816/Paint™

Education

BAUDVILLE™

High Performance Software

816/Paint™

Education

Teachers Guide by

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For Jodi and Danny — the best.

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Introduction

Art and Computers

When we talk about art, we're talking about a range of diverse expressions and activities, all of which share one major attribute — creativity.

An artist, after all, might be a composer or musician, choreographer or dancer, a poet or playwright, an actor, a filmmaker, a puppeteer, a designer of furniture or jewelry, an architect or a painter — the list goes on.

For many artists, finding the most appropriate media for personal expression requires a long period of searching. Today, the choice has been expanded to include computers. While children are eager to experiment with and meet the challenges of this new tool, many teachers are intimidated by this electronic "gadget." We hope this guide will allay your fears and help you introduce your students to a powerful graphics tool in which art and science blend together.

A Brief History

The first computer graphics, in the 50's, were done on printers; with X's, O's, and other characters delimiting portraits of characters such as the ever popular Snoopy — much like "typewriter art." In the 1960's video displays became common and graphics migrated from the printer to the screen (the computer CRT). In the 70's color arrived on the scene and, most importantly, microprocessors and personal computers. By the end of the decade, any individual could own a personal computer, an idea that was unthinkable only ten years before.

Curiously, there have been no similar milestones in the 80's. Instead, the 80's are marked by a dramatic increase in computer graphics capabilities accompanied by a dramatic decrease in cost of computer systems. With such a brief history, it's not surprising that there are no hard-and-fast concepts about what computer graphics are or where they fit into the creative process.

Computer Graphics

A computer graphic as seen on the video display can be the end in itself, in which case the artist's work must be viewed on a computer. Or, the image on the screen can be photographed and the resulting slides projected or printed using traditional photographic media. Computer graphics can be printed on a variety of materials including paper and acetate, or they can become part of a mixed-media creation. Fine artists are using computers to draw and paint, while craftspeople are using it to aid in the creation of just about anything you can think of, from weaving to stained glass.

Whether art or craft, there are some commonalities. In order to create on a computer, you must have a program. Without programs, computers can do nothing. In the early days of computer graphics, artists had to be programmers or work very closely with one. Today, specialized programs to create art are available for purchase. Of these programs, probably the most common is a paint program, such as 816/Paint. This program allows you to work on the computer much as you would when using traditional media although there are some differences that may be frustrating at first.

Using a paint program, for example, the artist draws using a graphics tablet, mouse, or other drawing implement (the input device in computer terminology). These drawing tools, which don't have the look or feel of traditional drawing implements such as pencils and brushes, may take some getting used to. Also, unlike traditional media, the computer artist is looking up at the video screen, while his or her hand is guiding an input device on the desk or table.

Other differences between computer graphics and traditional art media fall into two categories: the characteristics of the computer system being used and the characteristics of computer graphics itself.

Each computer graphic system has unique characteristics. Graphics created on an Apple® II, for example, look very different from those created on an IBM PC. Even within a single computer system there may be several types of available graphics. The Apple IIGS® computer has six different graphics modes, each with different capabilities and "looks."

The "look" of a computer graphic may vary on different computer systems (and different modes on the same system) because of resolution, color and luminance.

Resolution refers to the fineness of the image. The higher the resolution, the finer the image. Apple graphics (and indeed most modern computer graphics) are composed of dots, properly called pixels or picture elements. Each graphic mode has only so many pixels. Apple computers, for example, vary from low resolution (1,920 pixels), to high resolution (53,760 pixels), to double high resolution (107,520 pixels), to super high resolution (64,000 pixels). Further, the location of each pixel is strictly confined. One way to conceptualize this is to think of the screen as a piece of grid paper. You cannot place a pixel between the lines of the grid, only on the line intersections. This type of display is termed a raster graphic. (The other type of computer graphics, vector graphics, deals with lines rather than dots. Vector graphics are not commonly found on micro-

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computers although they were very important in the early history of computer graphics.) The creation of art with dots rather than lines lends a distinctive, granular look to most computer graphics.

Color capabilities vary as much as resolution. Even on the most sophisticated computer graphics systems, the number of available colors is limited. The most colorful Apple II graphics mode provides 4,096 colors but only 16 of these colors can be used on-screen at one time. You can achieve the illusion of more color by taking advantage of your paint program's ability to "mix" colors, a technique referred to as dithering, but even then the color choices pall when compared to traditional paint media where there are virtually unlimited colors available.

Luminance is another distinctive characteristic of computer graphics, at least as they are displayed on the CRT. Pixels are points of light. Unlike traditional media where the light is reflected off the art work and to our eyes, computer graphics on the CRT are themselves light sources. The computer graphic is luminescent. Even the subtle shadings possible on the Apple IIGS are brighter than any you would be able to coax out of paint.

While resolution, color and luminance affect the "look" of computer graphics, and may offer some restrictions, the electronic nature of the computer graphic offers powerful new capabilities. The pixels on the screen are but an interpretation of inner circuitry. Because of this, computer graphics are infinitely malleable. All, or any part of your image, can be easily eliminated, copied, stretched, reduced, and/or transformed into an entirely new image. Further, you can duplicate the electronic graphic as many times as you want and there will be no image degradation; the traditional concept of original versus copy or print becomes meaningless.

Computer graphics are an exciting new medium for you to explore with your students.

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How to Use This Guide

The aim of this guide is to help you use 816/Paint to introduce students to a powerful graphics tool—the computer.

We recommend its use for grades 6 through 10, although a number of variables make it difficult to exactly specify a grade level. Our experience has been that expectations for children vary from city to city and from school system to school system. Some students begin their art education in the early grades while some do not study art until the later grades. Some students work with computers in elementary school while others aren't introduced to computers until high school. It's possible, therefore, that fifth or sixth graders in one school might be comfortable with the same concepts and activities that tenth and eleventh graders in another school find challenging.

It's up to you, the teacher, to determine what your students are ready to deal with. The activities provided are meant to supplement, not replace, the standard art curriculum. They can be used as they are presented, but it is our hope that you will use them as a springboard to create art experiences tailored to the needs of your students.

These activities will help your students to:

- Grow in their ability to express ideas and emotions in a visual language;
- Understand the value of art as a creative and communicative activity;
- Learn to think critically as they make art-related decisions;
- Develop aesthetic critera that will guide their personal choices;
- Become increasingly perceptive so that visual experiences will heighten their learning and enrich their lives.

The activities may be interpreted in various ways but note that they are presented in order of the challenge they offer. Simple activities come first.

Following each activity, an Additional Activities section is designed to reinforce the skills acquired in that activity. In the Appendix, there are further suggestions for extending the art experience. We've chosen a directive approach to teaching as we wanted to be sure your students would learn to use all of 816/Paint's tools and options. We hope you will provide additional computer time in which your students can freely experiment with these tools.

If your school has a mixture of Apple II models, you should work in the highest resolution allowed (II GS users should use super hi-res 320). Using 816/Paint's file translator utility, students who worked on Apple IIe or IIc computers can translate their standard hi-res graphics to super hi-res.

Although 816/Paint allows you to create full page images (8.5" x 11"), we suggest students work with screen-size images unless otherwise indicated.

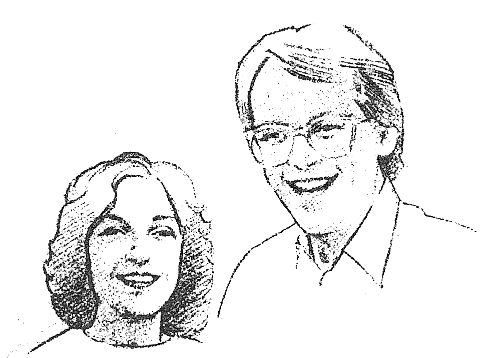
Hi-res users will find that colors don't appear in every position on the screen. To avoid this problem, have these students use brushes that are at least two pixels wide. (For more information about hi-res color problems, see "Computer Essentials" in the Appendix.)

SUPER

Some of the exercises in this book will work only with the super hi-res modes as more features were built into the super hi-res version of 816/Paint. These are noted with the icon shown at left.

Before beginning these activities, be sure to read the 816/Paint Instruction Manual and experiment with the program yourself. The computer will become another creative tool for your students to explore along with the more traditional art media. As you use these activities, keep in mind the unique characteristics of computer graphics. At the same time, relax. You don't have to become a computer graphics expert — or a computer expert — to guide your students in their exploration; in fact, you can learn with them, and indeed, learn from them.

Your role, as always, is that of catalytic agent.



Teach your students to see, to think, to evaluate, to solve problems, to communicate and to gain a sense of personal worth Develop in them a sensitivity to and appreciation of art.

Encourage originality, interpretation and growth. Provide opportunities for creative expression by presenting the material and the stimuli.

Then, stand by and encourage confidence.

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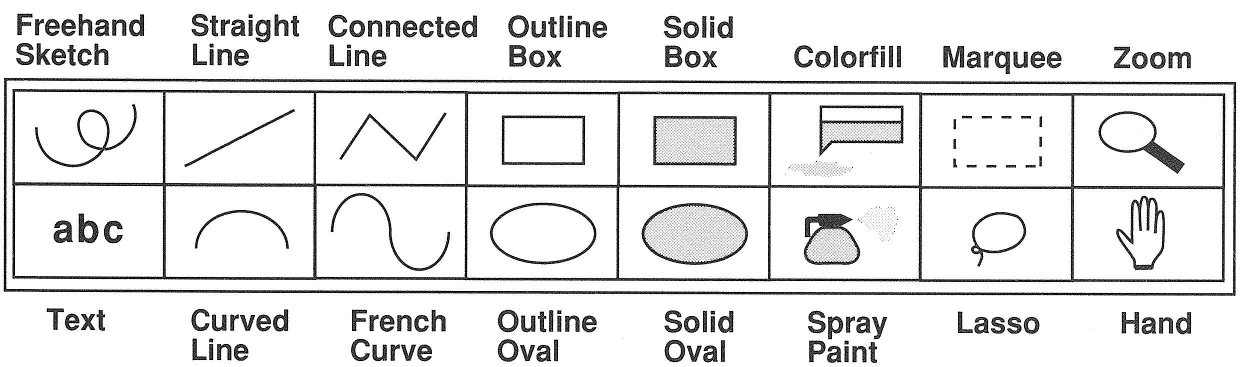
The Activities

The 816/Paint Drawing Toolbox



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Using 816/Paint

Aims:

To learn the basics of using 816/Paint.
To become comfortable manipulating the mouse.

Motivation:

Show students a variety of art tools including pencil, pen and ink, paint, charcoal, pastels and so on. Use each of the tools to portray a simple object, such as a bouquet of flowers.

Does each medium impart a special "look?"
Which medium would you choose to draw a detailed illustration of a bicycle?
Which medium might lend itself well to convey the warmth of a beautiful sunset?

Discussion:

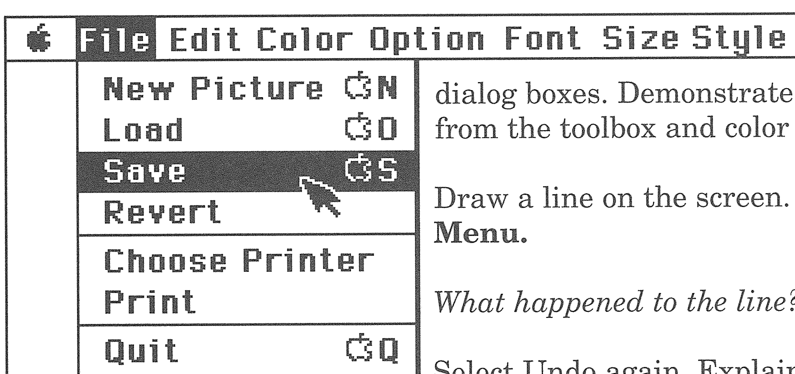
Artists have a wide range of tools with which to create their artwork. The computer is one of the newest artist's tools. Each tool lends a characteristic "look" to the artwork. Computers are no exception.

Before we can use the computer to create art, we must first learn to operate it.

Activity:

Demonstrate how to start up the computer and enter 816/Paint. (See page 4 of the 816/Paint Instruction Manual). Warn students that computer disks are fragile. The 816/Paint program disk and their data disks should be handled with care.

Demonstrate how to use your input devices: keyboard, mouse, joystick, and/or digitizing tablet. The three essential activities that must be mastered here are pointing, clicking, and dragging. (See page 3 of the 816/Paint Instruction Manual.)



Demonstrate how to use the pull-down menus and dialog boxes. Demonstrate how to make a selection from the toolbox and color palette.

Draw a line on the screen. Select **Undo** from the **Edit Menu.**

What happened to the line?

Select Undo again. Explain that the Undo Command will undo the last action performed. Selecting Undo a second time will redo what was undone. Show that Undo can also be accessed by pressing the [Esc] key.

Demonstrate how to save a screen onto a data disk. Encourage students to give their files short and distinctive names such as "Gestures.1" Explain that a file name may contain any combination of alphabetic or numeric characters but it must begin with a letter, and it cannot have spaces between the characters.

If your computer has only one disk drive, be sure students know how to switch disks so that the screen is saved onto their disks - not the program disk.

Stress the importance of saving graphics often. If someone trips over the computer's power cord or accidently turns the machine off, the graphic will be lost. Tell students that as soon as they like what they're drawing it is time to stop and save it.

If students save their graphics to a disk that already has a graphic with the same name, the new graphic will replace the old one. For that reason, suggest they save in stages as they work, and each time they save they can append a number to the name. For example, during one session at the computer, a student may save "Tree.1", "Tree.2", and "Tree.3". When the image is complete, the older versions can be deleted from the disk using the File Utilities on the 816/Paint disk.

Demonstrate how to load a saved image from disk. There are several super hi-res images stored in the "Pictures" folder on the 816/Paint program disk. If you're using hi-res or double hi-res, create a simple image in advance, so that students can practice with it. Have the students practice loading one of the images and have them save it to their disks.

Allow students to freely experiment with the program. Emphasis should be on using the **Freehand Sketch Tool**.

Before the end of the lesson, be sure each student has successfully loaded and saved an image.

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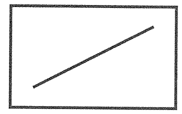
Design with Lines 1



Aims:

To learn to use the Straight Line Tool.
To create an interesting variety of straight lines.

Motivation:

Discuss and demonstrate on the board, parallel, horizontal, vertical and diagonal lines.

Have two or three students come to the blackboard and try to draw five evenly spaced, parallel straight lines.

Why is it difficult to draw perfectly straight lines?
Why aren't the lines evenly spaced?
What tools would help you solve this problem?

Have students try to draw five evenly spaced, parallel straight lines with the Freehand Tool in 816/ Paint.

Is it just as difficult to draw perfectly straight lines on the computer?
What additional tools would you need to solve this problem?

Discussion:

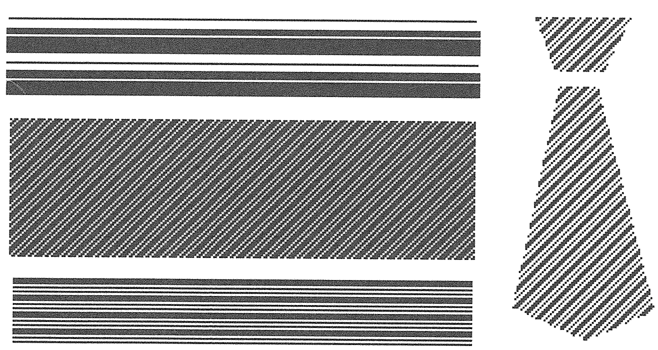
Talk about artists' tools such as rulers and T-Squares. While a computer cannot make an artist creative, it can make the creative process easier.

Activity:

Demonstrate the use of the **Straight Line Tool**.

Demonstrate how the lines can be made thick or thin by selecting different paintbrushes.

Demonstrate using the **Grid Option** for even spacing.



How can we arrange black, vertical, oblique and horizontal, parallel lines in an interesting way?

Have students make an arrangement of only parallel lines. Encourage them to make their arrangements as interesting as possible by varying the grouping, spacing and width of the lines.

Additional Activities:

Have students try the same project using fine-line, felt-tip pens, paper and rulers. As they work, point out that making lines of varying thicknesses is difficult with traditional tools. To accomplish this we'd need lots of pens with different sized points. Indicate how much easier it is when objects "snap" to a grid as compared to manipulating a ruler.

Students can cut their designs into the shape of a tie, shirt, shorts and so on to see what kind of textile designs they would make.

Encourage students to experiment further with straight lines. They might create arrangements of lines that interpret themes such as "The Battle of The Lines", "The Lines Are Going in Circles", "The King of Lines" and so on.

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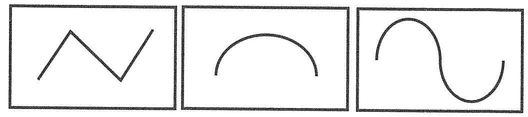
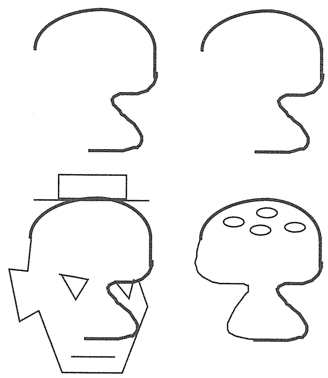
Design with Lines 2



Aims: To learn how to use the Connected Lines, Curve, and French Curve Tools.
To create pictures from lines.

