

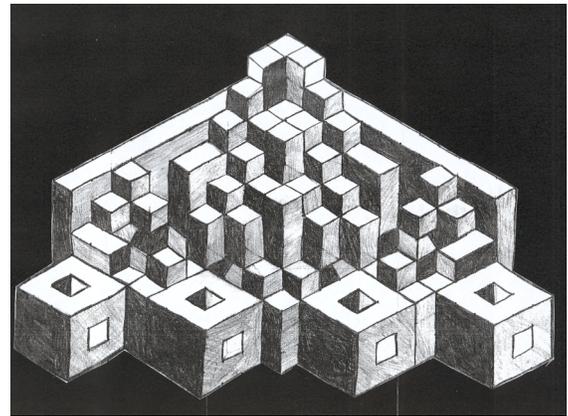


Grids and Values in Art and Math

GRADE: 6 and up

TIME: 2 sessions

Developed by Linda Pfisterer, Art Specialist



LESSON DESCRIPTION:

Students are introduced to the illusionary art of M. C. Escher. They use hard and soft lead pencils to shade a five-step value scale and then use contrasting values and a dot grid to make isometric drawings of cubes. Grids are used in the second session to make a cooperative enlargement of an Escher print.

KIT INCLUDES:

- lesson plan
- book, M.C. Escher
- transparencies, 10 **Day 1**
- transparencies, 2 **Day 2**
- Sets:
 - grids, 28
 - master of Escher print, *Morano, Calabria*, 15
 - individual pieces of the print, with/grid, 28
- paper line grid, 32"x42"
- vocabulary board

MATERIALS:

- pencils, use a soft lead like 6B, and hard lead, 2H. The 2H is the normal everyday pencil.
- Xerox value scale
- isometric dot grid
- erasers
- scissors
- glue sticks
- white sulfite paper, 8"x6"
- paper clips
- white butcher paper 36"x46"
- 1 fine point erasable pen, ie. Vis-à-Vis pen

VOCABULARY:

isometric cube drawing
cubes
value
contrast
shading
grid
parallel and vertical lines
grid enlargement

ART ELEMENTS:

- Line
- Shape/Form
- Color
- Value
- Texture
- Space/Perspective

ART PRINCIPLES:

- Pattern
- Rhythm/movement
- Proportion/Scale
- Balance
- Unity
- Emphasis

CONTENT CONNECTIONS:

math: grids, isometric cube design, enlargement using grids.

THEMES: Drawing in perspective and how objects appear 3D with shading.

OBJECTIVES AND ASSESSMENT CRITERIA:

1. Students will make a value scale with pencil shading and apply this information to the isometric cube drawings. The same value shading will be used in the class cooperative enlargement of an M. C. Escher print.
2. Students will use an isometric dot grid to draw a cube design with three shaded values.
3. Students will use estimation with a line grid to enlarge and shade a small part of a M.C. Escher print.
4. Students will collaborate with other students so the objects connect with the adjacent piece of the grid.

PREPARE:

Day 1: Xerox dot grid and value scale sheets in back of lesson. Cut 6"x9" black paper. Sharpen pencils.

Day 2: Cut white sulfite drawing paper, 6"x8". Use white roll paper 36"x 46". Draw a grid frame 32"h x 42"w on this paper, leaving a 2" border. The inside grid should be 8 across and 4 down using an 6"x8" vertical rectangle for the grid. This might be a good assignment for two students. Number off the grid rectangles 1-28 so it is easy to glue on the finished drawing.

ENGAGE AND EXPLORE:

Day 1. Use transparencies to teach and demonstrate.

1. Place *Hand with Reflecting Sphere*, a 1935 lithograph by M.C. Escher on the overhead and read the quote: “My goal is to awaken wonder in the minds of my viewers.” To really notice things in a piece of art you must look closely. M. C. Escher wanted you to wonder as you look at his art. What “I wonder” questions could you ask about this? (In the process of the questioning, students will notice it is a self-portrait, the left and right hand show reflection, the different position of the arms, and many other things.) Escher used a grid to plan the placement of objects in this lithograph print.

