# TangramTikz [en]

An extension of Ti*k*Z to display Tangrams,
outlining or not individual pieces,
with a single or individual colours

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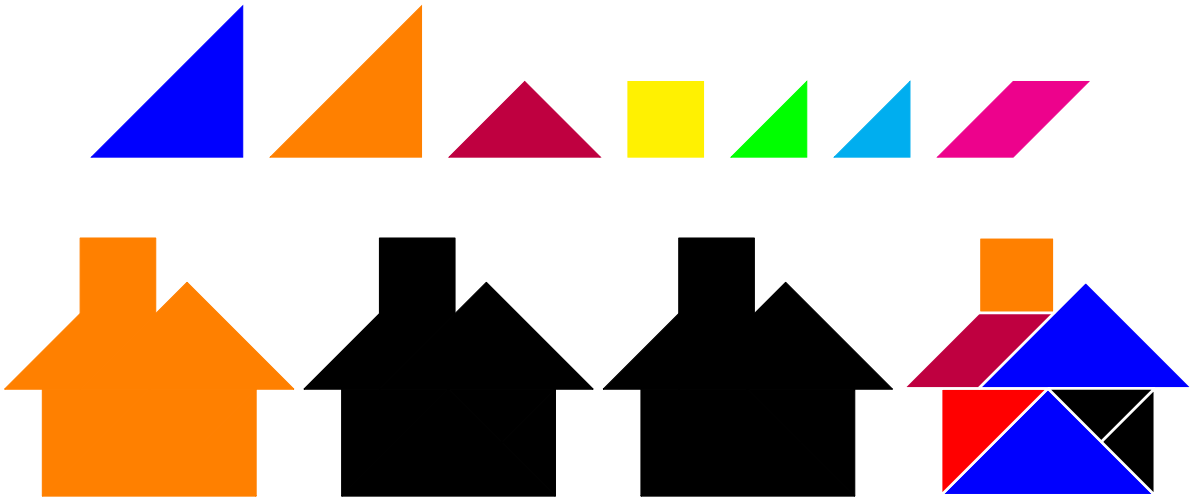
- Commands to display predefined Tangrams
- Commands to create Tangrams by positioning individual pieces
- Inspired by https://tex.stackexchange.com/questions/407449/typesetting-tangram-figures-in-latex



*Thanks to Eric Martin, teacher-researcher in Sydney, for his careful proofreading of the English version!*
*Thanks to Sarah Hadley, Laboratory Manager & Research Assistant at the University of Saskatchewan, for her feedback and ideas!*

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LaTeX
pdfLaTeX
LuaLaTeX
TikZ
TeXLive
MiKTeX

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# Contents

# Part I
# Introduction

## 1 The TangramTikz package

### 1.1 Origination

Some of the ideas come from https://tex.stackexchange.com/questions/407449/typesetting-tangram-figures-in-latex, with a partial solution by Andrew Stacey.

The package has then been *built* and *modestly enriched* on the basis of the styles and methods proposed by Andrew Stacey.

### 1.2 Loading the package, used packages

The TangramTikz package is loaded into the preamble using:

Code LaTeX
```
\usepackage{TangramTikz}
```

It is fully compatible with the usual compilation methods, such as latex, pdflatex, lualatex or xelatex.

It loads the following packages and libraries:

- `tikz` with the ⟨**calc**⟩ and ⟨**shapes.geometric**⟩ libraries;
- `xstring`, `xparse`, `simplekv` and `listofitems`.

### 1.3 Package design

The aim is to leverage Ti*k*Z functionality and define commands to display a Tangram puzzle:

- without gaps between pieces, so the overall shape stands out,
- or with a small gap between pieces, which are then individually recognisable,
- in the latter case, with pieces that are either *mono*coloured or *individually* coloured.

Code LaTeX
```
%Standalone command to display a Tangram
\TangramTikz[keys]<options tikz>{tangram_name}
```

Also available are an environment and a special command to build a puzzle by positioning each piece.

Code LaTeX
```
%Environment, with keys, to position the pieces
\begin{EnvTangramTikz}[keys]<options tikz>
    %Position each piece
    \PieceTangram[keys]<options pic>(offsetH,offsetV){TangBigTri}
    \PieceTangram[keys]<options pic>(offsetH,offsetH){TangBigTri}
    \PieceTangram[keys]<options pic>(offsetH,offsetH){TangMedTri}
    \PieceTangram[keys]<options pic>(offsetH,offsetH){TangSmalTri}
    \PieceTangram[keys]<options pic>(offsetH,offsetH){TangSmalTri}
    \PieceTangram[keys]<options pic>(offsetH,offsetH){TangSqua}
    \PieceTangram[keys]<options pic>(offsetH,offsetH){TangPara}
    %\filldraw[black] (0,0) circle[radius=4pt] ; %Origin to help positioning
\end{EnvTangramTikz}
```

# Part II
# Using the package

## 2 Dealing with individual pieces

### 2.1 The pieces

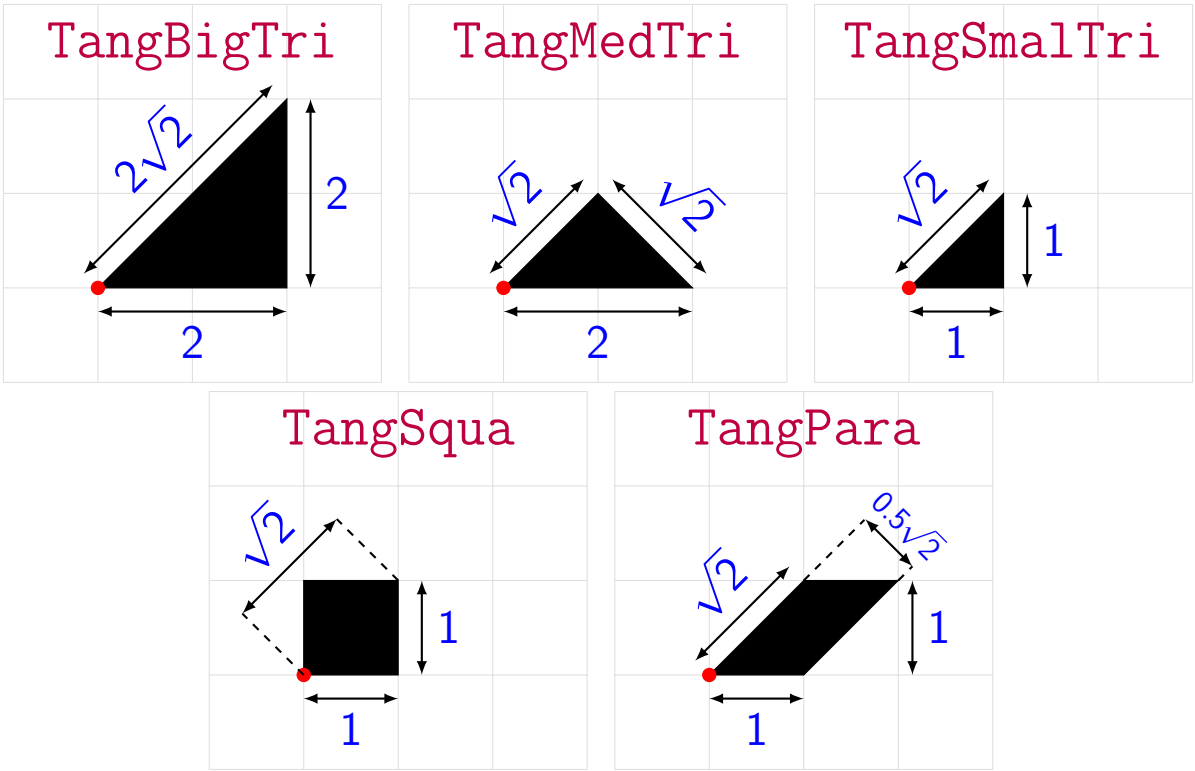
A Tangram consists of 7 pieces:

- 2 large triangles; 1 medium triangle; 2 small triangles;
- 1 square;
- 1 parallelogram.

Each piece that makes up the Tangram is defined in Ti*k*Z as an individual `pic`.

Next is a figure that shows the 5 kinds of pieces, with for each of them:

- the `name` of the associated `pic`;
- its initial *orientation*;
- its initial *origin*;
- its useful *dimensions* (given in *unit*).




Each *piece* can be:

- rotated, thanks to Ti*k*Z `rotate=...` option;
- flipped vertically or horizontally, thanks to Ti*k*Z `xscale=-1` and `yscale=-1` options;
- moved, by placing its origin at the point of coordinates `(x,y)` ;
- in case a piece is both rotated and flipped about a single axis, the rotation is performed before the flip.

Each piece comes with a Ti*k*Z style:

- `TangPuzz`: Tangram piece, *without border*, coloured (⟨**black**⟩ by default);
- `TangSol`: Tangram piece, *with a white border*, coloured (⟨**black**⟩ by default).

## 2.2 Positioning the pieces

A first method is given by Ti*k*Z `pic` syntax:

Code LaTeX

```
%Environment or tikz command
\pic[style,rotate=...,xscale=...,yscale=...] at (x,y) {piece_name} ;
```

The TangramTikz package offers a specific command to place the pieces:

Code LaTeX

```
%Environment or tikz command
\PieceTangram[style={color}]<xscale=...,yscale=...,rotate=...>(x,y){piece_name}
```

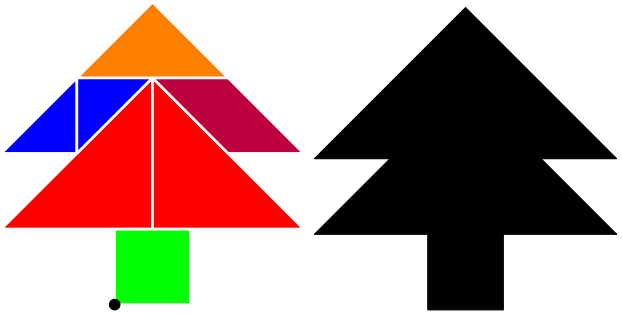
A Tangram is built from the 7 pieces, by:

- *placing* pieces at the origin;
- *rotating/flipping* them to give them the desired orientation;
- *moving* them to the desired location.

