Geometric Figures and Patterns

1. Look carefully at these beadwork patterns:

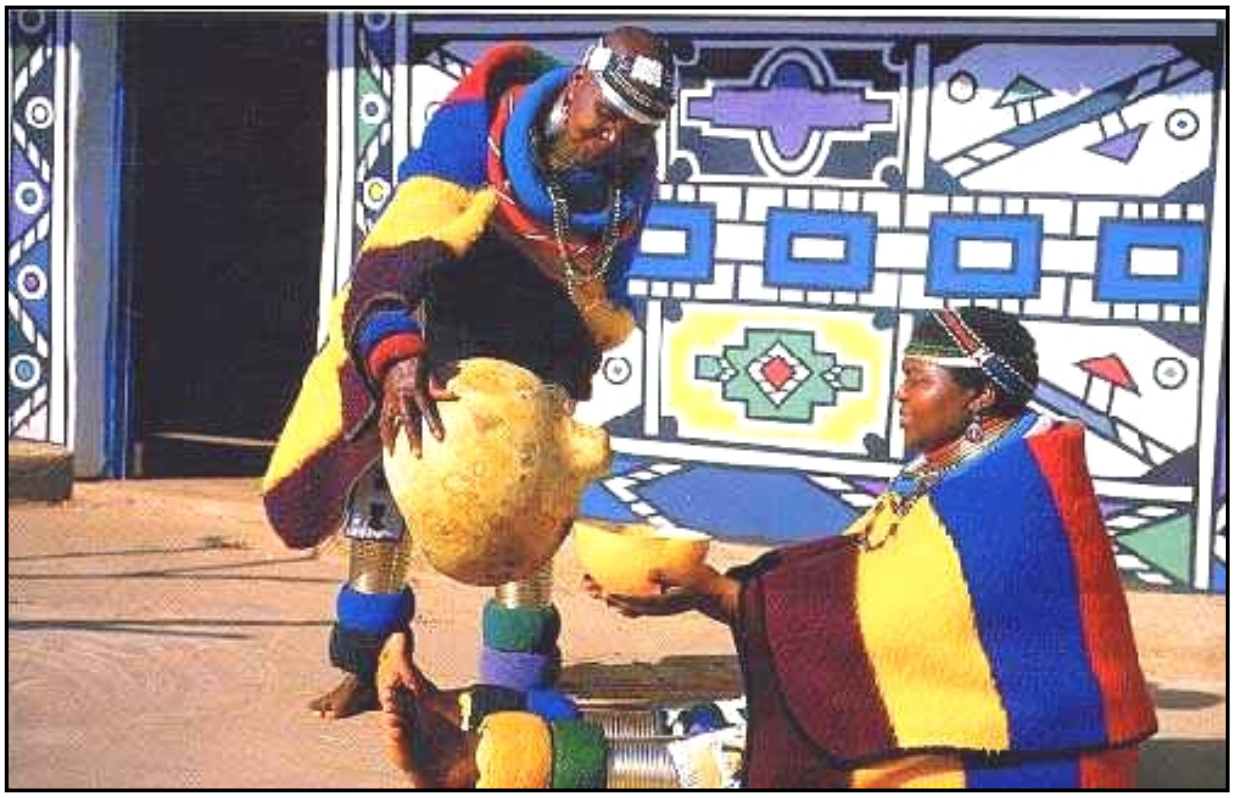
   (a) Draw the patterns in you book. Try to describe these patterns.

   (b) What geometric figures can you see in these pictures? Explain how you know what figures they are.

2. The Ndebele people like to decorate the walls of their homes with beautiful geometric patterns:

   (a) Draw the parts of the wall hidden behind the women. Try to describe these patterns.

   (b) What geometric figures can you see in these patterns? Explain how you know what figures they are.



Teacher Notes: Geometric Figures and Patterns

This activity requires that learners identify the geometric figures and patterns in cultural products. This provides practice in identifying figures of different sizes and in different orientations and in using terminology. Learners must indicate how they recognise the figures. They can use the language of transformations to describe the patterns.