Motivation: Draw a few curved lines on the blackboard.



Who can add straight lines that will turn this line into a recognizable object?

Have one student come to the blackboard and, adding only straight lines, turn your line into a simple picture.

Who can add curved lines that will turn these lines into a a recognizable object?

Have another student come to the blackboard and, adding only curved lines, turn your line into a picture.

Discussion: Artists use all kinds of lines in their pictures. Sometimes they need to use straight lines and sometimes they need to use curved lines.

Show students some of the traditional tools artists use to help them draw lines. Include a T-square, compass, ruler, triangle and French curve.

816/Paint gives us comparable tools for drawing on the computer.

Activity: Show students how they can create different types of lines using the **Connected Lines Tool, Curve Tool,** and **French Curve Tool** in 816/Paint.

Explain what a **rubberband line** is. Demonstrate how the Connected Lines Tool creates rubberband lines until you either double click to draw the last line segment, or click outside the picture window to unhook the rubberband line.

Demonstrate the difference between the Curve Tool, which draws a curve between two points, and the French Curve Tool, which draws a curve through multiple points.

Distribute Handout #1.

Which tool would be best to use to create the lines in each of the boxes?

When students have given the correct answers, have them use the line tools in 816/Paint to recreate the handout on the computer screen. Have them use the line tools to turn each "scribble", in each box, into a recognizable object or figure.

Additional Activities:

Have students create a new set of boxes with new scribbles. Then let them switch computers and, using the line tools, turn each other's scribbles into recognizable images.

Using black crayons or felt-tip pens, allow students to create picture names. Have them print their names across a sheet of paper. Use uppercase large block letters. Then, using another color crayon or marker, add lines that will turn each letter into a recognizable object or figure.

Advanced students might use a theme, such as birds, animals or toys.

The above activity could be extended into a stitchery project. Students can transfer their picture names, or just their initials, to a piece of fabric and embroider them.

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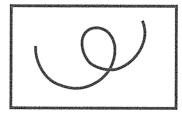
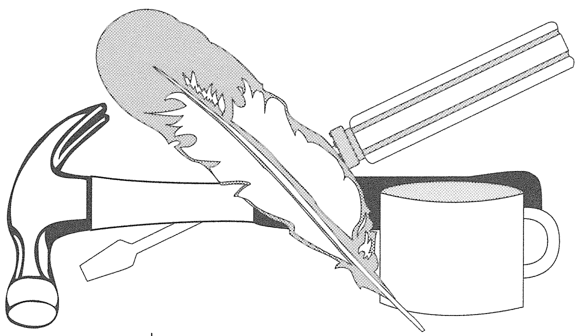
Looking and Remembering



Aims: To learn to use the Freehand Sketch Tool.
To develop observation skills.

Motivation: Hold up a tray of several simple objects such as a jar, a ruler, a box and so on. For more advanced students use ten or more objects. Let the students look at them for several minutes.



Remove the tray from view and have the students list all the objects they remember seeing. When they've completed their lists, show them the tray again and have them check their lists against the actual objects.

Discussion: Artists practice looking closely at the things that are all around them. If they observe well, they're better able to draw and paint.

Artists try to remember what they see. You can practice doing this by closing your eyes after looking at something and trying to remember everything that you saw.

Activity: Bring in a tray with different objects: fruit, pine-cones, leaves, rocks, labelled bottles and so on. For more advanced students, use more objects, or use objects that have more details to observe. Let the students look at this tray for several minutes. Remove the tray from view.

Have the students use the **Freehand Sketch Tool** to draw the objects they just saw. Encourage them to add as many details as possible.

When they're finished, show them the tray again and have them compare their drawings to the actual objects.

How many of you remembered what objects were on the tray?
How many of you were able to draw the objects that were on the tray?
How many of your objects show the fine details of these objects rather than just outlines?

Additional Activities: Have students make a list, from memory, of everthing that is visible in their kitchens. (Do not include items in closets, drawers, and so on.) Next to each item, have them write a brief description of the object such as its size, shape, distinguishing marks… When their list is complete, have students draw the kitchen.

Encourage students to take their lists home and note how accurate their memories were.

To help students develop their visual skills they can play "What Is It?" One student describes the physical appearance of an object and the other students must guess what the object is. The student describing the object may not give any hints as to how or why the object is used.

Fill a small carton with objects that would be difficult to distinguish if they weren't described accurately: a sponge, a sea shell, a tin can, a tube of toothpaste, a can opener and so on. Put the carton where it cannot be seen (under your desk). Place some sort of shield on top of your desk (a small screen could be made from cardboard) so that only the student in front of the room can see what's on it. Select one object from the carton and place it on the desk. The student describing the object to the class can look at it as he or she is describing it.

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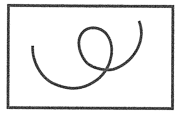
Contour Drawing



Aims:

To reinforce use of the Freehand Sketch Tool.
To coordinate eye and hand movement.

Motivation:

Have two students volunteer to come to the blackboard. Stand to the left of the board and hold up a large piece of paper with a line drawing of a simple object such as a cup or a daisy. Ask the volunteers to draw on the board exactly what they see on your paper. Next, ask them to keep their heads turned towards you and, without looking at the board at all, draw the picture again.

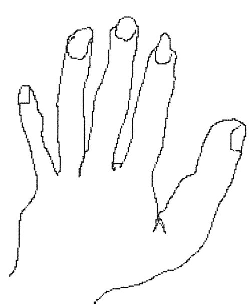
Discussion:

One of the most difficult things about drawing is getting your hand to do what your eyes tell it to do. Artists must train their eyes to see so that they notice all the details in the things they draw. Then they must develop the ability to coordinate their eye and hand movement.

Explain that the world is made up of shapes, not outlines. There is no outline around a tree, or a book, or a cat. Artists, however, frequently depict objects with delimiting lines. We call the line that defines the edges of an object a **contour** line. We can train our eyes to see the unbroken invisible line that surrounds an object and defines its contours.

Activity:

Have students use the **Freehand Sketch Tool** to draw their hands by guiding the mouse with one hand as their eyes travel along the contours of the other hand. Emphasize that they are not to look at the screen as they draw. As their eyes move very slowly along the contours of their hands, their other hand will guide the mouse, recording each change in direction as they see it. The only time they should lift their fingers from the mouse button and move the mouse is to move to a completely disconnected section, such as a fingernail. Even then, they are not to look at the screen.



Explain that the drawings will appear distorted at first, but as they practice they'll gain control of eye-and-hand movement and create exciting drawings.

Encourage students to create a few drawings with their hands "posed" in different positions.

Additional Activities:

Have students do contour drawings of objects such as shoes, keys and so on. Advanced students can do contour drawings of each other.

Have students use the Freehand Sketch Tool to draw a simple "mystery" object, such as a tree, by following directions as you call them out. They are to look only at the screen as you instruct them to "move up about an inch, move left about half and inch, move up about half and inch" and so on. Students will take pride in being the first to figure out what the object is.

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Gesture Drawing

Aims: To learn to use 816/Paint brushes.
To depict motion using gesture drawings.

Motivation: Draw a ball (circle) on the blackboard. Indicate that this ball is suspended in mid-air. Ask students how one could make the ball appear to be moving.

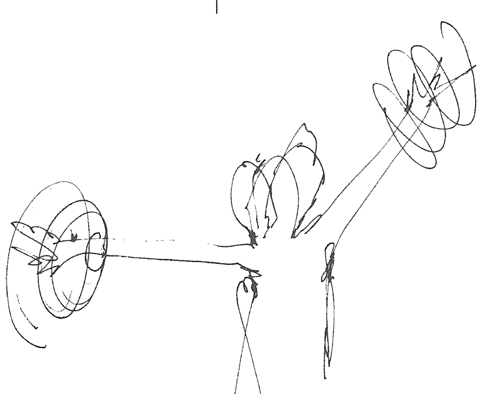
Rapidly draw a series of balls, overlapping each other, across the board. Explain that this is a **gesture** drawing. It attempts to capture the gestures — the movements — of the object it depicts.

Display photographs of moving figures such as dancers, sports figures or vehicles in which the picture is blurred and multiple "ghosts" indicate the movement. This will help students comprehend the concept of capturing motion on paper.

Show students reproductions of art work in which the artists tried to capture movement. Edgar Degas' crayon studies, Abraham Walkowitz's studies of the dancer Isadora Duncan, Marsden Hartley's "Man in a Chair," Marcel Duchamps' "Nude Descending a Staircase," and Giacomo Balla's "Leash in Motion" are excellent examples. The last two artists were "Futurists." You might want to tell students about the movement known as Futurism.

Discussion: Gesture drawing helps train the eyes to see and the hands to respond just as contour drawing does. Gesture drawing, however, is loose and free; it's like a recording of action or energy.

Activity: Show students that there are 12 different brush shapes in 816/Paint. Demonstrate selecting a brush by pointing at it and clicking. Show that the selected brush shape is highlighted.



Have a volunteer student stand in front of the room and change his or her position frequently. (Swinging arms, turning head, lifting feet, batting a baseball...).

Give the other students two to three minutes to select a brush and make a gesture drawing of the moving model. Their scribbled lines should move rapidly, bending and twisting with the figure. The line should be drawing the whole figure at once, capturing the movement. Emphasize that, unlike contour drawing, in this exercise we don't want the line to record outlines or details such as hair or shoelaces; we want to draw the action rather than the person.

After two or three minutes, change models. Encourage students to use different size brushes.

Additional Activities:

Take students outside to make pencil or charcoal gesture drawings of children playing, people walking down the street and people engaged in other activities.

Advanced students might do the same thing using brush and ink washes.

Bring a television set into the classroom. Tune into a program that has minimal action, such as a soap opera or quiz show, and have students use pencil or charcoal to draw people right from the screen. As students progress, change the program to something with more action, such as a program featuring dance, gymnastics or physical fitness exercises. Advanced students can try to do this activity with 816/Paint.

Note that the choice of television programs will probably be limited at the time you're doing this activity so you might want to tape appropriate programs in advance and play them back on a video cassette recorder.

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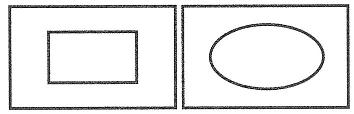
Discovering Shapes



Aims: To learn how to use the Box and Oval tools.
To learn about shapes.

Motivation: Draw a line and a solid rectangle on the blackboard.

This is a line and this is a shape.

What is the difference between the two?
Can you think of any other shapes besides rectangles?

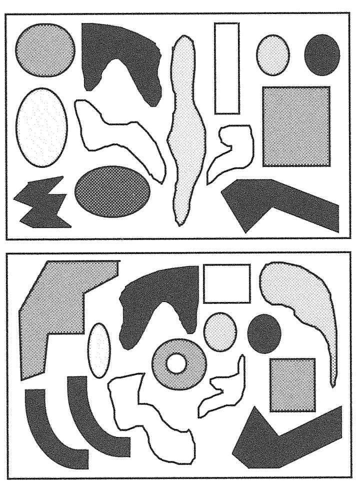
Draw ovals, circles, cylinders, cones, triangles and other polygons on the board and ask the students for the names of these shapes. Explain that these are **geometric** shapes.

Define **polygon** (a closed shape that contains multiple sides, such as a hexagon).

Draw some **freeform** shapes on the board.

How are these shapes different from the others?

Discussion: Show reproductions of "Colonial Cubism" by Stuart Davis, "The City" by Fernand Léger, "Boulevard" by Gino Severini, and "Runners" by Robert Delaunay.



Artists use all different kinds of shapes to create interesting paintings. Shapes can be geometric or freeform, small or large.

Shapes can be used to make interesting arrangements. A well-thought out arrangement is called a **composition**.

One kind of composition might be an arrangement of shapes that run mostly up and down or from left to right. Another kind might be an arrangement that starts in the center and makes a kind of circle.

Activity: Show students how they can create shapes using the **Box Tool** and the **Oval Tool** together with the line tools in 816/Paint.

Tell students to use these tools to create a variety of shapes in different sizes. Encourage them to make one composition with the shapes arranged up and down and another with the shapes arranged in a circular pattern.

How many shapes will you be able to make?
Can you make a triangle and an octagon?
How many free form shapes can you make?

Additional Activities:

Using colored construction paper, have students cut or tear out shapes of different sizes. Have them arrange and paste these shapes on a piece of background paper. Encourage them to try arrangements that are different from the ones they did with 816/Paint.

Repeat this activity but this time allow students to use any tools they need, such as compasses, rulers and so on, to draw the shapes first.

Using 816/Paint, have students try the same project but encourage them to combine lines with the shapes to make their compositions more interesting.

Have advanced students try to create as many polygons as possible in 816/Paint. They should start with a triangle (three sides) and then a rectangle, pentagon, hexagon, octagon and so on.

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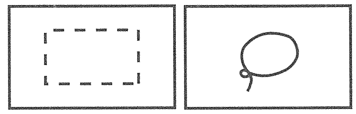
Changing Shapes



Aims: To learn to use the selection tools.
To alter shapes to create interesting designs.

Motivation: *How many ways can you cut up a pie?*

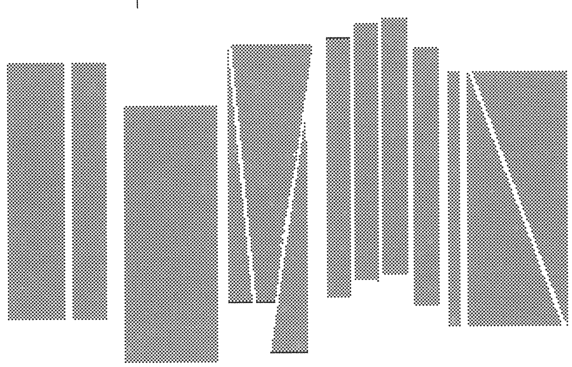
Draw a circle on the blackboard to represent a pie.

Have one student come to the board and "cut" the pie the most common way — by drawing lines that separate the pie into wedges.

Have other students come up and demonstrate alternate ways to cut the pie. Explain that the slices don't have to be even.

Discussion: To **distort** means to change, as by stretching parts out or making them wider or taller in places. By means of distortion, a new shape that looks different, and frequently more interesting, can evolve from the original one. An interesting and challenging way to change a shape is to break it up into distinct segments showing the whole as a sum of its parts.

Activity: Demonstrate the **Marquee Tool** and the **Lasso Tool**. Show how the Marquee Tool captures a rectangular area while the Lasso Tool conforms to the outline of the object being captured.



Have students draw a filled rectangle, square, or oval with the appropriate tool in 816/Paint. The shape should be relatively small — less than one-third the size of the drawing area.

Have students use the Lasso Tool to cut through the shape and move the cut section. Do this a number of times so that there is no longer one large shape but a series of sections of the shape.

Have students use the Marquee and Lasso tools to pull some of the pieces out, push some up, and pull some down a bit. Allow more space between some pieces than between others. Play around with pushing and pulling the pieces until interesting distortion are created.

The original shape should still be recognizable when finished.

Additional Activities:

Have students try the same activity with different shapes (circles, triangles and so on) cut from construction paper. Once they've cut through the shape with scissors, they can slide the pieces around until they're happy with the arrangement. They can paste the pieces onto a background paper.

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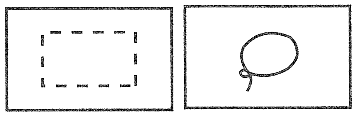
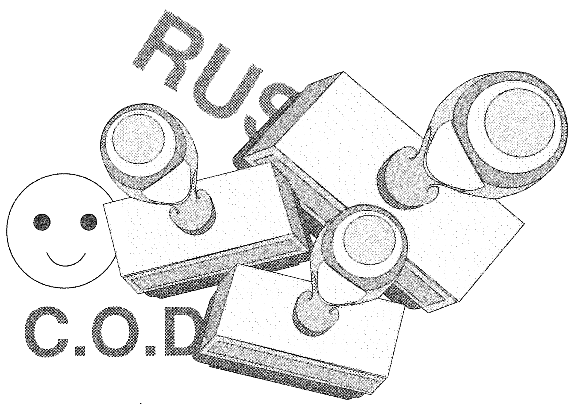
Stamping



Aims: To learn how to use Copy, Cut, and Paste.
To create multiple images by stamping.

Motivation: Hold up some common office stamps (time/date, Special Delivery, RUSH, COD…) and some picture stamps (star, animal...).



What are these?

Stamp the images all over a piece of paper taped to the blackboard.

Why would someone use stamps like these instead of writing the date, rush notice or whatever?

Can anyone think of something else that can be used to create repetitive images?

Show students a stencil and demonstrate how it's used.

