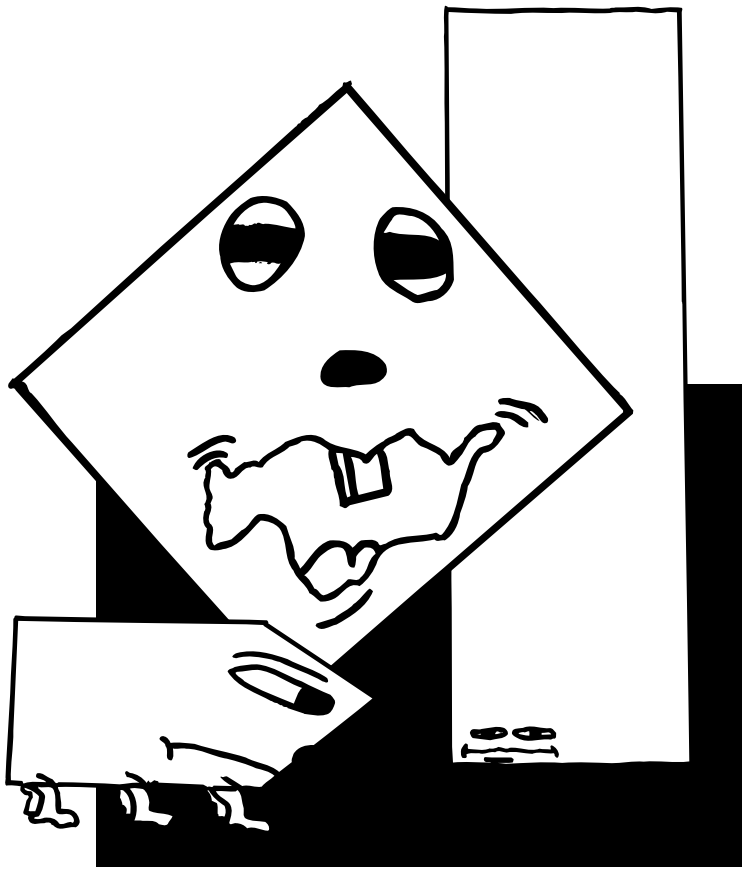
Plane Geometry



by:
Carol Lockhart

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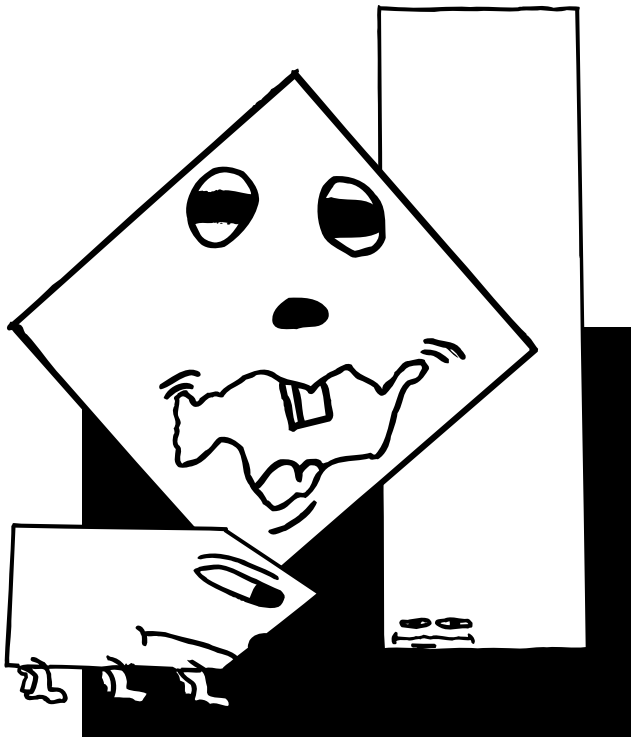
TEACHING MATERIALS
from the
STEWART RESOURCES CENTRE

SASKATCHEWAN TEACHERS' FEDERATION

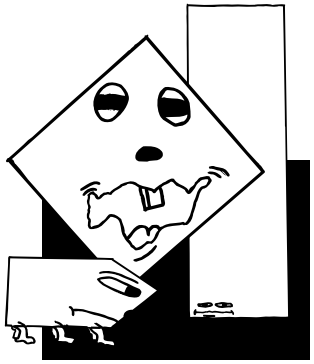
P105.11

Plane Geometry

by Carol Lockhart
CELs — 1994
P105.11



Strand: Geometry
Topic: Plane



Foundational Objectives

The student should:

- demonstrate confidence, desire, and an ability to solve a variety of mathematically related problems;
- demonstrate knowledge and understanding of why, when, and how to collect, organize, and interpret numerical data;
- demonstrate an understanding of numbers, patterns, counting, operations, and estimation;
- demonstrate a sense of spatial awareness and familiarity with two dimensional shapes and recognize relationships between geometry and the environment.

C.E.L.s

- Communication
- Numeracy
- Creative and Critical Thinking
- Independent Learning
- Personal and Social Skills and Values

Time Frame

- Approximately 7 hours.

  Note: Some activities may be extended if time is available. Manipulatives could be available for free time exploration. The stations lesson would take a varied number of hours depending on such variables as number of students and their abilities, as well as the number of stations each student is expected to complete.

1. *Free Exploring*

a) Learning Objectives:

G12: design classifications and sort two-dimensional shapes according to various characteristics.

b) Materials: Pattern blocks

c) Evaluation:

i) Free Exploring Observation Sheet - included with unit

ii) Portfolio Entry

d) Directions:

i) Allow students to freely explore pattern blocks on their own. This will enable the students to develop and structure such concepts as matching, sorting, ordering, following patterns, and comparing.

ii) Discuss with students what they have discovered that they can do with the blocks.

