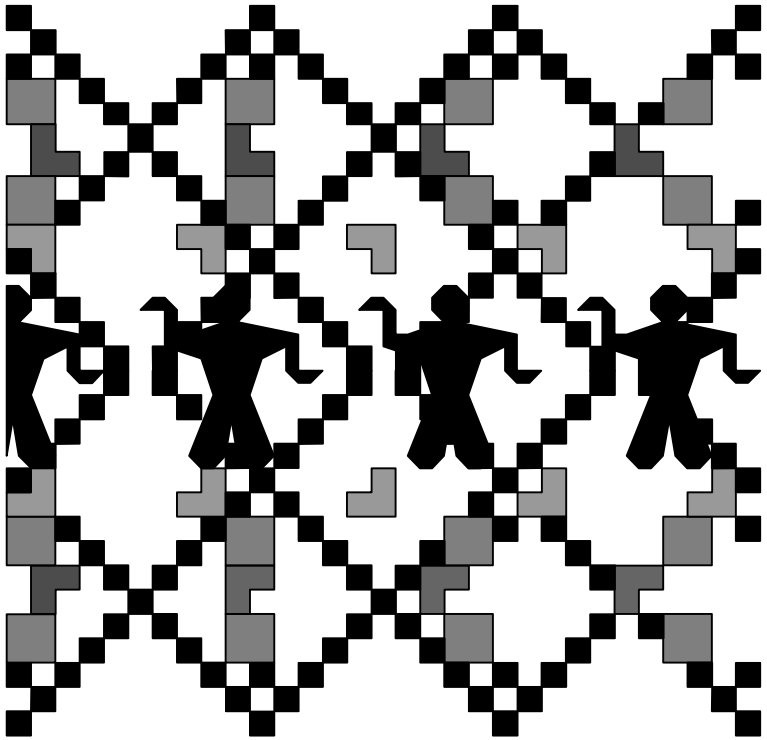
The Art of Mathematics

Ins and Outs of Stereograms

Steve Plummer and Pat Ashforth



Create simple stereogram drawings using ruler and pencil, or a computer drawing package.

Easy, step by step instructions for everyone.
Includes sample stereogram.

The Art of Mathematics

Maths or Art?

You don't need to be able to draw in order to create fascinating pictures. Anyone can achieve artistic results using simple mathematical techniques.

Others in the series:

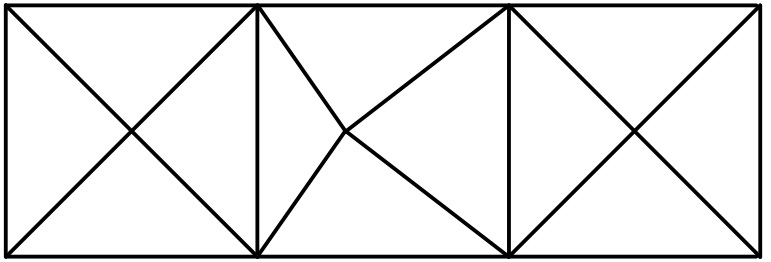
Get Everything In Perspective

First published in 1998
by Assign Publications,
166 Keighley Road, Colne, Lancashire, BB8 0PJ, England

http://www.woollythoughts.com

Ins and Outs of Stereograms

A step by step guide for drawing simple stereogram pictures, using ruler and pencil or computer software.



This booklet shows how to begin to draw pictures which fool the mind into seeing three dimensions on a two dimensional plane.

Requirements:

Plain paper, Ruler, Sharp pencil, Eraser, Accuracy

Stereogram pictures are a type of optical illusion. The brain is fooled into believing that the eyes are viewing a three dimensional scene not a flat picture.

This effect is created because the brain is used to interpreting binocular vision in a particular way and expects everything to behave in the same way.

The brain gets information from each of the eyes separately and puts these two sets of information together. The information is not the same from each eye. The right eye has a slightly different view of the world from that of the left eye. The view is different by about 2.5 inches (6.25 cm). This is approximately the distance between the centres of the pupils.

