## Problems of the Month

The Problems of the Month are designed to be used school wide to promoted a problem-solving theme at your school. The problem is divided into five levels, Level A through Level E, to allow access and scaffolding for the students into different aspects of the problem and to stretch students to go deeper into mathematical complexity. The goal is for all students to have the experience of attacking and solving non-routine problems and developing their mathematical reasoning skills.

Problem of the Month

Growing Staircases

Level A:
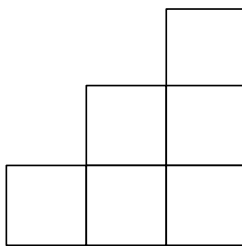
This is a staircase that goes up three steps.

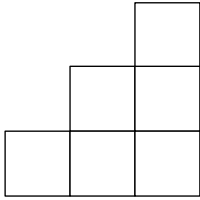How many blocks are needed for the first step?

How many blocks are needed for the second step?

How many blocks are needed for the third step?

How many blocks in all are needed to make this staircase of three steps?

Explain how you know.

Level B:

Draw the blocks in the diagram to make the fourth step.

How many blocks in all are needed to make a staircase with five steps?
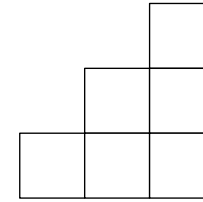
How many blocks does it take to build just the twelfth step?

How many blocks in all are needed to make a staircase of ten steps?

A staircase has 105 blocks, how many stairs does it have?

Explain your answers.

Level C:

How many blocks are needed to make just the one hundredth step? Explain how you know.

Write a rule to find the number of blocks needed for the nth step. Explain your rule.

Write a rule to find the total number of blocks needed to make a staircase with n number of steps. Explain your rule.

Write a rule that given y number of blocks you can tell how many steps are in the staircase. Explain your rule.

Level D:
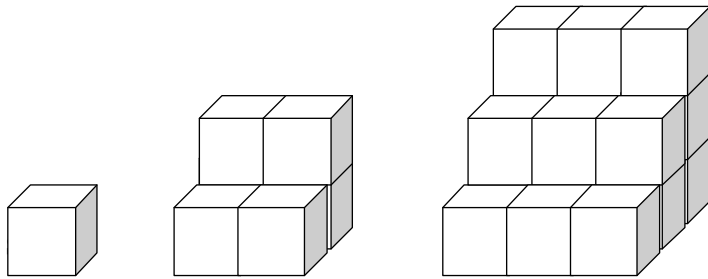
This set of staircases grows at a different rate.

How many blocks in all are needed to make a staircase with five steps?
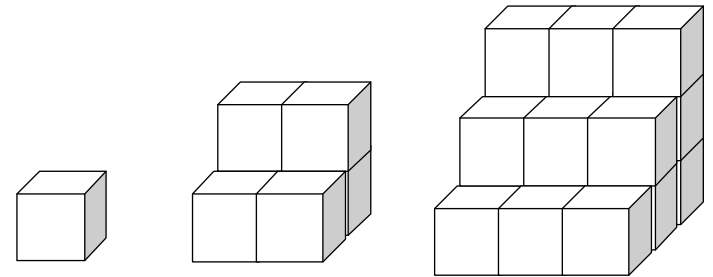
How many blocks make up the top step of a staircase with n steps?

How many blocks make up the first level (the base) of a staircase with n steps?

Given a staircase with 30 steps explain a process you might follow to determine the number of blocks necessary to build the staircase.

Explain your answers.

Level E:

Step 1   **Step 2**   **Step 3**

Using the pattern shown above, find a general (closed) formula to find the number of blocks needed to build a staircase with n stairs.

Justify why your formula works.

Explain and justify which stages will require an odd number of blocks to build them.