Examples:

- Can you stack them?
- Can you fit them together?
- Can you make a line?
- Can you make a wall?
- Can you make a pattern?
- What colors do you like to use together?

iii) Use of mathematical names for shapes is to be encouraged.

iv) Blocks could be left out for free time activities.

e) Extension:

i) Students work in pairs to see what they can make together.

ii) Narrative - writing for their individual portfolios. Students write the name of the figure that corresponds to the color. Encourage students to tell how they used the blocks and to discuss things they discovered about the blocks.

2. *Graphing*

a) Learning Objectives:

G14: trace and draw two-dimensional figures.

P2: design a plan and solve problems using manipulatives.

N12: identify one or more characteristics of an object or an event.

N16: compare sets using the phrases “more than”, “less than”, “equal to”.

N52: demonstrate subtraction by: b) comparing the number of objects; c) partitioning objects.

b) Materials: Pattern blocks, individual student graphs. Individual student graphs may be made from a plain colored vinyl tablecloth, which is cut into pieces, 31 cm x 29 cm. Use fine line permanent markers to draw the grid lines.

c) Evaluation:

i) Performance test, anecdotal records, observation checklist, or rating scale (included)

ii) portfolio entry.

d) Directions:

i) Each student takes two handfuls or a scoop of blocks.

ii) The blocks are sorted.

iii) The student graphs the blocks on his/her individual vinyl graph which was provided.

iv) Discuss the results with the students.

Examples:

- How many blocks are green triangles?
- Which shape has the most pieces? the fewest?
- How many more beige pieces called rhombus than red trapezoids?
- How many blocks did you scoop altogether?

e) Extension:

i) Use pattern block stickers or templates to record the results of the graph on large grid graph paper.

ii) Take another scoop of blocks to make a second graph. Compare this graph with the first graph.

Talk to a friend about it.

iii) Narrative - writing for portfolio. The students will write about their graphs. It is hoped that they would discuss how they sorted the shapes, the numbers of the different shapes, and how the numbers compared. They should also include any interesting data that they observed (e.g. no green triangles). These may be shared with the class.

3. *Trace and Draw*

a) Learning Objectives:

G14: trace and draw two-dimensional figures.

b) Materials: Circular objects such as lids, any square or rectangular shapes, pattern blocks, attribute blocks, geoboards and colored elastics.

c) Evaluation: Rating scales, observation checklists, or anecdotal records.

d) Directions:

i) The student will trace and draw geometric shapes to make a picture or mural. Mobiles could be made.

ii) The students will write a four line poem describing a particular shape. The poems could be cut out and glued onto construction paper, cut in the shape that the poem is about. The poems and projects from (i) could be used as a bulletin board display.

c) Extension:

i) The students will use elastics and geoboards to make geometric figures. Students could use the trace and draw materials as guides.

ii) Students may overlap, flip or turn figures during construction.

4. *Geometry Walk*

a) Learning Objectives: To promote a greater awareness of geometry in the real world, and

G13: name, illustrate, and identify examples from the environment of a square, rectangle, circle, triangle.

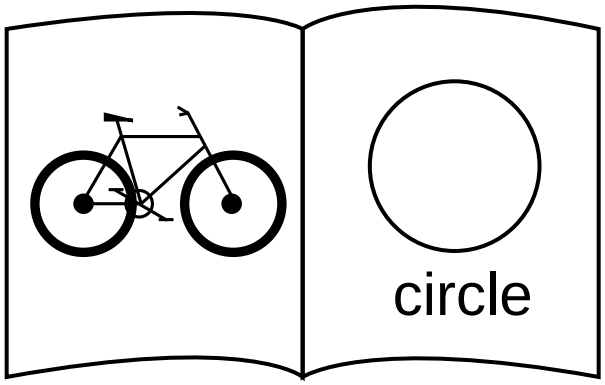
b) Materials: Sheets of 21.5 x 28 cm (8 1/2" x 11") white paper folded booklet style, colored construction paper for booklet cover, pencil on a string tied or taped onto booklet.

c) Evaluation: Completed booklet may be looked at.

d) Directions:

i) The students will explore the school building, schoolyard, and nearby neighborhood.

ii) While on the walk, students illustrate objects that contain the geometric shapes in their booklets. One side of the booklet has the illustration; the other side could have the name of the shape represented and what it looks like.



iii) Questions asked on the walk could focus not only on recognizing the shape and use of vocabulary, but also on the functional use of the shape. Example: Why tires are round instead of square?

5. Stations

a) Learning Objectives:

G15: differentiate between figure and background.

G16: combine two-dimensional geometric figures to make other figures.

P1: establish and/or demonstrate an understanding of a problem by using manipulatives.

b) Materials: Pictures (which have geometric shapes), story books (some titles listed in bibliography), pattern blocks, tangram pieces, paper cut-outs, pattern block stickers, pentominoes, paper, cards of bristol board.

c) Evaluation: Assessment at each station

d) Directions:

i) Students are divided into groups and, over a period of time, will visit each of the eight stations.

Station 1

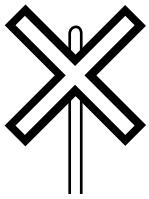
The students will analyze pictures and picture books to discover dominant figures. They will locate geometric shapes in the illustrations. The learners could construct a simple graph using colorful, plastic links such as shower curtain hooks or commercially produced links to show which picture/book they believe has the greatest number of different figures.

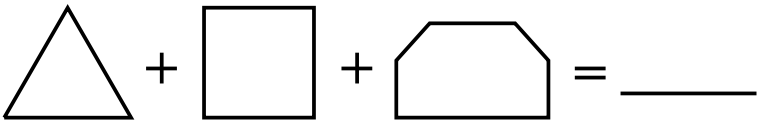
Station 2 - Traffic Sign Math

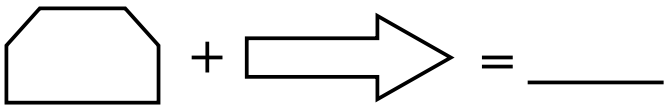
The student will count the number of sides on each traffic sign. They then solve number stories coded with the shapes. The C.A.A. has copies of the S.G.I. Driver's Handbook.