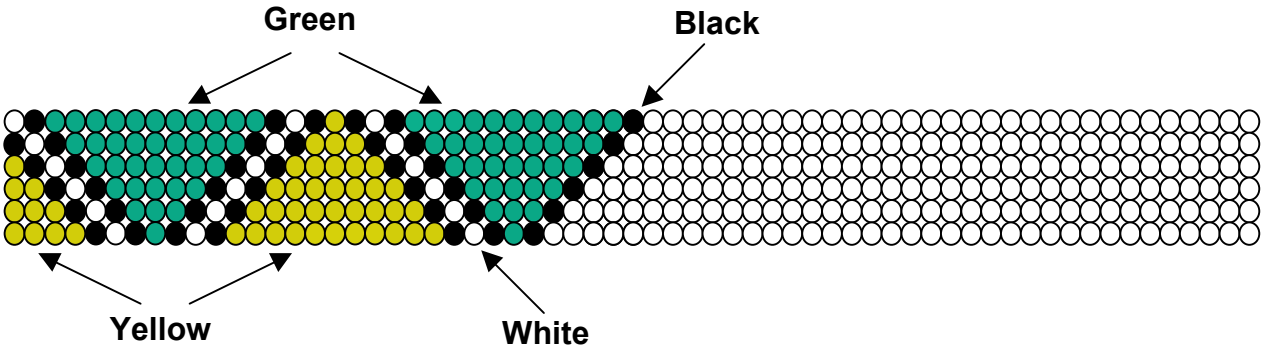
<u>Additional Activities:</u>

Encourage learners to additional pictures of cultural products and to identify the figures and patterns in these.

Mathematics and Beadwork

Beadwork made in South Africa is admired by people all over the world. This beadwork contains very interesting mathematics if carefully explored and investigated. Beadwork artefacts are sold all over South Africa – this contributes to the economy and tourism of our country.

Study the following picture of a section of a beadwork pattern used for a bracelet:



1. Rolene wants to repeat the pattern using the colours shown on the picture. Can you help her?

2. Zonia says she can see different geometrical figures in the pattern. What figures can you see?

3. Kate says she can identify some transformations in the pattern. Describe these movements.

4. How many black beads do you need for one pattern? Now find how many of each of the other colour beads you need for one pattern.

5. Suppose you are making a bracelet in which the pattern is repreated *n* times. How many of each colour bead do you need?

Teacher Notes: Mathematics and Beadwork

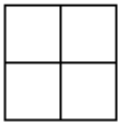
This activity highlights the mathematics in traditional art practices and shows links between geoemtry and algebra. It provides learners with additional practice in identifying geometrical figures and transformations.

Tessellations and Numbers

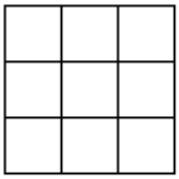
Alwyn used this small square to start a tessellation: 

He added more squares as shown in each pattern.

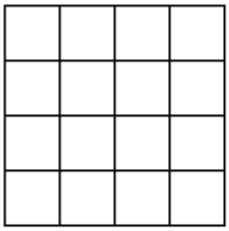
Pattern 1



Pattern 2



Pattern 3



Pattern 4

Draw Pattern 5:

Alwyn wants to find out how many small squares he will need if he wants to make more patterns. Can you help him by completing the table?

Pattern number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**10**	**23**	***n***
No. of small squares	1	4	9							

Explain in words how you find the number of squares in **any** pattern.

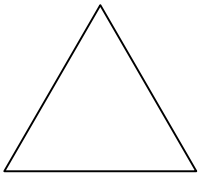
Can you find a rule to work out the number of squares for any pattern number? Write your rule in the "*n*- block" in the table.

