# ANIBOT PRODUCTION MANUAL

Arts Impact Math through Artistic Pathways

Student’s Name:

Instructor’s Name:

Period: \_\_\_\_\_\_\_\_\_\_\_

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Do Now

Analyze a rectangular prism (block).

How many faces?

How many edges?

How many vertices?

Hello! Hello!, 2002

by Jeffry Mitchell

Object in Two Triangular Pieces, 1986 by Vaclav Cigler

Draw one of the polyhedra seen in the TAM sculpture (from photo above)

Label polygon figures, sides and vertices that you see:

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DON’T FORGET TO USE YOUR RULER AND GRID LINES

TO HELP YOU DRAW!

Draw nets on 1-inch grid paper for the following sizes of cubes: 2 x 2 x 2 and 4 x 4 x 4 inches.

A net for a cube

Cube: 2 x 2 x 2 inches

Cube: 4 x 4 x 4 inches

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Draw a net on 1-inch grid paper for the following size of rectangular prism:

3 x 3 x 5 inches.

Net for rectangular prism

Rectangular Prism: 3 x 3 x 5 inches

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Draw a 2-D net on 1-inch grid paper for the following

size of rectangular prism:

3 x 4 x 5 inches

Net for rectangular prism

Cut out, fold and tape all four nets.

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?

Do Now

Draw a three dimensional object from two points of view (from the side, top, etc.). Draw

eraser, pencil, objects in the room.

Combine pairs of your

3-D solids made from nets.

Which combination of two

will become your Anibot?

?

?

?

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Arrange and sketch several different combinations of two polyhedra you have made from

nets and add some details like eyes, ears, whiskers, arms, etc. Start imagining which

polyhedra and which details will give your Anibot a form and personality.

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Glass Sculptures by Charles Parriot from the Tacoma Art Museum Collection

How does the artist communicate information about character using 3-D forms?

Tin Man, 1998 Witch, 2001

Decide on one Anibot design (chosen from six sketches) and sketch it to exact size and

scale of your rectangular prisms on one-inch grid paper. Draw it from two points of view.

What are the dimensions of the two polyhedra you will be

using for your Anibot design? Circle the two you are using below:

Cube: 2 x 2 x 2 inches

Cube: 4 x 4 x 4 inches

Rectangular Prism: 3 x 3 x 5 inches

Rectangular Prism: 3 x 4 x 5 inches

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Anibot Specification Sheet

Designer:

Date:

Sketch of Anibot added when

construction is completed, Lesson 4

Anibot Name:

Function or Specialty:

Polyhedra Featured:

Special Design Features:

Possible Upgrades:

Total Surface Area:

Entered when calculations are completed, Page 13

Total Volume:

Entered when calculations are completed, Page 14

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Self check your work.

o I can count grid squares, dot vertices, and draw faces using a ruler to make a net pattern.

o I can fold my net patterns into specific rectangular prism(s).

o I can draw and label my Anibot figure design from two points of view.

o I can complete a card with Anibot name and design features.

Why do designers of toys or cars or buildings need to draw their

product designs from more than one point of view?

2010 Lotus Evora

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Do Now

Congruency review and practice: Analyze nets for rectangular prisms.

Identify congruent faces in net diagrams.

How many congruent squares How many congruent squares

are in this net? are in this net?

How many congruent rectangles are in this

net?

Re-draw the nets for polyhedra you are using in your Anibot (dimensions on page 8).

Label all matching congruent shapes in both nets a letter and dimensions.

Each unique pattern shape has a letter label, name (square or rectangle), dimensions (l x w in inches

or grid squares), and total number of shapes that are that size.

Number of Shapes in Anibot 3-D Forms: This is your Anibot Production/Manufacturing “cut

list”.

Unique Pattern Piece Shape Name Dimensions

(length x width)

Quantity

A

B

C

D

E

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Surface Area = the “skin” of your Anibot

Calculate the surface area of each of your Anibot sculpture polyhedrons. A=lw for rectangle

A=s squared for square. Show your thinking process using counting, drawings, formulas, and equations.