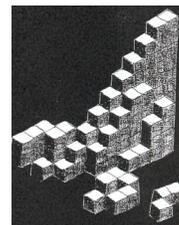
2. Place *Relativity* on the overhead and read Escher’s quote, “To portray something that does not exist, one has to present it in a perfectly ordinary, everyday way.” Escher used a triangular grid to design this scene. Our eye wants to look at the “real” parts and ignore the “unreal.” People usually stand vertically because of gravity. Find the people that look real. Then give the picture a half turn to the right and ask the students to find the new set of vertical people that look real. A turn to the left will again create a new group of people that look real. What happens if you turn it upside down? (Let students speculate as to why nothing is right from this position.) He used a triangle grid for the stairs. It has three sides. Could that be the reason why we cannot find a fourth side of upright people?

3. Place *Cycle* on the overhead and **cover the bottom 2/3s** of it with a paper. Which parts of the lithograph seem real? What is not real looking? (The floor design looks 3D. Get the students to tell you the floor looks 3D because of shading.) A shaded cube has 3 different values, light medium and dark. Without the shading it would look like a flat line design. Pull the paper down so only 1/3 is covered. What is changing now? Finally let students see the entire print to see how Escher used the cube shape to slowly change into the man shape, and the man evolves into the cube design. Escher used a grid to make this design.

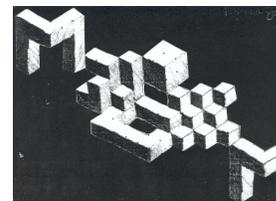
4. This is the same print with the tessellation shapes of the man. You can see the grid lines he used to draw the man. We will use an isometric grid to draw cubes that look 3D.

5. An artist named Vasarely created this optical illusion of cubes on a flat surface. Notice the three values on each cube give it the 3D effect. Turn this overhead around to show the view from different sides. The cubes will appear to move in and out creating an illusion. (Do this more than once so the students can all see the illusion.)

6. These rectangular prisms are used in a graph to give information. People like to get information from objects rather than words and numbers. Which year was there the most? Which year was there the least? Visual objects make it easy to find information.



7. Quilters also like to use the isometric grid to create their designs. Notice how the three different values make the cubes look 3D.



8. Artists like to use shading to create a three-dimensional drawing. When you place a light value next to a dark value you create contrast. First we will make a value scale and then shade cubes such as these students have done. These drawings have been cut out and glued on black paper for high contrast.

9. **Value scale:** Shade in the value scale beginning at the darkest step on the bottom. Gradually use less pressure to shade in the four rectangles, leaving the top one white. At the bottom of the page fill in two contrasting values. (Students might practice on a scrap of paper first to become familiar with how much pressure it takes to make a light and dark mark.)

First practice with different pressure to make light and dark marks.



Value Scale

Value is used in art to describe the lightness or darkness of a form, color, shape or line.

Shading is a gradual change from light to dark values.

1. Shade in the boxes to make a value scale going from light to dark.



Contrast happens when there is a dark value next to a light value.

2. Fill in two contrasting values.



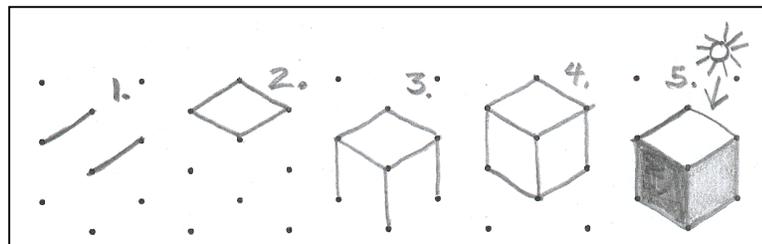
CREATE:

Students should now pick up supplies: pencils, eraser, value scale paper, grid paper, glue stick and 6x9" black paper. They should shade the steps in the value scale and then glue it to the black paper.