Options (`rotate/xscale/yscale`) are processed from right to left, and can be given in any order.

Code LaTeX

```
%Coloured solved version, default size
\begin{EnvTangramTikz}
    \PieceTangram[TangSol={green}]({0},{0}){TangSqua}
    \PieceTangram[TangSol={red}]({-1.5},{1}){TangBigTri}
    \PieceTangram[TangSol={red}]<rotate=-90>({0.5},{3}){TangBigTri}
    \PieceTangram[TangSol={purple}]<xscale=-1,rotate=0>({2.5},{2}){TangPara}
    \PieceTangram[TangSol={blue}]({-1.5},{2}){TangSmalTri}
    \PieceTangram[TangSol={blue}]<xscale=-1,rotate=90>({-0.5},{2}){TangSmalTri}
    \PieceTangram[TangSol={orange}]({-0.5},{3}){TangMedTri}
    \filldraw[black] (0,0) circle[radius=2pt] ; %help
\end{EnvTangramTikz}
%Standard version, default size
\begin{EnvTangramTikz}
    \PieceTangram[TangPuzz]({0},{0}){TangSqua}
    \PieceTangram[TangPuzz]({-1.5},{1}){TangBigTri}
    \PieceTangram[TangPuzz]<rotate=-90>({0.5},{3}){TangBigTri}
    \PieceTangram[TangPuzz]<xscale=-1,rotate=0>({2.5},{2}){TangPara}
    \PieceTangram[TangPuzz]({-1.5},{2}){TangSmalTri}
    \PieceTangram[TangPuzz]<xscale=-1,rotate=90>({-0.5},{2}){TangSmalTri}
    \PieceTangram[TangPuzz]({-0.5},{3}){TangMedTri}
\end{EnvTangramTikz}
```



# 3 Dealing with a whole shape

## 3.1 Command

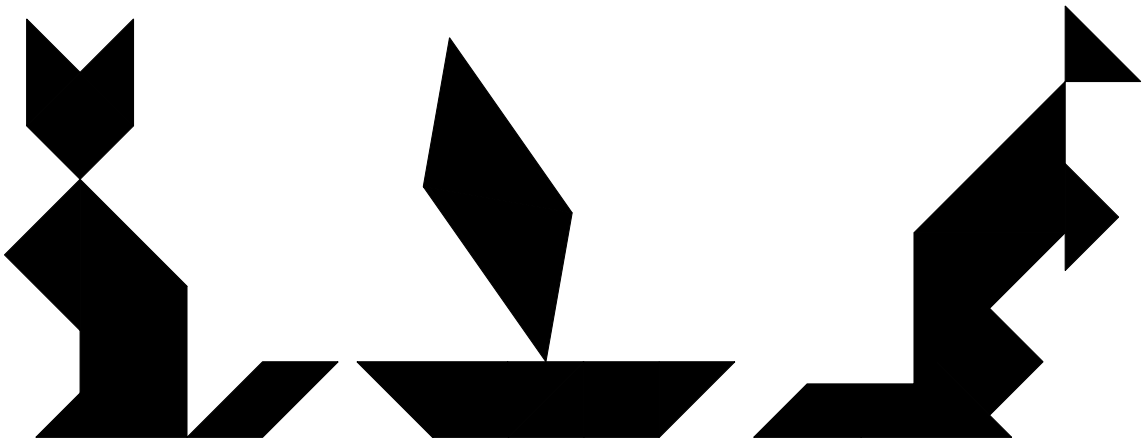
A collection of predefined Tangrams is included in TangramTikz, together with a standalone command to display them:

Code LaTeX

```
%Standalone command to display a Tangram
\TangramTikz[keys]<tikz options>{tangram_name}
```

Code LaTeX

```
%Standalone command to display Cat/Boat/Kangaroo with default options
\TangramTikz{Cat}~~\TangramTikz{Boat}~~\TangramTikz{Kangaroo}
```



## 3.2 Keys, options and arguments

The first argument, *optional* and provided within `[...]`, deals with the keys and their associated options:

- the boolean ⟨**Puzzle**⟩ to display *mono*coloured pieces, without border — default: ⟨**true**⟩
- the boolean ⟨**Solution**⟩ (NEW NAME SINCE V0.1.7 !) to display *mono*coloured pieces, with a border — default: ⟨**false**⟩
- the boolean ⟨**BlackWhite**⟩ which displays part layouts with border — default: ⟨**false**⟩
- ⟨**Color**⟩ to configure the *mono*colour associated with the previous booleans — default: ⟨**black**⟩
- the boolean ⟨**ColorSolution**⟩ (NEW NAME SINCE V0.1.7 !) to display coloured pieces, with a border — default: ⟨**false**⟩
- ⟨**ColorList**⟩ to list the colours of the pieces (`BT,MT,ST,SQUA,PARA` or `BT1,BT2,MT,ST1,ST2,SQUA,PARA`); default: ⟨**red,orange,blue,green,purple**⟩
- ⟨**PartsList**⟩ to specify the list of parts to be displayed (in the same *order* as the *complete* colors); default: ⟨**1234567**⟩
- ⟨**Sep**⟩, the width of the border in ⟨**Solution**⟩ mode. — default: ⟨**1pt**⟩

The second argument, *optional* and within `<...>`, provides options to the Ti*k*Z environment, for instance:

- change of unit
- change of scale
- rotation
- vertical alignment

The third argument, *mandatory* and within `{...}`, is the name of the predefined Tangram (from the following list).

### 3.3 Help for 'missing tan task'

To work with *missing tan task* operation ([link]), it is possible to display a small *help* puzzle with the names of the pieces displayed.

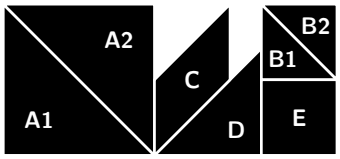
Code LaTeX
```
%commande autonome pour afficher une aide type 'mtt'
\TangramTikzHelp[keys]<tikz options>
```

Two specific keys are available, in addition to those detailed above:

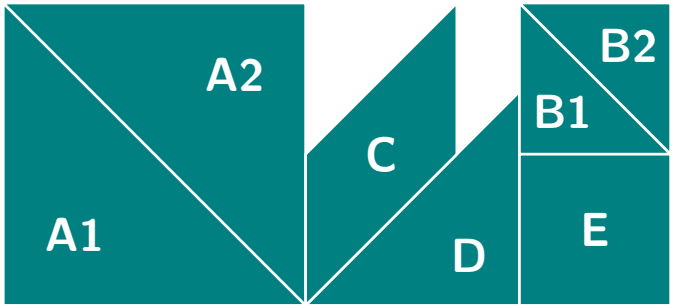
- boolean ⟨**Help**⟩ to show the name of the pieces; default: ⟨**true**⟩
- ⟨**Names**⟩ for the name of the pieces `BT1,BT2,MT,ST1,ST2,SQUARE,PARA` ;

default: ⟨**A1,A2,D,B1,B2,E,C**⟩

Code LaTeX
```
\TangramTikzHelp[Solution]
```




Code LaTeX
```
\TangramTikzHelp[Solution,Color=teal]<scale=2,transform shape>
```




Code LaTeX
```
\TangramTikzHelp[ColorList,Help=false]
```

The Ti*k*Z style for the nodes is given below.

Code LaTeX
```
\tikzset{tangramhelp/.style={text=white,inner sep=0pt,font=\sffamily\small\bfseries}}
```