Teacher Notes: Tessellations and Numbers

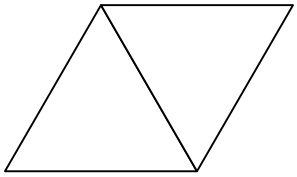
This activity illustrates the links between geometry and algebra. It is important at this stage that learners are able to work with the numbers and explain in words how to find the number of squares in ***any*** *pattern.*

More Tessellations and Numbers

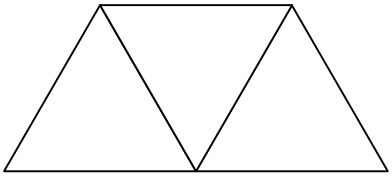
Zonia decided to make tessellations using an equilateral triangle. She starts with one triangle and each time adds one more to make the next pattern. Can you help her to complete patterns number 4 and 5?



Pattern 1



Pattern 2



Pattern 3

Pattern 4

Pattern 5

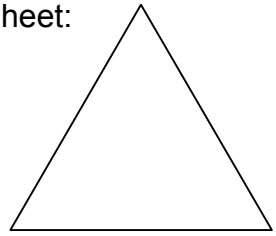
Zonia wants to find out how many **sides** there are in each pattern. Can you help her to complete the table below for each pattern?

Pattern number	Number of sides
1	**3**
2	**5**
3	**7**
4	
5	
6	
9	
21	
n	

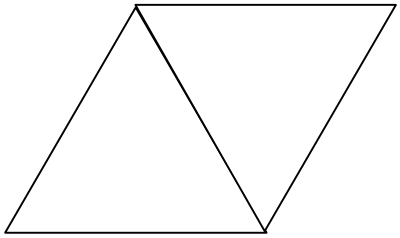
Can you find a rule to calculate the number of sides for any pattern number? Write your rule in words.

Making New Figures

Lucas is using this triangle from the figure sheet:



He has made this four-sided figure with two triangles:



What other figures can he make with this triangle?

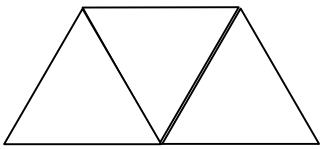
Now choose a **different** figure from your pattern sheet. How many different figures can you make with this figure?
Draw the figures in your book and try to give each figure a name.

Teacher Notes: Making New Figures

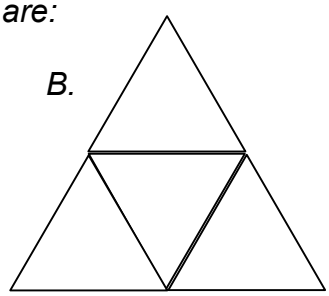
The first activity (using the equilateral triangle) should be completed in groups, with learners sharing their cut-out figures.

Some possible solutions for the equilateral triangle are:

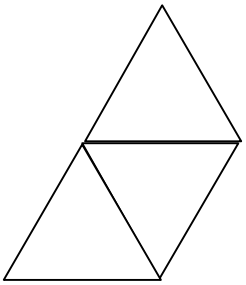
A.



B.



This activity requires that learners reflect on whether the figures they are making are, in fact, different to one another. For example, some learners will note that the figure below is the same as figure A, but has been rotated. Other learners will see these as different.