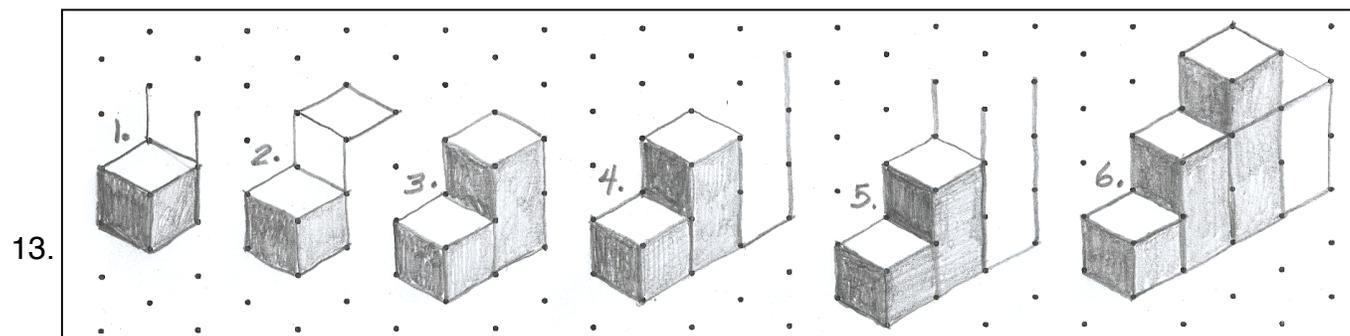
ISOMETRIC CUBE DRAWING: Use this lesson plan as a guide to demonstrate how to draw each concept.

10.-15. We will use this isometric dot grid as a guide to draw cubes with a light source and three different values: light, medium and dark. (This is the last transparency for day 1. Use the teacher guide and the lesson plan to guide your demonstration.)

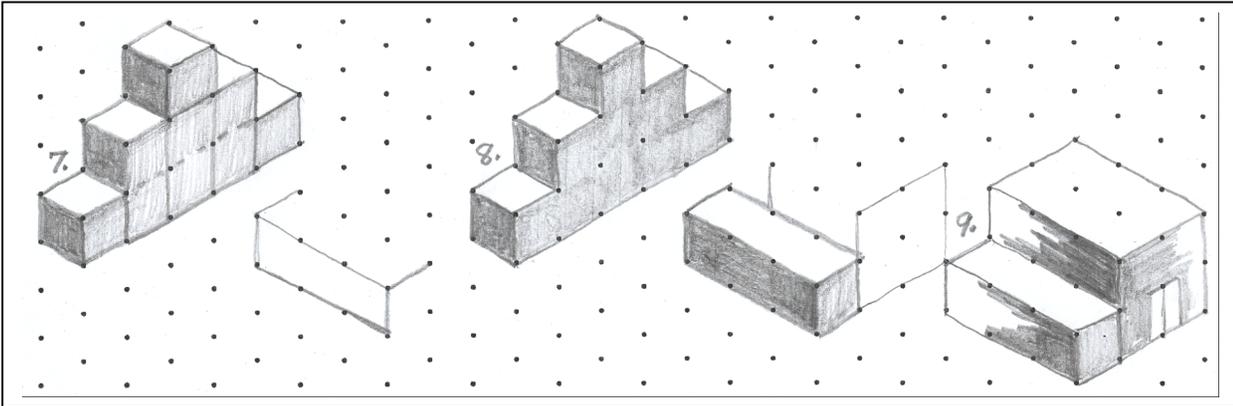
11. On the isometric dot grid, the word "bottom" is there to keep your paper in the correct position. Use parallel lines to demonstrate the steps in drawing the cube. It is important to designate the light source direction so each side of the cubes or shapes corresponds to the same light source direction. The top of the cube should be white when the light comes from above. Next decide which side will be the dark side and medium value side.



