

Assessing pupils' progress

in mathematics at Key Stage 3

Year 8

Examples of pupils' work

Focus: Ma2, Algebra

Mind readers and What's the trick?

Year 8

Algebra

LESSON 1: *Mind readers*

Puzzling it out Level 3

Here are the instructions for a puzzle. Fill in the missing numbers.

Think of a number:	60	14	-4	Start number
• Add 14	74	28	10	
• Halve your answer	37	14	5	
• Subtract 28	9	-24	28 -14	
• Multiply your answer by 4	36	-76	74 -56	
• Add 84	120	8	36 128	
• Halve your answer	60	14	14	Final number

Complete this sentence:
The final number in this puzzle will always be _____

Now complete the instructions for this different puzzle.
The first two rows are done for you.

Think of a number:	<i>This is cell C2</i>
• Add 4	= C2 + 4
•	= C3 * 8
•	= C4 / 2
•	= C5 - 16
•	= C6 / 4
•	= C7 - C2

Complete this sentence:
The final number in this puzzle will always be _____

Explain how you know.

Puzzling it out
Level 3

Here are the instructions for a puzzle. Fill in the missing numbers.

Think of a number:	60	14	-4	Start number
• Add 14	74	28	10 10	
• Halve your answer	37	14	5 5	
• Subtract 28	9	-14	28 3	
• Multiply your answer by 4	36	-56	92	
• Add 84	120	28	-8	
• Halve your answer	60	14	-4	Final number

Complete this sentence:
The final number in this puzzle will always be even.

Now complete the instructions for this different puzzle.
The first two rows are done for you.

Think of a number:	<i>This is cell C2</i>
• Add 4	= C2 + 4
•	= C3 * 8
•	= C4 / 2
•	= C5 - 16
•	= C6 / 4
•	= C7 - C2

Complete this sentence:
The final number in this puzzle will always be _____

Explain how you know.

Here are the instructions for a puzzle. Fill in the missing numbers.

Think of a number:	60	14	-4	Start number
• Add 14	74	28		
• Halve your answer	37	14		
• Subtract 28	9 9	14 14		
• Multiply your answer by 4	36			
• Add 84	120			
• Halve your answer	60			Final number

Complete this sentence:
The final number in this puzzle will always be _____

Now complete the instructions for this different puzzle.
The first two rows are done for you.

Think of a number:	<i>This is cell C2</i>
• Add 4	= C2 + 4
• X 8	= C3 * 8
• $\div 2$	= C4 / 2
• - 16	= C5 - 16
• 16 $\div 4$	= C6 / 4
• - original number.	= C7 - C2

Complete this sentence:
The final number in this puzzle will always be _____

Explain how you know.

Puzzling it out
Level 4

Here are the instructions for a puzzle. Fill in the missing numbers.

Think of a number:	60	14	-4
• Add 14	74	28	10
• Halve your answer	37	14	5
• Subtract 28	9	-14	-23
• Multiply your answer by 4	36	-56	-92
• Add 84	140	28	-6
• Halve your answer	70	14	-3

Start number x
 $x + 14$
 $x + 7$
 $x - 21$
 $4(x - 21)$
 $4(x - 21) + 84$
 $2(x - 10.5) + 42$
 Final number

Complete this sentence:

The final number in this puzzle will always be

$$\begin{array}{r} 0 \cancel{14} \\ 36 \\ -28 \\ \hline 8 \end{array} \quad \begin{array}{r} 21 \\ 37 \\ -28 \\ \hline 9 \end{array} \quad \begin{array}{r} 36 \\ +84 \\ \hline 140 \end{array}$$

Now complete the instructions for this different puzzle.
The first two rows are done for you.

Think of a number:	This is cell C2
• Add 4	= C2 + 4
• multiply by 8	= C3 * 8
• divide by 2	= C4 / 2
• minus 16	= C5 - 16
• divide by 4	= C6 / 4
• minus C2	= C7 - C2

23
23
23
23
92
1

Complete this sentence:

The final number in this puzzle will always be

The number you started with.

Explain how you know.

Here are the instructions for a puzzle. Fill in the missing numbers.

Think of a number:	60	14	-4
• Add 14	74		
• Halve your answer	37		
• Subtract 28	9		
• Multiply your answer by 4	36		
• Add 84	120		
• Halve your answer	60		

Start number
 Final number

Complete this sentence:

The final number in this puzzle will always be

the same as your start number.