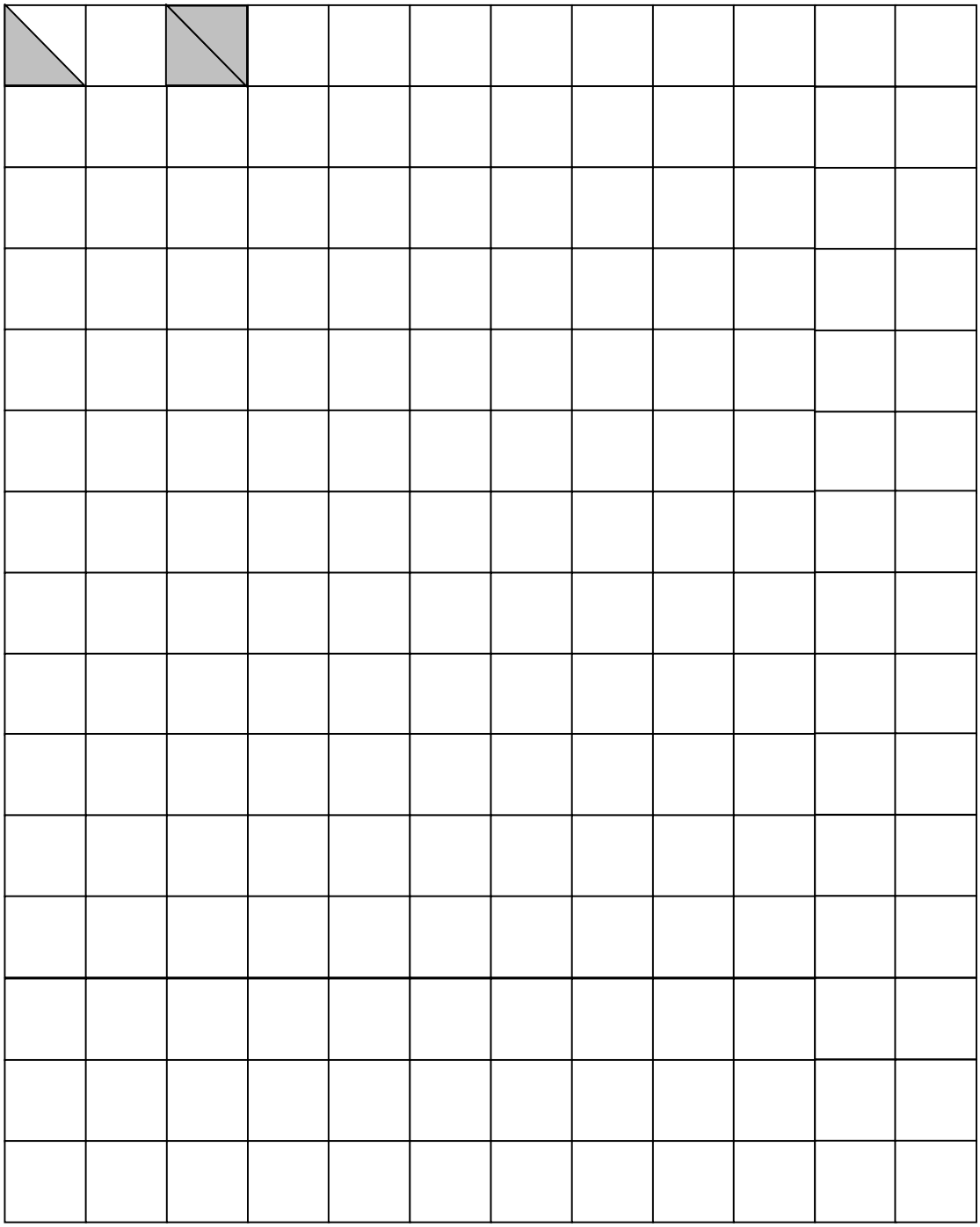


The teacher can organise the second part of the activity in different ways, for example, each group could be required to work on a given number of figures; learners in one group could be required to work on different figures and then to share ideas. In all cases it is important the learners draw their new figures (the teacher can decide whether this is by tracing or by drawing freehand) and try to name them. The teacher can assist with correct mathematical vocabulary if necessary.