Discussion: Stencils and stamps are used to save time, to avoid repetitive tasks and to decorate. Artists and craftspeople use stencils and stamps when they want to repeat the same images without having to draw them over and over again, or when they simply like the distinctive look of a stenciled or stamped image.

Show samples or pictures of stamping used in craftwork around the world. You might include Adinkra cloth from Ghana. This cloth is decorated with stamped designs. The stamps are carved from a calabash and dipped in black dye made from the bark of the badie tree. Kitchen supply shops frequently sell wooden cookie stamps. It was a tradition, in Sweden, to stamp designs on small cakes and cookies and give them to guests durings the holidays.

Activity: Demonstrate how the selection tools can be used to copy selected areas of the screen into the **Clipboard.** Show that the image in the clipboard can then be "pasted" onto the screen.

Demonstrate the difference between **cut,** which removes the selection from the screen, and **copy,** which makes a duplicate of the selection.

Show students that, if they hold down the option key when they drag a marquee or lasso selection, they'll leave a copy of the selection behind. They can use this technique to stamp selected areas all over the screen.

Have students create any small image. Select and stamp the image in regular rows or irregular rhythmic patterns.

Where does repetition suggest a rhythmic movement?

Additional Activities:

Have students create representational scenes that incorporate stamped images.

Have students design and create their own adhesive labels. They can divide the screen into boxes, stamp an original design into each box and then erase the guidelines. Print the finished stamps onto pin-feed labels available from most computer supply and stationery stores.

Students can make their own decorative stickers by printing their stamps onto self-adhesive, full sheet labels made by Avery®. Use the single sheet feed option of your printer.

Make interesting designs with a variety of home-made stamps. Potatos and plasticene can be carved with a butter knife. (Advanced students can carve hard rubber erasers with an X-Acto knife.) Lots of everyday items can be used, as is, for stamping. The erasers at the end of pencils are useful for stamping dots. The edges of cardboard can be inked and used to stamp lines. Encourage students to think of other items that can be used. Use tempera paint or commercial stamp pads for inking.

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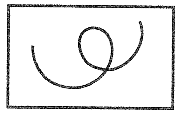
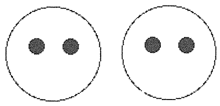
Showing Feelings



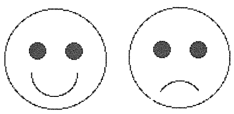
Aims: To learn how to edit brushes.
To use lines and shapes to express emotion.

Motivation: Using an easel or a large piece of paper taped to the board, draw two faces without mouths.



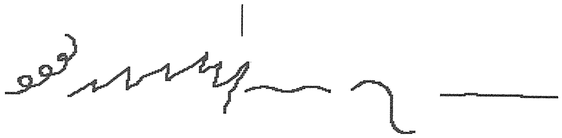
Which face is happy and which is sad?

Confirm that there is no way to tell. Add a smile to the first face and a frown to the second face.



Which face is happy and which is sad?

Draw these lines on the blackboard:



Which lines show gaiety, anger, speed, and calmness. Why?

Discussion: Lines can express emotion; they can make us feel sad, happy or angry.

Draw some loose, freeflowing shapes on the board. Next to these shapes draw some bold angular shapes. Shapes can also express emotion.

There's a language of art. Lines and shapes are important parts of that language. Artists express themselves with lines and shapes.

Show students reproductions of "The Cry" by Edvard Munch, "Way to Emmaus" by Schmidt-Rottluff, "Sounds in the Grass" by Jackson Pollack, "Blast" by Adolph Gottlieb, and "Tombstones" by Jacob Lawrence.

Ask students what the artists' lines and shapes express.

Activity: Explain to students that they may need special brushes to create the lines and shapes they need to express emotion. Show them how they can create custom brushes by selecting the brush to change and choosing **Edit Brush** from the **Option Menu**.

Show students that the **Paintbrush** command in the **Edit Menu** lets you use the image that is currently in the clipboard as a paintbrush. Then, using the Freehand sketch tool they can paint with this customized brush.

Ask students to think about a time when they were frightened, angry, lonely, happy or sad. Have them use brushes to make a design that expresses that feeling. Emphasize that they shouldn't use representational images; let the lines and shapes express the emotion.

Ask students to show their images to their classmates.

Can you guess what feelings your classmates were expressing?

Additional Activities:

Get a copy of the book, *The Love Story of the Dot and the Line* by Norton Juster (originally published in 1963 by Random House). This book tells the story of a line who desperately tries to impress a dot by demonstrating how many forms he can assume. The book brilliantly shows the diversity of lines. Use an overhead projector or hold up the pages so students can see the illustrations as you read the story to them.

Show the animated film version of *The Love Story of the Dot and the Line.*

Have students create line art with string. Using cardboard backing, white glue, scissors and strings of various thicknesses, they can create a line composition that expresses emotion. Students can make prints of their designs by inking the cardboard-backed string.

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The Color Wheel

Aims: To learn to use color in 816/Paint
To learn about primary, secondary, and complementary colors.

Motivation: Write the following sentences on the blackboard:

"You shouldn't cross the street against the light. The primary reason is that you might get hurt. The secondary reason is that it's against the law."

What does primary mean?
What does secondary mean?

Paint a red shape on a piece of paper attached to the blackboard. Paint a yellow shape and then a blue shape.

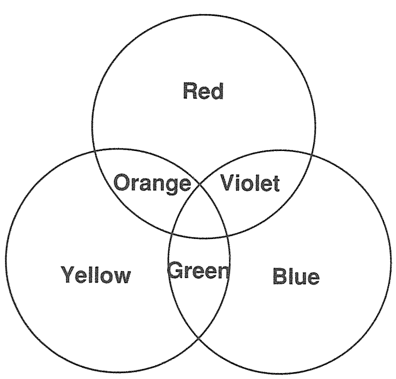
These are primary colors.

Paint a second row of red, yellow and blue shapes. Paint some yellow over the red and show students how the red becomes orange. Paint blue over the yellow and show how it becomes green. Paint red over the blue and show how it becomes violet.

These are secondary colors.

Discussion: Distribute Handout #2.

Display a color wheel.



The **primary** colors are red, blue, and yellow. All colors can be made from the primary colors.

The **secondary** colors are violet, orange, and green. A secondary color is made by mixing two primary colors.

When we show this relationship of primary to secondary colors we create a color wheel. A color wheel can tell us more interesting things about colors.

Colors that are directly opposite each other on the color wheel are **complementary** colors. The sky's oranges and blues at sunset and the holly plant's red berries and deep green leaves are examples of complementary colors. When complementary colors are mixed together they create brown.

Colors that lie next to each other on the color wheel are called **adjacent** colors. We can see adjacent colors in the autumn leaves.

Display reproductions of Paul Cézanne's "Still Life with Oranges," Piet Mondrian's "Composition," Fritz Glarner's "Relational Painting," and Claude Monet's "The Water-Lily Pond."

What kind of colors did these artists use?

Activity:

Show students how easy it is to select colors in 816/Paint. Have students experiment with using all the colors and patterns with lines and shapes.

Have students load the images they created for the activity "Showing Feelings." Encourage them to add color to their images to enhance the feelings they were trying to express.

Additional Activities:

For double hi-res and super hi-res only (others can do this activity with paint). Have students create a design using only primary colors, only secondary colors, and so on.

Have students create simulated stained glass windows using transparent colored tissue paper or cellophane. The cut pieces of transparent paper can be sandwiched between two sheets of wax paper. Gentle heating with an electric iron will fuse the papers together. Cut a frame from black construction paper. Encourage students to overlay the pieces of transparent paper to create new colors.

Distribute scissors, glue and colored construction paper. Have students go through magazines and cut out swatches (at least 1" square) of colors that fit into a primary, secondary, adjacent, or complementary color scheme. Students can then create collages using their "swatch" palettes.

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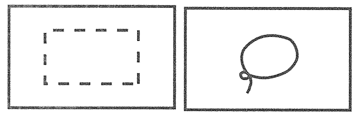
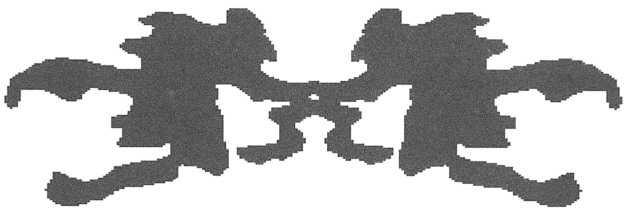
Find the Figure



Aims: To learn to use the selection tools to flip and rotate images. To encourage discovery and inventiveness in drawing.

Motivation: Make a large inkblot and hold it up to the class.



Who can see an animal, a figure, a tree or another object in this inkblot?

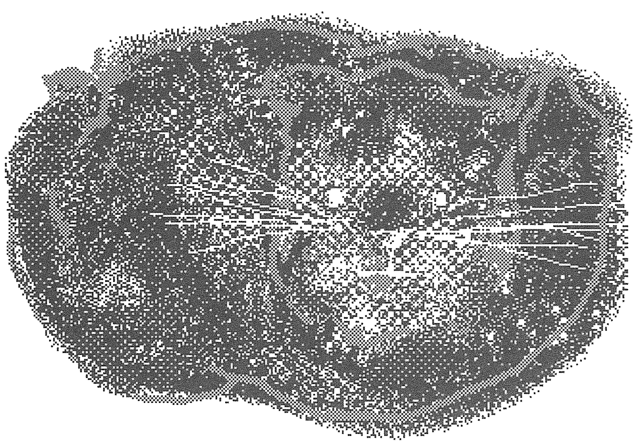
Turn the paper upside down and rotate it. Encourage students to find figures in the inkblot.

Allow a student to use crayon to outline the figure he or she finds.

Discussion: Talk about discovery. Sometimes artists have happy "accidents" where they discover something in their paintings, e.g. a color or a shape that they hadn't planned to use, and realize it makes the painting more exciting.

Activity: Demonstrate using the **Marquee Tool** and **Lasso Tool** to flip and rotate images.

Have students use the Freehand Sketch Tool to scribble a variety of lines and shapes.



When they're finished with their "scribbles", have students look for recognizable figures in their images. Encourage students to look for large figures, made up of a combination of shapes, such as a man walking a dog, rather than one shape that looks like a hand or face. Encourage students to use the selection tools to flip and rotate their images as they search for recognizable figures.

Now that you've found some recognizable shapes, enhance them so that others looking at your images will immediately see them. Use colors and patterns and add details to make these figures stand out from the rest of the design.

Which drawings show imaginative forms?

Which drawings suggest a particular mood or emotion?

Additional Activities:

Have students create more scribbles and exchange them with other students who must find strange beasts, mask-like faces or funny people. To do this, students may save their scribbled images to disk and swap disks with other students, or they may leave their images on the screen and switch computers.

Encourage students to look for recognizable figures in clouds and trees.

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Kaleidoscopic Images

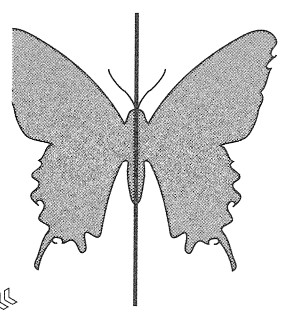
Aims: To learn to use the Mirror command.
To create a kaleidoscopic design.

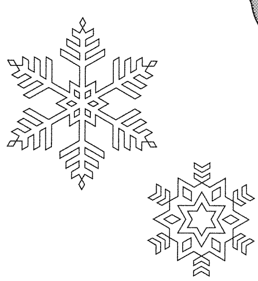
Motivation: Hold up a kaleidoscope.

Who knows what this is?
Who can tell us how a kaleidoscope works?

Elicit from students that kaleidoscopes work with mirrors. Usually bits of colored glass are put in the tube and, as the tube is rotated, the colored glass is reflected in the mirrors to form symmetrical patterns.

Discussion: Students might find it interesting to know how the kaleidoscope got its name. “Kalos,” in Greek, means beautiful, “eidos” means form and “skopos” means watcher — “beautiful form watcher.”





Discuss the meaning of the word symmetrical. **Symmetry** refers to the correspondence of opposite parts in size, shape and position. Symmetry is frequently used synonymously with balance.

Ask students if they can think of symmetrical things. List them on the board. (a butterfly, a leaf, a face, a body…) Draw a butterfly on the board and show how the center of symmetry is a vertical line. Explain that, in actuality, these things are not perfectly symmetrical. There are subtle differences between the left and right sides (the pattern in the butterfly's wings, the veins in the leaf, and so on).

Can you think of something in nature that's more symmetrical, i.e. the same all around, as are the images in a kaleidoscope?

Give students hints until someone comes up with the answer snowflakes. Draw a snowflake on the board. Show how everything radiates from the center of the snowflake—the center of symmetry.

Show students the **Mirrors** command in the **Option Menu**. Demonstrate how Mirrors works with the Freehand Sketch or Straight Line Tools. Demonstrate how the center of mirror symmetry is the center of the drawing window. Show students how to change the center of symmetry by clicking the Center button on the dialog box and then clicking at the point in the picture window where you want the mirror symmetry to be centered.

Activity:

Have students use Mirrors to create kaleidoscopic images, representational or abstract.

Additional Activities:

If you have access to a video digitizer, such as Computer Eyes, have students digitize portraits of themselves. In 816/Paint, have them use the Marquee Tool to select the entire left half of their faces and copy it. Next, have them paste the left half over the right half and flip it horizontally. Students will be surprised by the results.

Have students take a sheet of drawing paper and fold it into quarters. Using scissors, have them cut parts of the paper away. Unfold the papers to reveal symmetrical paper doilies or "snowflakes."

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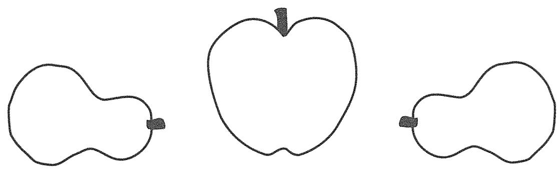
Design: Balance

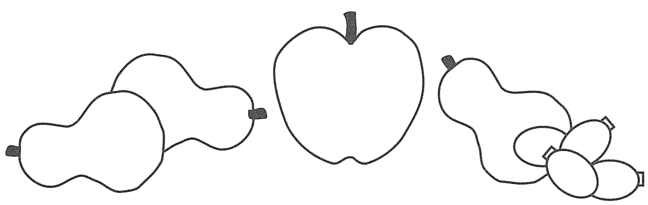
Aims: To reinforce skills in using 816/Paint's drawing tools.
To learn the importance of balance in a composition.

Motivation: Tape a large sheet of newsprint to the blackboard. Tell students that, with their help, you're going to draw a still-life arrangement.



Draw an apple in the middle of the paper. Ask students to suggest another fruit to add to the picture. When students suggest a fruit, e.g. a pear, draw one pear to the left of the apple and another pear in the exact opposite position, to the right of the apple.

Add more fruit to the picture. Each time you add the pieces of fruit, arrange them symmetrically (one or two pieces of fruit on each side of the apple).



Is this an interesting still-life? Why?

Draw another picture with the same large apple in the center. This time, arrange the other fruits so that they're asymmetrically balanced, e.g., a large pear on the right side of the apple and two small pears on the left side. Put three or four oranges on one side and a large bunch of grapes on the other.

Is this arrangement more interesting? Why?

Discussion: The first picture is an example of symmetrical or **formal balance** — one side of the picture looks very much like the other side.The second picture is an example of **informal balance**.

Artists try to make their creations as effective as possible by carefully arranging the different elements that make up the finished image. The term **composition** refers to the arrangement of objects in a picture.

Everytime an artist adds a new element, he or she alters the composition of the drawing or painting and new decisions have to be made. Introducing more objects tends to make the decisions even more important.

Balance is one of the things the artist must consider. The objects in the painting should relate well to each other so that the entire picture has a sense of being a unified whole.

Show students reproductions of paintings in which artists use formal and informal balance. Paul Cezanne's "Card Players" and some of his still-life arrangements would be good examples. Others include Paul Gauguin's "Old Women at Arles," Graham Sutherland's "Origins of the Earth," and Juan Miro's "Dog Barking at the Moon."

Activity:

Have students create a formally balanced arrangement of white circles, rectangles and triangles against a black background. Start by drawing a vertical line down the center of the screen. Add shapes, one at a time, to create a formally balanced composition.

Have students change the balance of their designs from formal to informal. They can do this by erasing some of the shapes (painting over them with black) and replacing them with other shapes of different sizes. For example, a large circle on one side can be balanced by two small triangles on the other side.

Additional Activities

Have students try the same problem using cut paper. Cut out ten to fifteen small squares and ten to fifteen small triangles. Tell them to imagine that the background paper has a line running through the middle of the sheet from top to bottom or from left to right. Arrange the shapes so that the composition is the same on both sides of the imaginary line (top and bottom or left and right.) Next, change the balance from symmetrical to asymmetrical by moving only five of the squares and five of the trianges. When they're pleased with their asymmetrical arrangements they can paste the pieces down.

Explain that balance plays an important part in interior decoration. Show students two picture of living rooms. One should have two facing sofas while another has a sofa facing two arm chairs. Have students look through decorating magazines and cut out examples of rooms, wall arrangements and so on, that are symmetrically and asymmetrical balanced.

