AFRICAN INSTITUTE FOR MATHEMATICAL SCIENCES
SCHOOLS ENRICHMENT CENTRE (AIMSSEC)
AIMING HIGH

This INCLUSION AND HOME LEARNING GUIDE
suggests related learning activities for all ages from 4 to 18
on the theme of 2D SHAPES
Just choose whatever seems suitable for your group of learners.

The TANGRAM 2D SHAPES activity was designed for Years 7 to 9.

TANGRAM 2D SHAPES

To make your 7-piece Tangram Puzzle, either make your own tangram pieces from scrap paper as shown in this video:
https://youtu.be/1l_U31PIfLQ
or use this diagram and carefully cut out the pieces.
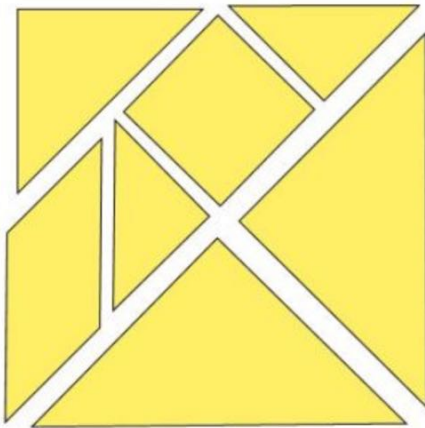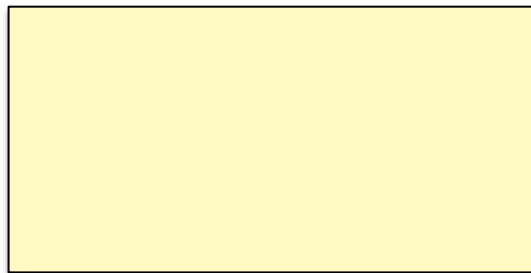Now use the pieces of your Tangram to make the following shapes:

- Isosceles triangle
- Rectangle
- Parallelogram
- Isosceles trapezium
- Pentagon

HELP

Cut out the 7 pieces for this tangram puzzle.
Can you fit them into this rectangular box without gaps and without overlapping?

Now try to make the other shapes.

NEXT

Four equilateral tiles are put together to make a new shape.
Which shape is impossible to make?

- Irregular hexagon
- Parallelogram
- Isosceles trapezium
- Regular triangle

INCLUSION AND HOME LEARNING GUIDE

THEME: 2D SHAPES

Young children

Give the 7 pieces to the children. Make a square with the pieces. Draw the square frame around the pieces. Take the pieces out of the frame and show the children how to put them back. Perhaps demonstrate how to put 5 pieces in place, can they put in the last two? Praise them if they can. Then put in 4 pieces? Can they do the other 3? Then… carry on this way if they interested. If not come back to it another time. When the child can confidently put the 7 pieces together to make a square they are ready to challenge some unsuspecting adult and ask them to solve the puzzle. Giggle, giggle, the child can do it – it's childs play.

Upper Primary

To make your 7-piece Tangram Puzzle, either make your own tangram pieces from scrap paper as shown in this video: https://youtu.be/1l_U31PIfLQ
or use this diagram and carefully cut out the pieces.

Use the pieces of your Tangram to make the following shapes:

• Isosceles triangle

• Rectangle

Talk about the 7 pieces of the Tangram and the square, isosceles triangle and rectangle they can make with the 7 puzzle pieces. What do the learners notice?

What can they say about edge lengths? Angles? Areas?

Lower Secondary

To make your 7-piece Tangram Puzzle, either make your own tangram pieces from scrap paper as shown in this video:
https://youtu.be/1l_U31PIfLQ
or use this diagram on page 2 and carefully cut out the pieces.
Now use the pieces of your Tangram to make the following shapes:

• Isosceles triangle

• Rectangle

• Parallelogram

• Isosceles trapezium

• Pentagon

Resources: Scrap paper. Scissors to cut out the tangram pieces.
Start by showing the learners pictures of the two-dimensional shapes they have to make from the tangram. Ask them to identify the shapes. Ask them to tell you about as many properties of those shapes as they can. Get the learners to discuss what we mean by regular shapes (regular shapes have all angles equal and all edge lengths equal) and irregular shapes (most shapes are not regular).

Ask the learners to try and make an isosceles triangle from the pieces in the tangram. If some learners are finding this difficult give them an outline of the isosceles triangle and ask them to fit the pieces into the outline with no spaces.

Continue in this way until all of the shapes are made. Through asking questions establish the properties of the shapes that have been made.

Key questions
The shapes are all made from the same pieces.
• What is different about the shapes you have made?
• What is the same about the shapes?
• You say the shapes are made from the same pieces, what does that tell you?
• You say the shapes are made from the same pieces, what does that tell you?
• Can you tell me anything about the areas of the shapes that you have made?

Year 10

Often Year 10 learners do not remember and understand all the maths that they should have learned in earlier years. This activity provides the basis of a good revision lesson. Get the learners engaged in this activity. Then conduct a discussion in which you ask the Key Questions and encourage the learners to notice and talk about properties of 2D shapes. Ask the learners to write a summary of what they know about properties of 2 D shapes.