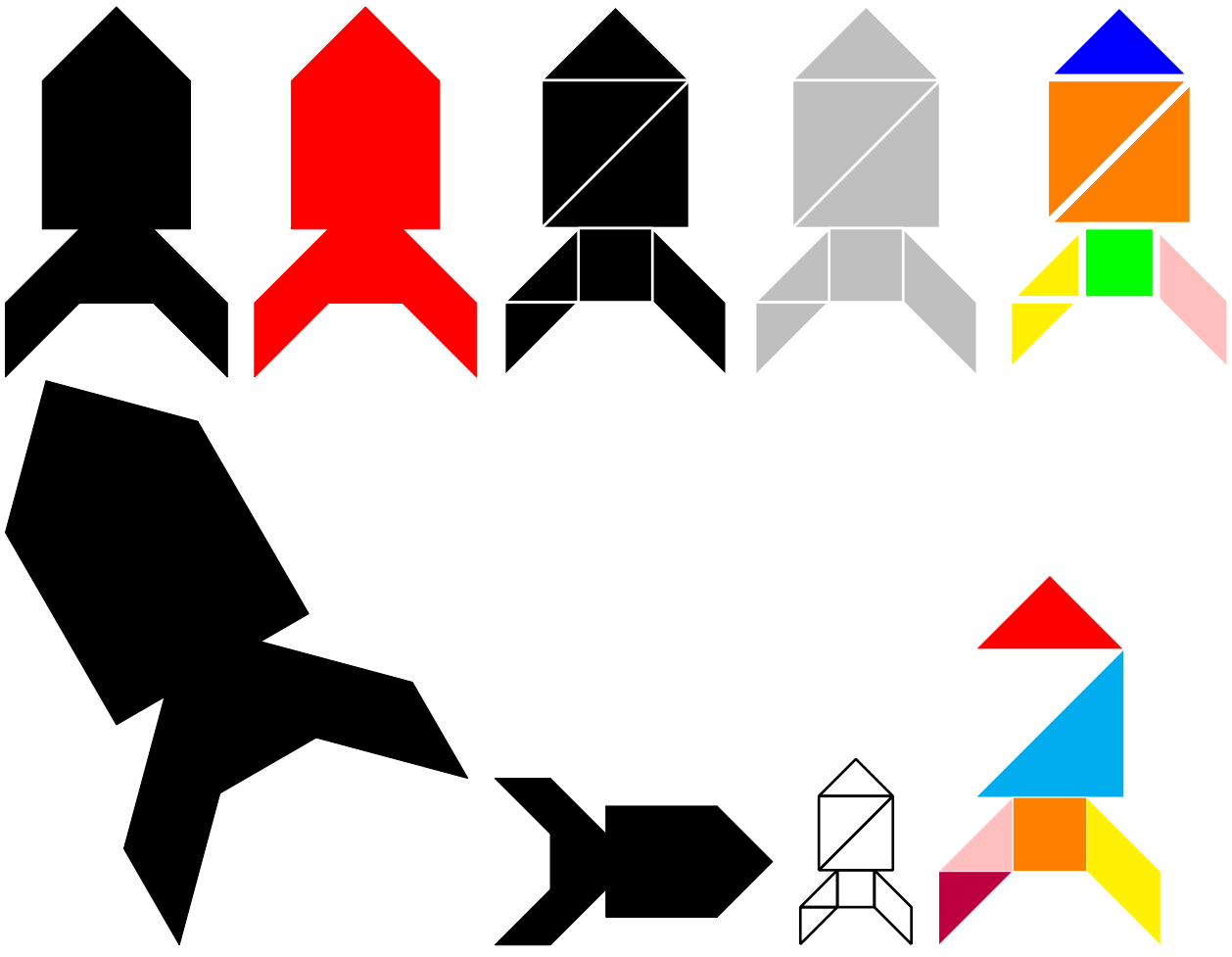
## 3.4 List of predefined Tangrams

- Square
- Pinguin
- Boat
- Home
- FirTree
- Cat
- Swan
- Pyramid
- Duck
- Rocket
- Candle
- Shirt
- Fish
- Sailboat
- Kangaroo
- Dog
- Plane
- Rabbit
- Rooster
- Jogger
- Dancer
- Camel
- Flamingo
- Heart
- Giraffe
- Horse
- Goat
- Lions
- Factory
- Angel
- Tower
- Ufo
- Chicken
- Turtle
- Crab
- Snail
- Goose
- Cow
- Gift
- Man
- Arrow
- Triangl

Code LaTeX

```
\TangramTikz{Rocket}~~
\TangramTikz[Color=red]{Rocket}~~
\TangramTikz[Solution]{Rocket}~~
\TangramTikz[Solution,Color=lightgray]{Rocket}~~
\TangramTikz[ColorSolution,ColorList={orange,blue,yellow,green,pink},Sep=1mm]{Rocket}

\TangramTikz<scale=1.5,rotate=30>{Rocket}~~
\TangramTikz<scale=0.75,rotate=-90>{Rocket}~~
\TangramTikz[BlackWhite]<scale=0.5>{Rocket}~~
\TangramTikz[PartsList=134567,ColorSolution,ColorList={cyan,green,red,pink,purple,orange,yellow},Sep=0pt]{Rocket}
```

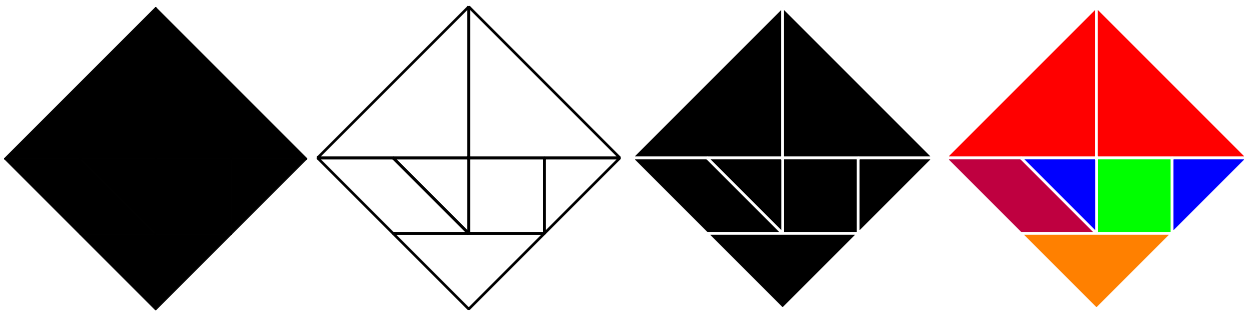


Part III

# A gallery of Tangrams

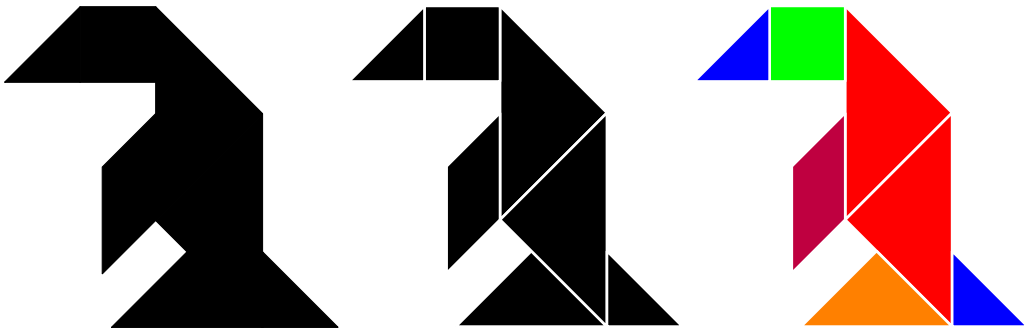
Code LaTeX

```
\TangramTikz{Square}
\TangramTikz[BlackWhite]{Square}
\TangramTikz[Solution]{Square}
\TangramTikz[ColorSolution]{Square}
```



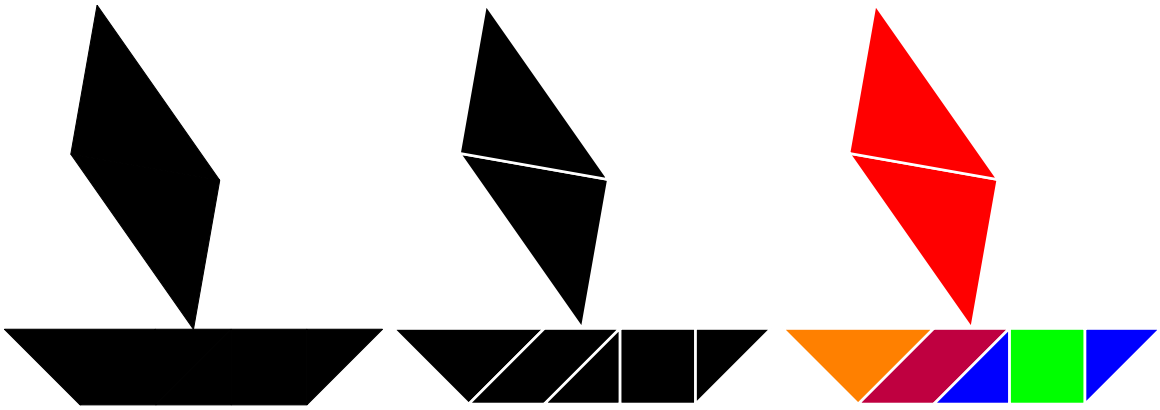
Code LaTeX

```
\TangramTikz{Pinguin}
\TangramTikz[Solution]{Pinguin}
\TangramTikz[ColorSolution]{Pinguin}
```



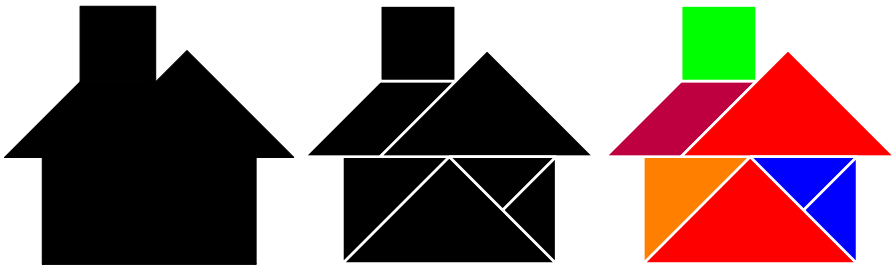
Code LaTeX

```
\TangramTikz{Boat}
\TangramTikz[Solution]{Boat}
\TangramTikz[ColorSolution]{Boat}
```



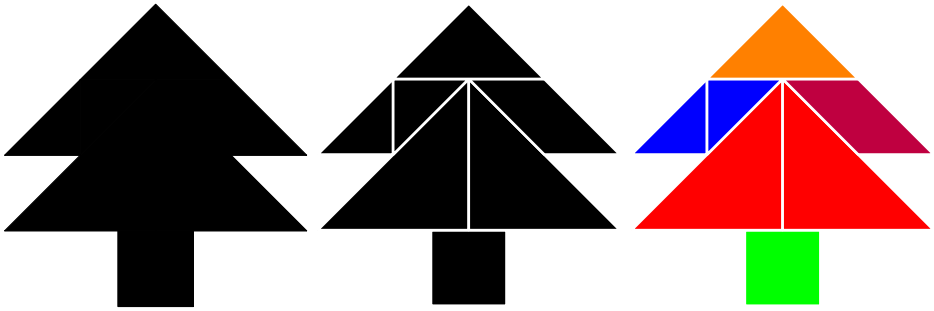
Code LaTeX

```
\TangramTikz{Home}
\TangramTikz[Solution]{Home}
\TangramTikz[ColorSolution]{Home}
```



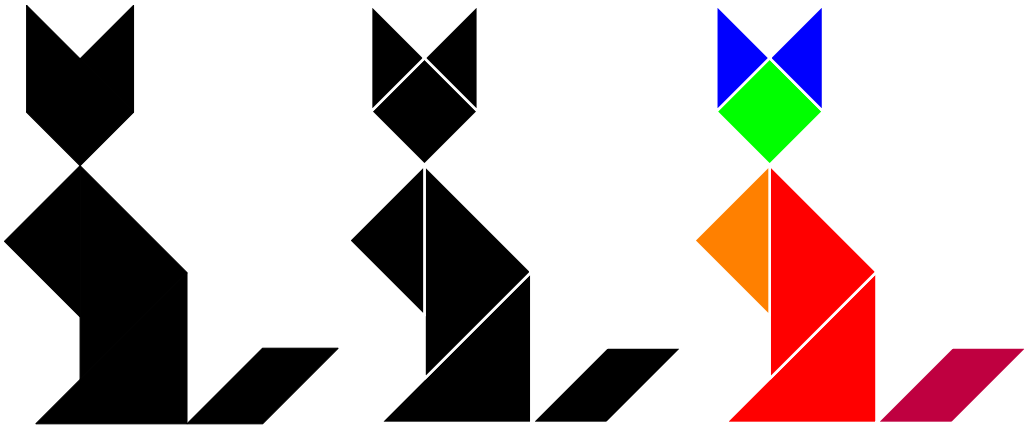
Code LaTeX

```
\TangramTikz{FirTree}
\TangramTikz[Solution]{FirTree}
\TangramTikz[ColorSolution]{FirTree}
```