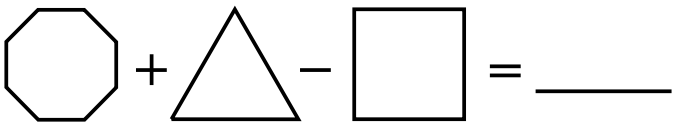
Examples: On teacher-prepared cards, (10 cm x 6 cm) each student will make up 2 of their own coded questions.

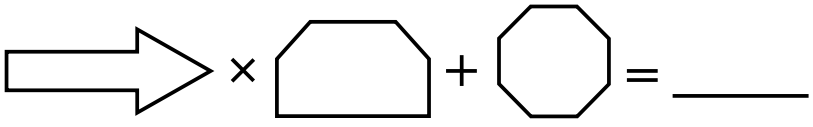
Count the number of sides on each traffic sign:



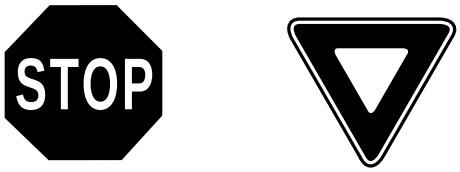




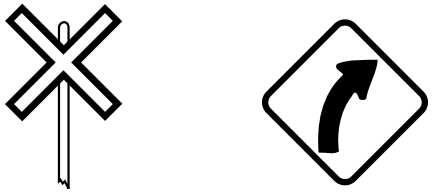




Traffic Sign Math