Years 11, 12 and 13

A Bigger Challenge: In a convex polygon all the interior angles are less than 180°. Only 13 convex polygons can be made using all 7 tangram pieces.
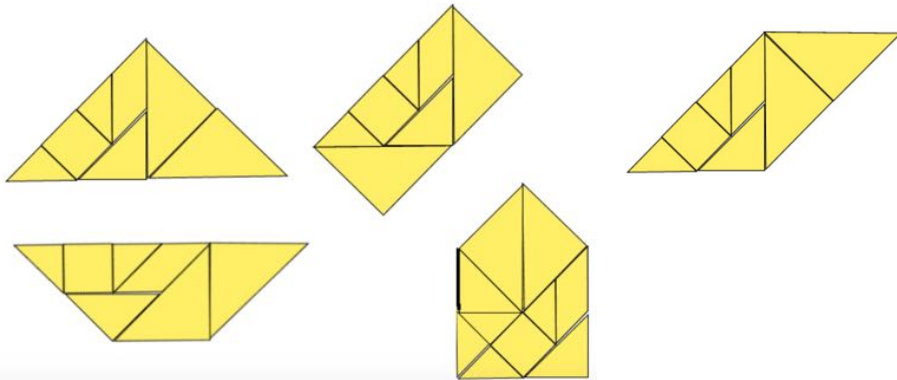
Can you make these polygons with the 7 tangram pieces?
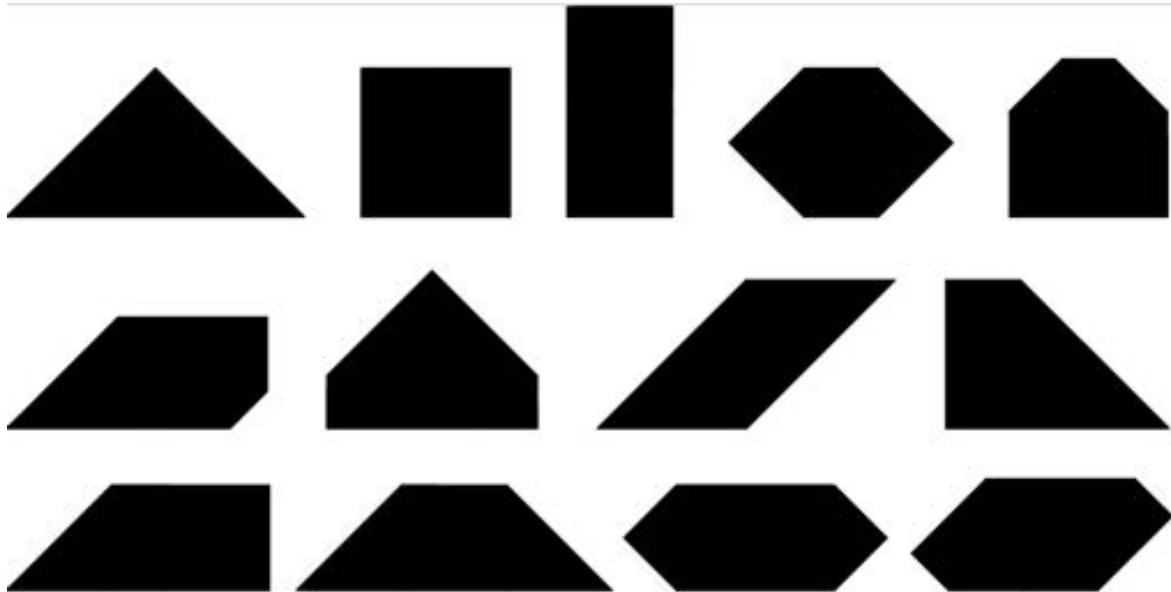
If you are part of a mixed-age or mixed-ability group, then you can benefit greatly by helping younger learners with these activities.
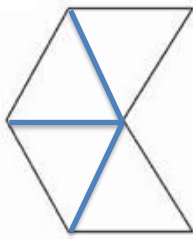
You could use the internet to find out more about Tangrams, perhaps try some other Tangram puzzles or create some new puzzles for yourself.
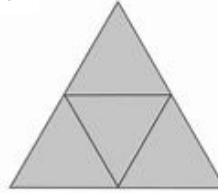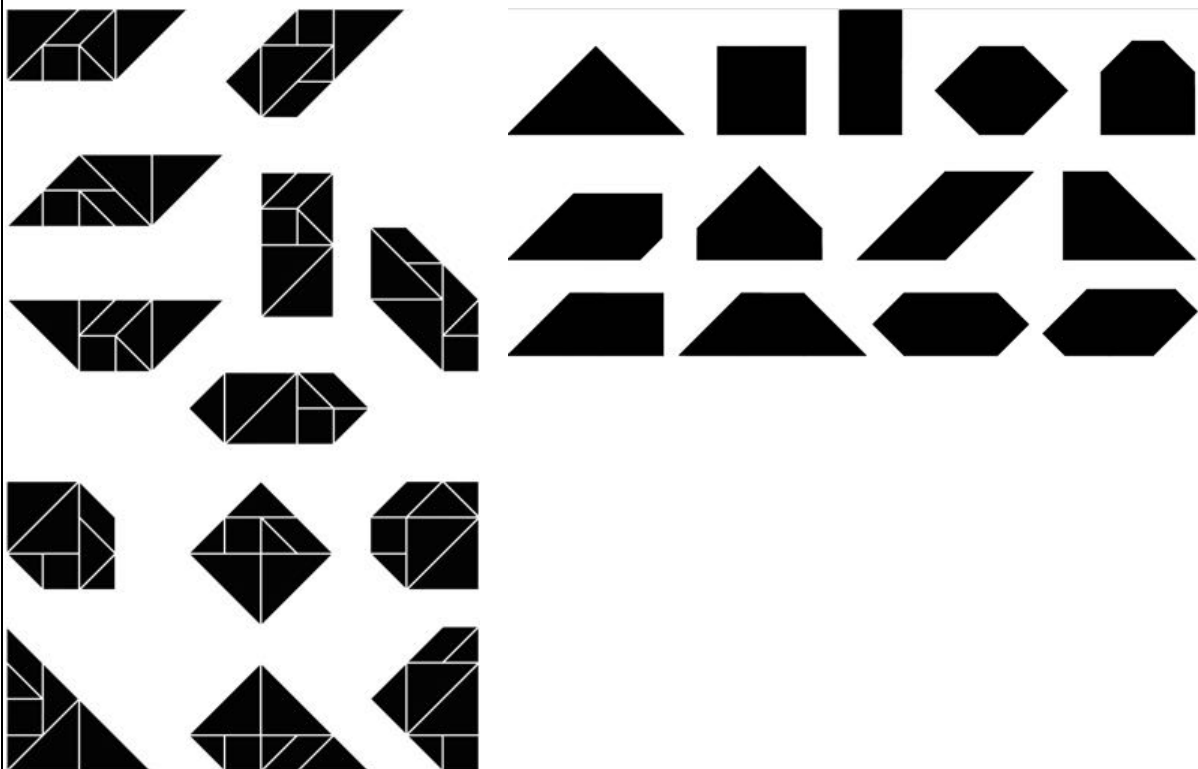
SOLUTIONS

