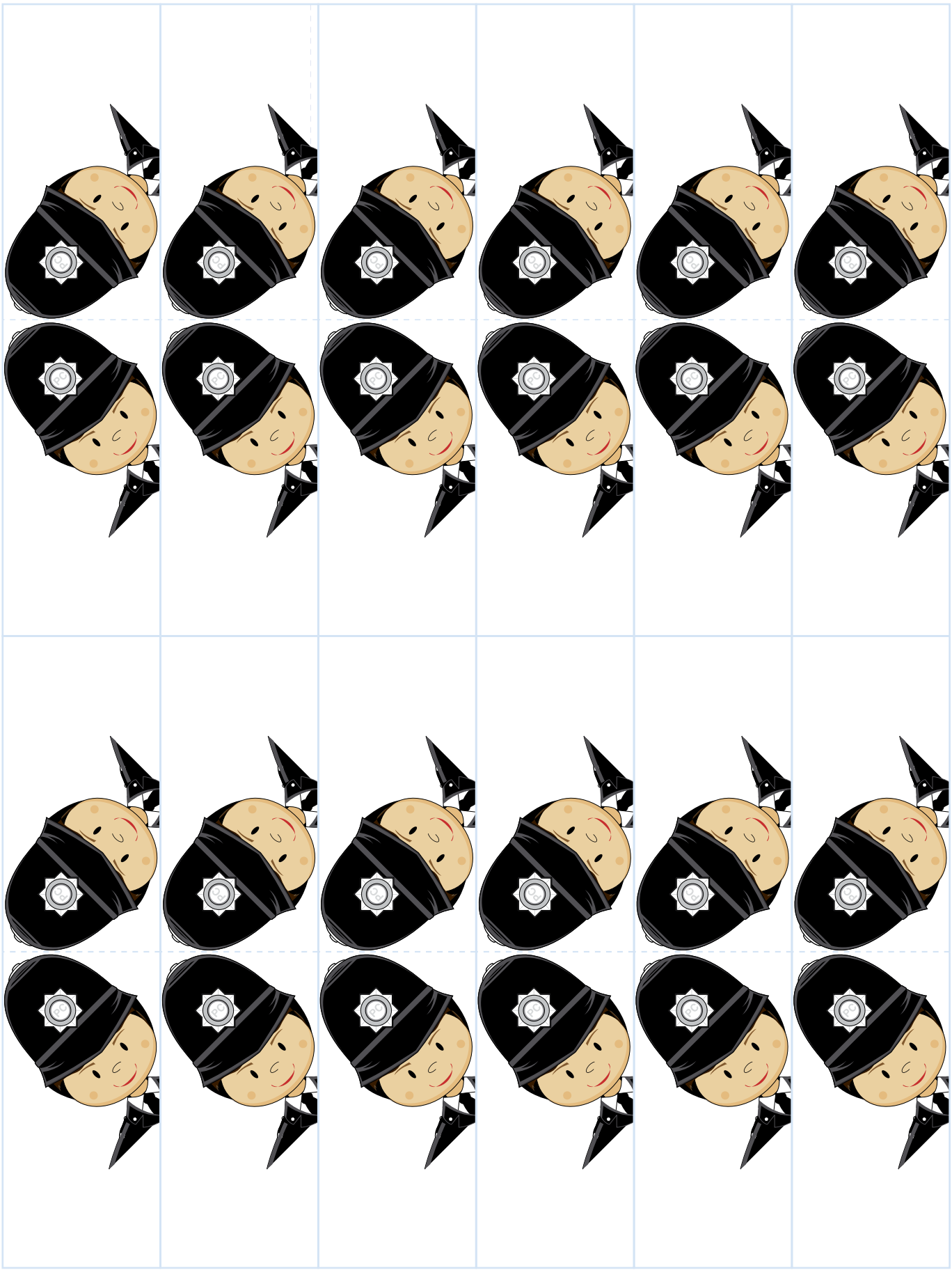
Now tell them that the right-angle police have decided that from now on, only the letters with right angles are allowed to be in our alphabet. Show **POLICE** on the whiteboard and ask how many right angles are in each letter. Confirm by showing **POLICE right angles**, then tell learners that as O, I and C have no right angles, the word POLICE will now be PLE!

Give each pair/group a copy of the **Alphabet** sheet and ask them to use their right angle to help decide which letters are still allowed.

Then they rewrite the title of their book (so ALICE IN WONDERLAND is now LE DERLD). Can they make up a title of a book that is the same before and after the right-angle police have been?

Question

- What other words do we use for a right angle? *(Corner, quarter-turn)*
- What right angles can you see in the classroom?
- How many right angles does this square have? What about if I turn the square like this? *(Learners commonly think that right angles must have vertical and horizontal lines.)* What can you tell me about rectangles? How many right angles do they have?
- Can you draw me a triangle that has a right angle? And one that doesn't? What about a circle?
- Are you confident about all the letters that do (or don't) have right angles? Were any hard to decide? Why?
- How many letters do have right angles? *(10)* How many of them are vowels? *(1)* Why does that make finding a title difficult?