_____ + _____ = _____



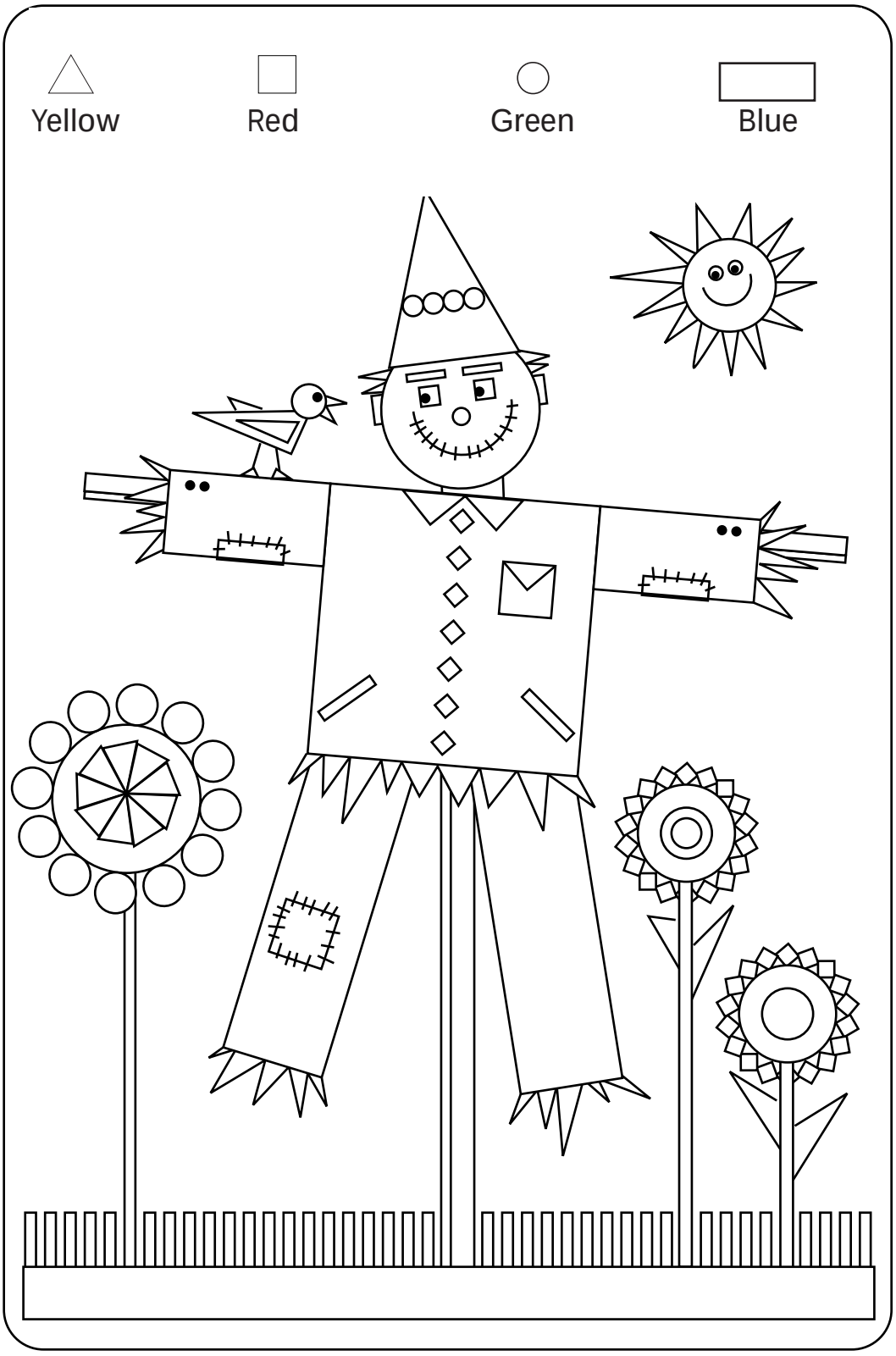
_____ + _____ = _____

_____ + _____ = _____

_____ − _____ + _____ = _____

Station 3

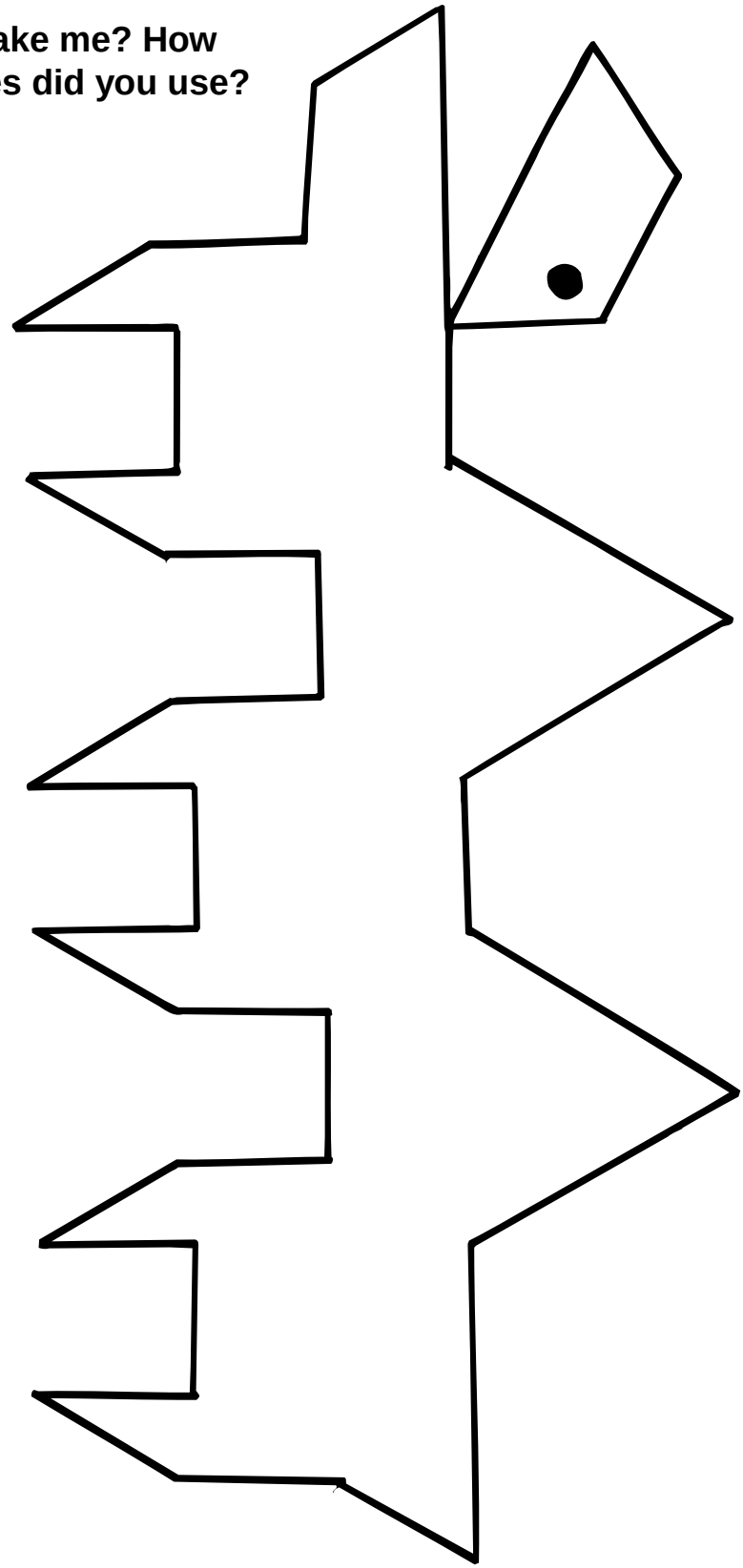
Students color pictures composed of geometric shapes where a color code is given. In free time students may enjoy making their own picture for others to color.