Solution for NEXT Task

a

b

d

Solutions for the 13 convex polygons.

Why do this activity?

This activity encourages learners to think about the properties of certain 2D shapes and use this knowledge to build those shapes from the pieces of the tangram. It deepens their understanding of those geometrical properties as a result of this. The activity is designed to lead to spontaneous discussion of how to make the shapes from the pieces provided.

Learning objectives

In doing this activity students will have an opportunity to:
- learn to recognise two-dimensional (2D) shapes and to notice their properties;
- develop understanding of the properties of 2D shapes.

Generic competences

In doing this activity students will have an opportunity to:
- **think flexibly**, be creative and innovative and apply knowledge and skills;
- **visualize** and develop the skill of interpreting and creating visual images.

Follow up

World of Tan - https://nrich.maths.org/14074

A collection of 30 stories by Lyndon Baker about Granma T, who owns a removals business in China. Here you will find a series of stories relating to Granma T, her grandchildren and colleagues, each one accompanied by one or more interactive tangrams. Join the Tan family on their adventures and enjoy creating different pictures from the seven tangram pieces.

Tangram Pattern (symmetry) https://aiminghigh.aimssec.ac.za/tangram-pattern/
Tangram Fractions https://aiminghigh.aimssec.ac.za/tangram-fractions/

Go to the AIMSSEC AIMING HIGH website for lesson ideas, solutions and curriculum links:

https://aiminghigh.aimssec.ac.za/ http://aiminghigh.aimssec.ac.za

Subscribe to the MATHS TOYS YouTube Channel

https://www.youtube.com/c/mathstoys

Download the whole AIMSSEC collection of resources to use offline with
the AIMSSEC App see https://aimssec.app or find it on Google Play.

Note: The Grades or School Years specified on the AIMING HIGH Website correspond to Grades 4 to 12 in South Africa and the USA, to Years 4 to 12 in the UK and school years up to Secondary 5 in East Africa.
New material will be added for Secondary 6.
For resources for teaching A level mathematics (Years 12 and 13) see https://nrich.maths.org/12339
Mathematics taught in Year 13 (UK) & Secondary 6 (East Africa) is beyond the SA CAPS curriculum for Grade 12

	Lower Primary Approx. Age 5 to 8	Upper Primary Age 8 to 11	Lower Secondary Age 11 to 15	Upper Secondary Age 15+
South Africa	Grades R and 1 to 3	Grades 4 to 6	Grades 7 to 9	Grades 10 to 12
East Africa	Nursery and Primary 1 to 3	Primary 4 to 6	Secondary 1 to 3	Secondary 4 to 6
USA	Kindergarten and G1 to 3	Grades 4 to 6	Grades 7 to 9	Grades 10 to 12
UK	Reception and Years 1 to 3	Years 4 to 6	Years 7 to 9	Years 10 to 13