12. Demonstrate how to draw stairs with examples (#1-3). Another way to begin the next flight of stairs (#4-6.) is by drawing one space over at the base and go up as many flights (spaces) as you need to be one step higher. Give students a chance to get this done and encourage those done early to draw 4 or 5 steps high. Keep the light source coming from the same direction as you shade each new form.

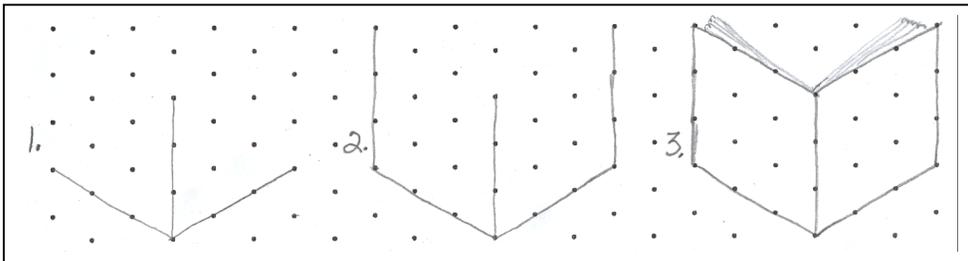


The most helpful clue to draw the descending stairs is to follow the parallel line across from the previous step that is the same height. There will be only two value sides showing on the cube as the stairs descend.

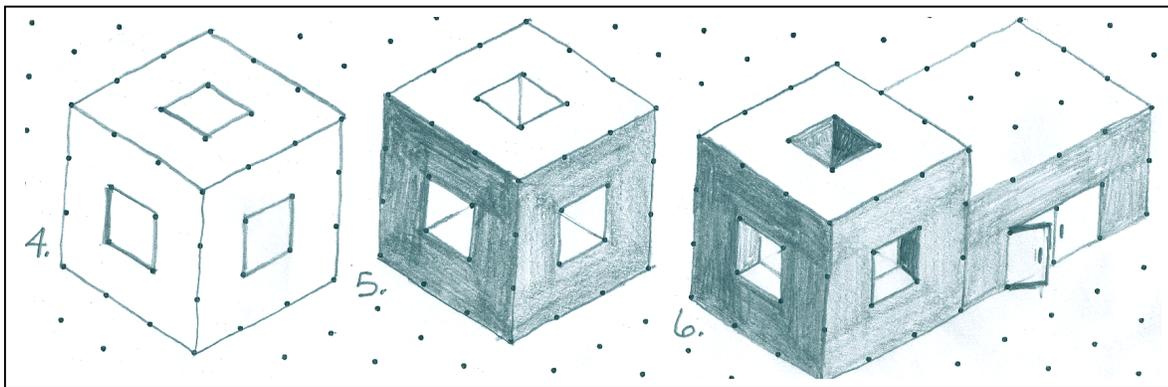


14. Steps #7-9. show a couple rectangular prisms coming out in the other directions, one behind the other. A door has been added, with the top of the door parallel to the bottom.

15. The last demonstration is a large cube three spaces long and three spaces wide. Step #1. is important because you begin with the vertical corner closest to you. The two base sides of the cube form an arrow. This vertical corner line with the arrow shape is important to remember later when you cut out the shapes to glue on the black paper. "Vertical lines always remain vertical and perpendicular to the bottom of the page." This is important to remember because students always want to slant the corners, and the sides of windows and doors.

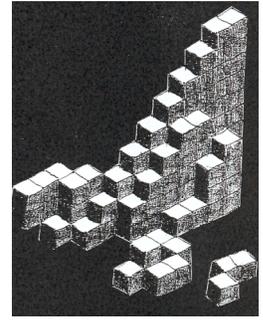


Steps #2-3. show the progression of the cube, allowing students to see how step 3 can be used for a book.



In steps #4-5 you complete the cube, add the windows and hole in the roof, and use the light source to shade the sides. In steps #5-6 the window sides have been added with shading to correspond with the light source. In step 6 an additional building with an open door gives added interest. All of the forms are from a bird's eye point of view.