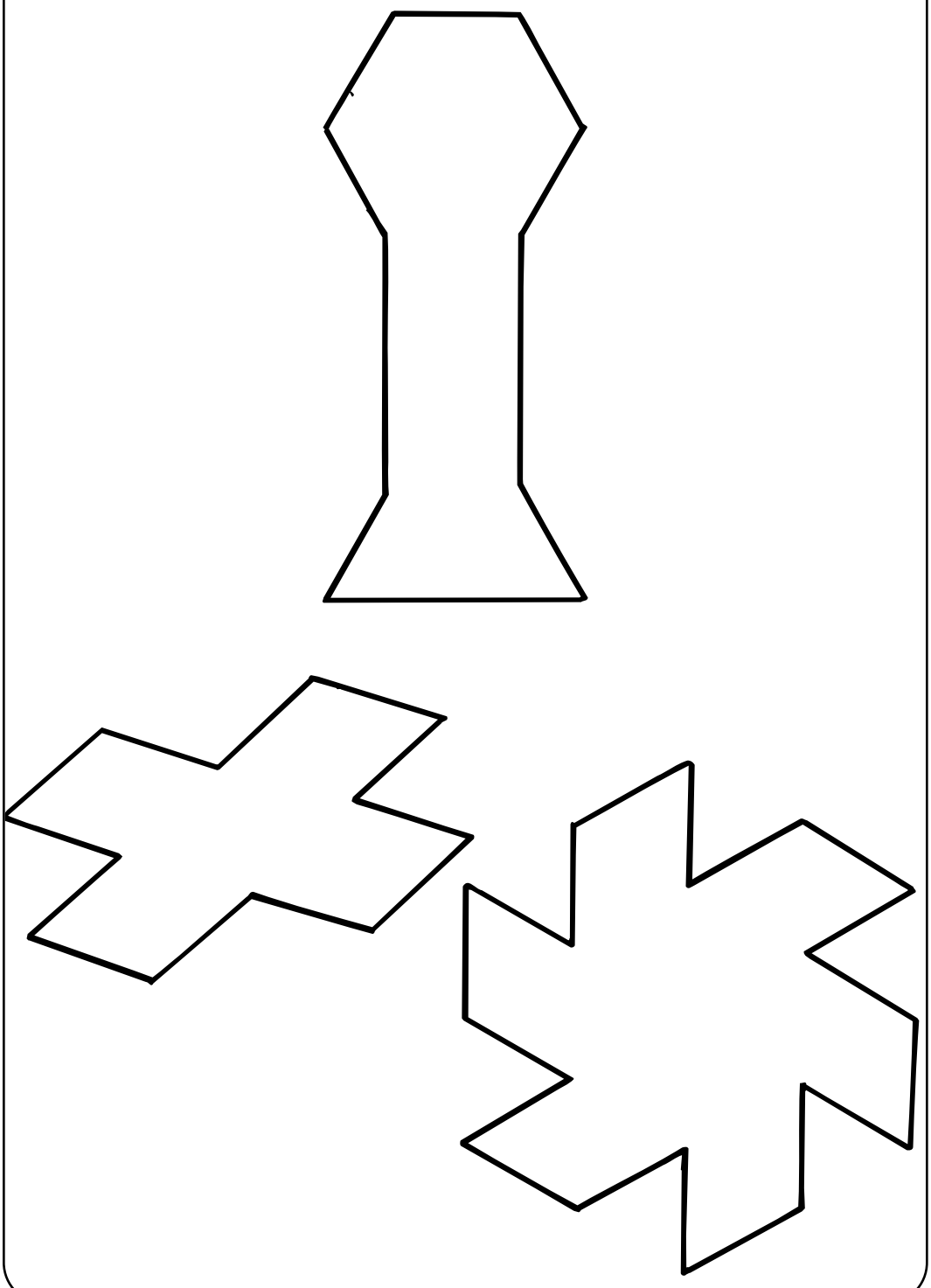
Station 4

Using pattern blocks, the students will fill in outlined figures.

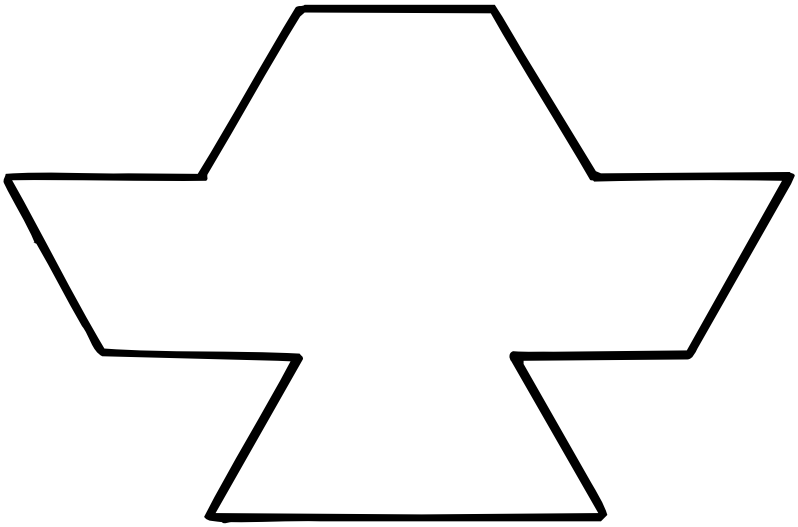
Can you make me? How many pieces did you use?



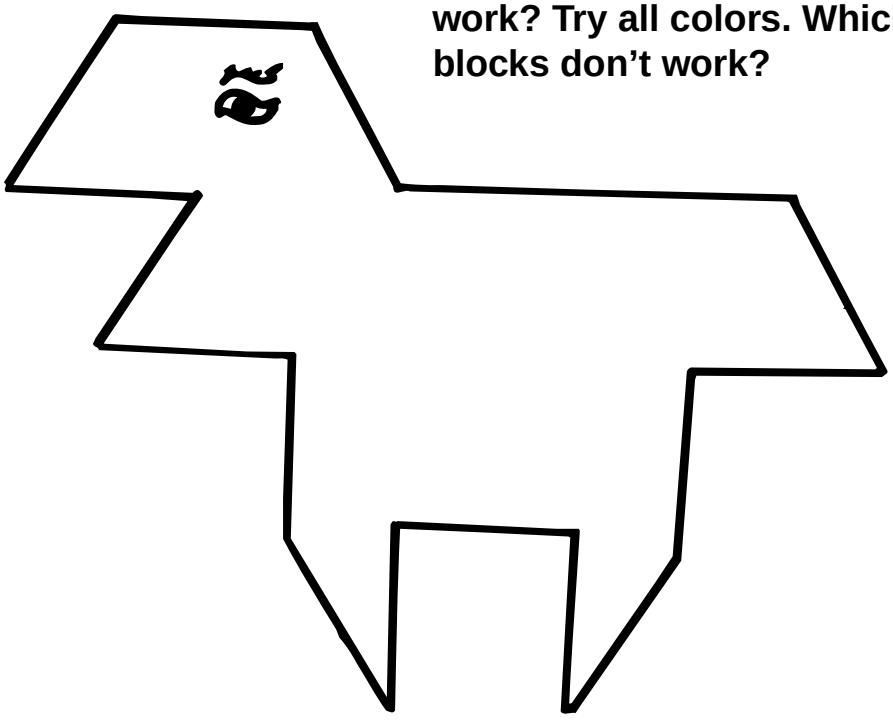
How many blocks did you use?



Fill in these shapes with blocks of one color.