WB

POLICE

WB

A B C D E

F G H I J K

L M N O P

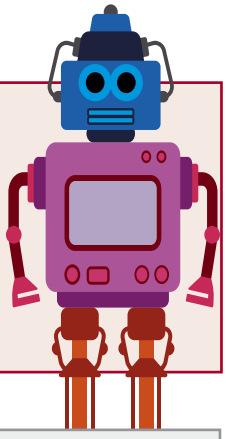
Q R S T U

V W X Y Z

Activity 5

Turning robot

Activity 5 – Turning robot



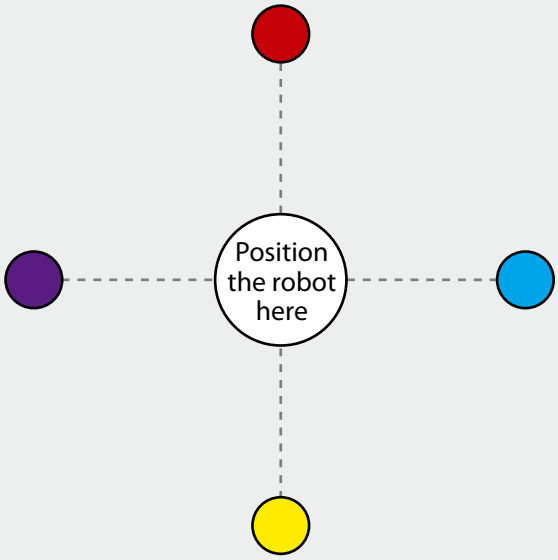
Outline

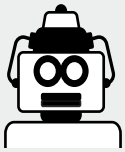
This activity extends the learning from **Activity 4 – Right-angle police**, by developing learners' understanding of right angles as turns.

Learners start their exploration by considering the ways a robot can turn, then extend their learning by 'becoming' the robot that turns according to the teacher's instructions.

You will need

For demonstration purposes, a large sheet of paper or card with four coloured spots as shown below





A 'robot' (or any other suitably engaging item)

Four individual large spots (or similar, e.g. P.E. cones) for the learners to face, coloured as above

Teachers' sheet – Robot moves

Activity 5 – Turning robot

Explain

Position the robot in the centre of the large paper or card, with the robot facing the yellow spot. Tell learners that the robot can turn both clockwise and anticlockwise and make sure that they understand the meaning of each.

The robot wants to face the red spot – how can it turn? How else can it turn? *(A half-turn clockwise or a half-turn anticlockwise)* Then position the robot to face the yellow spot again and say that the robot wants to face the blue spot. How can it turn? How else can it turn? *(A quarter-turn anticlockwise or a three-quarters-turn clockwise)*

The robot is now facing the blue spot. It is going to turn through one right angle. Which colour spots could it face? *(Red or yellow)* What could we say if we want the robot to turn to the yellow spot? *(Turn through one right angle clockwise.)*

Once learners understand the way that the robot turns, tell them that they are going to be robots and you are going to be the robot controller. You need robot police to help you check that learners are turning the correct way. (*Choose a few to be the police, changing regularly so that everyone has a go.)*

Move into a large space so each learner has space to turn. 'Switch' them into robots, and tell them they can only move as directed by you. Go through the list of instructions in **Robot moves**, adapting as appropriate for the group. Remind the police to watch carefully!

Complete the activity by you becoming the robot, with the learners directing your moves. *(This checks out their understanding. Making deliberate errors is fun, and ensures that learners have to explain what you are doing wrong.)*

Question

(These can be used during the activity or with small groups afterwards.)

- If you make a half-turn, does it matter whether you turn clockwise or anticlockwise?
- How many quarter-turns make a whole turn? How many right angles make a whole turn? If you face the yellow dot and turn through four right angles, where will you face now?
- How many right angles are there in a half-turn? . . . a quarter-turn? . . . two full turns?
- *(When you are the 'robot'.)* Can you find a different way to make me turn to face xxx? How many ways are there altogether? *(Infinite, as you could keep increasing the number of turns.)*

Robot moves

- A quarter-turn clockwise
- A half-turn anticlockwise
- A three-quarters-turn clockwise
- A full turn anticlockwise
- A quarter-turn anticlockwise then a quarter-turn clockwise
- Through one right angle clockwise
- Through three right angles anticlockwise
- Through four right angles clockwise
- Through one right angle anticlockwise then two right angles clockwise

Change the direction they are facing, so that they all face the same corner of the room. Emphasise that the starting point might be different, but the amount of turn is the same.

- Through one right angle clockwise
- A full turn anticlockwise, then a half-turn clockwise, then another half-turn clockwise
- Through one right angle anticlockwise, then a half-turn anticlockwise

Change the direction they are facing again.

- Through two right angles anticlockwise
- A quarter-turn clockwise, then one right angle clockwise, then a half-turn anticlockwise

And so on.