Polyhedron #1 Polyhedron #2

Show your work.

Total surface area for Anibot =

Have a teacher or a peer check your answer,

then enter this total on Anibot Specifications sheet APM page 9.

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Manufacturing of 3-D solids out of 2-D Shapes

Using the measurement of 12 inches wide (width of vinyl provided for polyhedron Anibot sculpture),

estimate what length of vinyl you will need to cut out all of your polyhedron pattern pieces. Remember

that each polyhedron face is cut out individually, but should be placed directly adjacent to other pieces

so there is no waste. Show your thinking process using drawings and calculations.

Surface area of Anibot = (recorded on page 12)

Width of vinyl material required = 12 inches

Estimated length of vinyl material required = inches

Circle the size of vinyl that you estimate you will need:

Vinyl comes in:

12 x 12

12 x 16

12 x 20

12 x 24

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Do Now

Calculate the surface area and volume for a 3 x 3 x 3 inch cube.

If you are constructing that cube out of wood and your board is 6 inches wide, how many

inches does your board need to be in length to be able to construct the cube?

Show your thinking process using counting, drawings, formulas, and/or equations.

Surface area for 3 x 3 x 3 inch cube =

Volume for 3 x 3 x 3 inch cube =

Length of 6-inch wide wooden board needed =

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Volume of Polyhedrons = the “guts” or insides of your Anibot

Using the two flat and folded up nets for your Anibot as a reference, calculate the volume of your two

polyhedrons. Volume formulas:

Polyhedron #1 Polyhedron #2

Height

Width

Depth (Length)

Volume (show your

work)

Total Volume of my two Anibot polyhedrons:

Have a teacher or a peer check your answer,

then enter this total on Anibot Specifications sheet APM page 9.

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Pattern Transfer (onto paper)

• Use grid paper to make your pattern for all of your Anibot’s rectangular prism faces (12 total).

Label each shape with the designated letter from the table on page 11.

• Count squares, dot vertices, and use a ruler to draw all of the faces for the two polyhedra.

Remember to fit pieces together to conserve material.

• Compare your estimate of vinyl material needed to the actual amount of vinyl needed as shown

on your paper layout.

Self check your work.

o I can identify quantities of singular and repeated faces of Anibot polyhedra (table on APM page 11).

o I can make an accurate pattern for all Anibot faces and draw lines with a ruler.

o I can use a formula to calculate correct sum of area of all Anibot faces.

o I can use a formula to calculate correct total Anibot volume.

Why is it important to know the surface area and volume of

something that will be constructed and stuffed?

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Do Now

Look at D.E. May’s Sculpture (inside the Plexiglas box).

What shapes were needed to build this sculpture?

Why would the artist make patterns ahead of time?

What would happen if the artist did not make accurate

measurements for the parts of this sculpture?

Pattern Transfer (onto vinyl)

• Align vinyl over paper pattern layout and paper clip all four sides.

• Carefully trace pattern shapes onto vinyl. USE A STRAIGHTEDGE.

• Carefully cut out vinyl pieces using long strokes to maintain straight edges; cut the marker lines

in half.

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Anibot Polyhedra Construction

• Lay out vinyl polyhedra faces just

like your net.

• Tear tape slightly longer than seam

always covering half of the tape

with each clear shape. Trim for

craftsmanship.

• Once your flattened polyhedron is

attached with tape just like your

net, pinch your adjacent edges

together to make the vinyl net 3-

dimensional. Put half the length of

the tape on one side and then wrap

it around to the other side.

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• Stuff to fill up the form, but still be able to close it (this makes it easier to tape).

Finish taping and secure down any loose areas of tape. Take your time for good craftsmanship!

Self check your work.

o I can align vinyl over pattern, trace lines with a ruler, and make smooth cuts.

o I can join adjacent vinyl edges evenly, flat, and lengthwise on seams and trim.

o I can stuff form and securely apply and fold tape over seams.

How does math help us use craftsmanship in constructing our Anibots?