Have students use cut paper, cardboard and other materials to create symmetrically and ansymmetrically balanced mobiles.

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Design: Dominance

Aims: To effectively use 816/Paint.
To learn the importance of dominance in a compositon.

Motivation: Show students reproductions of Marc Chagall's "Green Violinist," Rembrandt van Rijn's "The Night Watch", Josef Alber's "Nowhere", Francesco Guardi's "Visit of the Doge to S. Nicolo" and Georges de la Tour's "Adoration of the Shepherds."

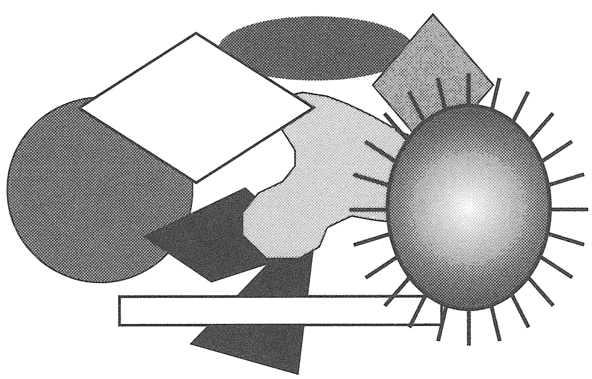
What catches your eye first in Chagall's painting? Rembrandt's? Albers? The others?

Discussion: An important design concept is called **dominance**. An art work has dominance when one part of it is more important than any other part. A shape can become dominant because it is larger than the other shapes. A color can become dominant when it's used more than any other colors in the painting or when it's brighter than the others.

We refer to the dominant area of a composition as its **center of interest**. That area catches our attention as soon as we look at the picture.

What techniques did the artists use to draw our attention to a particular part of their paintings? (Albers used Color, Guardi used pointing hands, poles and other objects, Rembrandt and de la Tour used light, Chagall used position and color…)

Activity: Have students use lines, shapes and color to create compositions that effectively use balance and dominance.



Encourage them to experiment with the different techniques used by the artists in the paintings they looked at.

Explain that the dominant area of the composition should not be so dominant as to negate the importance of other elements of the composition.

Stress that the center of interest does not have to be in the center of the composition.

Additional Activities

Have students cut an equal number of squares, circles, and triangles out of colored construction paper. Arrange these shapes on a background sheet to create interesting compositions that show balance and dominance.

Advanced students can look through interior design magazines to find rooms that effectively use dominant shapes (furniture, accessories, wall arrangements...) and/or colors.

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Color Choices SUPER

Aims: To learn to use color palettes.
To learn how color affects paintings.

Motivation: Hold up two bananas: one green and one yellow.

Which banana would you rather eat?

Hold up two blouses: one bright red or yellow and one black or deep purple.

Which blouse would be more appropriate to wear to a funeral?

Discussion: Color, and decisions regarding the choice of color, play an important role in our daily lives. Color is important to artists too. An artist tries to use colors that will most effectively express the message of his painting.

Show reproductions of Paul Gauguin's "Jacob Wrestling with the Angel," Giorgio de Chirico's "Melancholy and Mystery of a Street," and Edward Hopper's "Early Sunday Morning," or other paintings where color choices are very distinctive.

How might the message of these paintings change if different colors were used?
What would the mood of Hopper's painting be if he used bright reds and yellows?

Activity: As students watch, load the image "Banana.Tomato" from the 816/Paint disk. (It's in the Picture Folder.) This image was created with a video digitizer and is the computer equivalent of a photograph.

After students have had a chance to look at the image, restore the standard palette by selecting **Std Palette** from the **Color Menu**.

What happened to the image? Why?

Use the **Edit Palette** command in the **Color Menu** to bring up the **Palette Editing Window.** Press the **Palette** button. Select the monochrome, black and white palette and put away the Palette Select panel.

What happened to the image? Why?

Repeat the procedure above and show students how "Banana. Tomato" looks with different palettes.

Explain that in 816/Paint we can create eight different palettes for every image. Custom-made palettes can be saved to disk and used with different paintings. Explain how to save and load palettes. (See page 29 of the 816/Paint Instruction Manual.)

Have students create a landscape and then, by loading palettes from the Palette Folder on the 816/Paint disk, they can see how it looks with different palettes.

Additional Activities:

Have students stack sheets of colored construction paper in twos (red over green, blue over yellow, and so on). Have them cut a variety of shapes from the stacked paper so that each student ends up with two sets of shapes that differ only in color. Encourage them to arrange one set of their shapes into an interesting composition and paste them down. Have them duplicate the first arrangement with the second set of shapes to see the effect of color changes. Students should note how much easier it is to do this with the computer where all they have to do is change palettes.

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Color Mixing: HSI SUPER

Aims: To understand color mixing using the Hue, Saturation, and Intensity model.
To learn about computer color mixing.

Motivation: Use three small jars of red, green, and white tempera paint, a mixing tray, and a large blank sheet of paper. Paint a large red square on the paper.

What color do you see here?

As students watch, pour some red into the mixing tray. Add a small quantity of green to the red (the mixture should be 3/4 red to 1/4 green), and paint a large square of the new color.

What color do you see here?

Pour some red into a clean area of the mixing tray. Add a small quantity of white to the red. Paint a large square of the new color.

What color do you see here?

Discussion: The three squares are the same color or hue. **Hue** is the property of color that gives it its name, such as red, blue, or yellow; all the squares are red.

In the second square, we added green to the red to change intensity. **Intensity** is the property of color that gives it its brightness. Every color has a range of intensities from bright to dull.

In the third square, we changed the tone of the red by adding white to it. The property of color that gives it its lightness or darkness is called **saturation**. Every color has a range of saturation from light to dark.

Emphasize that mixing colors in paint is different from mixing colors with a computer. In 816/Paint we can mix up to 4,096 colors two different ways; today we'll learn to do it by adjusting hue, saturation, and intensity.

As students watch, select the standard palette of 816/Paint by choosing **Std Palette** from the **Color Menu**. Double click on the "current color" or choose **Edit Palette** from the **Color Menu**. Select the dark blue color, fifth from the left end of the palette. (Between red and green.)

Point to the right or left edge of the slider marked **H** (for Hue) and press the mouse button, showing students how 816/Paint cycles through the available hues. Return to the original blue.

Explain that this blue is highly saturated (the slider bar cannot go any more to the left). Point to the right edge of the slider marked **S** (for Saturation) and press the mouse button, showing how 816/ Paint changes the tone of the blue until it's pure white. Cycle back to the original fully saturated blue.

Point out that this blue is at the maximum intensity (the slider bar cannot go any more to the left). Point to the right edge of the slider marked **I** for Intensity and press the mouse button. Note that the color changes in intensity; it becomes duller and duller.

Have students experiment with mixing colors using the HSI color model. When they're ready, have them select one color and then create a palette with different intensities of that color. Encourage them to create a simple image using their custom-made palettes.

Additional Activities:

Show students how to use the **Spread** button to produce a smooth range of colors across the palette from the current color to the next color picked. (See page 26 of the 816/Paint manual.)

Have students create paintings with monochrome palettes. They can do this by selecting one color and, by changing its saturation, creating a palette with sixteen tones of that color. They can also do this by using the Spread button. When they've completed the painting have them edit the palette so that it is all the same color but with sixteen variations of intensity. They'll see their paintings change as they make the palette changes.

Have students look through decorating magazines and find rooms with color schemes they especially like. Then, have them mix those colors and use them as a basis for a painting.

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Color Mixing: RGB SUPER

Aims: To understand color mixing using the Red, Green, Blue model. To learn another method of computer color mixing.

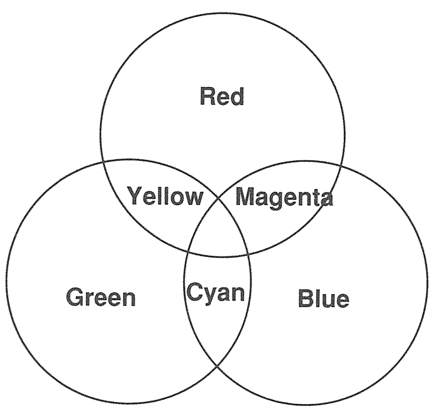
Motivation: Using three small jars of red, blue, and yellow tempera paint and a large blank sheet of paper, paint a large red square and a large blue square on the paper.

What colors do you see here?

As students watch, add some yellow to the red and blue jars and paint large square of the new colors.

What colors do you see here?

Discussion: When we mix colors with paint, crayons, or pastels we consistently get the same results. Red and yellow give us orange; blue and yellow give us green; and red and blue give us violet. Mixing colors with computers works on a different principle.



In paint (or pastels, or crayon and so on) the primary colors are red, yellow and blue. On computers, colors are created from light and the primary colors are red, green, and blue. These colors correspond to the way the electronics on RGB monitors work.

Today, we'll learn how to adjust the RGB values to create new colors.

Activity: As students watch, choose the standard palette of 816/Paint by selecting **Std Palette** from the **Color Menu**. Double click on the "current color" or choose **Edit Palette** from the **Color Menu**. Select the dark blue color, fifth from the left end of the palette. (Between red and green.)

Explain that this blue is a "pure" blue; it consists only of blue, no green or red is mixed in. Using the mouse, drag the red slider to add red to the blue. Ask the students to describe what is happening. If you have already covered the HSI model of color mixing, encourage students to watch the HSI sliders to see what moving only the red slider does.

With the red slider at its maximum, slide the blue slider to the left. Note the color changes that occur. With no blue in the mix, add green by dragging the green slider.

Arrange the sliders to produce yellow (full red and green). Add blue to this mix and note what happens to the color. If you've already covered the HSI model, be sure your students note that adding blue is the equivalent of moving the saturation slider.

Have students freely experiment with mixing colors using the HSI color model.

When students have completed their experimentation, emphasize that the RGB mixing provided by 816/Paint provides an alternative to the HSI method. The method we choose depends on what kind of color we're trying to mix. If we want a pure blue, it's simplest to slide the RGB sliders. However if we're trying to alter the intensity of a color, it's simplest to slide the HSI sliders.

Additional Activities:

Have students create a palette that contains orange, violet, purple, gray and any other colors of their choice using the RGB model for color mixing. Have them create a simple image using their custom palettes.

Have advanced students create a palette appropriate to one of the following themes:
"The Colors of Autumn."
"The Colors of Spring."
"The Colors of Winter."
"The Colors of Summer."
Have them create a painting using their customized palettes.

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Tone

Aims: To learn about the dithered colors in 816/Paint's standard and double hi-res mode.
To learn about tone.

Motivation: Using red tempera paint, paint a large solid rectangle. Next, add white to the paint, half and half, and paint another rectangle. Add more white to the paint and use it to add another rectangle.

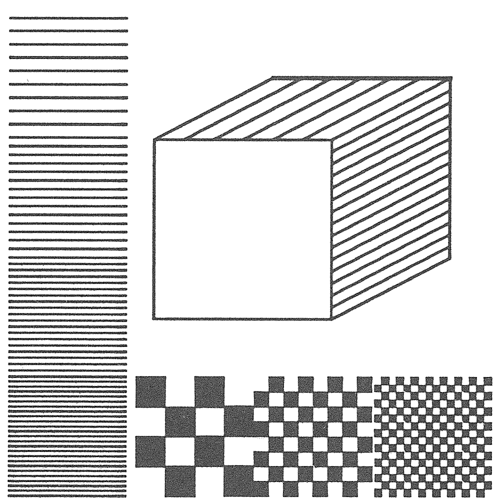
What color is the first box?
What color is the second box?
What color is the third box?

Explain that all the boxes are the same color — red — but they are different **tones** of red.

Show reproductions of line drawings and engravings by Gustave Doré, Heath Robinson and/or Harold Nelson. These illustrators created art in which lines, dots and patterns are brilliantly used to vary tone.

These artists used only black ink but their pictures look as if there is a huge variety of tones. How did they do this?

Discussion: When we add black or white to a color, we change its tone. When creating line art, such as pen and ink drawings, tones are created in a different way. Instead of adding white to the color, we use the white paper of the background. If we draw lines or dots very close together, just a little white paper shows through. Our eyes blend the white with the black and we get dark tones. If we place the lines or dots further apart, lots of white paper shows through and we get light tones.



On the Apple IIGS in super hi-res mode, we can use the color mixing controls to produce a range of colors with different tones. (Remind students that changing the saturation of a color is equivalent to changing its tone.)

In hi-res or double hi-res mode, however, we have a fixed palette of colors; they cannot be mixed together in the traditional way. To create tones of these colors, we use a technique similar to that used with line art. We create checkerboard patterns of white or black with the color. This technique is called **dithering**.

Activity:

Show students how, in standard and double hi-res modes, there are eight patterns in the palette at the bottom of the screen. The first four patterns are dithered colors. When you click on two colors from the palette (the row above the patterns) they are automatically dithered in the pattern boxes. Click on white. Click on red. Show students how the first four pattern choices become dithered reds and whites — simulated tones of red. Click on black. Click on blue. The patterns change to simulate tones of blue.

Have students create a tone chart in which each color is shown going across the screen from its lightest tone to its darkest tone. Start by using the Solid Box Tool to create a row of boxes down the left side of the screen. Each box should be one of the solid palette colors (violet, orange, green, black and white in standard hi-res; red, blue, yellow, and so on in double hi-res). Next to each color, use the dithered patterns with the Solid Box Tool to complete the chart.

Additional Activities:

Have students create a tone chart using black lines against a white background. Start by using the Box Tool to draw a small (approx. 1" x 1") box. Using the marquee, copy and paste the box so that there are ten boxes on the screen. In the first box, using the Straight Line Tool, draw vertical lines as close together as possible, so that very little of the white background comes through). In the second box, draw the lines a little further apart. Continue this until you've created as many tones as possible.

Have students do the same activity as above, but this time use dots instead of lines.

Have students duplicate the last two activities using pen and ink or felt-tip pens. Students will find they can get considerably more tones by using pens with very fine points. *Why?*

Advanced students should be encouraged to experiment with creating tones in a variety of ways: straight lines, wavy lines, dots, cross-hatching, stippling and so on.

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Light and Shade

Aims: To reinforce our skills in working with the HSI color model and/or with dithered patterns.
To learn how to use light and shade to enhance our paintings.

Motivation: Distribute Handout #3.

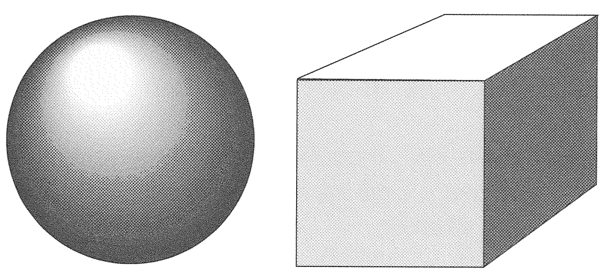
Which ball looks more real? Why?
How did the artists make the ball look so real?

Show reproductions of Rembrandt van Rijn's "Aristotle Contemplating the Bust of Homer," "The Man with the Golden Helmet," "Self Portrait as St. Paul," and/or "The Night Watch."

Which parts of these paintings seem to be bathed in glowing light? Does the light appear to be coming from the left, right, top or bottom of the picture? How can you tell?

Place a spotlight in front of the room and focus it so that it illuminates some simple objects. A large white volleyball and a white cardboard box would be best.

Discussion: Drawings and paintings composed only of flat colors tend to lack dimension. Light and shade enhance images — make them appear three-dimensional — by giving volume to the subjects. This added dimension of volume distinguishes a circle from a sphere.



Show students how, when the lamp is placed above and to the left of the objects, the lightest portions appear at the upper left, and the darkest, on the lower right.

Show that the box receives the most light on its upper surface. Therefore, when we paint this box, that would be the whitest portion of the painting. The front side receives slightly less light than the top and so a middle shade would be used to paint it. The shaded side, on the right, is quite dark. We'd use the darkest shade of our color to paint that part.

Show students how the light plays on the ball. Show them that, on the ball, there are no sharp edges to intercept the light. Light and shadow blend in the areas where the lights meet the darks and the surface becomes gradually darker as it curves away into deep shadow.

Move the light around and have students observe how the objects change.

Where is the box lightest now? Why?
Where is the ball darkest now? Why?

Activity:

Using 816/Paint, have students paint the ball and the box illuminated by the light. Turn off the overhead room lights to accentuate the lighting from the spotlight; the light from the monitors should be sufficient for the students to work comfortably. Students working with standard or double hi-res should use the dithered colors to create the darks and lights. Students working in super hi-res can mix different shades of colors using the HSI model.

Additional Activities:

Arrange a still-life using four or five simple objects such as vases, fruit, small white boxes and so on. Do not use any transparent glass objects, such as bottles, since the play of light on glass is too complicated for beginning art students. (If possible, in advance of this lesson, you could spray-paint some objects white. The effects of light and shade would be much easier to discern on these white objects). Illuminate the still-life with a spotlight. Turn off the lights in the room and have students paint the still-life.