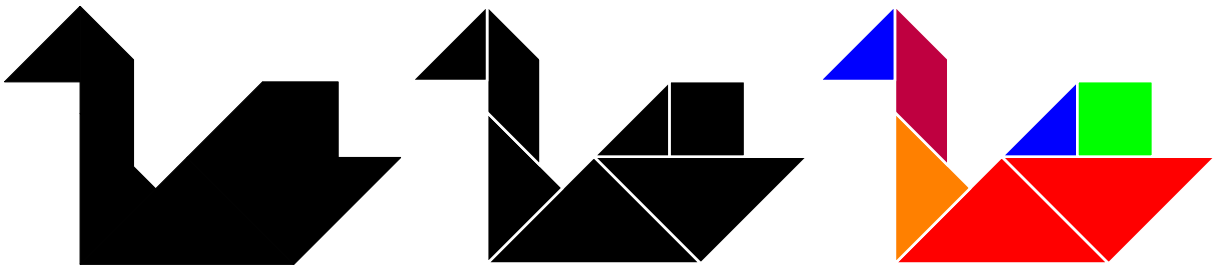
Code LaTeX

```
\TangramTikz{Cat}
\TangramTikz[Solution]{Cat}
\TangramTikz[ColorSolution]{Cat}
```



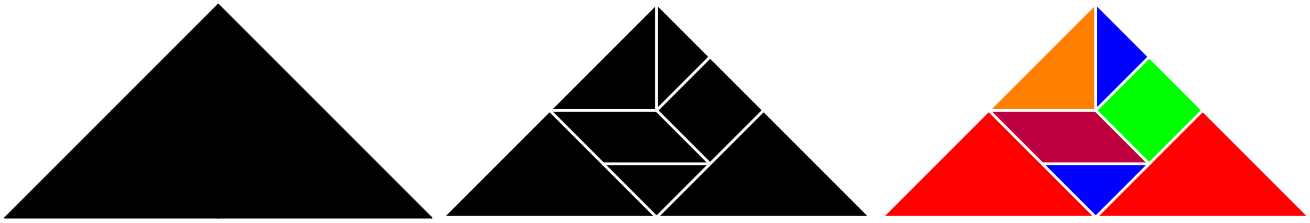
Code LaTeX

```
\TangramTikz{Swan}
\TangramTikz[Solution]{Swan}
\TangramTikz[ColorSolution]{Swan}
```



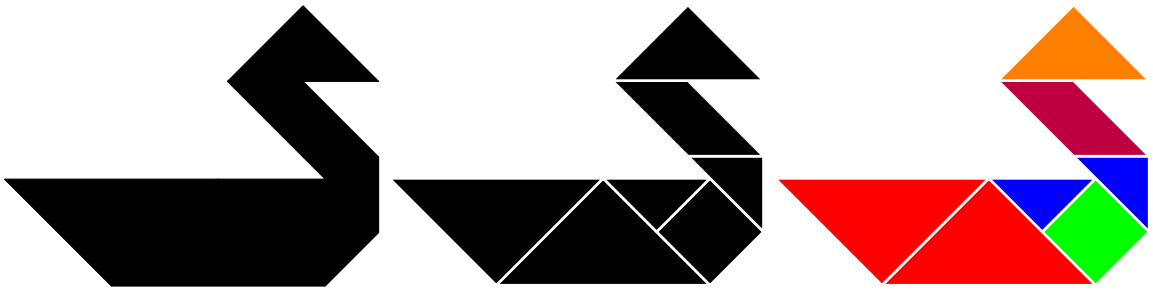
Code LaTeX

```
\TangramTikz{Pyramid}
\TangramTikz[Solution]{Pyramid}
\TangramTikz[ColorSolution]{Pyramid}
```



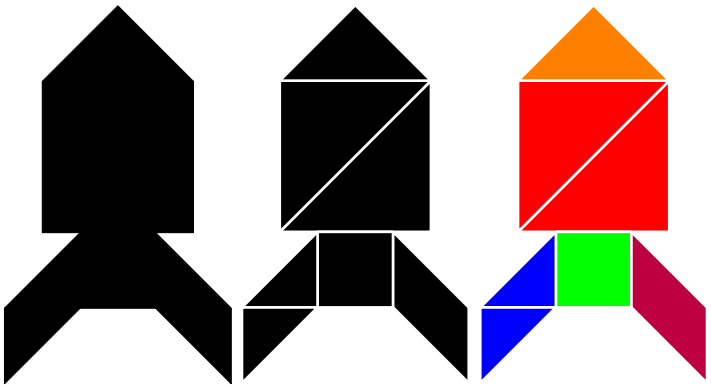
Code LaTeX

```
\TangramTikz{Duck}
\TangramTikz[Solution]{Duck}
\TangramTikz[ColorSolution]{Duck}
```



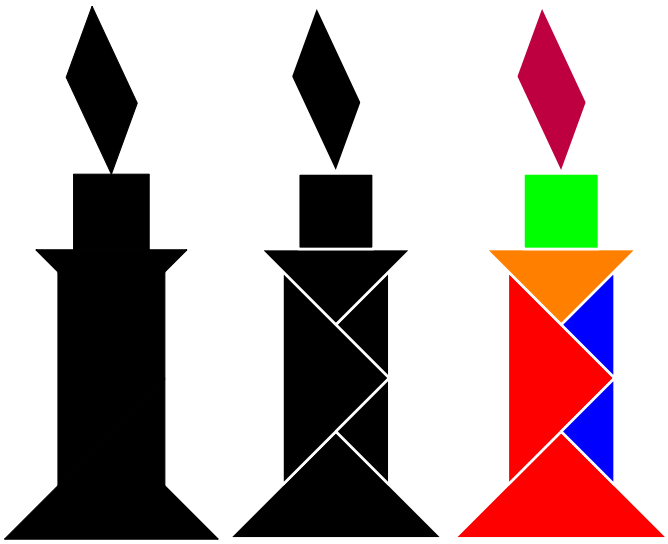
Code LaTeX

```
\TangramTikz{Rocket}
\TangramTikz[Solution]{Rocket}
\TangramTikz[ColorSolution]{Rocket}
```



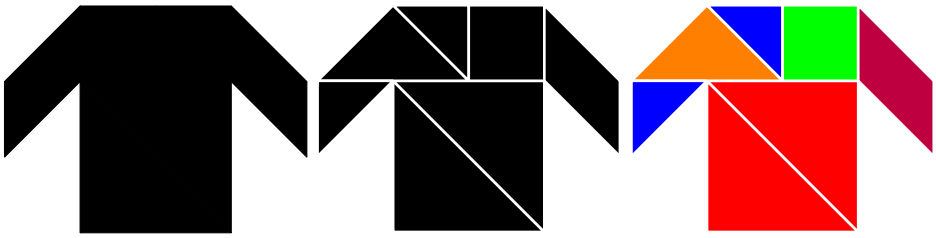
Code LaTeX

```
\TangramTikz{Candle}
\TangramTikz[Solution]{Candle}
\TangramTikz[ColorSolution]{Candle}
```



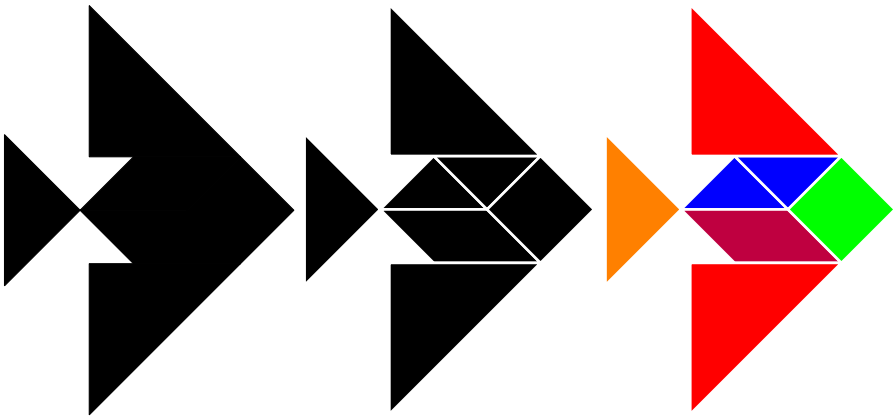
Code LaTeX

```
\TangramTikz{Shirt}
\TangramTikz[Solution]{Shirt}
\TangramTikz[ColorSolution]{Shirt}
```



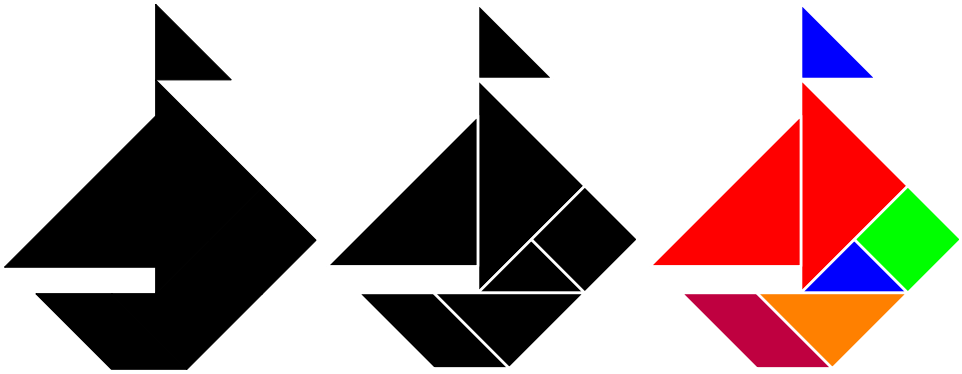
Code LaTeX

```
\TangramTikz{Fish}
\TangramTikz[Solution]{Fish}
\TangramTikz[ColorSolution]{Fish}
```



