

Fold Up Houses

Materials

- 24 squares and 24 triangles as shown ([MiniGeofix](#))

Task 55 ... Years 4 - 10

Summary

A mythical company makes 'flat pack' houses. Lay out the house panels on the ground according to a particular pattern, fold up and 'Hey presto!' ... new house. Houses can be made in rows of any length so the company needs to be able to calculate in advance the number of square and triangle pieces it needs for any given order. Therein is the problem.

If I tell you any length of row, can you tell me how many square and how many triangle pieces will be needed.

Content

- 2D representation of 3D objects
- nets
- basic arithmetic operations
- number patterns
- generalisation of number patterns
- visual and symbolic representation of generalisations
- linear algebra including:
 - concept of a variable
 - generalisation
 - substitution
 - solving equations
- graphical representation of functions
- simultaneous equations
- concept of proof

You Need

- Twenty-four [24] mini-squares and twenty-four [24] mini-triangles

The Story

The Fold Up House Company makes houses from squares and triangles. First they make them on the ground, then they fold them up to make the house.

Size 1

Size 2

Your Task

1. The first picture shows a Size 1 house built on the ground. Make this then fold it up to make the house.
2. Make and fold the Size 2 house.
3. Design, make and fold a Size 3 house.
4. Investigate the number of squares and triangles used in each size of house.

Challenge

If you tell the Company any size house, they will tell you the number of squares and triangles needed to build it. Explain to someone else how they do this.

FOLD UP HOUSES

© Mathematics Task Centre 2011 Task 55

Iceberg

A task is the tip of a learning iceberg. There is always more to a task than is

The pattern of use may be described as follows:

Squares

Multiply the size number of the house by three and add two.

Triangles

Multiply the size number of the house by two, add twice the size less two, then add two more.

However, this is not the only way. It is important though, whichever language the students choose, that they can show you with the pieces why each number and operation is in their description.

Words can then be expressed in many ways and students should be encouraged to explore more than one. These words could be:

- rewritten in algebraic symbols
- represented by a table of values showing the numbers needed for each size house
- graphed as ordered pairs showing squares and triangles needed for each size house.

Given graphing produces two non-parallel linear graphs there must be a point of intersection (a point where the number of squares and triangles in the row of houses is the same), so we have an introduction to the concept of simultaneous linear equations. In this case the concept traces back to an item in the table of values. Also, technology in the form of a spreadsheet or graphic calculator, could be used to explore the problem.

Extending the problem further might involve:

- Posing a reverse problem by explaining that the company has a certain number of square and triangle pieces in stock and asking: *What is the longest row house they could build from these pieces?*
- Asking students to create their own 'row house' design which grows according to a different pattern and explore questions similar to those above.

Whole Class Investigation

Tasks are an invitation for two students to work like a mathematician. Tasks can also be modified to become whole class investigations which model how a mathematician works.

If you have a collection of MiniGeofix with enough pieces for pairs to use, this task can be easily converted to a whole class lesson. The only workable alternative would be the larger [3d Geoshape](#) pieces and they would be better used in groups of four. The class investigation

would parallel the work on the card and the iceberg questions listed. It might also lead to an expectation that students would publish a report of the investigation, selecting from a range of possible media, eg: print, digital photography, PowerPoint, poster, video, web site...

At this stage, *Fold Up Houses* does not have a matching lesson on Maths300.

Is it in Maths With Attitude?

Maths With Attitude is a set of hands-on learning kits available from Years 3-10 which structure the use of tasks and whole class investigations into a week by week planner.

The *Fold Up Houses* task is an integral part of:

- *MWA Pattern & Algebra Years 9 & 10*

Follow this link to [Task Centre Home](#) page.