Have students draw the illuminated volley ball using pencil. Show them how to shade by varying the pressure on the pencil as they draw.

Have advanced students make a line drawing of the volleyball and the box. Shade it with lines, dots, crosshatching or stippling.

For advanced students, add a transparent glass object, such as a vase or bottle and/or use a second spotlight and illuminate some objects with two light sources.

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Warm and Cool Colors

Aims:

To become proficient in using the Toolbox and the Palette.
To understand what is meant by warm and cool colors and how artists use them to convey a message.

Motivation:

Hold up samples of packaged commercial soap, including Coast, Tone, Pink Dove and Ivory.

Each of these packages was designed by a professional artist. Each artist was told by the manufacturer of the soap that a certain "message" should be received when potential customers see the packaging. The artists designed the packages and used colors that they believed would impart this message.

Were the artists successful? What did the manufacturers of these soaps want the artists to tell us about their products? (Coast— blue — cool and refreshing; Tone — beige — warm and natural; Dove-pink- warm and soothing; Ivory — white — pure.)

Discussion:

Fine artists as well as commercial artists must decide which colors will help convey their messages. One of the things they often take into consideration is whether to use warm or cool colors. Warm colors, such as red, yellow, and orange, might generate a feeling of heated excitement or they might give us a feeling of soothing warmth as in a sunset. Cool colors such as blue, green, and purple might make us feel depressed or they might be as soothing and refreshing as a beautiful lake surrounded by trees.

Our responses to colors are taken into consideration by industrial designers and city planners as well. In government and industry, for example, fire alarm boxes are red as are other dangerous areas including moving parts of machines. Yellow is the easiest color to see and it's used for caution signals, highway lane markers and hazards such as steps that are hard to see.

If you were designing the packaging for a laundry detergent, would you color the box with blues and greens, or with reds and yellows? Why?
What might these colors suggest to the buyer?

Activity:

Have students use 816/Paint to design the front panels of packages for imaginary commercial products (detergents, beverages, tisssues, paper towels). Tell them to keep their designs simple; the message about the product should be conveyed in the colors they use. The text (name of the product) can be done freehand using a wide brush.

Additional Activities:

Advanced students can create three-dimensional replicas of the packaging by assembling cut construction paper.

Ask students to use lines and shapes to create abstract images on the screen. If your students are working in standard or hi-res, have half the class use warm colors, while the other half uses cool colors. If students are working in super hi-res, have them mix two palettes and see how their images look both in warm and in cool colors.

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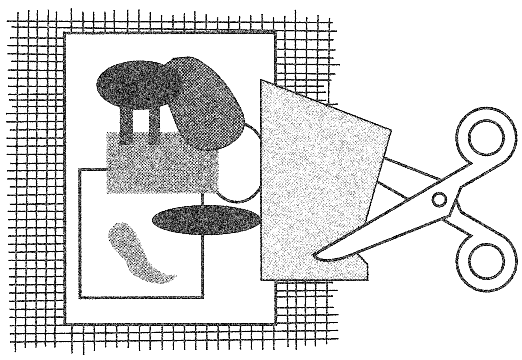
Mixing Media

Aims: To learn how to print computer graphics.
To explore the possibilities of mixed media.

Motivation: Have two or three volunteer students come up to the front of the room. Ask each student what kind of fabrics were used for their shirts, blouses, pants, skirts, socks, shoes and so on.

Ask students how many of them wear only one kind of fabric (cotton, wool, leather) at a time. Ask students why they combine different fabrics.

Discussion: Just as we combine fabrics to create a special effect when we dress, some artists combine media to convey a special effect in their artwork.



Mixed media can often produce richer surfaces and more complex drawings.

Ask students what kind of media an artist can use. List their responses on the blackboard until they realize that the choices are virtually endless.

The nature of computer graphics doesn't allow for paint or other materials to be used on the CRT, but if we print our images onto paper, we can enhance the computer graphics with other media.

Activity: As students watch, draw a few rectangles with 816/Paint. Use the **Choose Printer** command on the **File Menu** to select the printer and interface options that match the equipment in your classroom.

Explain to students that, once this is done, the selection is saved to disk and does not have to be done again unless they use a different 816/Paint disk.

Demonstrate how to select **Print** from the **File Menu**. Show students that they can elect to print a full page graphic, a screen-size graphic or just a selected part of their graphic. Explain the difference in the three choices.

Print the graphic you created.

Have students create a new graphic, representational or abstract, and print it out. Then encourage them to enhance their images with paint, crayons, stitchery, pencil, ink, chalk, and so on.

Additional Activities:

Have each student create a graphic using the same theme such as the sun, flowers, holidays and so on. Have the students print their graphics and join them by gluing them to a large piece of fabric such as felt or burlap. Add stitchery, pasted fabrics, sequins and other media to turn the joined graphics into an exciting wallhanging.

Encourage students to load some of their previous 816/Paint images and print them.

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Patterns

Aims:

To learn to edit patterns.
To create a world of patterns.

Motivation:

Draw a line on the blackboard.

What do you see? (a line)

Draw a series of closely aligned parallel lines.

What do you see now? (lots of lines)
What do we call a series of lines like this? (stripes)
What do we call a series of repeating dots or circles? (polka dots)

Discussion:

Show the illustrations of Edmund Dulac and Kay Nielsen. Show reproductions of Gustave Klimt's "Portrait of Madame Fritz Riedler" as well as paintings by Matisse and Gauguin. Select paintings that use lots of patterns.

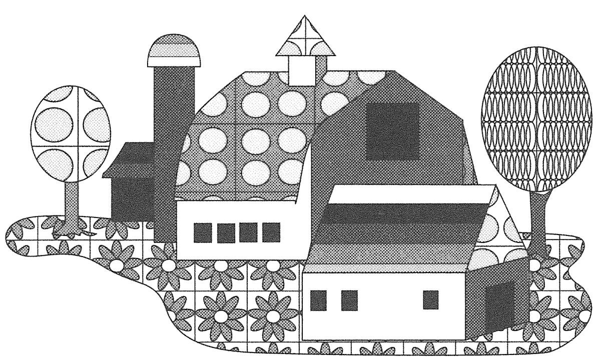
Display wallpaper samples, wrapping paper and patterned textiles.

The Dover publications pictorial reference books on patterns are particularly good resources.

When a single element is repeated many times, all the elements together are called a **pattern**. We can see patterns practically everywhere we look. Discuss patterns in nature, patterns used for textiles, wallpaper, wrapping paper, and so on.

Activity:

Creating patterns can be tedious work using traditional artists' tools. It's easy when we use 816/Paint where we can have up to four multi-colored, patterns associated with each of our drawings.



Demonstrate how the cut and paste tools can be used to make repeats and patterns. First turn the invisible grid on. (Select **Grid** from the **Options Menu**.) Use the drawing tools to create a circle inside a square. Select the image with the Marquee Tool and copy it. Repeatedly paste the image, "tiling" it across the screen.

Explain that 816/Paint has an even easier way to create patterns.

Show students how to edit patterns by double clicking on the pattern to be changed or by clicking on the pattern once and selecting **Edit Pattern** from the **Color Menu**.

Demonstrate how they can capture any 8 x 8 pixel area of the screen and have it automatically become a pattern. Do this when the Edit Pattern dialog box is open by pointing at a spot outside the palette or pattern edit window and clicking the mouse.

Additional Activities:

Have students draw an interior or exterior scene and paint it with patterns instead of solid areas of color. Their world of patterns might consist of striped skies, dotted mountains and paisley grass.

Ask students to create a custom pattern and fill the screen with it. Print it out. These printouts can be used as wrapping paper.

Have students create an indoor or outdoor scene using cut pieces of patterned fabrics, wallpaper and other papers. Their collages can use the patterns advantageously, so that floral patterns are used as gardens, trees and so on.

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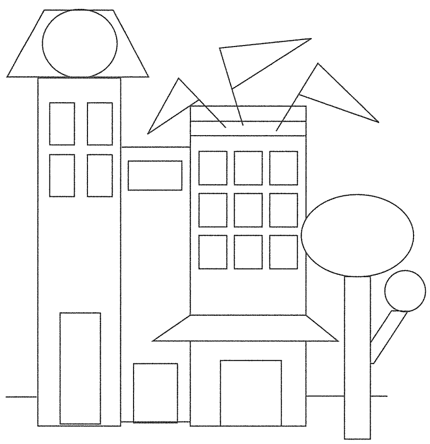
Seeing Shapes

Aims: To learn to use the shift key to constrain lines, ovals and rectangles. To create recognizable images using shapes.

Motivation: Display a large (11 x 14 or larger) photograph of a cityscape with lots of buildings.



How many circles and rectangles can you find in this picture?

Put a sheet of tracing paper over the picture. Have a volunteer come up and outline, with a red crayon, all the circles and squares.

Lay a new sheet of tracing paper on the picture. Ask another student to come up and do the same thing, this time finding triangles. Stack the two sheets of tracing paper on top of each other and hold them up.

How many familiar shapes did we find?
Can you recognize the original picture?

Discussion: Even the most complicated scene can be understood if we look for familiar shapes; squares, triangles and circles can be found everywhere if we look hard enough.

It's easier to draw what we see if we start by breaking objects into basic shapes. Usually we do this mentally, but today, to make things easier, we'll use tracing paper.

Activity: Distribute magazines, tracing paper and soft pencils. Have the students look through the magazines to find a picture they'd like to draw. Tell students to put a sheet of tracing paper over the picture and trace over all the objects, or parts of objects, that seem to be squares or rectangles. Put the tracing paper aside. Lay a new sheet and do the same thing with triangles and diamonds. Next, do it with circles and ellipses.

Demonstrate how, in 816/Paint, holding down the shift key when they draw lines, ovals, and rectangles **constrains** the objects and generates straight lines, diagonals, circles and squares.

Have students use the 816/Paint drawing tools to copy the shapes from their tracings. They should do one type of shape first, the rectangles, the ellipses and so on, until all the shapes from the three sheets of tracing paper are drawn on the screen. The combined shapes should bear a close resemblance to the original photographs (minus the details).

After they finish drawing the shapes, encourage students to look at the original photographs and add any necessary details, lines and colors to finish their compositions.

Additional Activities:

Have students bring in photographs of as many different trees as they can. Show students how different trees have distinctive shapes. The maple tree spreads fanlike and curves skyward to form round symmetrical patterns. The white elm is shaped like a vase of flowers. The eucalyptus tree's foliage creates a tall, dome-like shape. The oak grows into a broad, spreading mass.

Have students create a painting on the theme "The Shape of Trees."

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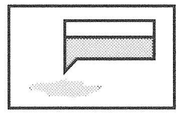
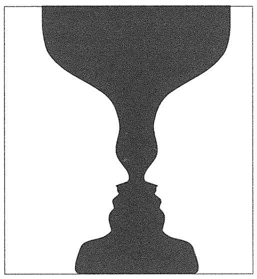
Negative Space



Aims: To learn to use the Colorfill Tool and the Invert Command.
To experiment with positive and negative space.

Motivation: Distribute Handout #4.

What do you see in this picture?



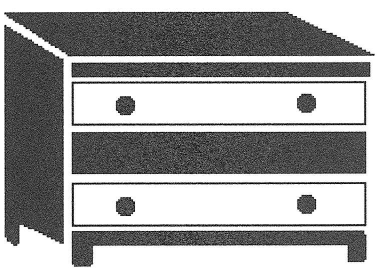
In the first picture, the students who focus on the white area will see two profiles. The students who focus on the black area will see a chalice. (In the second picture it will be reversed.)

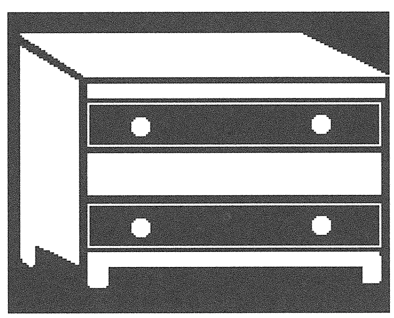
Have students compare the two pictures on the bottom of the master page.

Which is more interesting? Why?

The second picture uses the empty spaces (negative space) effectively; the shapes contribute to the emotion of the picture.

Discussion: When we compose a drawing, we're arranging objects on a paper or on the screen. The objects occupy space, which we call **positive space**. The space around and between these objects is **negative space.** On the handout, in the first picture, if we consider the black part of the image the positive space, we see a chalice. If we consider the white space the positive space then we see two profiles. The exact opposite holds true in the second picture.





A successful artist will pay as much attention to the negative spaces as to the positive spaces in his composition. It is not enough to concentrate on figures — whether they be trees, people, fruit or flowers — we must concentrate on the space around them as well. Negative spaces should be interesting shapes.

Activity: Demonstrate how the **Colorfill Tool** is used to fill an enclosed area with the current color or pattern.

Have students use the drawing tools to make a black and white drawing of a corner of the classroom. Encourage them to simplify the compositions by emphasizing the geometric forms and leaving out what is not essential.

Have students use the Colorfill Tool to fill areas of their pictures with solid blacks and whites. The entire composition should be built up with stark forms related to each other in direct black and white contrast.

Have students save their images, print them, invert them and print them again to see the effect of making the positive space become the negative space.

Additional Activities:

Place two objects (select objects with interesting silhouettes such as pitchers, lamps, and so on) fairly close together where they can be seen by the entire class. Have students draw only the spaces between the objects (the negative space).

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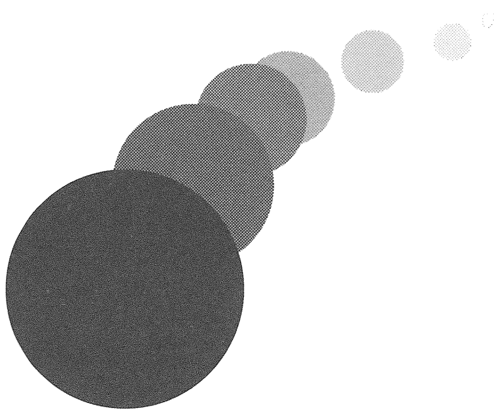
Near and Far

Aims: To reinforce use of the Lasso Tool.
To create an illusion of depth in drawing and painting by making objects appear to be near and far.

Motivation: On a piece of paper attached to the blackboard, draw a series of circles or rectangles that appear to recede into the background. Create the effect by making the front shapes overlap the others. Then, paint the shapes so that the nearest ones are brightest in color.



Which shape is closest to you?
Which shape is furthest away?

When students select different shapes, have one student come up to the picture and touch each shape.

Are any of the shapes actually nearer or further away then any of the others?

Explain that the paper is a two-dimensional surface and the shapes just "appear" to be near or far.

Discussion: A drawing is nothing more than marks on a flat surface. An artist may choose to have his picture appear flat and two-dimensional, or he may give the illusion that the picture has depth.

Artists use different techniques to suggest space and depth in their pictures. These techniques are based on facts about how we see.

The further away an object is, the smaller it seems to be. The further away an object is, the closer it is to the horizon and therefore we draw it higher on the page.

When we look at objects, those that are closest overlap and block out part of the objects behind them.

We can see more details on objects that are nearer to us. Objects that are far appear less focused. Their colors don't seem as bright.

Activity: Distribute Handout #5. Have students cut out the figures and arrange them in a composition that shows Near and Far.

Have students work with simple geometric shapes. Have them use the three visual effects discussed above to create a composition in which some of the objects appear to be very near to the viewer while others appear to recede into the distance.

Encourage students to use the lasso tool to rearrange the shapes until they've achieved the most dramatic effect of depth in their images.

Additional Activities:

Show students reproductions of Ben Shahn's "Miner's Women" and Georges Seurat's "Bathers at Asnières." "Days of Slowness," or other paintings by Surrealist artist Yves Tanguy should also be included.

Have students compare these paintings to the works of primitive painters such as Grandma Moses and Edward Hicks. Point out that although these paintings don't try to give a feeling of depth they are charming and pleasing to look at.

Have students create two versions of a landscape. One should be flat, with no attempt to make objects appear to be near and far, and one should give a feeling of depth. Students can create these landscapes with 816/Paint and/or with colored construction paper.

Advanced students should be shown how paintings can be broken down into foreground, middleground and background.

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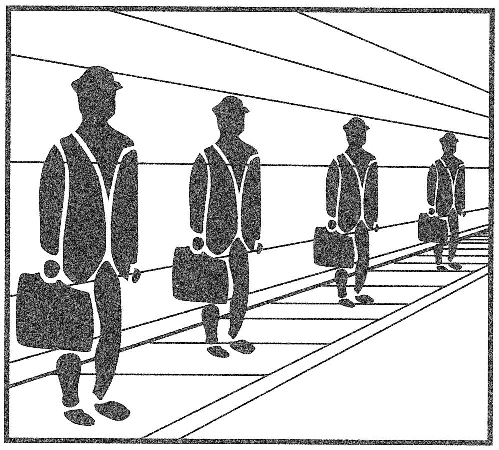
One-point Perspective

Aims: To learn to use the Rays Option with the Connected Lines Tool. To use the computer to develop an understanding of one- point perspective.