Code LaTeX

```
\TangramTikz{Sailboat}
\TangramTikz[Solution]{Sailboat}
\TangramTikz[ColorSolution]{Sailboat}
```

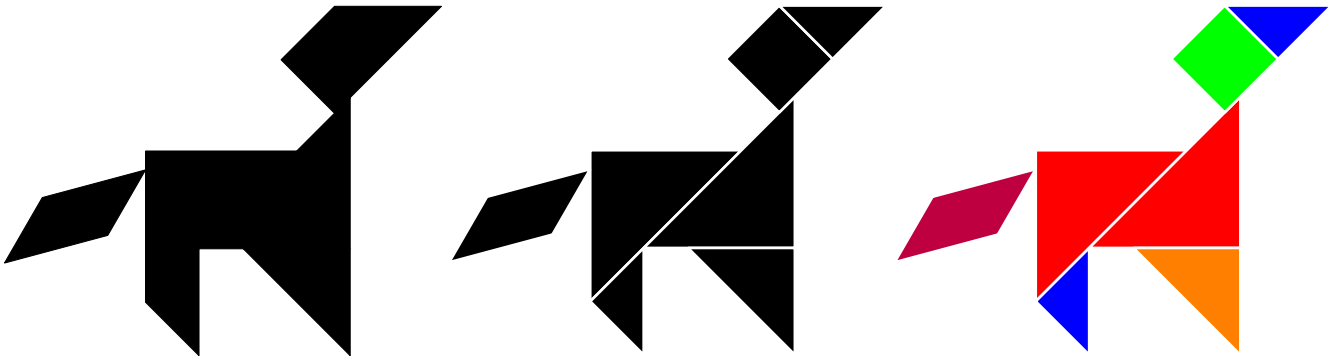


Code LaTeX

```
\TangramTikz{Kangaroo}
\TangramTikz[Solution]{Kangaroo}
\TangramTikz[ColorSolution]{Kangaroo}
```

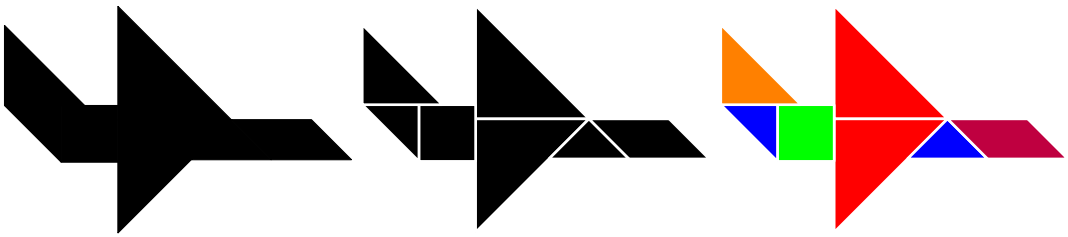
Code LaTeX

```
\TangramTikz{Dog}
\TangramTikz[Solution]{Dog}
\TangramTikz[ColorSolution]{Dog}
```



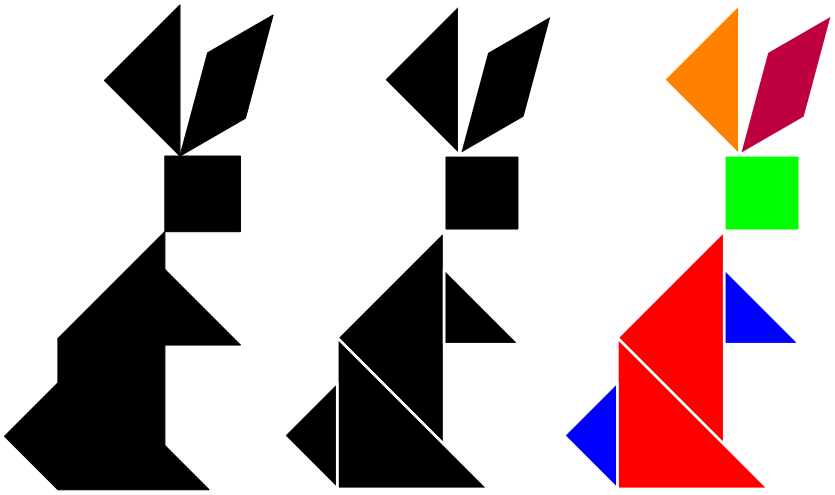
Code LaTeX

```
\TangramTikz<scale=0.75>{Plane}
\TangramTikz[Solution]<scale=0.75>{Plane}
\TangramTikz[ColorSolution]<scale=0.75>{Plane}
```



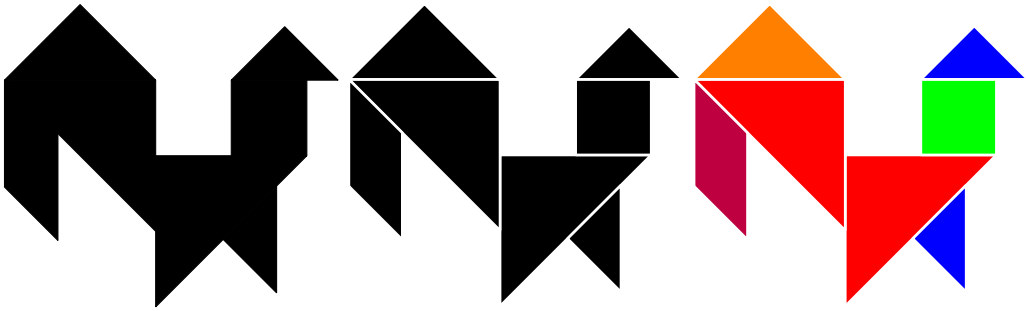
Code LaTeX

```
\TangramTikz{Rabbit}
\TangramTikz[Solution]{Rabbit}
\TangramTikz[ColorSolution]{Rabbit}
```



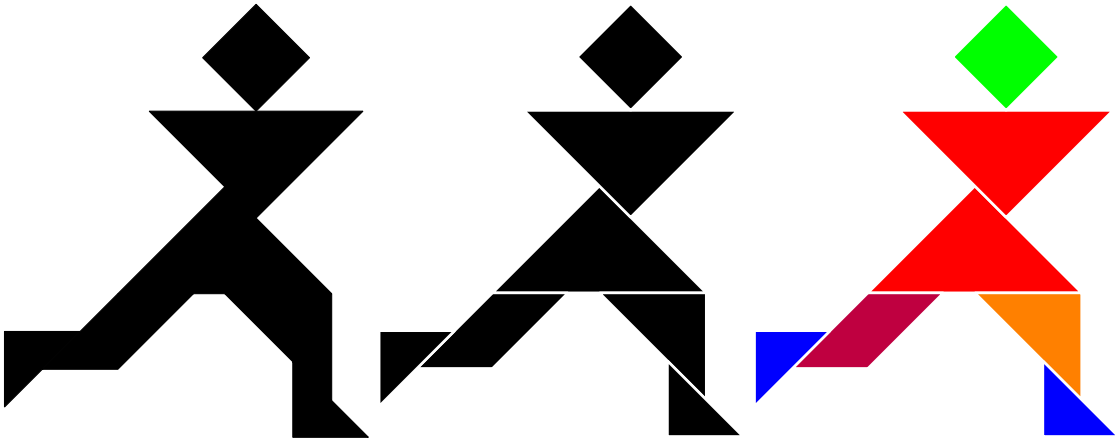
Code LaTeX

```
\TangramTikz{Rooster}
\TangramTikz[Solution]{Rooster}
\TangramTikz[ColorSolution]{Rooster}
```



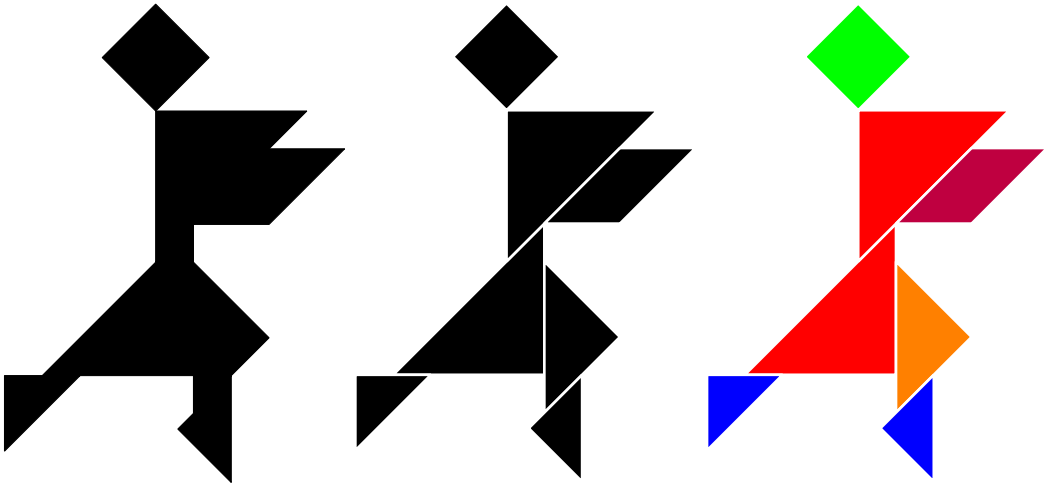
Code LaTeX

```
\TangramTikz{Jogger}
\TangramTikz[Solution]{Jogger}
\TangramTikz[ColorSolution]{Jogger}
```