To demonstrate this phenomenon, look out of the window at a lamp post, or other marker. Look at the background behind the post. Close, or cover, your right eye and take note of the part of the background that is now hidden by the post. Keep your head still, open the right eye and close, or cover the left eye. The background covered by the post will now have changed slightly. Some of the bits you could see before can not now be seen and some bits which were covered are now visible.

These messages which are sent to the brain are interpreted as depth of view, when they are put together. The greater the difference the greater the depth of view.

The use of conflicting information can be used to trick the brain into thinking that depth of view exists when it does not. In a picture the brain has to be made to believe that some parts of the picture are nearer to you and other parts are further away.

These instructions show how to draw a row of square-based pyramids viewed from above. They will appear to stick out from, or recede into, the page.

The drawing has to be looked at in a particular way for this effect to be seen. Looking at it in a normal way it will look like a series of squares with lines inside. Do not expect to see any strange effects until the drawing is complete and all the required elements are present. You will need to make your right and left eyes look at different parts of the picture. You can practise this technique after you have completed the first stage of the drawing.

When the pyramids are viewed from above their bases become the background. To convince the brain that this is the background the bases of the pyramids must be exactly alike. The distances between like points must be identical. Ideally this should be 6.25 cm as this is the distance most acceptable to the majority of people. However, most people's eyes are very flexible and can easily accommodate looking at smaller distances. The distance used in these instructions is 4 cm because it fits more conveniently onto an ordinary sheet of paper and should still be fairly easily viewed by most. Making the bases any smaller than this could make it difficult to see the 3D effects.

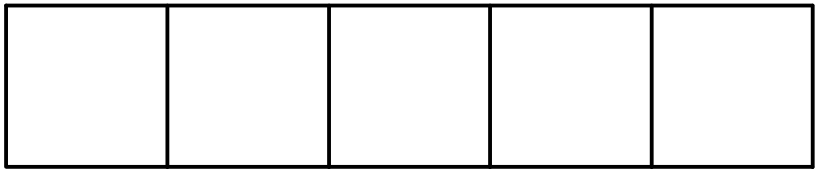
Notes

The drawing must be as accurate as possible. Your eyes will notice minor differences in distances and interpret them as depth of view where it may not be intended.

The diagrams in this booklet are smaller than those you will be drawing. It will be very difficult to see the effects at this size. They are for information only. Take notice of the measurements given.

Stage 1
The repeat on the background is to be 4 cm.

Draw a row of 5 squares each 4 cm square.

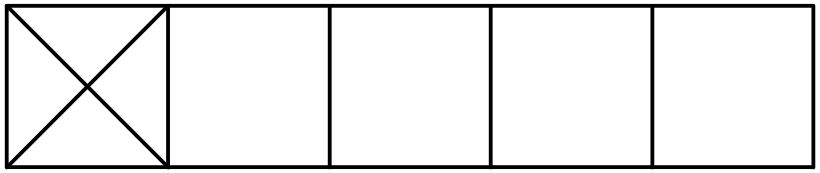


Viewing Stage 1
You can now practise viewing your squares before you add any further details.

You need to make your left eye look at the second square from the left and your right eye look at the third square from the left so that the brain superimposes the picture it sees with the right eye on to that seen with the left eye. The noticeable effect of this is that you will see six squares not five.

If you find this difficult, hold the paper close to your face with the tip of your nose on the line between the second and third squares. The left eye should be looking into square 2 and the right eye should be looking into square 3. Slowly move the paper away but keep looking into the same squares. If the squares go out of focus concentrate on trying to keep them in focus, whilst attempting to look through the page. When the squares are in focus you should see a line of six squares. If you can not see six squares now you are unlikely to see the effects later. Try changing the size of your squares. (Corresponding changes will have to be made later.)

Stage 2



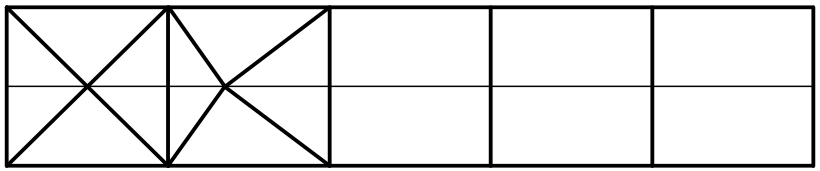
In the first square:

Join opposite corners using straight lines. The lines will cross in the centre of the square. This meeting point is the top of the pyramid, seen from above.