Motivation: Distribute Handout #5.



What happens to the objects — the telephone poles and the figures — as they recede into the distance?

Students should note that the objects along the side of the straight road get smaller as they recede into the distance at the horizon.

Have students recall how, at the edge of the shore of the ocean, the water seems to rise from their feet and meet the sky at eye level. The sky seems to come down to meet the water. Where the sky and the water meet is the **horizon line**.

Discussion: As objects recede they seem to disappear on the horizon. (Where the horizon line appears depends upon the position of the viewer in relation to the objects being viewed. From below eye level, the horizon line appears high; from above eye level the horizon line appears lower).

The point at which the objects seem to disappear is called the **vanishing point**.

What happens to the road between the poles as it recedes into the distance?

If you have a long hallway in your school, place a large red circle of paper on the end wall. Have students stand at the opposite end of the hall. Show them how the lines of the ceiling appear to go down and together while the floor lines appear to go up and together — all lines appear to extend to the red circle. Explain that, if the hall was very long, all the lines would eventually meet at the vanishing point.

This visual effect is known as **one-point perspective**. The most basic rule of one-point perspective is that parallel lines appear to converge, or meet, as they recede into the distance.

Ask students to study the handout. Stress the fact that vertical elements, such as the poles and the figures, stay vertical.

Show reproductions of "Annunciation with Saint Emidius" by Carlo Crivelli and "Annunciation" by Domenico Veneziano, or other Renaissance paintings which show the use of one-point perspective. Place tracing paper over the reproduction and, with red marker or crayon, draw the converging parallel lines that would serve as the skeletal outline for the painting.

Activity:

Show students that when they use the Connected Lines Tool they can draw rays emanating from one point by holding down the key when starting the first line. Every time they click the mouse to complete a line, they'll get a new rubberband line stretching from the starting point. Demonstrate how double-clicking will draw the last ray.

Have the students use the Straight Line Tool to draw a horizon line across the screen. At any point on the horizon line, draw an "X" for the vanishing point. Have them use the **Rays Option** to draw a series of lines radiating from the vanishing point to the left and right edges of the screen.

Using the rays as guide lines, have the students recreate one of the one-point perspective examples shown on the handout.

Additional Activities:

Advanced students can use 816/Paint or pencils and rulers to draw a street scene with one-point perspective. Encourage them to make the scene as detailed as possible (wastebaskets, trees, chimney, television antennas and so on).

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Two-point Perspective

Aims: To reinforce skills in using the 816/Paint drawing tools.
To develop an understanding of two-point perspective.

Motivation: Display a large cardboard carton. Ask students to view it from different angles: face on, from above, from the corner and so on.

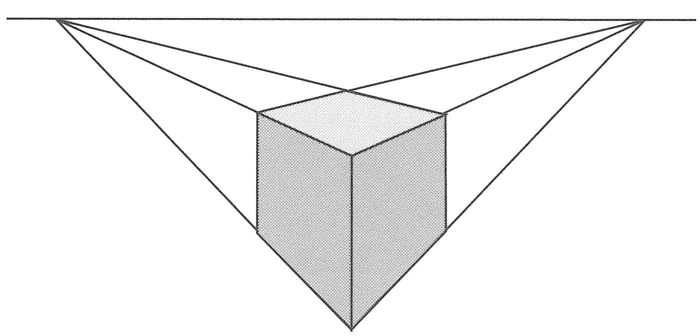
How many sides of the carton can you see at one time? (at most, three)

Have students focus their attention on one corner of the carton. As they stand, facing the carton from a corner, have them close one eye and hold up their thumbs to compare the size of the closest corner with that of the distant corner. Have students do this standing different distances from the carton.

Which of the sides appear to be longer?
Are the sides really different heights?
How do the size relationships differ when standing different distances from the box?

Have a student stand at a distance from the carton and visually align a ruler with its top. Show that the ruler is not horizontal (it's not parallel to the floor or ceiling).

Discussion: Ask students to describe the appearance of the top and bottom of the carton. Even though they're straight, depending upon where the students stand, the top and bottom will appear to be at an angle.



Demonstrate with a simple line drawing on the blackboard, how the top and bottom of the carton converge to two vanishing points.

Show a reproduction of Vincent Van Gogh's, "The Artist's Room at Arles" or another painting that demonstrates the use of two-point perspective.

Activity: Have students draw a horizon line and then indicate two vanishing points on the line. Have them draw two series of lines radiating from the two vanishing points to the edges of the screen.

Using these lines as guide lines, students should draw a series of cubes from several different angles.

Additional Activities:

Advanced students can use 816/Paint or pencil and paper to draw a two-point perspective image of "A Corner of the Street."

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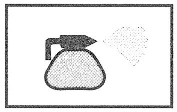
Impressionism 

Aims:

To learn to use the Spray Paint Tool.
To create an Impressionist painting.

Motivation:

Display reproductions of Claude Monet's "Impression: Sunrise," Auguste Renoir's "Landscape Near Menton," Georges Seurat's "An Afternoon at La Grande Jatte," and, for contrast, any painting by Georges Rouault in which the artist used heavy black outlines.

All but one of these paintings were painted by artists known as **Impressionists**. The Impressionists tried to capture the different colors of light as it reflected off objects. They usually didn't paint outlines around the objects in their paintings because they said there are no lines in nature — only forms, color and light.

Which of these paintings were done by Impressionist painters?

Discussion:

The Impressionists tried very hard to see and capture all the colors of nature. They tried to show, for example, that a leaf is not just green. Because of the way light reflects on the leaves, it's made up of many colors.

Some Impressionists, like Seurat, didn't mix colors on their palettes. They painted their pictures with thousands of dots of pure colors, such as red, blue and yellow. The dots were placed very close together so that, as you look at the painting, your eyes blend the colors and you see oranges, greens and so on.

The Impressionists avoided "hard edges." The objects in their paintings seem to softly blend from one to the other.

816/Paint has a tool that will help us paint in the Impressionist style.

Activity:

Demonstrate the **Spray Paint Tool**. Explain that it is similar to an artist's tool called an airbrush.

Show students how they can spray colors. Show them that, as they go over the same area, the dots of color becomes denser and denser until, eventually, the area is filled with solid color.

Have students practice combining different colors with the Spray Paint Tool.

Have students paint a scene from nature using only the Spray Paint Tool. Explain that they'll have to use color to separate objects since they can't create lines with this tool. Encourage them to combine different colors in the various objects, such as mountains and trees, to create a feeling of light and depth in their paintings.

Additional Activities:

Have students create Impressionist-style paintings using tempera paint with sponges instead of brushes.

Have students experiment with spatter painting. Cut a stencil from cardboard and place it over a sheet of drawing paper. Dip a toothbrush into paint and drag an ice cream stick across the bristles of the brush to spatter the paint onto the paper. Try different combinations of color to create an Impressionist effect.

Students can create spatter paintings in 816/Paint. Use the **Edit Brush** command to create custom "spatter brushes."

Have advanced students use the Spray Paint Tool as an airbrush to shade objects for "realistic" renderings.

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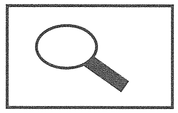
Miniatures



Aims: To learn how to use the Zoom Tool.
To create a computer graphic "miniature."

Motivation: Draw two 1" by 1" squares on the blackboard. Time a student as he or she writes every letter of the alphabet into one of the squares. The letters may not touch each other or touch the edges of the square.

Have another student come to the board to do the same thing with the second square. Give this student a magnifying glass.

Who took a longer time to write the alphabet? Why?
How did the magnifying glass help?

Discussion: It is often helpful, indeed necessary, for an artist to use a magnifying glass for detail work.

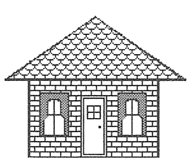
Show reproductions of Indian and/or Persian miniature paintings. Show some illuminated pages from Books of Hours such as "Trés Riches Heures du Duc de Berry" or "Rohan Book of Hours."

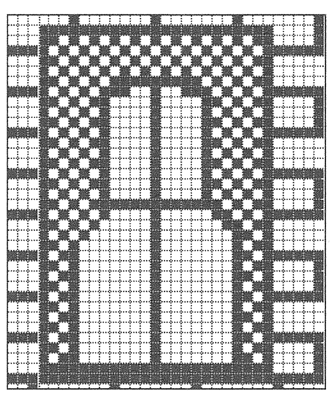
Point out the intricate details and rich patterns used in these works.

Do you think the artists who did these illustrations used a magnifying glass?

Computer artists sometimes need to see things a bit closer as when they want to change the color of just one pixel without changing the color of neighboring pixels.

Activity: Demonstrate the **Zoom Tool** in 816/Paint. Show students that there are three different magnification levels.





Show students the **Scroll Zoom** command under the **Options Menu**.

Have students create a miniature landscape or still life. The entire picture is to occupy no more than one quarter of the screen. Encourage them to use the Zoom Tool to create as detailed a picture as possible.

Additional Activities:

Needlepoint: Have students design a picture for needlepoint (a simple animal or object) by drawing it in 816/Paint and zooming in on it. Then, they can use a felt-tip pen to transfer it to grid paper. One box on the grid paper represents one pixel on the screen. Have students create a needlepoint of their images.

Mosaics: Students can zoom in on any of their computer graphic images and use them as templates for paper mosaics. They can duplicate their images, pixel by pixel, using tiny squares cut from colored construction paper. Advanced students can use real mosaic tile.

Show reproductions of Georgia O'Keefe's flower studies such as "Black Iris," Arthur Dove's "Plant Forms," and Ben Shahn's "The Welders." Have students use 816/Paint to create close-up studies of objects such as shells, leaves and so on. Every-day objects take on special qualities when enlarged.

Advanced students can use pencil, pen and ink or watercolor to create detailed drawings of objects they view under a microscope.

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Variations

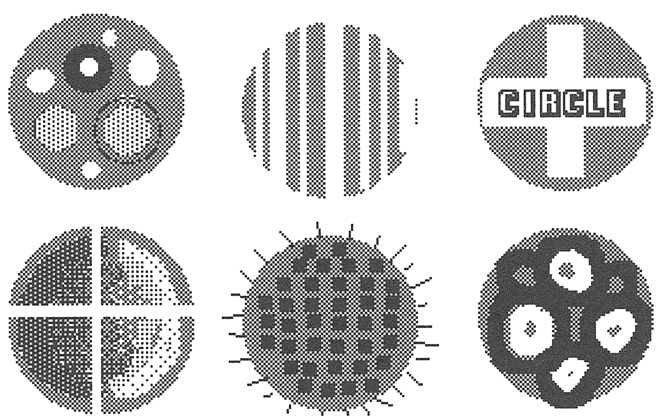
Aims: To reinforce skills with the drawing and painting tools in 816/Paint. To challenge our creativity and imagination as we create variations on a theme.

Motivation: Hold up a shoebox.

How many different uses for this box can you think of?

List some of the more imaginative responses on the board.

Discussion: A very important aspect of art is creativity. Being creative means taking a fresh approach — doing things differently from the way others do them. Creative artists give people a new way to look at things.



Show reproductions of "Musical Forms" by Georges Braques, "Still Life" by Le Corbusier, "The Violin" by Juan Gris and "The Old Violin" by William Harnett.

If a thousand artists painted the same subject we'd see a thousand different interpretations. Each artist thinks and feels differently about his subject and each will try to tell a different story. A portrait of a snail, in one artist's painting, might be a detailed study of the intricacies of a snail's shell, while in another's, it might be a garden scene in which the snail is eating the leaf of a plant.

How many things can you think of that would make a simple object like a circle more interesting to look at?

Activity: Have students use the **Oval Tool** with the shift key to create a circle approximately one-sixth the size of the screen.

Using copy and paste, have students make five more circles, for a total of six on the screen.

Ask students to use all the drawing and painting tools in 816/Paint and try to do something different and interesting with each circle.

Additional Activities: Have students do the same activity with rectangles, triangles, or other shapes.

Have students stack five or six sheets of colored construction paper and cut out circles (giving them five or six circles). Fold them, cut or tear them, glue things to them, add interesting lines and colors to them. Paste the circles down on background paper or join them with string and wire clothes hangers to create mobiles.

Have each student paint an interpretation of one topic. Topics might include: “My Favorite Hour in School”, “My Town (Village, City or Country)”, “My Favorite Holiday” and so on. When images are complete, print them out and bind them into a book called, “As I See It”.

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Bizarre Relationships

Aims: To reinforce skills in using cut, copy, and paste.
To make a statement using bizarre combinations.

Motivation: Ask students to recall a dream in which strange things happened. Perhaps people, animals or objects were unusually small, large or placed in unusual positions. Confirm that even though these dreams are bizarre, they seemed quite real at the time. In fact, these dreams seemed to be more than real.

Show students reproductions of "The Eternal City" by Peter Blume, "Persistence of Memory" or "Premonition of Civil War" by Salvadore Dali as well as other Surrealist works. René Magritte's paintings, such as "Thérapeute", are especially recommended.

Point out that these paintings portray a dream-like world.

Why do you think the artists chose to make such unusual images?

Would more traditional views of their subject matter make the same statements as these bizarre images?

Discussion: Artists don't try to imitate the real world but rather to communicate their personal visions of the world. Frequently they will use bizarre relationships to communicate a message.

Art that depicts unusual worlds, often referred to as "dream" worlds, is known as **Surrealism**. Surrealistic paintings are generally very detailed and realistic (life-like) even though they portray unrealistic events.

Activity: Have students load images they created for other activities. The images must be representational ones. Have them cut, copy and paste the objects into bizarre arrangements. For example, using a previously drawn still-life, students can have a banana growing out of an apple. They can add new elements to the painting to make it more bizarre. They may also combine elements from more than one painting. Students using the super hi-res version of the program can resize the objects using keyboard commands.

Print the completed graphics and post them on the bulletin board.

Where is surprise achieved through unusual size? shape? color?
What is meant by proportion? scale?
Where do familiar objects look strange? humorous? frightening?

Additional Activities:

Cut a variety of pictures from newspapers or magazines. Arrange them in unusual ways and paste them down. A boat can sail up a building. A man can climb along the surface of an apple.

Have students use 816/Paint or paint and paper to illustrate an everyday scene as it might appear to a caterpillar.

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Distortion SUPER

Aims: To learn how to stretch and shrink a marquee selection.
To create an interesting painting using stretch and shrink to distort images.

Motivation: Display a reproduction of "Guernica" by Picasso.

How does this painting make you feel? Is it a happy painting?
Is this painting about joy, war, or the seasons?

Discussion: "Guernica" is a wall-size painting by Pablo Picasso. In 1937 he was upset by the civil war in his country, Spain, and was horrified by the news of a bombing attack on a little town called Guernica. Picasso painted this picture to show how ugly war is and how it damages and destroys.

Picasso could have painted a realistic picture of the bombing but he deliberately chose to distort the figures in his painting to convey emotion. He deliberately made everything broken and ugly to tell you that a terrible thing happened in this town.

Have students point out the places where Picasso used the most distortion and discuss the effects of this distortion.

Many artists use distortion to make their pictures more interesting and powerful.

Show reproductions of "Five Women in the Street" by Ernest Ludwig Kirchner, "Tragedy of Man" by Oskar Kokoschka, "Lolotte" by Amedeo Modigliani, and "Andrew and Francis" by El Greco.

Show some cartoons or comic strips in which distortion is used for humorous purposes.

Distortion can be used to convey humor as well as anger or sadness.

Activity: Have students create a painting using the theme of joy, sadness, fear or loneliness. Encourage them to use human as well as animal figures in their compositions. Explain that they don't have to concentrate on creating "true-to-life" figures because they'll be distorting the figures to emphasize the emotion of the paintings.

Show how the key is used to stretch and shrink marquee selections in 816/Paint. When the student's images are almost complete, encourage them to distort some of the figures, as well as other objects in the picture, to create a stronger emotional impact.

Additional Activities:

Discuss the popular amusement park attraction in which a room is full of mirrors that distort everything they reflect. When we look into these mirrors we appear short and fat, tall and thin,wavy and so on. Have students create a painting called "House of Mirrors" in which objects are reflected in distorted ways.

Have advanced students look through magazines and cut out one or two interesting human or animal figures. Have them place the figures on a piece of background paper, look at them and think about which parts they'd like to distort. Suggest they try extending them to make them appear larger or overlapping them to make them appear smaller. They can do this by cutting the figures into thin (about one-half inch) strips and carefully moving and placing the strips to create the desired effect. When students are satisfied with their images they can paste down the pieces.

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Fantastic Creatures

abc

Aims: To learn to use the Text Tool and to erase.
To stretch our imaginations and create fantastic creatures.

Motivation: Show students pictures of mythical creatures such as the unicorn, dragon, mermaid, and so on.

Who can identify these creatures?
Do these creatures really exist?