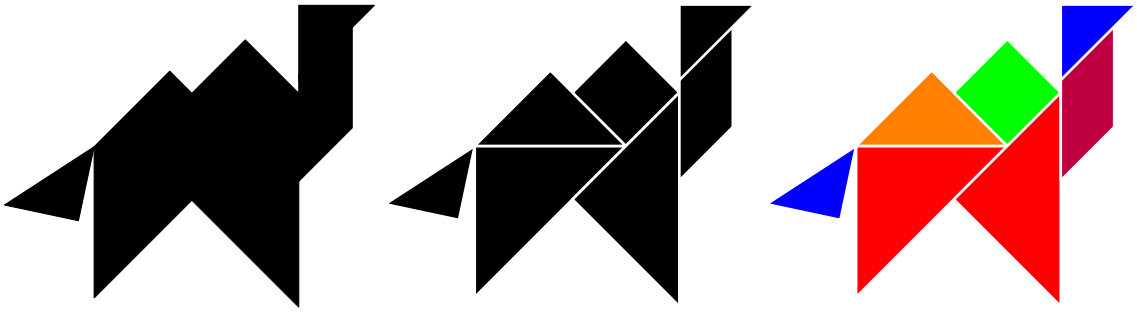
Code LaTeX

```
\TangramTikz{Dancer}
\TangramTikz[Solution]{Dancer}
\TangramTikz[ColorSolution]{Dancer}
```



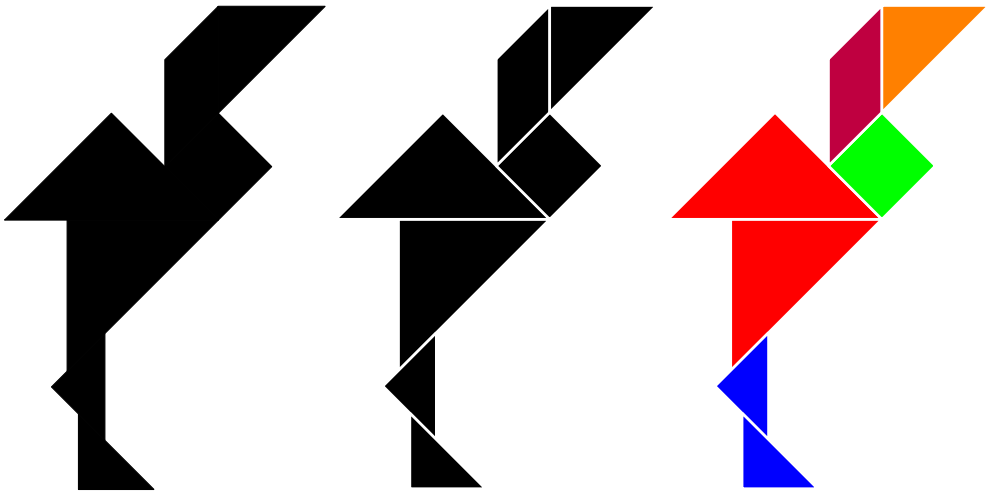
Code LaTeX

```
\TangramTikz{Camel}
\TangramTikz[Solution]{Camel}
\TangramTikz[ColorSolution]{Camel}
```



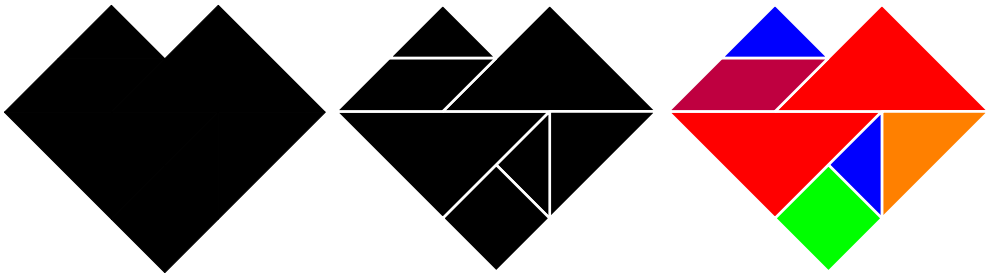
Code LaTeX

```
\TangramTikz{Flamingo}
\TangramTikz[Solution]{Flamingo}
\TangramTikz[ColorSolution]{Flamingo}
```



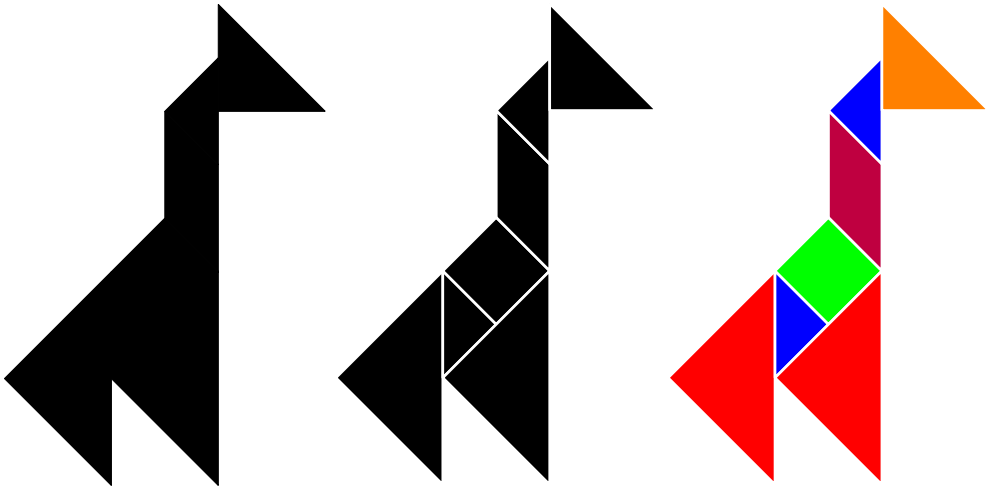
Code LaTeX

```
\TangramTikz{Heart}
\TangramTikz[Solution]{Heart}
\TangramTikz[ColorSolution]{Heart}
```



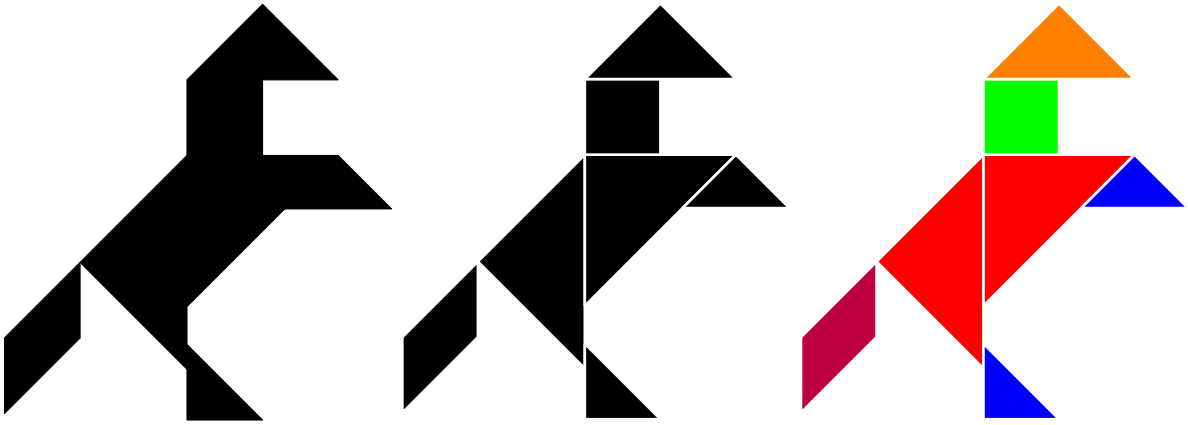
Code LaTeX

```
\TangramTikz{Giraffe}
\TangramTikz[Solution]{Giraffe}
\TangramTikz[ColorSolution]{Giraffe}
```



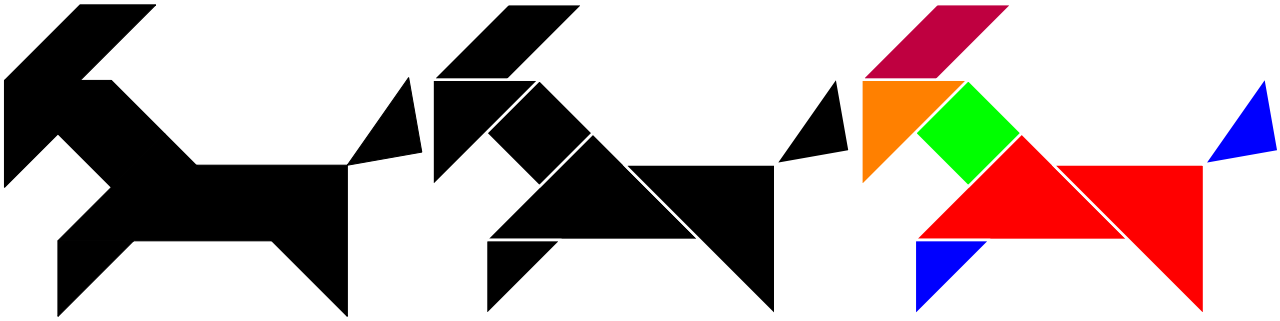
Code LaTeX

```
\TangramTikz{Horse}
\TangramTikz[Solution]{Horse}
\TangramTikz[ColorSolution]{Horse}
```