Figures on Grid Paper

1. John has used two triangles to make a square. What other figures can he make with two triangles like this?

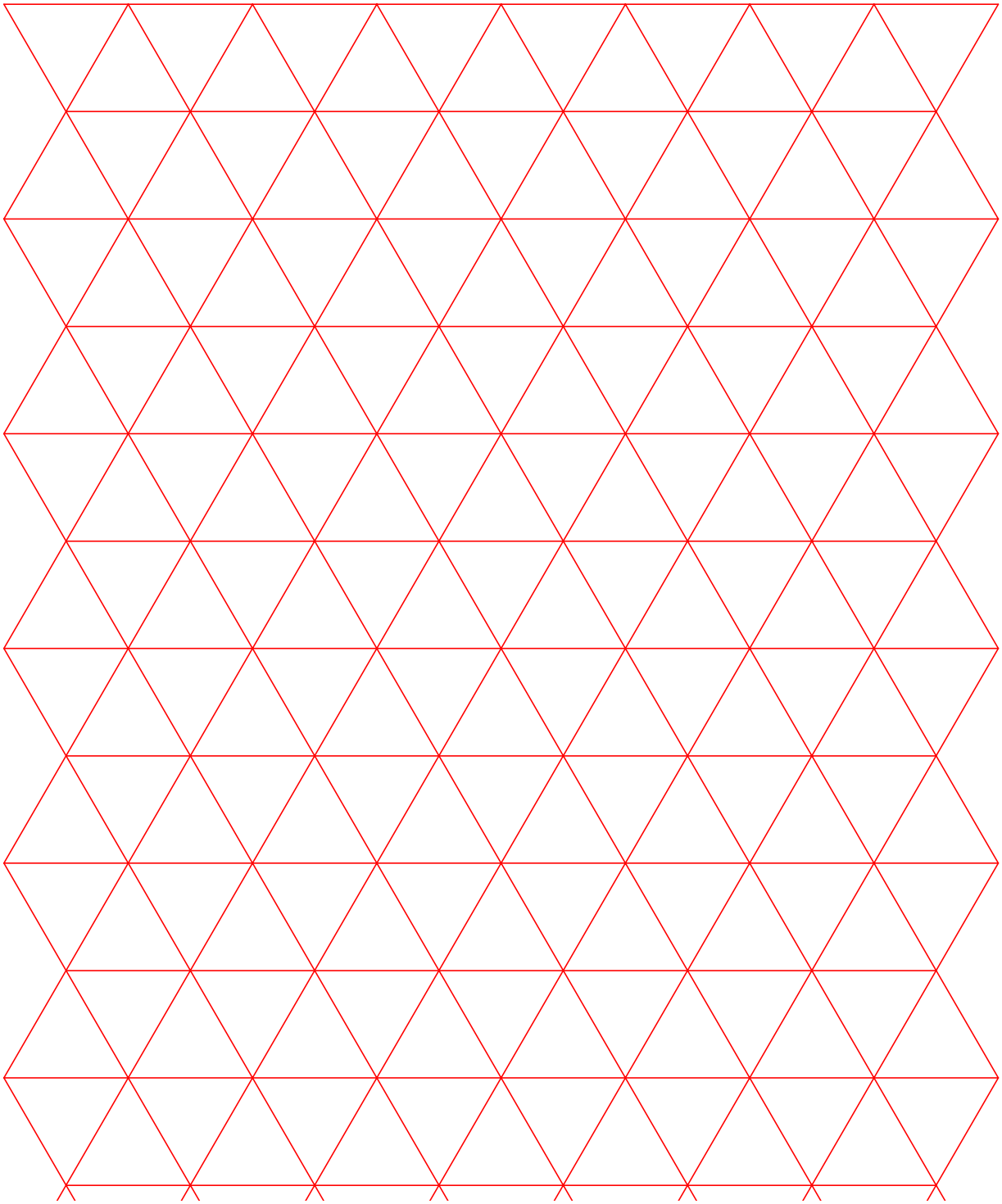
   Draw the figures on the grid and give each figure a name if you can.



2. What figures can you make with three triangles? And with four? In each case draw the figure and try to give it a name.
3. Continue to increase the number of triangles. What about five triangles? And six?

This grid paper is made up of triangles.

4. What figures can you make with two triangles? Draw the figures and try to give each a name.
5. What figures can you make with three triangles? Continue to increase the number of triangles as in question 2 and 3 above.



Teacher Notes: Figures on Grid Paper
This activity requires that learners construct larger figures form smaller figures (using squares and triangles). Learners will have to consider which figures are actually different, for example, figures on different orientations. Learners might not know the names of all the figures – the teacher can assist with the mathematical terminology where necessary. Learners could also classify figures according to the number of sides.

Source of Ideas:
Holmes, E. E. (1995). ***New Directions in Elementary School Geometry.***

CONTINUE TO MODULE 5D