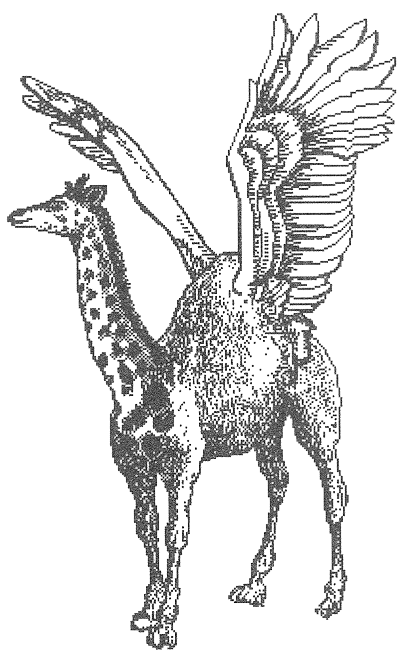
Allow a volunteer student to recount the legend of the unicorn. If there are no volunteers, recount the legend yourself.

Discussion: People have always used their imaginations. Exciting myths, fairytales and folklore come from this ability to imagine. Often our imagination is fed by actual occurrences or things. The mermaid, for example, is part woman and part fish. The unicorn is part horse and part goat, with the added attraction of a horn.

Who can tell us what kind of animal Pegasus is?

Our imaginations let us see, do and create things that would be impossible in actuality.

Activity: Show students how to "erase" selected areas of the screen by using the brush tool with the background color. They can also erase objects by selecting them with the Marquee or Lasso Tools and pressing the delete key.



Show students how, by selecting the **Text Tool**, they can type words onto their graphics.

Have students type the names of as many animals as they can think of that have more than one syllable, such as elephant, rhinoceros, chimpanzee, aardvark or hippopotamus. They should type a blank space between the syllables. Encourage them to use the **Grid Command** from the **Option Menu** so that the words align properly. Walk around the room and help students with their spelling.

When they've completed their lists, have students use the MarqueeTool to move and combine syllables from the names of two or three different animals, e.g. rhinophant, elevarkamus and so on.

When they have the combination name they like, they can erase all but that name and then create the imaginary animal the name describes.

Additional Activities:

Illustrators use words with pictures to tell a story. Encourage students to create legends about the fantastic animals they created and type the legends around the images of the animals. When students have completed their graphics, print them and bind them into a book of "Fantastic Creatures."

Have students create imaginary creatures by cutting pictures of people and animals from magazines. They can cut the figures into sections and mix and match the sections.

Advanced students can create three-dimensional versions of their creatures using clay, papier-maché, plaster or other media.

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Posters

Aims: To learn to use the Hand Tool and the Font, Size and Style Menus. To design and create posters.

Motivation: Distribute Handout #6.

Which lettering do you prefer? Why?

SANS SERIF
SERIF

Explain that one poster uses a **serif typeface** and one poster uses a **sans-serif typeface**. Show that serifs are like little feet added onto letters. They serve the function of guiding our eyes across a line of text to make it easier to read.

Discussion: Show students more samples of different typefaces. You might get these from a local print shop or a book on type.

There are many different typefaces. Some are long and skinny, some are short and wide, some are like script and some are very ornate and decorative. Typefaces are designed by artists who are very careful to make sure that every letter in the typeface goes well with the others.

Type is used to communicate a message. We see type in magazines, books, signs and posters. It's important to select a typeface that's appropriate for its purpose. Posters, for example, must be read and understood quickly because we usually glance at them only a moment as we walk down the street. A decorative, difficult-to-read typeface would be inappropriate. The lettering should be large and attractive so that it catches our attention. For the same reason, the images used on posters should be simple but attractive.

Activity: Demonstrate how to use the **Font**, **Size,** and **Style Menu**s in 816/Paint.

Show students that the point sizes shown in heavy print on the **Size Menu** look best on the screen and when they're printed. You might explain to advanced students that these sizes are real fonts while the other sizes are scaled by the 816/Paint program.

Using a theme, perhaps a school activity such as a dance, elections or a sports event, have the students design a poster. The posters should be created full-page size rather than screen size.

Show students how to use the **Hand Tool** to move around the screen.

Have students print their posters. Post them on the bulletin board.

Additional Activities:

Show students posters by Henri de Toulouse Lautrec and Alphonse Mucha. Explain that these posters were created at a time when posters were considered a fine art rather than commercial art. Have students create a "decorative" poster.

Show reproductions of pages from Corita Kent's "Damn Everything but the Circus". Show "Poem Picture" by Piet Mondrian, "Snail, Woman, Flower, Stars" by Juan Miro, and "Field Painting" by Jasper Johns. Explain that fine artists frequently use letters and words to enhance their paintings. Discuss how the use of type in these works differs from the way it's used in commercial art.

Have advanced students use 816/Paint to create a composition that effectively combines type with lines and shapes.

Have students create a type collage using words and letters cut from magazines and newspapers.

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Animation 1: Page Flipping

Aims: To introduce students to animation.
To create a page flip animation on the Apple II.

Motivation: Show a flip book to the students. If you don't have one, you can make a simple one by drawing a bouncing ball, one frame per page, in a small (2" x 3") pad of paper. Ask the students to describe what happens to the object as you flip through the pages.

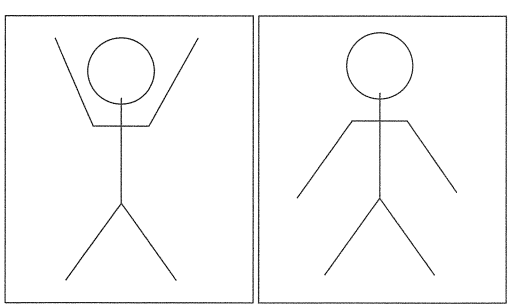
Is the object really moving? Or does it just seem to be moving?

Discussion: In animation, the illusion of movement is achieved by rapidly showing a series of sequenced pictures called "cels." As the pictures change, our eyes and brains interpret what is happening as movement. The flip book is a simple and entertaining example of this effect.

On the Apple II, in standard hi-res mode, a similar effect can be achieved with two images and a process known as **page flipping**. In page flipping, two pictures are loaded into memory at different places. By asking the Apple to rapidly shift between showing the two pictures, the viewer sees an animation effect.

A small BASIC program is required to achieve this effect. The program is shown at the end of this activity. Enter it into the computer and save it onto the student's data disks. Be sure you have a copy on the disk you'll be saving your demonstration pictures to.

As students watch, create a simple drawing, in standard hi-res mode, of a stick-figure with the arms held up. Save the drawing to disk as Figure1. (Have students note that you checked to be sure the "unpacked" button is pressed when you save the drawing).



Erase the upheld arms and draw new arms that are being held down. Save this picture to disk as Figure2. Once again, be sure the "unpacked" button is pressed. Emphasize that the unmoving parts of the two images must be identical. That's why you used the original drawing and erased the arms rather than trying to redraw the whole stick figure.

Quit 816/Paint and enter Applesoft BASIC. Your system must be set for 40 column text for this program to work. Run the Page Flip program. When the program asks for the name of picture 1, enter the name Figure1. Enter the name Figure2 when you're asked to. The program will then load the pictures to different hi-res areas of the computer's memory and begin to flip pages. You can change the number of flips by changing the number in line 20 of the program. (e.g. 20 NUM=100 would double the number of flips.) You can change the speed of the flips by changing the number in line 30 of the program; the higher the number, the slower the flips. (e.g. 30 T=250 would speed up the animation.)

Because of how the Apple computer is constructed, only two images can be used for page flipping.

Activity:

Have students create a simple image for page flipping. They might do an eye blinking, ET's finger flashing, and so on. The quality of the drawing is not as important as is the concept of keeping unmoving parts of the drawing in exactly the same place in both cels.

Additional Activities:

Ask students to make their own flip books using a pencil and a small pad of paper. Each page should contain a picture that is subtlely different from the one on the previous page. It's best to start at the back of the book and work forward. Then, it will be easier to calculate movement changes because students can see the previous drawing through the next page.

Advanced students can look at Edward Muybridge's stop-action photographs. These photographs can be traced onto paper and constructed into flip books.

Page Flip Program:

```
10 D$=CHR$(4)
20 NUM=50: REM NUMBER OF FLIPS
30 T=500: REM TIME DELAY
40 N=0: REM COUNTER
50 INPUT "ENTER THE NAME OF PICTURE1:";P1$
60 INPUT "ENTER THE NAME OF PICTURE2:";P2$
70 PRINT D$"BLOAD"P1$",A$2000"
80 PRINT D$"BLOAD"P2$",A$4000"
90 POKE -16297,0:POKE -16302,0:POKE -16304,0
100 POKE -16300,0
110 FOR D = 1 TO T: NEXT D
120 POKE -16299,0
130 FOR D = 1 TO T:NEXT D
140 N=N+1:IF N<NUM THEN GOTO 100
150 TEXT
160 END
```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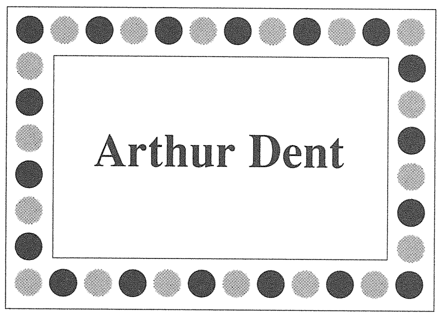
Animation 2 SUPER

Aims: To learn to use color cycling.
To learn a special kind of animation technique.

Motivation: Ask students to recall old-fashioned movie marquees — those made up of rectangles of light bulbs. If you have access to a video-tape of such a marquee, show it.



Why do the lights appear to move around the marquee?
Are the bulbs moving?

Load the picture "Pyramid816" from the Picture.Folder of the 816/Paint disk. Select the **Cycle Colors** option from the **Color Menu**. Ask students to focus on the red stripes and describe what they see. The stripes appear to be moving up the pyramid.

Discussion: Animation can be achieved through the clever use of color. This illusion of movement is a result of 816/Paint's capacity to store eight different palettes per graphic and cycle through them.

Tell students to look at the palette area at the bottom of the screen. The palettes are changing very rapidly. The stripes appear to move because the palettes are changing. Emphasize that the picture isn't changing; the colors are changing as the palettes are switching.

For this activity, we'll refer to the colors by number. Call the black at the far left of this palette "color 1" and number the rest of the colors successively so that the white on the far right is "color 16."

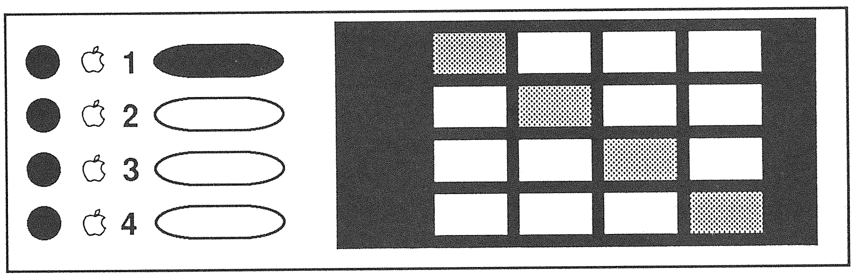
Clear the picture from the screen by selecting **New Picture** from the **File Menu**. Remove all but palettes 1 through 4 from the cycle animation by pressing the appropriate buttons. Press the OK button to put away the palette windows.

At the top of the screen, just underneath the menu bar, draw four filled boxes. (Use the **Grid Command** from the **Option Menu** to assist you in making them the same size.) For box 1, use color 1; for box 2 use color 2 and so on. You're using palette 1 from the "Pyramid816" image so the boxes should be: deep red, deep blue, red and purple-ish red respectively.

Bring up the Palette Edit and Palette Select windows. Students should still be able to see the boxes you drew in the small area of your picture shown between the palette windows and the menu bar. Edit palette 1 so that colors 3, 4, and 5 are white. (Copy the white from the far right of the palette.) As you do this have the students note that three of the boxes have disappeared.

Where did they go?

Select palette 2 by pressing the elongated palette select button to the immediate left of palette 2.



Have students note that the invisible boxes are back!

Edit this palette so that the red from position 2 of palette 1 is in position 3 of this palette. Repeat this until the red forms a diagonal across a rectangle of white. Turn on color cycling. The box appears to move across the screen.

Activity:

Have students make a "Movie Marquee" by following these step-by-step instructions:

1. Create a rectangle of dots or boxes using alternating colors from the palette: dot 1 in color 1, dot 2 in color 2, dot 3 in color 1, dot 4 in color 2 and so on.

2. In the middle of this rectangle, type your name using the Text Tool and a different color from the palette.

3. Edit the palettes so that palette 1 has red in position 1 and white in position 2, and palette 2 has white in position 1 and red in position 2. Be sure that only these palettes are included in the cycle by pressing the appropriate dots in the Palette Select window.

4. Turn on color cycling. The speed of the cycling may have to be adjusted as it is critical to generating the illusion of a marquee.

Additional Activities:

Color cycling is commonly used in the weather segments of local news shows. Ask students to watch a television weather forecast. Then, have students create a weather map by drawing a map of the United States, or an imaginary country, and adding color cycled symbols: storm clouds, rain, the jet stream, shining sun and so on.

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Appendices

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Computer Essentials

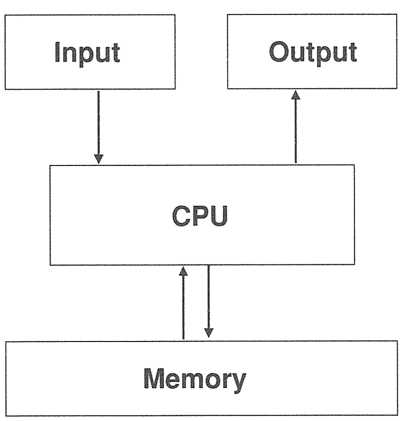
In order to understand what computer graphics are and why they have maddening limitations at times, you first must understand some computer basics.

There are five models of Apple II computers: the original Apple II, released in 1977, the Apple II Plus, the Apple IIe, the Apple IIc, and the Apple IIGS. In general, the later the model, the more sophisticated the capabilities of the computers. The Apple IIe is an exception to this rule as Apple changed several components of the system to make it equivalent to the Apple IIc. Owners of the original Apple IIe model could upgrade their system by purchasing a simple kit. The upgraded Apple IIe is called Apple IIe enhanced. The Apple IIe can also be upgraded to be equivalent to the Apple IIGS, although doing so is rather expensive.

Regardless of model, all Apples share a basic architecture. Two major components make up a modern microcomputer: hardware and software. Hardware is the physical components: the plastic, metal, and silicon. Software is programs: the non-tangible components of the system. Let's look at the hardware components of the Apple II first.

Hardware

The Apple II (all models) is a typical modern microcomputer. Inside the system box, a small bit of circuitry called the Central Processing Unit (or CPU) provides the computational power for the computer. You might think of the CPU as the "brain" of the computer. The different Apple II models have different CPUs. The original Apple II, Apple II Plus, and Apple IIe computers have a 6502 CPU at their heart. The Apple IIc and Apple IIe enhanced has a 65C02 CPU. The Apple IIGS has a 65816 CPU. These CPUs are upwardly compatible, that is, programs written for the original Apple II in 1977 will run on the latest model of the Apple IIGS but the reverse may not be true.



The CPU is not intelligent by any stretch of the imagination; it can only do very simple math, logical comparisons, and a few other simple operations. The sophisticated things you see the computer do are a result of clever programming.

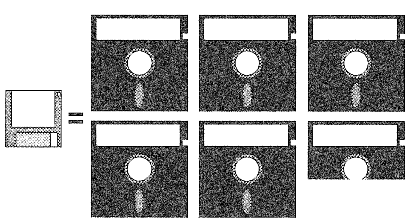
Since we have to communicate with the CPU, all microcomputers have input/output circuitry. In a way, people have input/output circuitry too. Input to our brains comes from senses such as sight, sound, and touch. Talking and writing might be considered our channels of output.

You give information to the computer (which color to use, what numbers to add up, and so on) via input; you get information from the computer (the picture display, the sum of a total of numbers, and so on) via output. The most common input device is the keyboard, although, on Apple II computers, the mouse is becoming almost as common. The most common channel for output is the video monitor. Printers are also important for output.

Memory is the final major hardware component of all modern microcomputers. Just as we need memory to store everything we learn, so does the computer. Memory provides a place for you (via the input device) to store the instructions you want the computer to carry out and the data (information) you wish to work on. Memory also provides a place for the CPU to store the results of its computational work, such as a letter done with a word processor, a graphic created with a paint program, or a record of your finances created with a spreadsheet program.

There are two types of memory: external and internal. Internal memory comes in two flavors: ROM and RAM. ROM stands for Read Only Memory and is "permanent," that is, the contents of ROM cannot easily be changed and ROM retains the information stored in it even when the computer is turned off. ROM, similar to our own "long-term" memory, is used primarily to store system information and programs. For example, the program which tells the computer how to use the keyboard is stored in ROM.

RAM, or Random Access Memory, is volatile (not unlike our own "short-term" memory: 'What was his name again?'). Once the computer is turned off, all the information that was in RAM is lost. RAM is used to store data, such as the graphics you create, and programs such as 816/Paint.