Now complete the instructions for this different puzzle.
The first two rows are done for you.

Think of a number:	This is cell C2
• Add 4	= C2 + 4
• Multiply your answer by 8	= C3 * 8
• Divide your answer by 2	= C4 / 2
• Subtract 16	= C5 - 16
• Divide your answer by 4	= C6 / 4
• Subtract your start number	= C7 - C2

21
65
4840
2420
84
21
00

Complete this sentence:

The final number in this puzzle will always be

0

Explain how you know.

I tried some and they worked out as 0.

Puzzling it out
Level 4

Here are the instructions for a puzzle. Fill in the missing numbers.

Think of a number:	60	14	-4	Start number
• Add 14	74	28	10	
• Halve your answer	37	14	5	
• Subtract 28	9	-14	-23	
• Multiply your answer by 4	36	-56	-92	
• Add 84	120	28	-8	
• Halve your answer	60	14	-4	Final number

Complete this sentence:
The final number in this puzzle will always be _____

Now complete the instructions for this different puzzle.
The first two rows are done for you.

Think of a number:	<i>This is cell C2</i>
• Add 4	= C2 + 4
• X 8	= C3 * 8
• ÷ 2	= C4 / 2
• -16	= C5 - 16
• ÷ 4	= C6 / 4
• 1/4 - what you started with	= C7 - C2

Complete this sentence:
The final number in this puzzle will always be _____

Explain how you know.

Here are the instructions for a puzzle. Fill in the missing numbers.

Think of a number:	60	14	-4	Start number
• Add 14	74	28	10	
• Halve your answer	37	14	5	
• Subtract 28	9	-14	-22	
• Multiply your answer by 4	36	-56	-88	
• Add 84	120	28	-8	
• Halve your answer	60	14	-4	Final number

Complete this sentence:
The final number in this puzzle will always be the number you started with

Now complete the instructions for this different puzzle.
The first two rows are done for you.

Think of a number:	<i>This is cell C2</i>
• Add 4	= C2 + 4
• X 8 multiply by 8	= C3 * 8
• 1/2 halve it	= C4 / 2
• Subtract 16	= C5 - 16
• Divide by 4	= C6 / 4
• Subtract 1	= C7 - C2

Complete this sentence:
The final number in this puzzle will always be _____

Explain how you know.

Puzzling it out
Level 5

Here are the instructions for a puzzle. Fill in the missing numbers.

Think of a number:	60	14	-4	Start number
• Add 14	74	28	10	
• Halve your answer	37	14	5	
• Subtract 28	9	14	-23	
• Multiply your answer by 4	36	56	-92	
• Add 84	120	28	-8	
• Halve your answer	60	14	-4	Final number

Complete this sentence:
The final number in this puzzle will always be the same as the 1st

Now complete the instructions for this different puzzle.
The first two rows are done for you.

Think of a number:	<i>This is cell C2</i>
• Add 4	$= C2 + 4$
• $\times 8$	$= C3 * 8$
• $\div 2$	$= C4 / 2$
• $- 16$	$= C5 - 16$
• $\div 4$	$= C6 / 4$
• $-$ the number you started with	$= C7 - C2$

Complete this sentence:
The final number in this puzzle will always be -3

Explain how you know.

Here are the instructions for a puzzle. Fill in the missing numbers.

Think of a number:	60	14	-4	Start number
• Add 14	74	28	10	
• Halve your answer	37	14	5	
• Subtract 28	9	-14	-23	
• Multiply your answer by 4	36	56	92	
• Add 84	120	28	-8	
• Halve your answer	60	14	-4	Final number

Complete this sentence:
The final number in this puzzle will always be the same as your start number

Now complete the instructions for this different puzzle.
The first two rows are done for you.

Think of a number:	<i>This is cell C2</i>
• Add 4	$= C2 + 4$
• Multiply by 8	$= C3 * 8$
• Divide by 2	$= C4 / 2$
• Subtract 16	$= C5 - 16$
• Divide by 4	$= C6 / 4$
• Subtract your first number.	$= C7 - C2$

Complete this sentence:
The final number in this puzzle will always be zero

Explain how you know.

Puzzling it out
Level 5

Here are the instructions for a puzzle. Fill in the missing numbers.

Think of a number:	60	14	-4	Start number
• Add 14	74	28	10	
• Halve your answer	37	14	5	
• Subtract 28	9	-14	-23	
• Multiply your answer by 4	36	56	-92	
• Add 84	120	328	-8	
• Halve your answer	60	14	-4	Final number

Complete this sentence:
The final number in this puzzle will always be the number you started with

Now complete the instructions for this different puzzle.
The first two rows are done for you.

