Breaking Up a Chocolate Bar

How many steps are required to break an m x n bar of chocolate into 1 x 1 pieces?

You can break an existing piece of chocolate horizontally or vertically.

You cannot break two or more pieces at once (so no cutting through stacks).

Find the value of the letters

SEND + MORE = MONEY

Fraction Puzzle

Can you arrange the numerals 1 to 9 (1, 2, 3, 4, 5, 6, 7, 8 and 9) in a single fraction that equals exactly 1/3 (one third)?

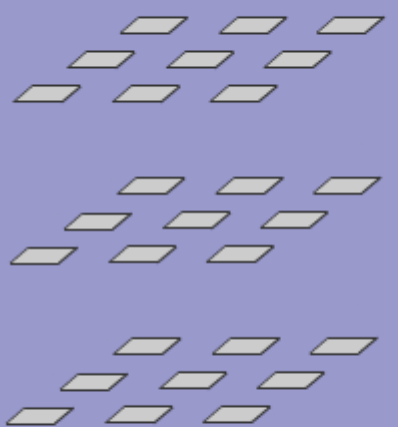Example that doesn't work: 7192/38456 = 0.187

Nine Colours

You have 27 small cubes, 3 each of nine colours.

Use the small cubes to make a 3 by 3 by 3 cube so that each face of the bigger cube contains one of every colour.

Use the guide here to help you: http://nrich.maths.org/content/01/04/six1/squareso.swf
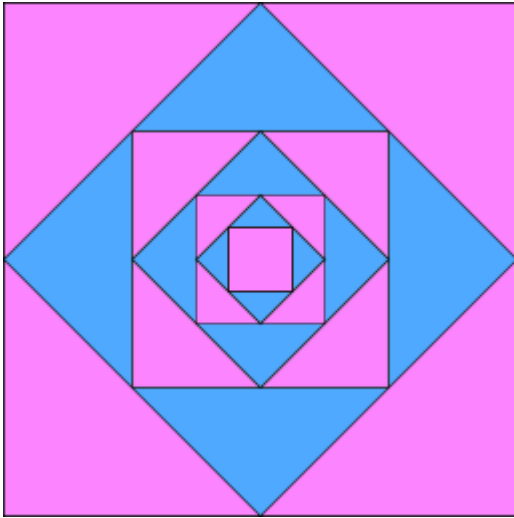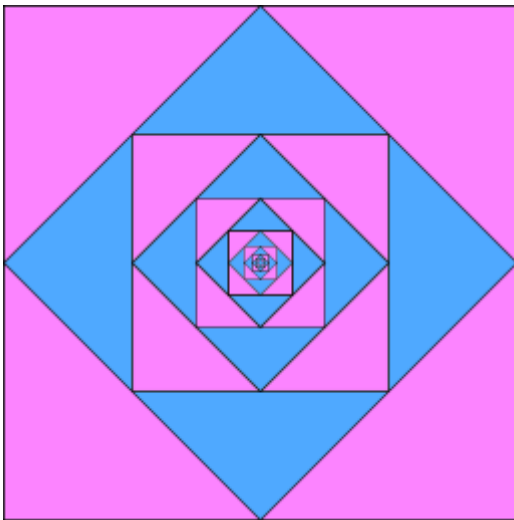
Diminishing Returns

Take a look at the image below:

Work out what proportion of the image is coloured blue.

Try to provide a convincing explanation that your answer is right.

Imagine continuing the pattern towards the centre of the square:

If this process could be continued forever, what proportion of the image would be coloured blue?

Try to provide a convincing explanation that your answer is right.

Below is a collection of images created using repeating processes.

Choose a few of the images below, and work out what fraction of the total is taken up by the five largest blue shapes.

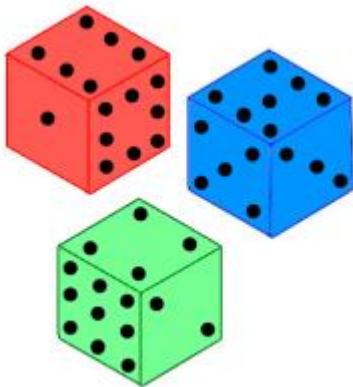Add your fractions to estimate the proportion of the total that is coloured blue.

If each process could be continued for ever, what proportion of the whole image would be coloured blue?