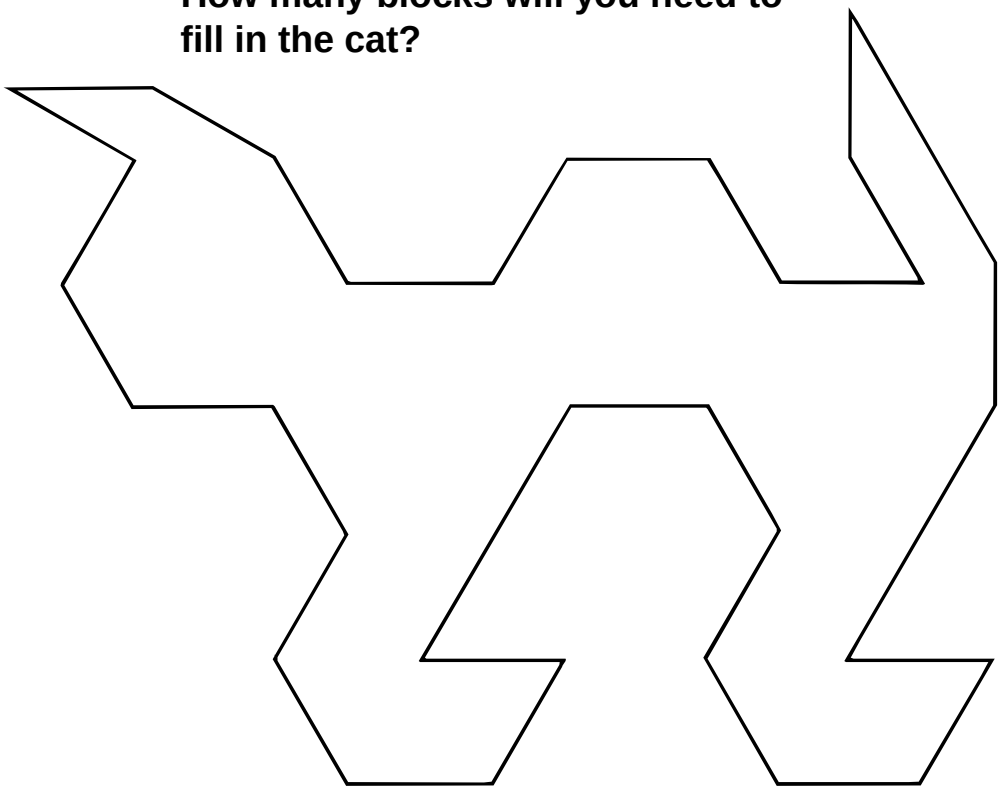
Do all blocks work? Can you predict which blocks will work? Try all colors. Which blocks don't work?



Station 5

Using tangram pieces, the student will draw his/her own puzzle shape on 15 cm x 15 cm cards, drawing the outline only. The student must tell/ write down, how many of the pieces were used in the puzzle. These will later be used by the other students who will try to solve the puzzles.

How many blocks will you need to fill in the cat?



Put a marker on the number of blocks you used.

11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
20	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**
29	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**

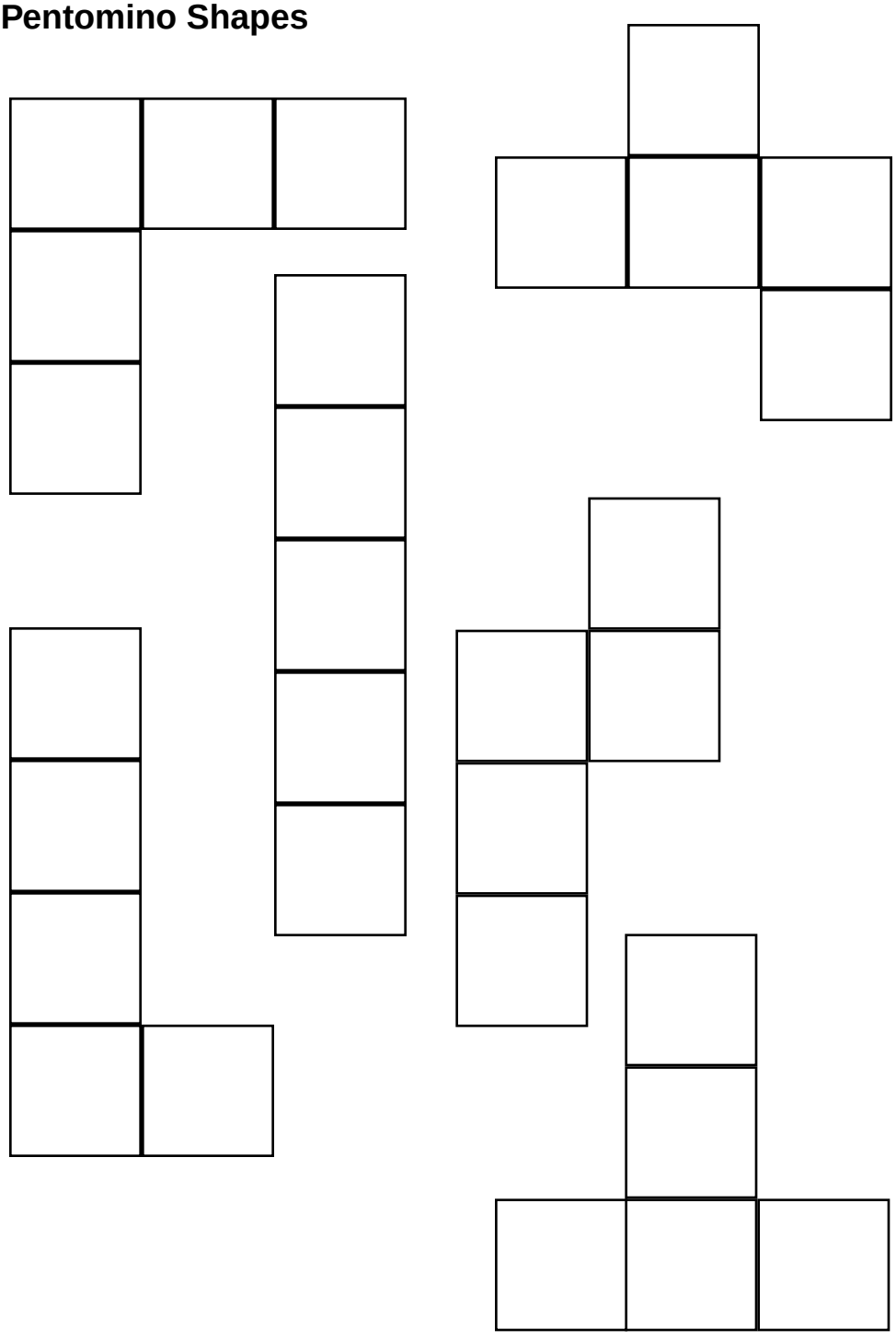
Can you fill in the cat another way?