Think of a number:	<i>This is cell C2</i>
• Add 4	= C2 + 4
• multiply by 8	= C3 * 8
• divided by two	= C4 / 2
• Subtract 16	= C5 - 16
• divide by 4	= C6 / 4
• subtract the number you started with	= C7 - C2

Complete this sentence:
The final number in this puzzle will always be 0.

Explain how you know.

I know this by checking and trying different numbers.

Here are the instructions for a puzzle. Fill in the missing numbers.

Think of a number:	60	14	-4	Start number
• Add 14	74	28	10	
• Halve your answer	37	14	5	
• Subtract 28	9	-14	-23	
• Multiply your answer by 4	36	-56	-92	
• Add 84	120	28	-8	
• Halve your answer	60	14	-4	Final number

Complete this sentence:
The final number in this puzzle will always be the number you started with

Now complete the instructions for this different puzzle.
The first two rows are done for you.

Think of a number:	<i>This is cell C2</i>
• Add 4	= C2 + 4
• Multiply your answer by 8	= C3 * 8
• Divide your answer by 2	= C4 / 2
• Subtract 16	= C5 - 16
• Divide your answer by 4	= C6 / 4
• Subtract the number you started with	= C7 - C2

Complete this sentence:
The final number in this puzzle will always be The number you started

Explain how you know. n with + 4
 $n + 4$
 $8n + 32$
 $8n + 16$
 $2n + 4$
 $n + 4$

Puzzling it out
Level 6

Here are the instructions for a puzzle. Fill in the missing numbers.

Think of a number:	60	14	-4	Start number
• Add 14	74	28	10	
• Halve your answer	37	14	5	
• Subtract 28	9	-14	-23	
• Multiply your answer by 4	36	-56	-92	
• Add 84	120	28	-8	
• Halve your answer	60	14	-4	

Complete this sentence:
The final number in this puzzle will always be the same as the start number

Now complete the instructions for this different puzzle.
The first two rows are done for you.

Think of a number:	<i>This is cell C2</i>
• Add 4	= C2 + 4
• times 8	= C3 * 8
• half it	= C4 / 2
• # subtract 16	= C5 - 16
• ÷ by 4	= C6 / 4
• subtract the starting number	= C7 - C2

Complete this sentence:
The final number in this puzzle will always be 0

Explain how you know.

$$\begin{array}{r} n+4 \\ 8n+32 \\ 4n+16 \\ 4n \\ n \\ 0 \end{array}$$

Here are the instructions for a puzzle. Fill in the missing numbers.

Think of a number:	60	14	-4	Start number
• Add 14	74	28	10	
• Halve your answer	37	14	5	
• Subtract 28	9	-14	-23	
• Multiply your answer by 4	36	-56	-92	
• Add 84	120	28	-8	
• Halve your answer	60	14	-4	

Complete this sentence:
The final number in this puzzle will always be the starting number

Now complete the instructions for this different puzzle.
The first two rows are done for you.

Think of a number:	8	<i>This is cell C2</i>	x
• Add 4	12	= C2 + 4	$x+4$
• Multiply #	96	= C3 * 8	$8x+32$
• Divide by 2	48	= C4 / 2	$4x+16$
• Subtract 16	32	= C5 - 16	$4x$
• Divide 4	8	= C6 / 4	x
• Subtract the number you started with	0	= C7 - C2	0

Complete this sentence:
The final number in this puzzle will always be 0

Explain how you know.

$$\begin{array}{r} x \\ x+4 \\ 8x+32 \\ 4x+16 \\ 4x \\ x \\ 0 \end{array}$$

Year 8

Algebra

LESSON 2: *What's the trick?*

The n version sheet 1
Level 3

Use algebra to show how this puzzle works.

	The n version	
Think of a number:	n 5	Start number
• Double it	10	
• Add 12	22	
• Halve your answer	11	
• Subtract the start number	6	Final number

What will the final number of the puzzle always be? 6

Here is a different puzzle. The algebra shows how the puzzle works. Complete the instructions.

	The n version	
Think of a number:	n 5	Start number
• ADD 9	$n + 9$ 14	
• TIMES 2 ADD 18	$2n + 18$ 42	
• TIMES BY 2	$2n$ 52	
• IT WILL BE YOUR ORIGINAL ANSWER +10	n 5	Final number

The algebra shows that the final number of this puzzle will always be n . Use words to explain what that means.