In the following stages the tops of the pyramids will be drawn in the other squares. They will not be in the centre of the squares. They will move to right or left, depending on the effect required. These differences in the distances between the top points, when compared with the unchanging background are what gives the completed drawing its depth when it is viewed correctly.

Note
Binocular vision only interprets distances *across* the page as depth of view. The top points of the pyramids must all be at the same height above the base line of the squares (but this does not have to be on the half way line)
To ensure that the points stay in a straight line:
draw a very fine line which can be removed later.

Stage 3



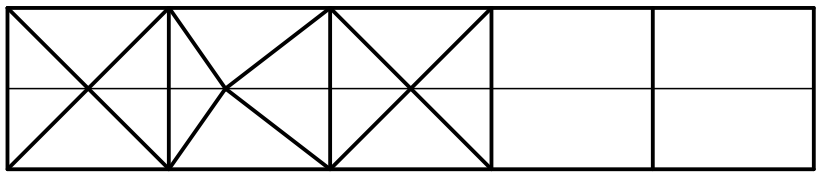
In the second square:

Mark the top of the pyramid on the guide line 3.4 cm away from the top of the first pyramid. Join this point to the four corners of the square.

When you view the complete drawing the second square will be superimposed on the first and a pyramid will be created. This pyramid is to appear to stick out of the page therefore the tops of the pyramids in squares one and two have to be closer together than the squares in the background.

Note
When pyramid points are closer together than the repeat in the background the pyramids will appear to stick out of the page.
The pyramids will seem to go into the page when the points are further apart than the background .

Stage 4

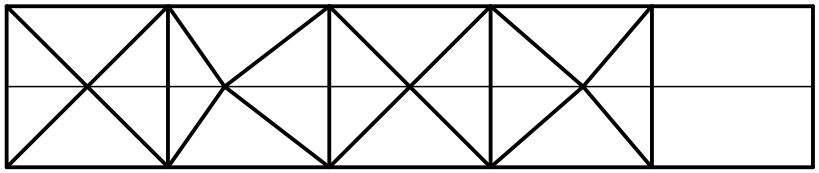


In the third square:

Mark the top of the pyramid on the guide line 4.6 cm away from the top of the second pyramid. Join this point to the four corners of the square.

The third square will be superimposed on the second and a pyramid will be created. This pyramid is to go into the page so the points of the pyramids in squares two and three must be further apart than the background distance.

Stage 5

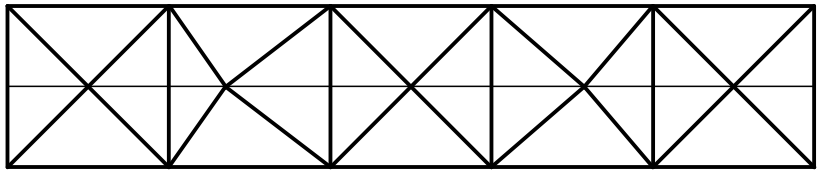


In the fourth square:

Mark the top of the pyramid on the guide line 4.3 cm away from the top of the third pyramid. Join this point to the four corners of the square.

The fourth square will be superimposed on the third and a pyramid will be created. This pyramid is to go into the page but not as far in as the previous pyramid. The points of the pyramids in squares three and four must be further apart than the background distance but less than the distance between the points of the pyramids in squares two and three.

Stage 6



In the fifth square:

Mark the top of the pyramid on the guide line 3.7 cm away from the top of the fourth pyramid. Join this point to the four corners of the square.

The fifth square will be superimposed on the fourth and a pyramid will be created. This pyramid is to stick out from the page but not as much as the pyramid created by squares one and two. The points of the pyramids in squares four and five must be closer together than the background distance but further apart than the distance between the points of the pyramids in squares one and two.