Station 6

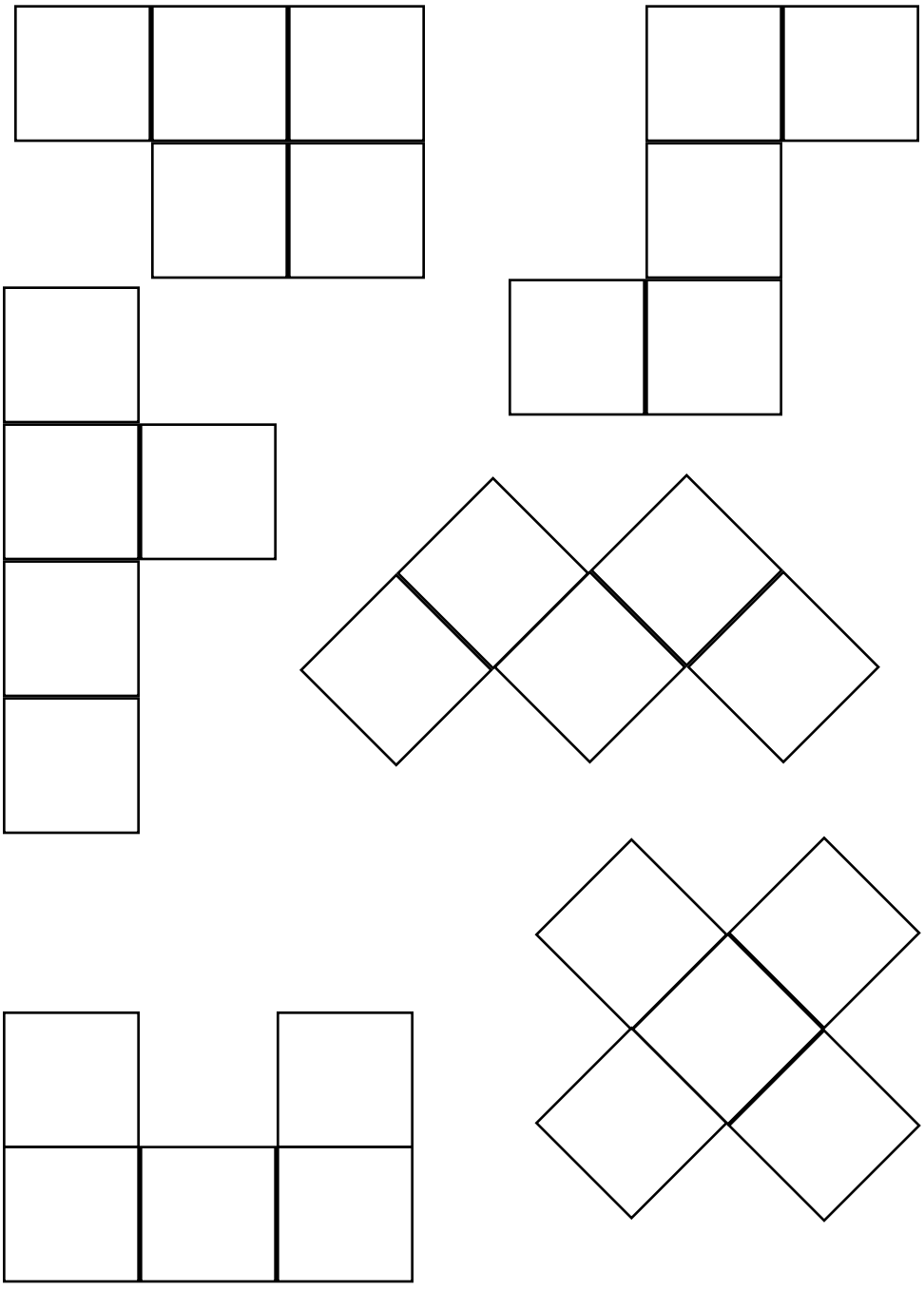
The student will choose a maximum number of 5 pentomino pieces, construct a shape using the chosen pieces, and draw their outline. The teacher will assign a value to each shape. The student then solves for the total value of their puzzle.

The teacher has a chart showing what value corresponds to which shape.

