# SAMPLE SCHEME OF WORK

*The sample scheme of work presented below, was produced by one of our teacher collaborators and was followed by all teachers in the maths department in their school.*

The outline below covers 4 or 5 computer lessons, with plenty of feedback, discussion, written problems and written explanations in between. You may well move faster or slower than this plan. At minimum, students should become familiar with the software and have made successful progress through both ‘traintrack’ and two other challenging models.

Do make time to discuss the important concepts – I’ll note those below where I think they’ll arise naturally.

In written tasks I would allow any sensible notation. There is no need to discourage ‘number of repetitions x 3’ or ‘r x 3’ in favour of ‘3r’. They might write ‘unlocked number x 3’. Encourage them to think about what the unlocked number is controlling, and whether they’d like to call it something more specific…

| **Lesson** | **MiGen models** | **Summary** | **Example lesson plan** | **Concepts** |
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| 1 | **Free play** | Software fluency:<br>building blocks;<br>patterns;<br>colouring;<br>calculations and ‘unclosed’ numbers;<br>unlocking numbers;<br>(‘negative’ tiles). | Lead pupils step-by-step though creating a small image (eg, a smiley face), creating a building block and then a pattern. *(Opportunity for discussion of the translations.)*<br>(NB – to repeat a single tile, you need to make the single tile into a building block first!)<br>Show them how to build calculations by dropping number tiles on top of other number tiles – this can be done on the main page, rather than in the pattern properties box. Demonstrate that ‘3+5’ or ‘2x4’ repetitions works just as well as 8 in the pattern properties box. *(This is a great time to talk about the equals sign as an expression of equivalence, rather than an instruction to write down the answer. Make sure that they’re comfortable with statements such as 5+2=1+6 - maybe get them to fill in some blanks?)* | Translations.<br>Equivalence, unclosed expressions and the equals sign.<br>Generalisation.<br>Dependence. |

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| | | | Show them how to unlock and (optionally) name a number – can they predict what will happen when they unlock the number of repetitions?  The translation vectors?  What happens to the colouring in each case?  Why?<br>Demonstrate that a copy of an unlocked number can be made by dragging from it.<br>Present the problem of how to keep a pattern coloured when there is an unlocked number.  What's the problem?  Could you get around that?  How might you explain what's changing verbally?  How are they working out the correct number of tiles for large numbers?  Can they explain the 'rule'?  Challenge any unexplained reference to 'nth term' or '3n' – many will have learnt these ideas by rote at previous schools, and have no idea what it actually means.  'What's n?' is usually a question they can't answer beyond saying 'any number', so they will need to engage explicitly with the idea that they are taking the number of repetitions, whatever that happens to be, and doing something to it.  They may well start by unlocking the number of tiles separately, rather than copying the number of repetitions – animating and watching the numbers will draw their attention to the fact that these need to always be the same, and then they'll probably need reminding that they know how to do this.<br>Students should try to create an expression using an unlocked number in order to solve this problem – they may need some help/guidance, but encourage as much independence as possible, and certainly a lot of discussion and class feedback.  Include some discussion of equivalence of '3 x number' and 'number x 3 'number + number + number', or whatever label they've used. | |

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| | | | Finish by entering the model rule to colour the general model.<br>If time to fill, you could demonstrate the use of 'remove this pattern' to create 'negative tiles' which cancel out tiles of that colour. Ask students to create a pattern of 3x3 squares with any translation. Can they create a negative pattern which removes the middle of all of their squares? (These should still be static models.) However, very few students choose to use this feature, and it can be discussed as and when pupils ask about it or start to discuss the need to 'remove' tiles. | |
| 2 | **Mr Happy's Hair** | Colouring animated models and linking patterns by repeating use of variable. | Make it clear that they need to create the example model by adding a second pattern to the one given, NOT by altering the given model. Then enter the model rule at the bottom by adding together the two pattern totals.<br><br>Ext – Can they add a negative pattern to make Mr Happy with hair, but no nose?! | Generalisation.<br><br>Dependence.<br><br>Linking variables. |
| 2/3 | **Traintracks** | Build traintrack structure, animate, and colour. | Encourage them to use a mixture of repeated and unrepeated designs to create their own structures, then ask them to create harder given structures (structure only, not animated), such as 'traintrack'. *(They may try to build this tile by tile - let them try! Suggest that they make it one section longer, then another, then another… is there a quicker way for them to do it using the software features? Similarly, if they are counting tile by tile in order to colour the patterns, let them – they'll hopefully figure out that they can multiply up within a repeated structure, particularly if you suggest a large number of repetitions! Once they've started to use a multiplicative method, encourage them to just enter the calculation)*<br><br>For those that finish quickly, ask whether they can build the pattern in a different way – or if this spans two lessons, ask them to build the model differently the second time around. | Algebraic equivalence, expressions, variables and constants, generalisation. |

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| | | | At end of lesson, leave time to discuss different models and different rules. Perhaps get pairs to present their methods and final model rules – compare these and encourage discussion of the equivalence of different rules. Talk explicitly about the parts of the rule which change and those which don't. Suggest structural changes to the pattern and ask students to suggest how their rule would need to change.<br>HW or end of lesson – written Traintrack task which consolidates structural approach to generalisation and encourages written explanation/justification (see Traintrack task on Y-Drive). | |
| 4-7 | **Lines and Crosses**<br>**Stars**<br>Extension task: Try some non-linear patterns | (at least two with computers, up to two looking at written problems) | Attempt increasingly more complex models – for those who are confident, encourage them to build Lines and Crosses (or similar) using two repeated patterns and no static parts – this will require them to have one more repetition of lines than of crosses.<br>By this point, it's important to move regularly between computer-based problems and written tasks – they needn't necessarily bear any relation to each other (although it's helpful if the first couple do), but they should be encouraged to imagine trying to build models in order to figure out the repeated and static elements, and then to use annotated pictures to explain their general rules.<br>Consider some simple non-linear problems too. Even if they can't build 'growing house', can they use the structure of the model to generalise the number of tiles of each colour/in total?<br>Given a rule (eg, 5n+2), can they create building blocks which adhere to it? | |