Use algebra to show how this puzzle works.

	The n version	
Think of a number:	n 5	Start number
• Double it	$N \times 2$ 10	
• Add 12	$2N + 12$ 22	
• Halve your answer	$2N + 6$ 11	
• Subtract the start number	$N + 6$ 6	Final number

What will the final number of the puzzle always be? 1 + the number you start with.

Here is a different puzzle. The algebra shows how the puzzle works. Complete the instructions.

	The n version	
Think of a number: 6	n	Start number
• 15	$n + 9$	
• 30	$2n + 18$	
• 12	$2n$	
• 6	n	Final number

The algebra shows that the final number of this puzzle will always be n . Use words to explain what that means.

The n version sheet 1
Level 4

Use algebra to show how this puzzle works.

	The n version	
Think of a number:	n	Start number
• Double it	$n \times 2$	Final number
• Add 12	$n + 12$	
• Halve your answer	$n/2$	
• Subtract the start number	$n - n$	

What will the final number of the puzzle always be? _____

Here is a different puzzle. The algebra shows how the puzzle works. Complete the instructions.

	The n version	
Think of a number:	n	Start number
• add 9	$n + 9$	Final number
• Multiply by 2	$2n + 18$	
• Subtract 18	$2n$	
• Divide by 2	n	

The algebra shows that the final number of this puzzle will always be n . Use words to explain what that means.

Use algebra to show how this puzzle works.

	The n version	
Think of a number:	n	Start number
• Double it	$n \times 2$	Final number
• Add 12	$2n + 12$	
• Halve your answer	$2n + 6$	
• Subtract the start number	2n 6	

What will the final number of the puzzle always be? _____

Here is a different puzzle. The algebra shows how the puzzle works. Complete the instructions.

	The n version	
Think of a number:	n	Start number
• add nine	$n + 9$	Final number
• Double it	$2n + 18$	
• Subtract 18	$2n$	
• Halve it	n	

The algebra shows that the final number of this puzzle will always be n . Use words to explain what that means.

The n version sheet 1
Level 4

Use algebra to show how this puzzle works.

	The n version	
Think of a number:	n	Start number
• Double it	$2n$	
• Add 12	$2n + 12$	
• Halve your answer	$2n + 12 \div 2$	
• Subtract the start number	n	Final number

What will the final number of the puzzle always be? the same as the start number

Here is a different puzzle. The algebra shows how the puzzle works. Complete the instructions.

	The n version	
Think of a number:	n	Start number
• Add 9	$n + 9$	
• Double your answer	$2n + 18$	
• Subtract 18	$2n$	
• Halve your answer	n	Final number

The algebra shows that the final number of this puzzle will always be n . Use words to explain what that means.

The n version sheet 1
Level 5

Use algebra to show how this puzzle works.

	The n version	
Think of a number:	n	Start number
• Double it	$2n$	
• Add 12	$2n + 12$	
• Halve your answer	$n + 6$	
• Subtract the start number	6	Final number

What will the final number of the puzzle always be? 6

Here is a different puzzle. The algebra shows how the puzzle works. Complete the instructions.

	The n version	
Think of a number:	n	Start number
• Add 9	$n + 9$	
• Double your answer	$2n + 18$	
• Subtract 18	$2n$	
• Subtract the number you started with	n	Final number

The algebra shows that the final number of this puzzle will always be n . Use words to explain what that means.

The n version sheet 1
Level 5

Use algebra to show how this puzzle works.

	The n version	
Think of a number:	n	Start number
• Double it	$2n$	
• Add 12	$2n+12$	
• Halve your answer	$n+6$	
• Subtract the start number	6	Final number

What will the final number of the puzzle always be? 6

Here is a different puzzle. The algebra shows how the puzzle works.
 Complete the instructions.

	The n version	
Think of a number:	n	Start number
• Add 9	$n + 9$	
• Double your answer	$2n + 18$	
• Subtract 18	$2n$	
• Halve your answer	n	Final number

The algebra shows that the final number of this puzzle will always be n .
 Use words to explain what that means. start number

The n version sheet 2
Level 4

Use algebra to show how this puzzle works.