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Do Now

Check your Anibot polyhedra—are they sturdy? Where do they need reinforcement? Burnish

down tape and find the weakest points. Review your Anibot design and Specification Sheet:

What details and shapes will you need to communicate information about the function and personality

of your Anibot?

• Heavier duty duct tape in clear and colors is added to reinforce and strengthen Anibot

polyhedra. Use scissors to cut tape and carefully attach.

• Connect polyhedra for your Anibot sculpture. Refer to original sketches to determine where

those connection points will be. Cut a three fourth-inch piece of soft and hard hook and loop tape

(Velcro), and apply one piece on either side of the connection.

• Take a look at the materials we have available—tapes, colorful wire and chenille stems (pipe

cleaners).

• Add wire by piercing a tiny hole in vinyl and then poking wire into the inside of the polyhedron.

Foam and eyes can be carefully cut, then backing peeled away to attach.

• Draw your finished Anibot on the Anibot Sculpture Specification Sheet.

Self check your work.

o I can add details securely to distinguish character attributes.

Describe how the specific details that you added

communicate the function and personality of your Anibot.

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ARTS IMPACT FAMILY LETTER

Sixth Grade – Anibots

Dear Family:

Your child has participated in an Art and Math project. We learned how two-dimensional

geometric shapes can be combined to create three-dimensional forms for sculpture (3-D art) by

creating an “Anibot” (part machine, part animal…) soft sculpture made out of math shapes.

• We created a net pattern—flattened 2-D representation of 3-D forms on grid paper

using craftsmanship—careful drawing with rulers.

• We chose two 3-D forms made from nets to help us design and construct an Anibot. Our Anibot

designs, Anibot (part machine and part animal or human), are soft sculpture composed of

two cubes or rectangular prisms.

• We calculated the surface area of our Anibots.

• We calculated the volume of our Anibots.

• We figured out which shapes should be used for patterns to guide cutting out all of the pieces

we needed to build our Anibots. We then used craftsmanship in tracing and measuring our

polyhedron pieces on a soft clear vinyl material and cut them out.

• We carefully taped our vinyl shapes/faces together and stuffed our polyhedrons with

recycled shredded paper, packing peanuts and other clean cast-off materials--then closed

them up.

• We attached our Anibot body parts using Velcro pieces.

• We added fun details—eyes, noses, whiskers, wings, feet and other attachments to give our

Anibots personality and communicate about what their function is.

• We built one more rectangular prism or cube as an upgrade to make our Anibot faster,

smarter, or give it special powers. We then attached it to our Anibot. We added this third

polyhedron upgrade a couple months after completing our Anibots to help us review and

remember what math concepts we learned.

You could build cubes and rectangular prisms by cutting and taping precise geometric two-dimensional

shapes made of paper or cardboard. They could become machine, animal, or abstract sculptures.

Enduring Understanding

Geometric shapes drawn and measured mathematically in two-dimensions

can be attached and filled to create three-dimensional forms.

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Math Artistic Pathways

A partnership between Puget Sound Educational Service District and Tacoma School District

ABOUT THE RESEARCH GRANT

Arts Impact: Math Artistic Pathways (MAP) is a joint project of Puget Sound Educational Service District (PSESD) and Tacoma

Public Schools (TPS) in the Puget Sound Region of Washington State. Arts Impact (AI) is a successful two-year teacher

training model that incorporates Artist Mentors to prepare classroom teachers to teach standards-based arts and shared

academic concepts through arts-infused lessons.

How the Arts help students

• Active learning reaches students with different learning styles

• The arts teach students skills needed in the 21st century to learn, live and work: innovation, collaboration, creativity,

critical thinking

What students learn through the Arts

• Proportion

• Creating 3-dimensional objects from a 2-dimensional drawing

• Scale and enlargement

Other project goals

• Improve student engagement in math

• Improve student achievement in math

• Increase student opportunities to participate in the arts

Participating Schools

Treatment Group

• First Creek Middle School; Brad Brown, Principal

• Jason Lee Middle School; Jon Kellett, Principal

Control Group

• Gray Middle School; Kevin Ikeda, Principal

Arts Impact

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