Mathematical mysteries
Activity 1

Focus of activity: Solving equations using the bar model.

Working together: conceptual understanding

- Write 7 + a = 10. Explain that this is called an <u>equation</u> and 'a' stands for a <u>mystery number</u>. *We are just using a instead of an empty box, □. Sketch a bar model to show this equation. 7 plus a mystery number makes 10. What is a, the mystery number?*

10	
7	a

- Repeat with 10 – b = 6. *We have 10, if we take away b, we are left with 6. So, b and 6 must add up to 10. What is b? Does that work?* 10 – 4 = 6. Yes!

10	
6	b

- Write 4c = 20 (explaining that 4c stands for 4 × c). *Four lots of c, a mystery number, make 20. Sketch a bar model to show this. What is c?*

20			
c	c	c	c

- Repeat with 3d = 15. Ask children to copy the diagram, and to write the mystery number instead of d in each place. Share answers.

15		
d	d	d

Up for a challenge?
Write a + b = 10. Explain that *a* and *b* are two new mystery numbers. Children discuss what they might be. Draw out that there are lots of possibilities this time. List some pairs, e.g. 9 and 1, 8 and 2.

Now it's the children's turn:
- Children work in pairs to solve equations using the bar model.
- Go round the group and mark their answers as they work them out, e.g. initially after three examples.

S-t-r-e-t-c-h:

If children cope well, ask them to list some possible pairs of answers for a x b = 12.

Some children may be able to do the easier activity on day 2 of the weekly plan.

Things to remember

Remember that we can use a letter to stand for a mystery number, instead of an empty box or other symbol, but we go about working out what the mystery number is in just the same way. Ask a child to think of a simple sum, but write a instead of one of the numbers they thought of. Can the rest of the group guess what number they thought of instead of a in their sum?

You may want to add something that has emerged from the activity. This may refer to misconceptions or mistakes made.

Resources	Outcomes
• Mini-whiteboards and pens	1. Children can solve simple equations using the bar model.
	2. Children begin to find pairs of numbers that satisfy an equation with two unknowns.

Work in pairs, but write on your own sheet.

Things you will need:
• A pencil

What to do:

Work out what mystery number each letter stands for:

10	
8	a

8 + a = 10

a = _____

8	
b	3

b + 3 = 8

b = _____

12	
9	c

12 − c = 9

c = _____

20	
d	d

2d = 20

d = _____

28			
e	e	e	e

4e = 28

e = _____

30		
f	f	f

3f = 30

f = _____

S-t-r-e-t-c-h:
List some possible pairs of answers for a x b = 12

Learning outcomes:
• I can solve equations using the bar model.
• I am beginning to find pairs of numbers that work in equations with two mystery numbers.

Spot the rule
Activity 2

Focus of activity: Counting sequences.

Working together: conceptual understanding
- Write the following sequence of numbers: 1, 4, 7, 10, 13, 16, 19, but cover the last three numbers with Post-its™ before children see them. *This is a pattern of numbers – we call it a sequence. What do you think the next number is in the pattern?* Ask children how they decided this. Draw out that each number is 3 more than the last number. So, the <u>rule</u> is add 3. Remove the Post-it™ to check. Ask children to guess the next two numbers, then remove the Post-its™ to check.
- Repeat with 3, 7, 11, 15, 19. Hide the last two numbers with Post-its™. Ask children to work out what the rule is this time. Test out their rule by asking them to guess the next number under the Post-it™. Show the next number. Do they need to change their mind about the rule? Children use their rule to work out the next hidden number. Reveal the number to confirm.
- Write the following sequence: 11, 21, 31, 41. Ask children to work in pairs to write the next three numbers in this sequence. Share answers. *What's the rule this time?*
- Write the following sequence but cover the first two numbers. 40, 42, 44, 46, 48, 50, 52. Ask children to suggest what the rule might be, and then to use this to work out the hidden numbers. *We had to work backwards this time!*
- Write 5, 10, 15, 20, 25, 30 and cover the 3rd and 4th numbers. Children suggest a rule and then test out their rule by working out the missing numbers and seeing if 20 is the next number in the sequence.

Up for a challenge?
Challenge children to make up their own rule to generate a sequence. Other children work out what the rule is.

Now it's the children's turn:
- Children work out the missing/next numbers in sequences and write the rule for each one.
- Go round the group and mark their sequences, e.g. initially after three examples. If children struggle to write the rule, ask them to tell you in words, and then move on to recording the rule.

S-t-r-e-t-c-h:
If children cope well, ask them to make up their own rule to generate a sequence. A partner works out the mystery rule.

Things to remember

Remember that sequences of numbers have a rule which helps us to work out the next number, and the next and the next… Write the following sequence: 4, 8, 12, 17, 20, 24. Say that one number is wrong in this sequence because it doesn't follow the rule. Can children work out which number is wrong?

You may want to add something that has emerged from the activity. This may refer to misconceptions or mistakes made.

Resources	Outcomes
• Post-it™ notes	1. Children can identify the rule of a sequence and use it to work out missing numbers or continue the sequence.
	2. Children begin to use their own rules to generate sequences.

Spot the rule
Activity 2

Work in pairs, but write on your own sheet.

Things you will need:
• A pencil

What to do:

Spot the rule for each sequence. Use this to work out the missing numbers.

2, 7, 12, 17, ____, ____, ____   The rule is _____

1, 5, 9, 13, ____, ____, ____   The rule is _____

3, 10, 17, 24, ____, ____, ____   The rule is _____

____, ____, 23, 26, 29, 32, 35   The rule is _____

4, 14, ____, ____, ____, 54, 64   The rule is _____

20, 26, ____, 38, ____, 50, 56   The rule is _____

S-t-r-e-t-c-h:
Make up your own rule. Use this to write a sequence of seven numbers. Can your partner work out your rule?

Learning outcomes:
• I can spot the rule of sequences and use it to work out missing numbers.
• I am beginning to use my own rules to generate sequences.