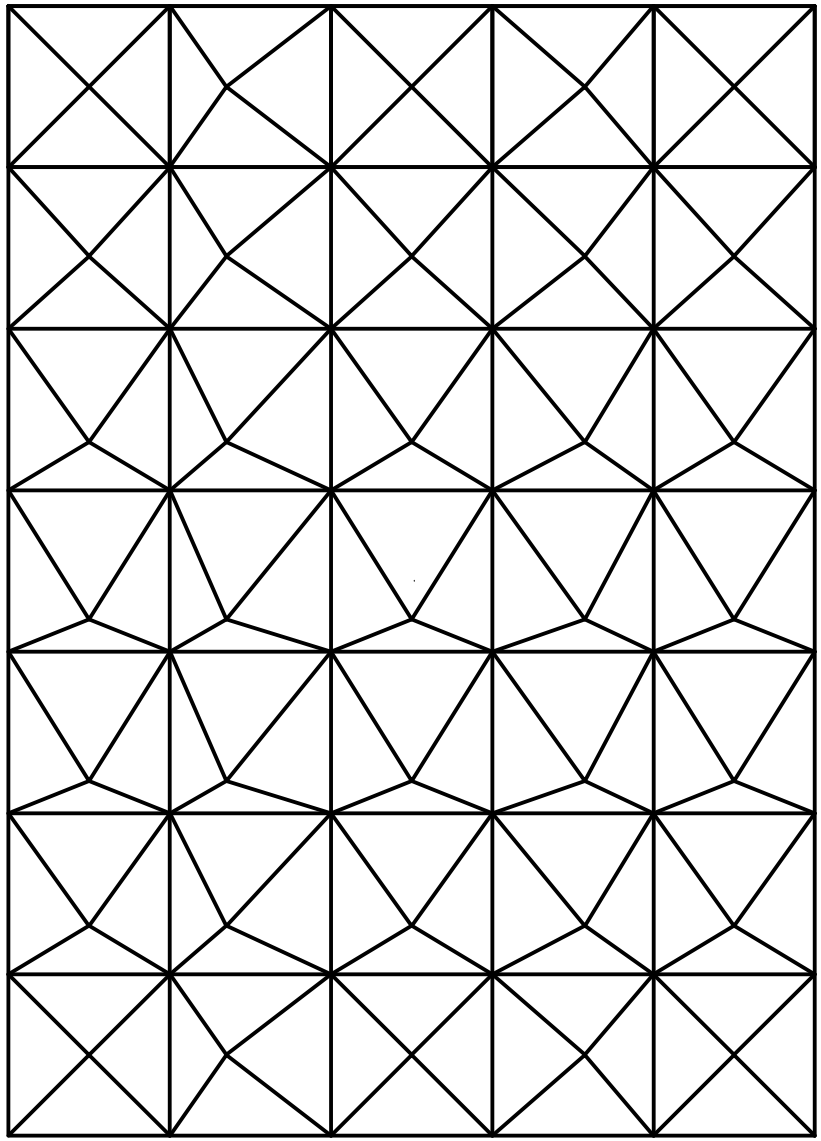
The line of pyramids is now complete.

Viewing the completed line of pyramids

Look at the drawing in the way described on page 5. When the squares are in focus you will see a line of six squares. Squares one and six will be flat against the page. Squares two and five will be pyramids which stick out of the page, with square two sticking out more than square five. Squares three and four will go into the page with square three going in further than square four.

Stage 7

Turn the paper sideways and draw rows of squares going across the page using the original squares as the starting points for each row. The pyramid points must line up across and down the page.



Viewing the full page

The full page can be viewed holding the page in either landscape or portrait position.

Changing the shapes

You have now created a 3D drawing using very simple shapes. You do not have to use pyramids. With thought and practice it is possible to create any shape against a background. When the drawing gets more complex the shapes in the foreground may begin to overlap. This will cause problems but these can be overcome.

Adding colour

You could also try experimenting with adding colour to the drawings. When your eyes superimpose one shape on another they will also superimpose any colours. If one of the triangles is coloured blue and the equivalent triangle in the next square is coloured yellow the brain will mix the two colours and see a green image.