

Algebraic patterns and expressions

Examples of pupils' work

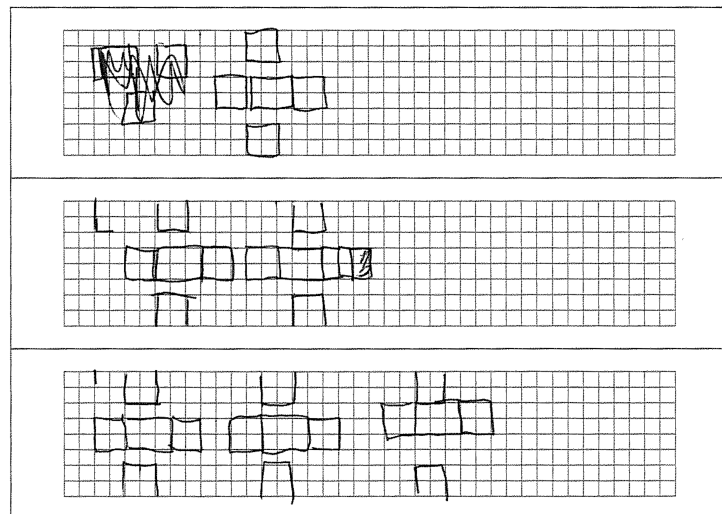
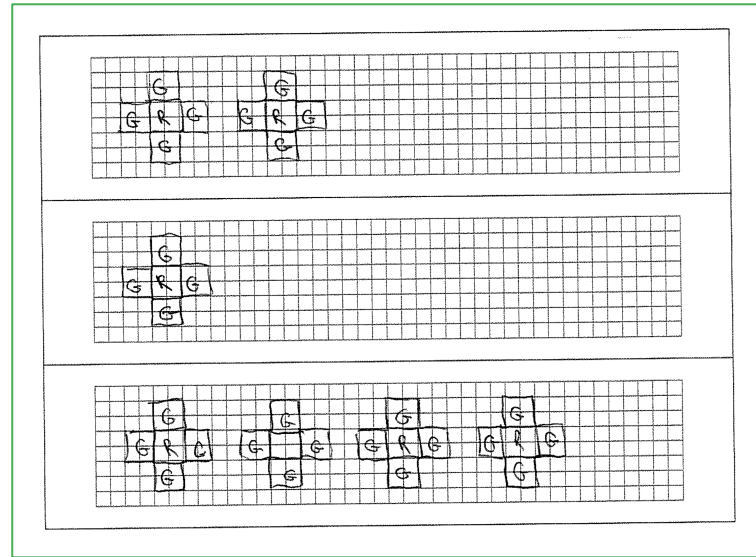
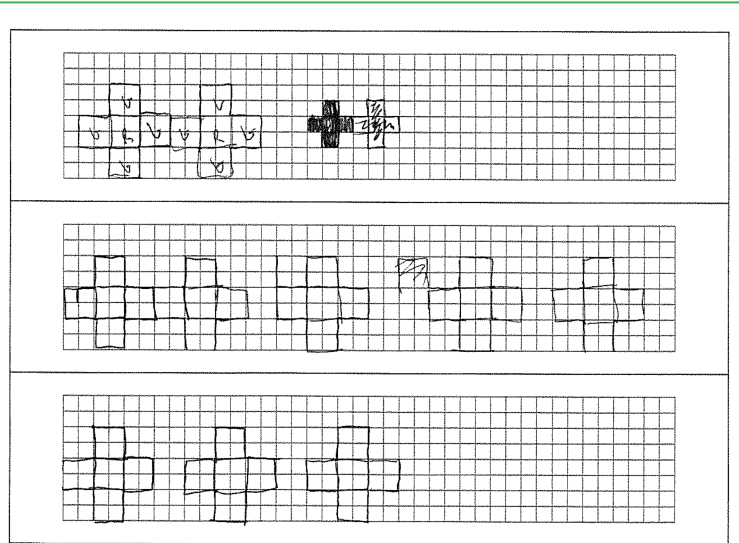


Examples are from

- Investigation 1, Q. 1A "Sketch any of the three figures in the Pattern Player"
- Investigation 1, Q. 1C "Describe the pattern..."
- Investigation 1, Q. 1 F G H "Copy your expression for total..."
- Investigation 2, Q. 1 A B "Describe the pattern's structure and predict the expression for the total number of lights."
- Investigation 2, Q.1 D E "Explain how the numbers and variables in your pattern are related to the lights in the pattern"



"Sketch any of the three figures in the Pattern Player" (Inv 1, Q1A)



Discuss the responses...