Students should work on their own now as they creatively let their cubes grow into many interesting combinations. Remind them to shade in all the cube sides according to the light source direction as they draw each form. It gets confusing if too many shapes are drawn before the shading begins. **A helpful hint is to shade as you draw each form.**



Cut out the best parts of the cube drawings and arrange them on the black paper. Be sure to have the placement of the cubes so the vertical corners remain vertical or perpendicular to the bottom of the black paper.

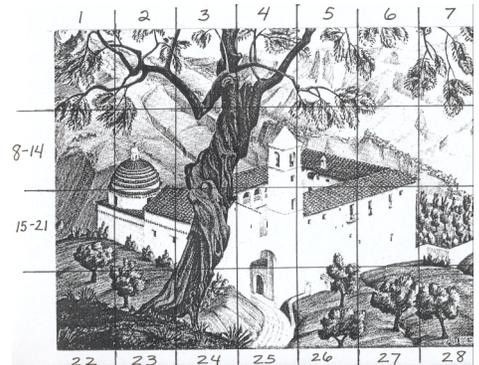
ENGAGE AND EXPLORE:

Day 2. Use transparencies 1. and 2. to teach and demonstrate.

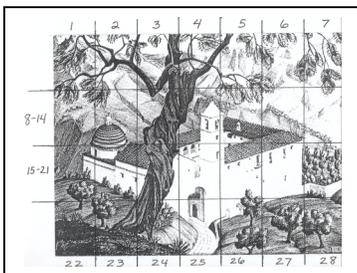
1. Many artists use the vertical and horizontal grids to plan a very large painting or sculpture. They draw the grid lines over their sketchbook drawings and carefully draw what is in each rectangle until they have transferred the entire small sketch to the size enlargement they need to complete their art. This lesson uses the Escher print, *Morano, Calabria*. It shows a twisted tree. (The teacher may choose anything they want to enlarge, draw the grid, Xerox your master, and then cut up the pieces into rectangles and glue them to a paper with placement numbers. In choosing something to enlarge, look for something with at least 3 values, things of interest in almost all the rectangles, and different textures.)

(Show the Escher print you intend to have students enlarge)

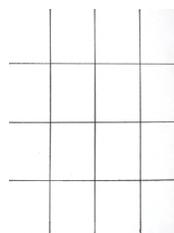
The lesson today will be about enlarging one of M. C. Escher's prints using a different grid. The vertical and horizontal lines of this grid separate the print into small rectangles. Each student will draw what they see in one rectangle. This will be a collaborative effort from the entire class. If you do not have 28 students in the class, some students may choose to take two rectangles to enlarge. If careful estimation and shading is correct, the grid pieces will fit together to make one large drawing of Escher's print. The shading skills you learned in the last lesson will be used as you draw the values of light, medium and dark to accurately portray each part of the grid.



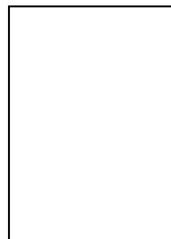
Each student will use these materials: drawing pencils – hard and soft,



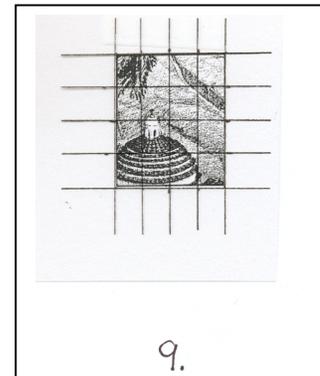
Master copy of Escher print.



Grid for enlargement



Drawing paper, 8"x6".



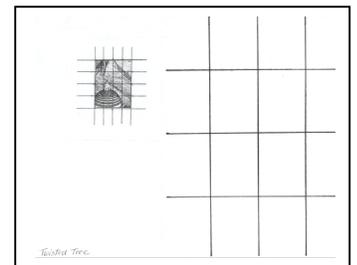
Individual piece of the print with the plastic grid over the print.