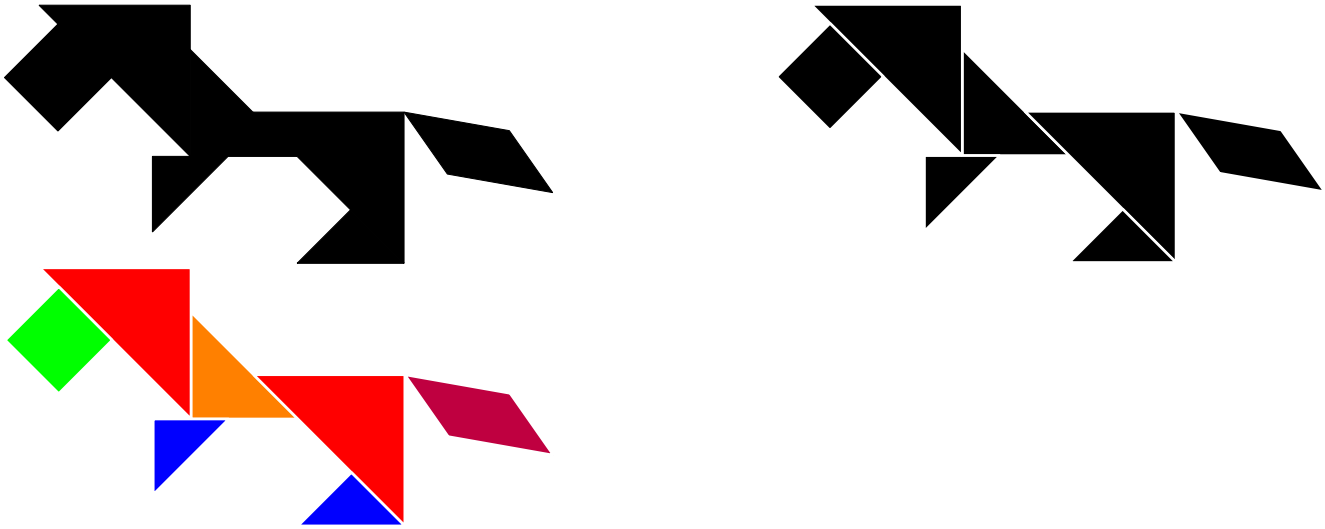
Code LaTeX

```
\TangramTikz{Goat}
\TangramTikz[Solution]{Goat}
\TangramTikz[ColorSolution]{Goat}
```



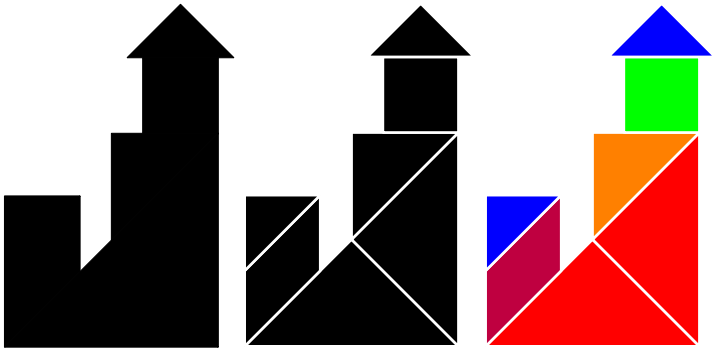
Code LaTeX

```
\TangramTikz{Lions}
\TangramTikz[Solution]{Lions}
\TangramTikz[ColorSolution]{Lions}
```



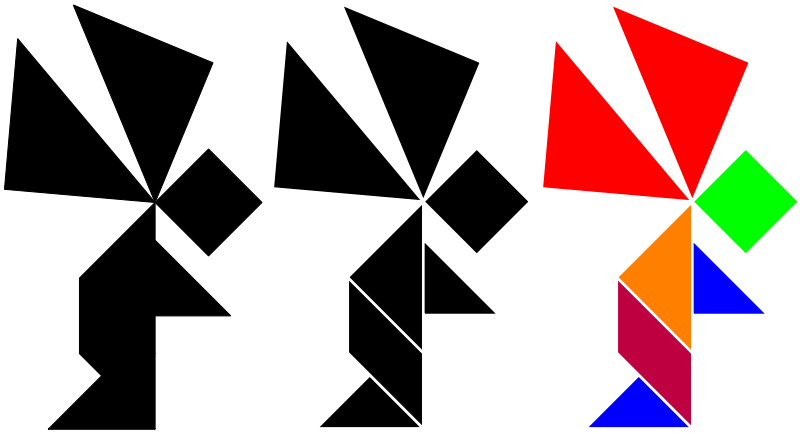
Code LaTeX

```
\TangramTikz{Factory}
\TangramTikz[Solution]{Factory}
\TangramTikz[ColorSolution]{Factory}
```



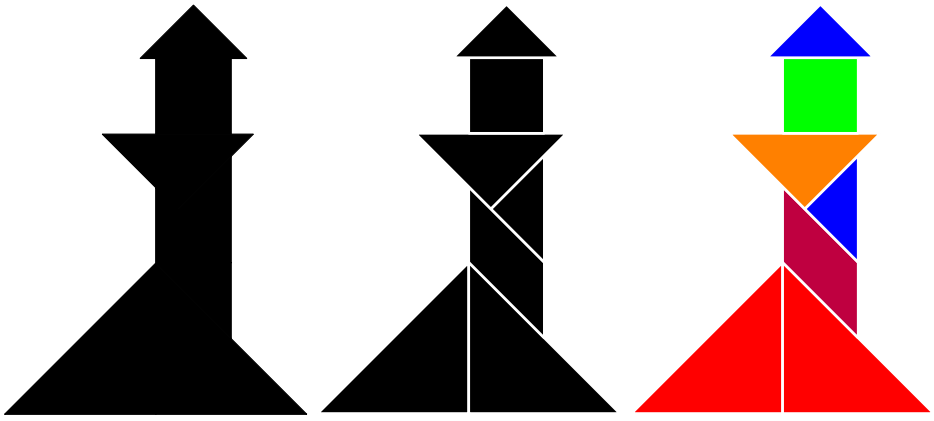
Code LaTeX

```
\TangramTikz{Angel}
\TangramTikz[Solution]{Angel}
\TangramTikz[ColorSolution]{Angel}
```



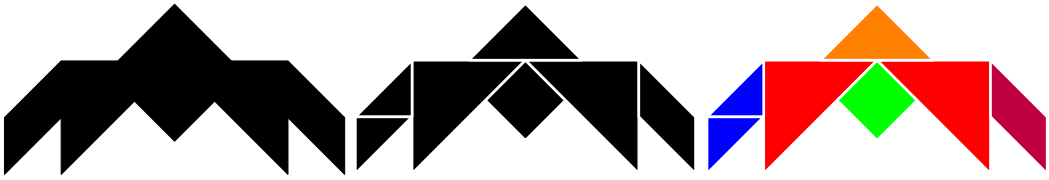
Code LaTeX

```
\TangramTikz{Tower}
\TangramTikz[Solution]{Tower}
\TangramTikz[ColorSolution]{Tower}
```



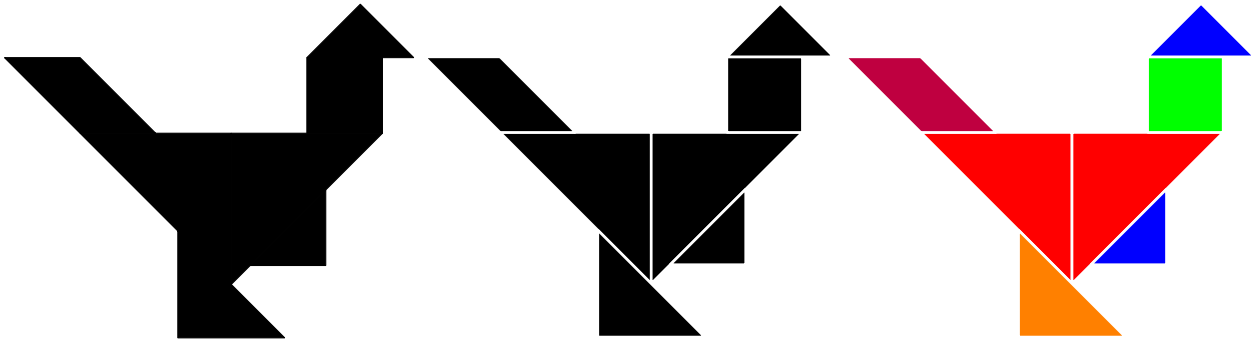
Code LaTeX

```
\TangramTikz<scale=0.75>{Ufo}
\TangramTikz[Solution]<scale=0.75>{Ufo}
\TangramTikz[ColorSolution]<scale=0.75>{Ufo}
```



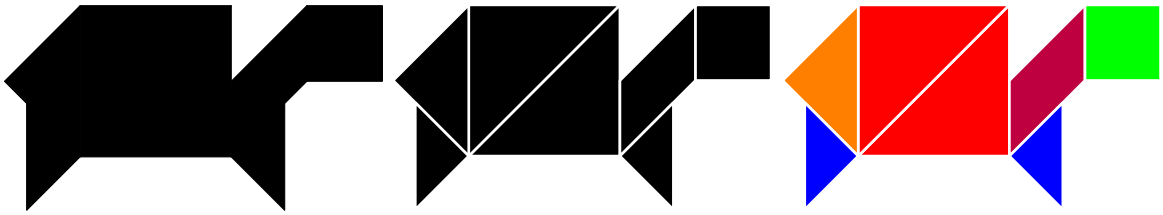
Code LaTeX

```
\TangramTikz{Chicken}
\TangramTikz[Solution]{Chicken}
\TangramTikz[ColorSolution]{Chicken}
```



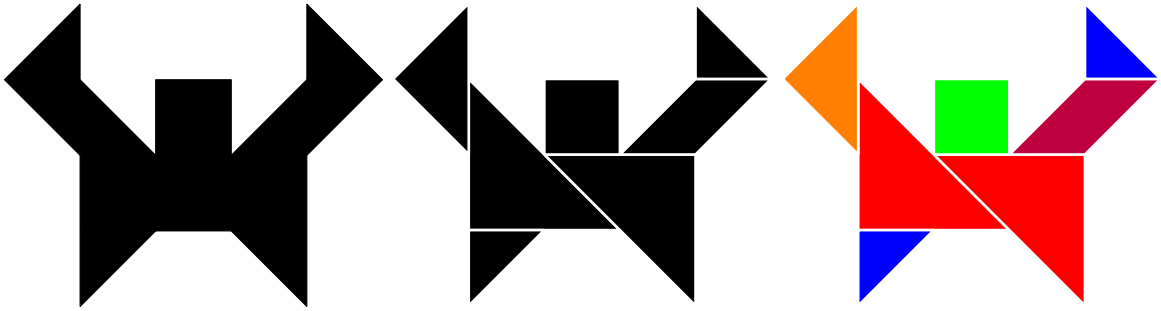
Code LaTeX

```
\TangramTikz{Turtle}
\TangramTikz[Solution]{Turtle}
\TangramTikz[ColorSolution]{Turtle}
```