- The three pupils are seeing the pattern very differently – how would you support them to 'see' what is needed to recreate it accurately?

"Describe the pattern..."(Inv 1, 1C)

c) Describe the pattern: What does each of the figures (images) of the pattern have in common?

↳ They all look like crosses.

d) What is changing from one figure to another?

↳ The amount of boxes.

c) Describe the pattern: What does each of the figures (images) of the pattern have in common?

↳ The pattern is the same all the time. There are always the same size and shape.

d) What is changing from one figure to another?

↳ there are two different colours

c) Describe the pattern: What does each of the figures (images) of the pattern have in common? ^{Same}

Single square repeated pattern.. they have a colour size plus it goes up in the same sign. Speed. Flower.

d) What is changing from one figure to another?

↳ adding one more design multiple.

- What language are the pupils using?
- What language might support pupils to better describe the pattern's structure?

"Copy your expression for total..." (Inv 1, Q.1 F G H)

g) Copy your Expression for Total.

£ $3 \times 6 = 18$

h) In your expression:

i) What does the number represent?

£ 3 means lights in block
6 means how many times the pattern is in the sequence

ii) Which part is the variable and what does it represent?

£ 6 (alex) is how many patterns there are.

g) Copy your Expression for Total.

£ $(3 \times bob)$

h) In your expression:

i) What does the number represent?

£ How light are there in one figure

ii) Which part is the variable and what does it represent?

£ ~~Bob~~ The variable is called bob ^{Bob} represent how many times the pattern is being repeated

f) Select the name of your variable and drag the slider that appears to check if your pattern grows as expected.

Variable name:	<input type="text"/>
Variable value:	<input type="text"/>

g) Copy your Expression for Total.

£ $3 \times 8 = 24$ (fred)

h) In your expression:

i) What does the number represent?

£ 3 represents the lights in a block
8 (fred) represents the number of blocks

ii) Which part is the variable and what does it represent?

£ 8 (fred) represents the variable as it shows how many blocks there are.

- How is pupils' appreciation of an algebraic variable developing?
- How would you use the software to support further discussion?

Describe the pattern's structure and predict the expression for the total number of lights." (Inv 4, Q1 A B)

- 1)
- a) Describe the pattern's structure in words or pictures and how it is different from other patterns you have seen. It might help if you think about the starting pattern and how it grows. (You may wish to use the Step Forward and Step Back to help).

It is different from other patterns I've seen because it is on a different shape and also has two different colours.

- b) **Predict:** What do you think the expression to give you the total number of lights (for any pattern of this type) will be?

There's gonna be two different expressions but the total lights is addition of both expressions.

- 1)
- a) Describe the pattern's structure in words or pictures and how it is different from other patterns you have seen. It might help if you think about the starting pattern and how it grows. (You may wish to use the Step Forward and Step Back to help).

It is 3 orange lights surrounded with green lights.

- b) **Predict:** What do you think the expression to give you the total number of lights (for any pattern of this type) will be?

8 x number of blocks

- 1)
- a) Describe the pattern's structure in words or pictures and how it is different from other patterns you have seen. It might help if you think about the starting pattern and how it grows. (You may wish to use the Step Forward and Step Back to help).

The pattern's structure is different because it has two colours.

- b) **Predict:** What do you think the expression to give you the total number of lights (for any pattern of this type) will be?

56

- 1)
- a) Describe the pattern's structure in words or pictures and how it is different from other patterns you have seen. It might help if you think about the starting pattern and how it grows. (You may wish to use the Step Forward and Step Back to help).

Are green
are orange
pattern
orange one

- b) **Predict:** What do you think the expression to give you the total number of lights (for any pattern of this type) will be?

$(5 \times \text{block}) + (3 \times \text{wall})$

- What are the pupils noticing?

"Explain how the numbers and variables in your pattern are related to the lights in the pattern" (Inv 1, Q1D)

d) Check: Was your prediction correct? [The lights in the Pattern Player would be correctly coloured]. If not, modify your expression.

✓ yes

e) Explain: How the numbers and variables in your expression are related to the lights in the pattern.

✓ They're linked

d) Check: Was your prediction correct? [The lights in the Pattern Player would be correctly coloured]. If not, modify your expression.

✓ 1/5 correct!

e) Explain: How the numbers and variables in your expression are related to the lights in the pattern.

✓ Well there is 3 orange blocks and 5 green and in my expression it says $(3 \times \text{bob}) \times (5 \times \text{bob})$ therefore they will change at the same rate ~~and will never~~

- How will you use the software to enable pupils to respond to this challenging question?