Try to provide convincing explanations that your answers are right.
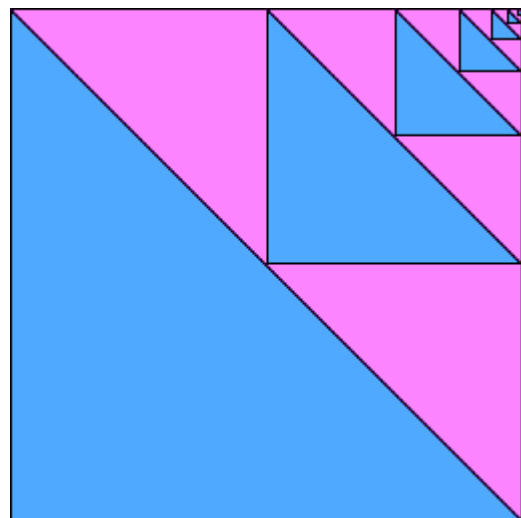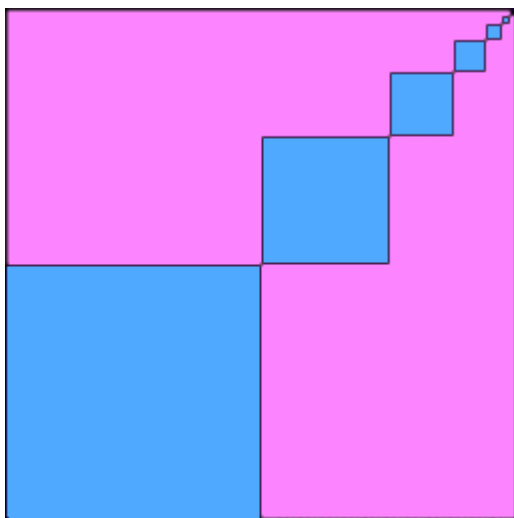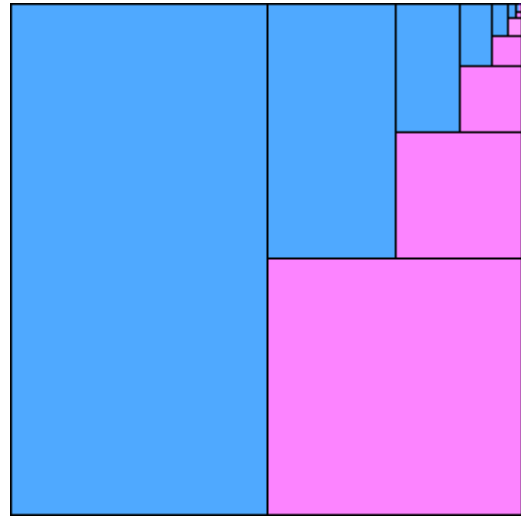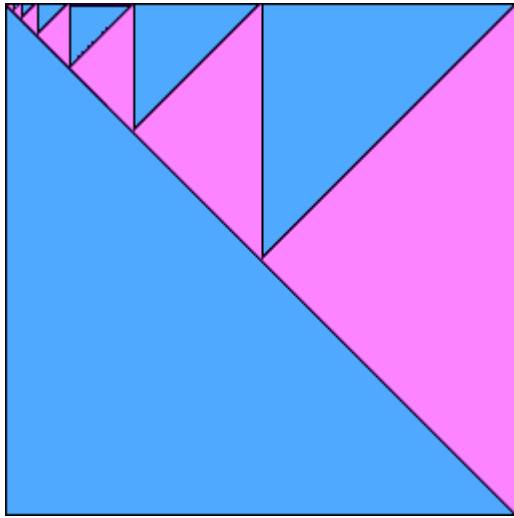
Non-transitive Dice

Here are three dice that are used to play a game for two players:

The red die has the numbers {1, 1, 6, 6, 8, 8}

The green die has the numbers {2, 2, 4, 4, 9, 9}

The blue die has the numbers {3, 3, 5, 5, 7, 7}

Each player chooses a different die. They roll their dice. The winner is the person whose die shows the bigger number.

Alison and Charlie are playing the game. Charlie wants to go first so Alison lets him.

Was that such a good idea?

Can you advise Alison on which die to choose once she knows which die Charlie has selected?