	The n version	
Think of a number:	n	Start number
• Add 6	$n+6$	
• Double your answer	$n+6 \times 2$	
• Add 4	$n+6 \times 2 + 4$	
• Halve your answer	$n+6 \times 2 + 4 / 2$	
• Subtract the start number	$n+6 \times 2 + 4 / 2 - n$	Final number

What will the final number of the puzzle always be? _____

Here is a different puzzle. The algebra shows how the puzzle works.
Complete the instructions.

	The n version	
Think of a number:	n	Start number
• divide by 5	$\frac{n}{5}$	
• add 1	$\frac{n}{5} + 1$	
• double your answer	$2n + 10$	
• Take away 10	$2n$	Final number

The algebra shows that the final number of this puzzle will always be $2n$.
Use words to explain what that means.

Use algebra to show how this puzzle works.

	The n version	
Think of a number:	6 n 8	Start number
• Add 6	12 $n+6$ 14	
• Double your answer	24 $2n+6$ 28	
• Add 4	28 $2n+10$ 32	
• Halve your answer	14 $n+10$ 16	
• Subtract the start number	8 10 8	Final number

What will the final number of the puzzle always be? 8

Here is a different puzzle. The algebra shows how the puzzle works.
Complete the instructions.

	The n version	
Think of a number:	n	Start number
• Divide Divide by 5	$\frac{n}{5}$	
• Add 1	$\frac{n}{5} + 1$	
• Double your answer Add 8	$2n + 10$	
• Subtract 10	$2n$	Final number

The algebra shows that the final number of this puzzle will always be $2n$.
Use words to explain what that means.

The n version sheet 2
Level 5

Use algebra to show how this puzzle works.

	The n version	
Think of a number:	n	Start number
• Add 6	$n+6$	
• Double your answer	$2n+6$	
• Add 4	$2n+10$	
• Halve your answer	$n+10$	
• Subtract the start number	10	Final number

What will the final number of the puzzle always be? 10

Here is a different puzzle. The algebra shows how the puzzle works. Complete the instructions.

	The n version	
Think of a number:	n	Start number
• Divide by 5	$\frac{n}{5}$	
• Add 1	$\frac{n}{5} + 1$	
• times by 10	$2n + 10$	
• subtract 10	$2n$	Final number

The algebra shows that the final number of this puzzle will always be $2n$. Use words to explain what that means.

Use algebra to show how this puzzle works.

	The n version	
Think of a number:	n	Start number
• Add 6	$n+6$	
• Double your answer	$2n+12$	
• Add 4	$2n+16$	
• Halve your answer	$n+8$	
• Subtract the start number	8	Final number

What will the final number of the puzzle always be? 8

Here is a different puzzle. The algebra shows how the puzzle works. Complete the instructions.

	The n version	
Think of a number:	n	Start number
• Divide by 5	$\frac{n}{5}$	
• add 1	$\frac{n}{5} + 1$	
• times by 2 add 10	$2n + 10$	
• minus 10	$2n$	Final number

The algebra shows that the final number of this puzzle will always be $2n$. Use words to explain what that means.

The n version sheet 2
Level 5

Use algebra to show how this puzzle works.

	The n version	
Think of a number:	n	Start number
• Add 6	$n + 6$	
• Double your answer	$2n + 12$	
• Add 4	$2n + 16$	
• Halve your answer	$n + 8$	
• Subtract the start number	8	Final number

What will the final number of the puzzle always be? 8

Here is a different puzzle. The algebra shows how the puzzle works. Complete the instructions.

	The n version	
Think of a number:	n	Start number
• Divide by 5	$\frac{n}{5}$	
• Add 1	$\frac{n}{5} + 1$	
• Multiply by 10	$2n + 10$	
• Subtract the number you started with.	$2n$	Final number

The algebra shows that the final number of this puzzle will always be $2n$. Use words to explain what that means.

The n version sheet 2
Level 6

Use algebra to show how this puzzle works.

	The n version	
Think of a number:	n	Start number
• Add 6	$n + 6$	
• Double your answer	$2n + 12$	
• Add 4	$2n + 16$	
• Halve your answer	$n + 8$	
• Subtract the start number	8	Final number

What will the final number of the puzzle always be? 8

Here is a different puzzle. The algebra shows how the puzzle works. Complete the instructions.

	The n version	
Think of a number:	n	Start number
• Divide by 5	$\frac{n}{5}$	
• Add 1	$\frac{n}{5} + 1$	
• Multiply by 10	$2n + 10$	
• Subtract 10	$2n$	Final number

The algebra shows that the final number of this puzzle will always be $2n$. Use words to explain what that means.

The final number will always be twice the number you started with.