CREATE:

Set out supplies: 6"x8" white drawing paper, pencils, erasers, grids, paper clips, and the Escher print master.

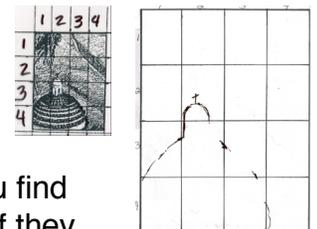
Students can pick up their supplies while the teacher hands out the rectangle and grid piece that each student will enlarge. Some rectangles are more difficult, so give those to the more confident artists and the students that easily follow directions. Some students may draw more than one enlargement since each print is divided up into 28 parts. Do not hand out the second rectangle until the first one is completed. When students have their supplies they can check to see where their grid rectangle is located in the print master.

Show students how to lay out their white drawing paper on top of the laminated grid (paper clipped) so they can see through to know where the grid lines lie. Place this near the small grid rectangle they plan to enlarge.



2. Use the overhead with the flip-up grid on the print. Demonstrate to the students how to begin drawing the important lines with the hard lead pencil. (The soft lead pencils do not erase easily. It is fine if the entire drawing is done with the #2 lead in most common pencils).

To lay out or draw the important lines of the objects in the rectangle, look for the large and important shapes or lines. Look to see where they touch on the grid lines. Count the quadrants vertically and horizontally to find the same rectangle in the small grid print to enlarge the same shapes and lines on the drawing paper grid. With a fine tip wet erase marker, place small marks as you find where the line moves within the grid lines. After you check your marks to see if they look correct, you can fill in the line to establish the shape. It works well to begin by looking for lines or shapes that touch the outside edge of the grid rectangle. Demonstrating this is important.



Give students about 20 minutes to work on placing the lines in the correct spaces. Then let some students who have connecting objects get up and match their drawings with the student with the adjacent connecting shapes. This should be done before shading begins.

Shading should begin when students have blocked in the main lines. It is easiest to begin with the darkest values and then shade the gray areas. Large gray areas can be filled in quickly by laying the pencil almost on its side to gently shade in large areas with a smooth look instead of many hard pencil lines.

As students finish they can bring their pieces to the large grid paper taped to the board and find the number that matches the rectangle they enlarged. They may glue it down. It would be fine for any of them to make value or line corrections to make the drawings a bit more accurate as they fit together.

If a couple students finish early they might begin gluing on the black border made from 3"x18" black construction paper. At the right is the finished collaborative collage.



CLOSE:

Follow-up: Make the isometric grid paper available to the students so they can continue developing more ideas in their drawings. Some of the very best designs are developed at a later date giving students a chance to digest what they learned so creativity can grow. Use this lesson prior to teaching perspective as it is a good building block. After the enlargement lesson, have students bring in their favorite cartoon character to enlarge using the grid method.

ASSESSMENT:

Teacher administered assessment tool

DN	OK	UP	Lesson_____ Teacher_____
			Grade_____ Date_____ Number of Students_____
			Using the thumbs up, ok, and down technique, ask your students the following questions and record their answers. (K=knowledge, S=skills, C= creativity, A=attitude, E=engagement)
			1. Did you shade a five value scale with pencil and use them in your drawing?(S)
			2. Can you now use the isometric cube concept to create buildings? (S,K,C,E)
			3. Did you use one light source with three values in your isometric cubes? (K,S,E)
			4. Did you estimate with a line grid to enlarge your piece of the print? (K,S,A,E)
			5. Did your enlargement drawing connect correctly with line and value? (K,S,E,A)
			6. Did you add an imaginative touch to your isometric cube drawing? (C)
			7. Did you actively listen and follow directions? (A)
			8. Did you do your best during this lesson? (E)

Teacher self-critique

8. My teaching of this lesson:

1	2	3	4	5	6	7	8	9	10
needed improvement							was highly successful		

9. What would I do differently next time?

ALIGNMENT:

Alignment of Standards:

Art: A1,2,3,4,5; C3,4,5; D6
English C, E
M2.2,M5.2.2, M5.2.7

Alignment of GLE's:

Reading: R2.6,
Math: M2.2, M5.2.2, M5 Math:

CREDITS:

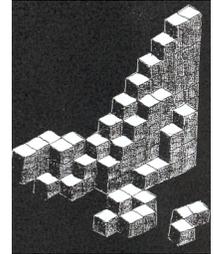
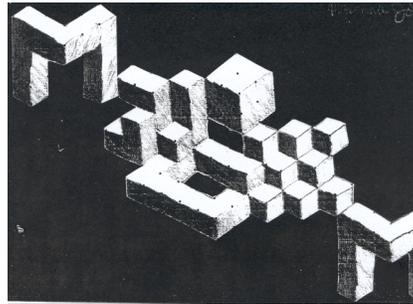
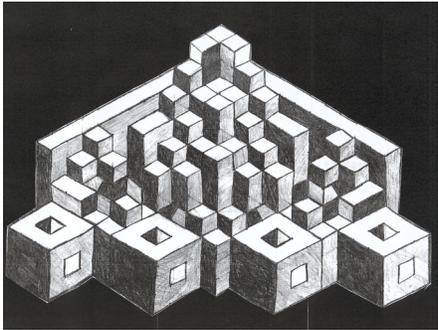
Project ARTiculate is supported by the Fairbanks North Star Borough School District, the Alaska Arts Education Consortium, and a U.S. Department of Education Development and Dissemination Grant



Grids and Values in Art and Math

The art of M. C. Escher was studied as we looked at his Illusionary art and how he used grids to make it happen. We shaded a value scale going from white to black with all the grays in between. A dot grid was used to draw isometric drawings of cubes with a pencil as our tool.

The second day of this lesson we used a rectangular line grid to make a cooperative enlargement of an Escher print.

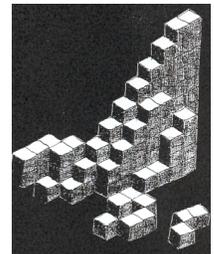
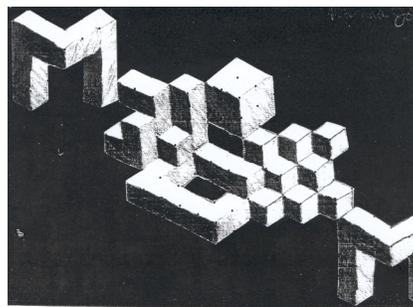
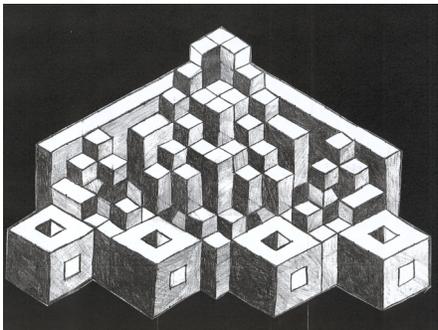


The grids we learned to use will come in handy in the future.

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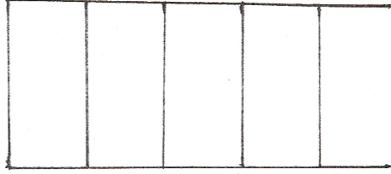
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Value Scale

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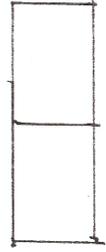
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1. Shade in the boxes to make a value scale going from light to dark.



Contrast happens when there is a dark value next to a light value.