Pentomino Shapes



Pentomino Shapes



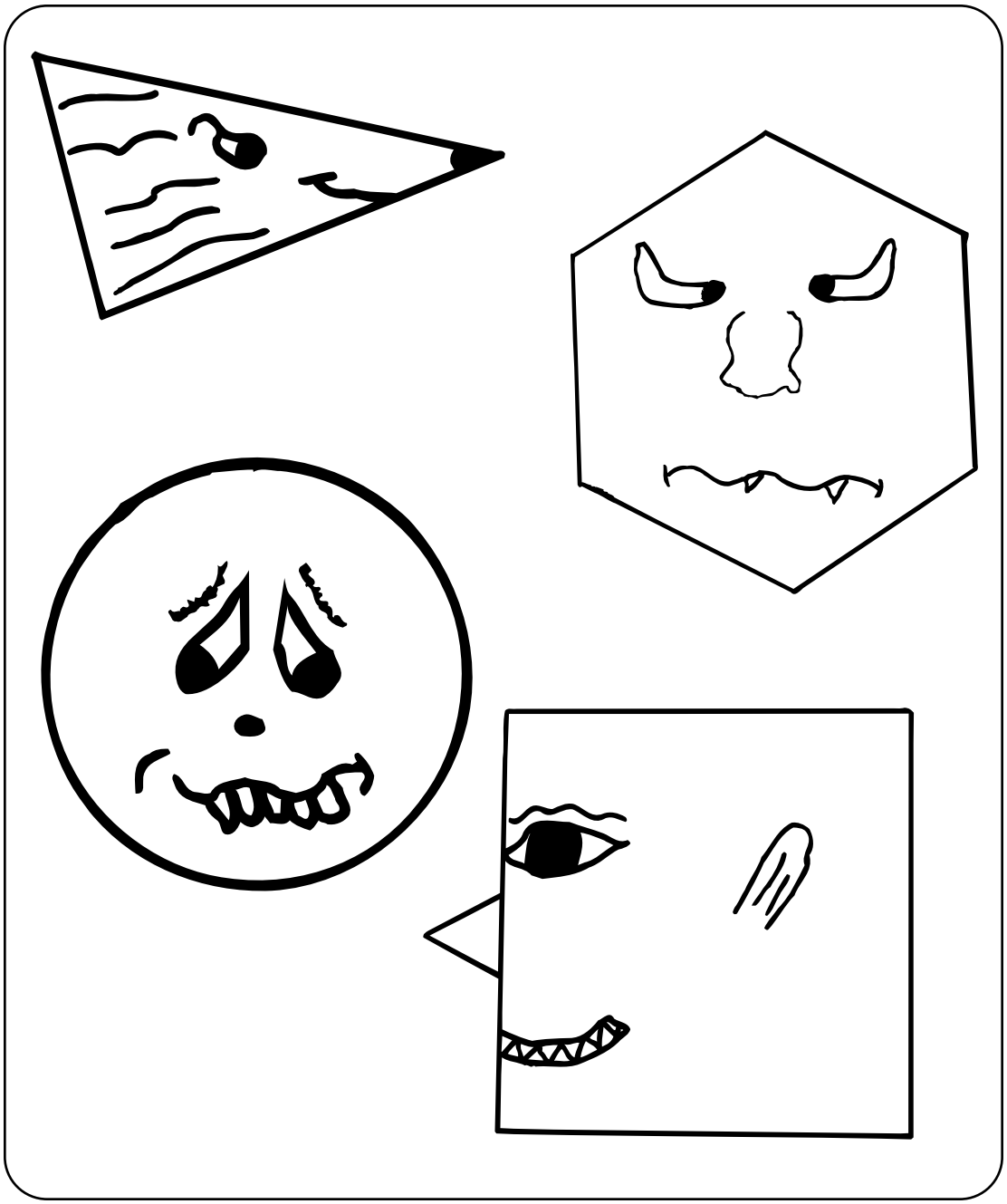
Station 7

The student will construct or trace their favorite geometric shape and justify their choice.

Station 8

Using paper cut-outs, pattern block stickers or tracing pattern blocks, the student will create a pattern, design or picture.

Each station should be set up with all the materials the students will need at a particular station. I use colorful baskets, styrofoam trays, and containers, various sized and shaped tins, mac-tac covered boxes and ziploc bags.



6. *Origami Activities*

Students will enjoy creating projects from paper. The models formed incorporate geometric shapes that the children have been categorizing, locating, and making during the unit. Titles of books for origami projects are included in the resource list.

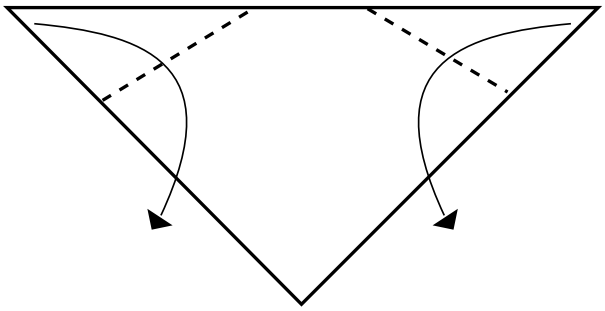
Other ideas:

- Geometry in nature
  - tree bark
  - animal skins (skunk stripes, bird feathers, snakes, turtles, shells, pine cones, etc.)

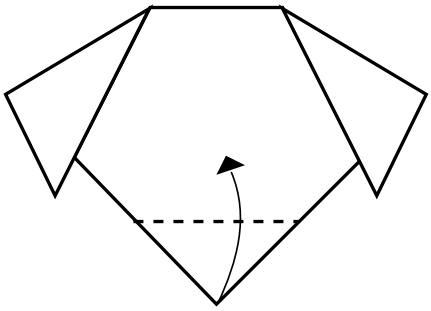
- 5 min. math
  - guess my shape
  - quick graph of shapes
  - shape addition, subtraction (# of sides values for each)

- Native “bead work” on graph paper.

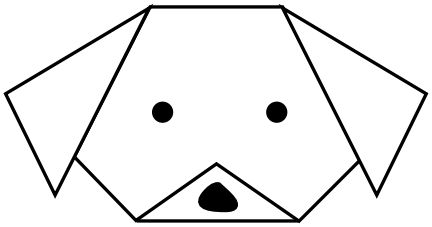
Dog



1. Fold in half to make a triangle



2. Fold the tips of the bottom



3. Fold the tips of the bottom up. Draw eyes and nose.

Reference List

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