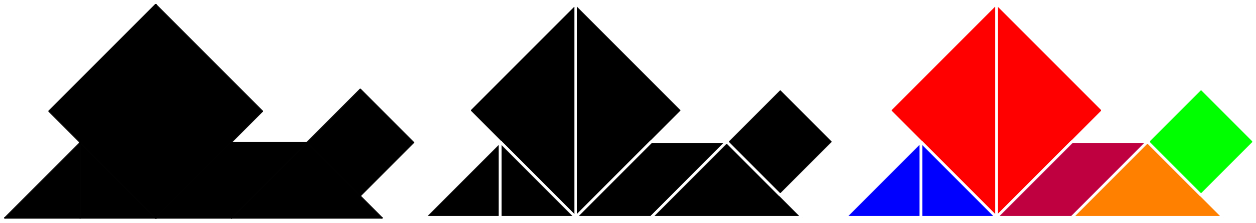
Code LaTeX

```
\TangramTikz{Crab}
\TangramTikz[Solution]{Crab}
\TangramTikz[ColorSolution]{Crab}
```



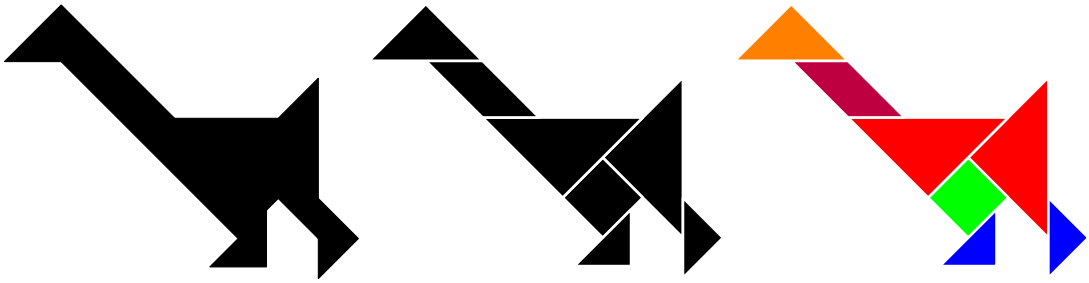
Code LaTeX

```
\TangramTikz{Snail}
\TangramTikz[Solution]{Snail}
\TangramTikz[ColorSolution]{Snail}
```



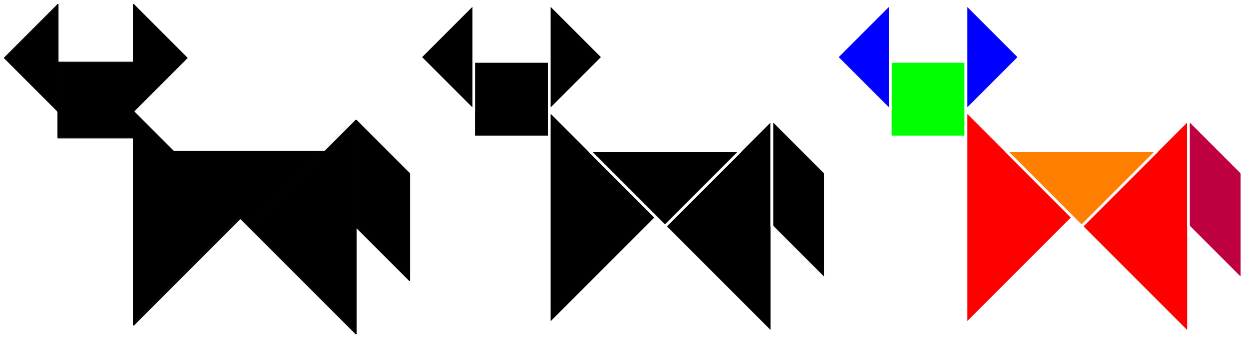
Code LaTeX

```
\TangramTikz<scale=0.75>{Goose}
\TangramTikz[Solution]<scale=0.75>{Goose}
\TangramTikz[ColorSolution]<scale=0.75>{Goose}
```



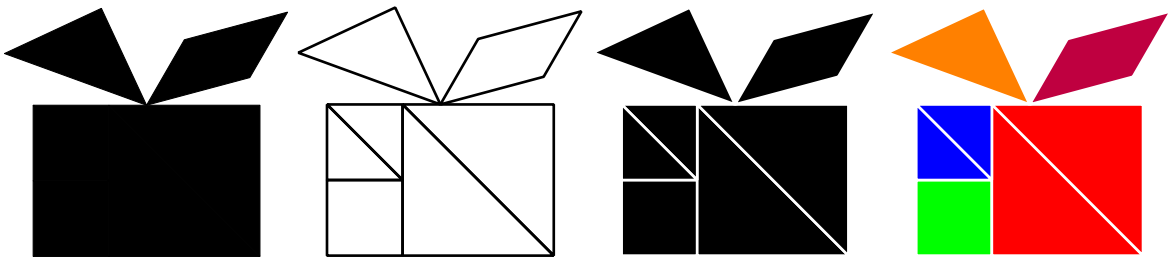
Code LaTeX

```
\TangramTikz{Cow}
\TangramTikz[Solution]{Cow}
\TangramTikz[ColorSolution]{Cow}
```



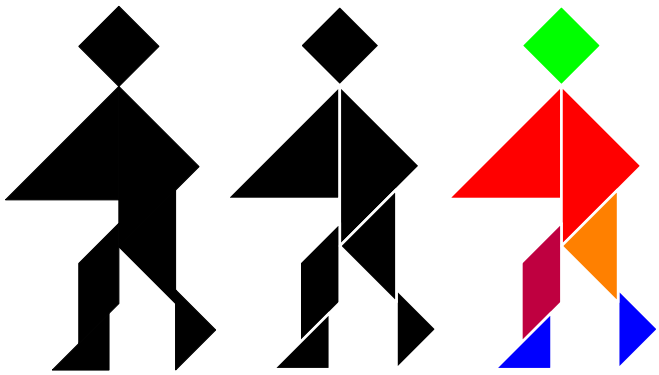
Code LaTeX

```
\TangramTikz{Gift}
\TangramTikz[BlackWhite]{Gift}
\TangramTikz[Solution]{Gift}
\TangramTikz[ColorSolution]{Gift}
```



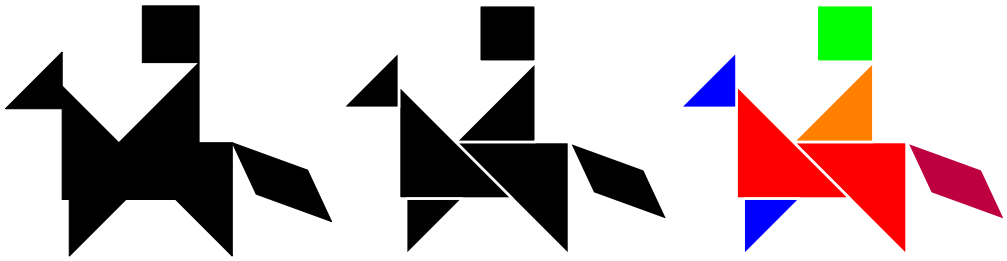
Code LaTeX

```
\TangramTikz<scale=0.75>{Man}
\TangramTikz[Solution]<scale=0.75>{Man}
\TangramTikz[ColorSolution]<scale=0.75>{Man}
```



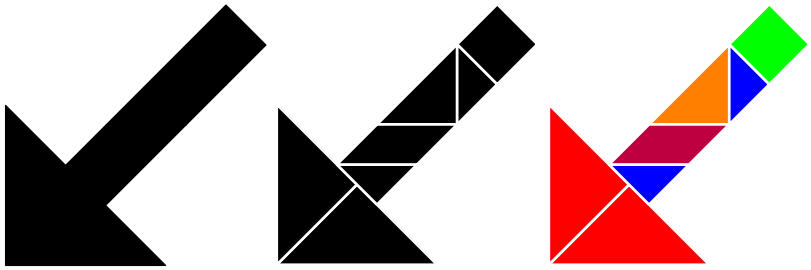
Code LaTeX

```
\TangramTikz<scale=0.75>{Horseman}
\TangramTikz[Solution]<scale=0.75>{Horseman}
\TangramTikz[ColorSolution]<scale=0.75>{Horseman}
```



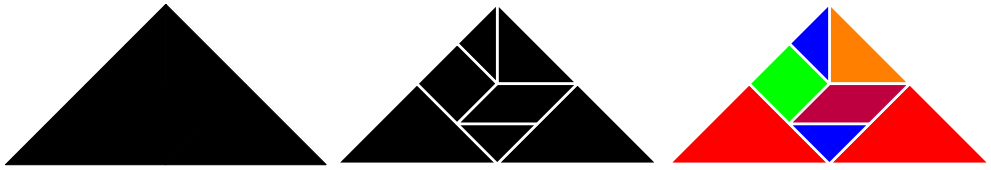
Code LaTeX

```
\TangramTikz<scale=0.75>{Arrow}
\TangramTikz[Solution]<scale=0.75>{Arrow}
\TangramTikz[ColorSolution]<scale=0.75>{Arrow}
```



Code LaTeX

```
\TangramTikz<scale=0.75>{Triangl}
\TangramTikz[Solution]<scale=0.75>{Triangl}
\TangramTikz[ColorSolution]<scale=0.75>{Triangl}
```



# Part IV
# History

v0.2.2 : Bugfix + new models
v0.2.0 : New key for choosing parts + new model + enhancements for colors + help
v0.1.8 : [BlackWhite] key + Cow/Gift models
v0.1.7 : Bugfixes in english doc + Renaming certain keys
v0.1.6 : New models
v0.1.5 : New models
v0.1.4 : New models
v0.1.3 : New models
v0.1.2 : New models
v0.1.1 : New models
v0.1.0 : Initial version