2. Fill in two contrasting values.

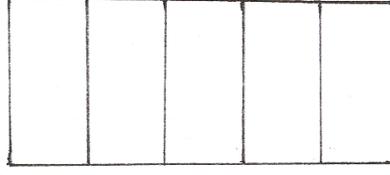


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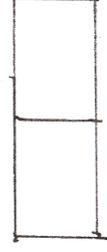
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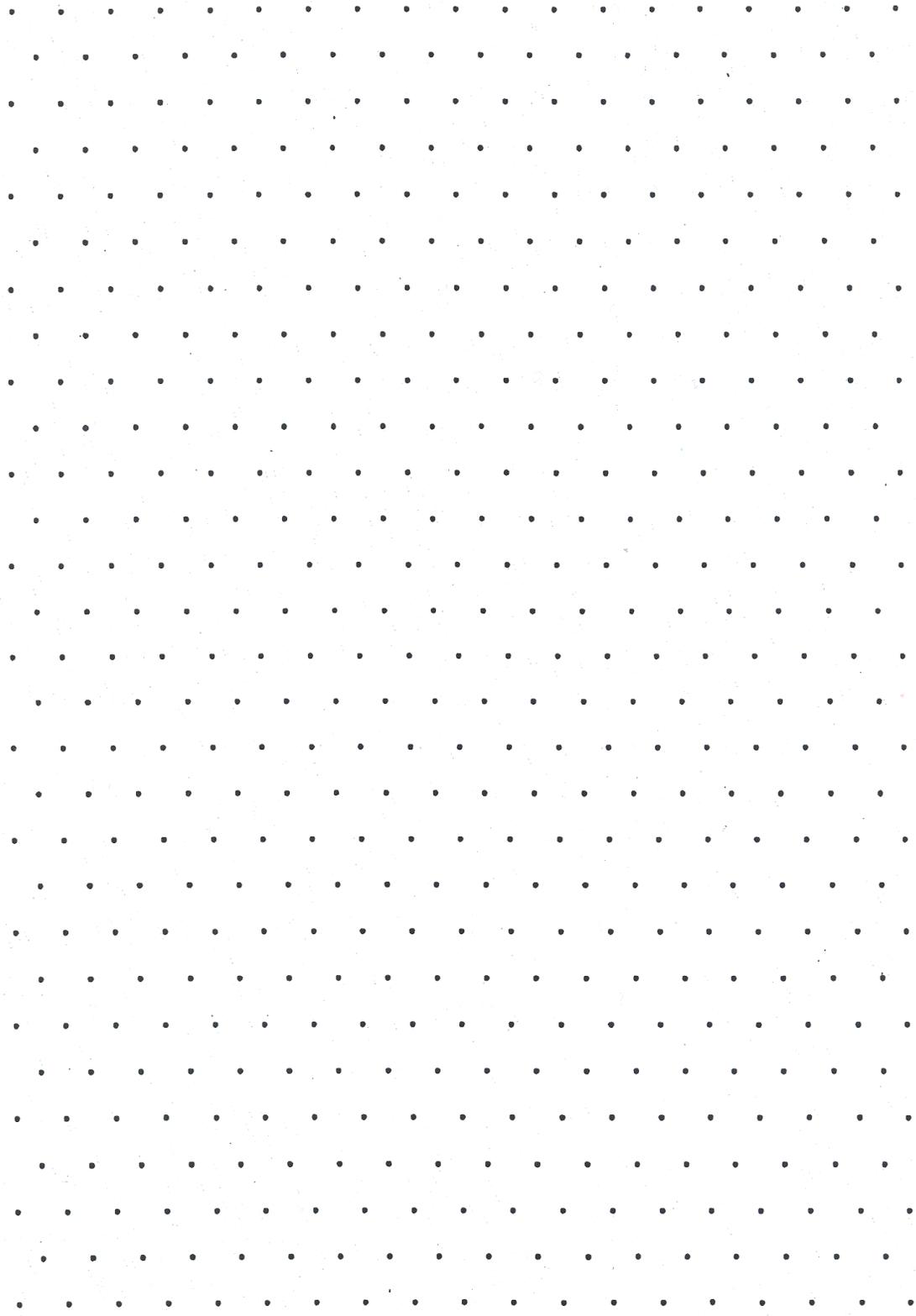
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Isometric Dot Grid

Bottom