External memory comes from outside of the computer. The most common type of external memory is a floppy disk. Information that is stored in RAM and would otherwise be lost once the computer is turned off, can be safely stored on a floppy disk. Apple computers support two types of floppy disks which vary in their physical size and memory capacity. Bigger is not better in this case, for the 3 1/2" disk can store nearly 6 times as much as the 5 1/4" disks because of improved technology.

Now that you're familiar with some of the technology of the Apple II computer, let's see how it relates to computer graphics.

Hardware and Computer Graphics

The type of graphics the system is able to produce is a direct result of the video circuitry hardware present in the system.

The computer's screen display is made up of dots, which we call pixels. In graphics mode, these pixels are displayed in a grid, much like graph paper, with rows and columns. When you draw, and see a horizontal line, for example, what you're actually seeing is a row of pixels. Resolution is the term used to describe the density of pixels on a computer graphic. The greater the number of pixels, the higher the resolution. The higher the resolution, the more details you can put into your graphic.

Many compromises were made in the Apple II circuitry because most people used standard color televisions, rather than video monitors, when the Apple II was first released. Standard color televisions — at least those

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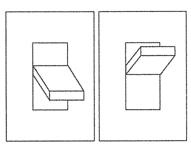
of the mid '70s — had some severe limitations including the inability to clearly show more than about 320 dots (or pixels) across each line of the screen. To deal with these limitations and other technical problems, the original Apple II was limited to 280 horizontal dots across each line of the screen and 192 lines vertically (a total of 53,760 dots).

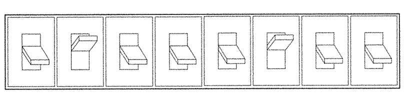
These 280 by 192 pixel graphics were termed high resolution graphics (hi-res) to distinguish them from the low resolution graphics that the Apple computer also offers. Apple's low resolution graphic mode (lo-res) offers 40 horizontal pixels by 48 lines but we won't concern ourselves with lo-res here.

Pixels are stored in the system RAM and displayed on the screen of your monitor. The CPU can directly manipulate each pixel on the screen. An Apple II computer graphic, then, is a "snapshot" of a piece of the random access memory of the computer.

Computers store informations in blocks of memory called "bytes" and these bytes are composed of eight bits. If a whole byte of memory were assigned to each hi-res pixel, we'd need over 53,000 bytes to store a graphic. Since the Apple II can only work with a little over 65,000 bytes of RAM, there'd be little space left for programs! So rather than a whole byte per pixel, the Apple II stores each pixel as one bit, using only seven bits per byte. (the eighth bit was "thrown away," at least in the beginning.)



Off On



A byte

With one bit representing one pixel, the graphics must be black and white. Why? Well, a bit can be likened to a light switch: it's either on or off. If the bit is "on" we see white. If it's "off" we see black. We do get color in our Apple II graphics, however, and that's due to the way Steve "Woz" Wozniak, designer of the Apple II, developed the video circuit. Without getting too technical, suffice it to say that the Apple's video circuitry alternately produces green and violet pixels across the screen. Since the pixels alternate, and there are 280 pixels across the screen, you can only put a green or violet pixel in 140 locations across the screen. The way it works out, a pixel will either be green or violet depending on its horizontal location on the screen.

Sound confusing? Remember that we said the screen is a grid. Well, the rows and columns of the grid are numbered—from 0 to 279 horizontally, and from 0 to 191 vertically. The upper left hand corner of the screen, then, is position 0,0 while the bottom right hand corner of the screen is position 279, 191. If a pixel lies in an even row, e.g. 10,13, it will be violet; if it lies on an odd row, e.g. 11,13, it will be green. To see this in action, try to draw a vertical green line starting at the uppermost left hand corner of your screen (position 0,0). You won't be able to. You will, however, be able to draw a violet line.

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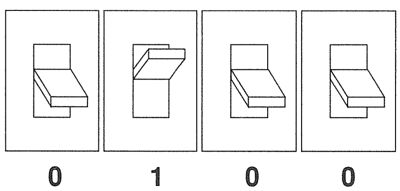
White, by the way, is produced when two pixels are side-by-side.

Wozniak went a little further to make the graphics more colorful. The video circuitry was altered to "see" the unused bit in each byte (that eighth bit that was originally thrown away). If this bit is "on," the pixels in the whole byte will be orange or blue rather than green or violet. If all this is too complicated for you to deal with, just remember these hi-res color limitations. When you're working in hi-res your pixels can be blue, orange, violet or green, depending upon where they're positioned on the screen. You cannot successfully place an orange pixel next to a green pixel (or a blue pixel next to a violet pixel) unless you happen to be in one of 39 places on the screen where the bytes butt up against each other. If you try to do so, you'll find that the colors "flip" each other. Try it.

With the introduction of the Apple IIe, Apple added 64K of RAM and introduced new graphic capabilities, double hi-res. As its name implies, there are twice the number of pixels: 560 horizontal pixels by 192 lines. Rather than stick with one bit per pixel, Apple assigned four bits to each pixel. Four bits can describe 16 different pieces of information. (If we let 0 represent a bit that is "off" and 1 represent a bit that is "on," there are 16 different combinations of four bits: 0000, 0001, 0010, 0011, 0100, 0101,0110, 0111, 1000, 1001, 1010, 1011, 1100, 1101, 1110, 1111.) The significance of all this is that double hi-res gives us 16 different colors to work with.



The next step in the evolution of the Apple II occurred in 1986 with the release of the Apple IIGS. It was a quantum leap. The 65816 CPU allows for 16M of RAM and is significantly faster than its 6502 ancestor. Two new graphics modes were created: super hi-res 320 and super hi-res 640.

In super hi-res 320 we get 320 pixels horizontally and 200 lines. A pixel is represented by four bits, so, as in double hi-res, we get 16 colors.

In super hi-res 640 we get 640 pixels horizontally and 200 lines. In this graphics mode, however, a pixel is represented by only two bits so we get only four colors.

The colors in these two new graphics modes are not fixed as they are in double hi-res. A pixel does not have to always be red or blue. Instead, the video generator looks up the color each bit combination should represent from a table called a palette. The palette is a list of 16 colors from a choice of 4,096. To change the color of your pixels, you need only select a new palette.

You can't just load a hi-res image into the super hi-res screen but first must translate it so that the bits and bytes will be correctly interpreted. Baudville provides file translators with 816/Paint to allow you to go from hi-res to double hi-res to super hi-res, but not the reverse.

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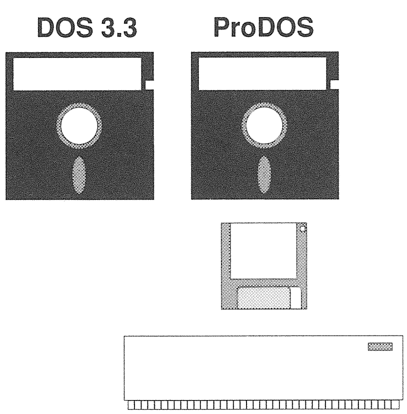
The final hardware contribution to Apple II graphics was an accident. Because the pixels in super hi-res 640 mode are very small and close together, it was noticed that they blur together. (The technical name for this phenomenon is dithering.) Thus, a blue pixel next to a red one looked like a larger purple pixel. By carefully constructing the palette table, super hi-res 640 mode, which is limited to four colors, could have what appeared to be 16 colors. Unfortunately, there's a penalty for using dithering, the effective horizontal resolution is reduced to 320 as two adjacent pixels blend to form one.

Software

Without software, all of these hardware possibilities would be as useful as a record player without records. The software is what makes the computer do everything. The low-level routines buried inside the Apple II ROMs are only a piece of the puzzle. These routines may tell the CPU how to operate peripheral devices or how to put a character on the screen but not much more. A "master control" program is needed to combine the low-level functions into useful ones. This "master control" program is called "the operating system." The operating system lets you do things like format a disk, clear the screen, pass keyboard input to Applesoft BASIC and so on. Useful things; essential things.

All Apple II computers, except the II GS, have a built-in cassette tape operating system. That is, the ROM operating system is geared toward loading data from, or saving data to, an audio cassette deck attached to the computer. In the 1970's, disk drives costs thousands of dollars and most home computer users used cassette tapes. In the late 70's, Apple released the Disk II® disk drive, and with it, a new operating system called DOS 3.1. (DOS, pronounced to rhyme with "toss," is short for Disk Operating System.) With DOS loaded into the computer, you could work with 5 1/4 diskettes.



Along with the disk drive, purchasers receive a disk that contains DOS. When you turn the computer on, the disk drive reads DOS from the disk into the computer. This process is termed "Booting DOS," or "Booting the computer," or just "Booting."

Through the years, Apple made changes to the disk operating system and DOS 3.1 evolved to DOS 3.2 and finally to 3.3. At this point, Apple introduced a high-capacity storage unit called ProFile™, a hard disk. Unlike floppies, hard disks can store thousands of files. A DOS intended for a 5 1/4" floppy could never cope with such capacity. A new DOS, ProDOS® appeared. ProDOS is the current disk operating system for all Apple II computers. ProDOS cannot read DOS 3.3 disks and vice versa. Fortunately, 816/Paint contains a disk utility which will enable you to transfer graphics stored on DOS 3.3 disks to ProDOS.

With any DOS, disks must be prepared for use. The process, somewhat similar to putting the grooves on a phonograph record, is called "formatting" (sometimes, initializing). Disks can be formatted using the File Utilities program on the 816/Paint disk. Since graphics take up lots of disk space (8K, 16K, or 32K for hi-res, double hi-res, and super hi-res images respectively), it's always a good idea to have several formatted disks available at all times.

Software and Computer Graphics

With DOS booted, you can deal effectively with the disk drive but what of graphics? Apple II, II Plus, IIe and IIc computers include built-in support for writing programs using lo-res graphics and hi-res graphics but not double hi-res graphics. The Apple IIGS has a wide variety of built-in graphics tools for super hi-res graphics. You can easily plot a pixel, draw a line, set the color of the pixel or line, and so on. Unless you're quite accomplished in programming, however, you wouldn't be able to create graphics of great significance.

For a long time, anyone who wanted to use a computer had to learn how to program. Not so today. We feel it is very useful for anyone seriously interested in computer graphics to learn some elementary programming. Apple's own Applesoft Tutorial, listed in the bibliography, does an admirable job of introducing beginning BASIC programming — with a bit of graphics thrown in. However, if all you want to do is paint and draw with a computer, you don't have to concern yourself with programming at all.

That's where software comes in.

There is an astonishing variety of graphics software available for the Apple II computer. This software allows you to concentrate on the task at hand — painting, drawing, animating, by providing you with the programs needed to do it. 816/Paint is an example of a paint program. Baudville also produces graphics programs to create animations (Take One) and to create certificate printouts (Award Maker Plus).

That's about it. Believe it or not, we've only just touched the surface of the relationship between computer hardware and software and graphics. For further information you should consult one of the books in our bibliography.

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Suggestions for Additional Activities

Photographing the Screen

Color output from dot matrix printers is useful for many projects, however, it is not of high enough quality for some uses. For high quality output, you can photograph the screen.

You'll need a 35mm camera, tripod, and shutter release. Because of the small size of most Apple II monitors, you must have a lens that will allow you to focus very close to the screen. A standard macro lens would be best although inexpensive magnifying filters also work well. Any film will work but keep in mind the color balance of the film. KodaChrome® type films tend toward the red/yellow side of the spectrum whereas EktaChrome® type films tend toward the green/blue. Shutter speed must be set to *slower* than 1/30th of a second (1/8th usually works well).

Set the camera on a tripod. Load the graphic into 816/Paint. Remove the menus and toolbox by pressing 0.(Zero). Set the f-stop and shutter speed, darken the room to eliminate glare and reflections and snap the picture. It's best to "bracket" your shots — take three pictures of each screen: one at the f-stop read from your light meter, one at an f-stop higher, and one at an f-stop lower.

Don't limit your photography to full screen images. Experiment with using the macro lens to zoom into a small piece of a graphic.

Videotape

If you're using an Apple IIGS, you can videotape your student's graphics very easily. Just attach a VCR to the Video Out Port at the rear of the Apple IIGS. Press the Record button on the VCR and whatever is on the screen will be captured on videotape. You can create very effective "slide show" presentations this way.

If your VCR has dubbing capabilities, you can record music on the sound track and create your own music videos. If you have videotape editing facilities at your school, consider combining live-action footage with the computer graphics.

Video output from an Apple IIe or Apple IIc does not tape correctly. If your students are using these computers and you don't have access to an Apple IIGS for the taping session, you may be able to coax your local Apple dealer to allow you to use the store's demonstration Apple IIGS for the videotap-ing.

Sculpture

Computer graphics can become "sculpture." One school based a project on Michelangelo's "David." A photograph of the sculpture was digitized in segments (1/4 of the body per segment). Each student in the class took a digitized image, reacted to it, and modified it. The final images were photographed off the screen. The photographs were then mounted on boxes and piled up, reconstructing David. The result was an exciting sculpture.

Portraiture

Use a video digitizer and digitize all the students. Let the students load their images into 816/Paint and alter them. They'll enjoy changing their hairstyles, aging themselves, seeing themselves with different noses, eyebrows, and so on.

Design a Flag

Discuss symbols and have students combine this new knowledge with their knowledge of color associations to create flags. They can designs flags that symbolize themselves, their school, their town and so on. Print the flags and display them individually or mount them together to create a wall hanging.

Another View

Have students take one of their paintings and zoom in on it. Start by printing out the painting and placing a piece of cardboard with a window (a small rectangle approximately 1/4 of the image) cut out of it. Move the cardboard around on the print and, looking through the window, select an area of the painting you find most interesting.

Create a new full-screen painting of just this small part of the first painting. The results will probably be abstract compositions.

Books

One of the advantages of creating art with the computer is that you can make multiple copies of each screen. Introduce a lesson on bookbinding. Younger students can bind their books by hand using punched holes threaded with wool. Older students can try their hand at more sophisticated binding techniques.

Students can vote on a theme for their book and create special graphics for it or they can create a class sampler of their favorite 816/Paint graphics. They can vote on which graphic to use as the cover.

Print a class set of each student's contribution. For added "class" have each student hand sign each printout of his or her graphic. After they've bound their prints, they can take their books home to show them to family and friends.

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Glossary

A

alert: special type of window which informs you of something, usually a problem. One of the most common alerts tells you that a disk is full. You must dismiss the dialog by pressing a button before you can continue. See dialog box.

aliasing: also called "the jaggies." Lines and edges of a computer graphic that are not drawn horizontally or vertically will be stair stepped. The higher the resolution, the less apparent the aliasing.

algorithm: formula for accomplishing a programming task.

analog: continuous — infinitely variable. Oil painting is an analog medium; the paint can be mixed to give an almost endless range of colors. See digital.

anti-aliasing: process where aliasing is minimized by careful placement of colors. Sophisticated paint programs offer anti-aliasing brushes or functions.

application: user program. Compare with system software and application.

area fill: see fill.

artifacting: production of false color by placing pixels too close together for the video system to resolve. Technically, Apple standard hi-res colors are produced by artifacting.

ASCII: American Standard Code for Information Interchange. A collection of 128 alphanumeric characters and symbols whose internal computer representation is standardized. For example, the ASCII code for the letter "A" is 65 and the ASCII code for the letter "a" is 97. All ASCII codes can be represented in 7 bits (numbers less than 128). Codes lower than 32 are nonprinting, control codes. For example, the ASCII code to ring the bell on a terminal is 7.

aspect ratio: the proportion of height to width on a display screen or other output device. For most CRTs, the aspect ratio is such that objects with the same number of pixels in both the vertical and horizontal direction will appear elongated on the y axis. The type of display monitor used also affects the aspect ratio of the screen image.

B

backup: copy, duplicate.

background color: the base color of the screen. Graphic objects will be invisible when drawn in the background color. In text mode of the Apple IIGS, the background color is set through the control panel and can be one of 16 colors. See foreground color.

bit: binary digi**t**, smallest unit of information. A bit can hold only 1 piece of information: off or on, 0 or 1, black or white. In computer terms, a bit is often represented by a 0 or a 1 depending on whether a circuit component is carrying electricity or not.

bit map: the contents of a frame buffer or other graphics data structure where each pixel is represented by a bit, byte, or word of memory.

bit pad: an input device consisting of a surface with an attached stylus or puck. Moving the stylus or puck on the surface generates position information which can be used by the computer software to position a cursor or enter command information. Bit pads can be based on magnetic, ultrasound, or infrared technology although magnetic is most common. Sometimes called a graphics tablet.

brush: a shape used for drawing on the graphics screen.

border color: color of CRT exterior to active graphics area. On the Apple IIe and IIc, the border color is always black; on the Apple IIGS the border color is set through the control panel and can be one of 16 colors.

boot: start up a computer. The term comes from the old adage "pull yourself up by your bootstraps" and refers to the fact that starting up a computer involves reading an operating system in from a disk. A seeming paradox if a computer must have an operating system to work.

boot disk: disk which is able to startup a computer. Boot disks must contain DOS and other system software and therefore can hold less user data than data disks.

buffer: area of RAM memory used to temporarily store information. See frame buffer.

button: input device which generates one bit of information: on or off. Buttons are often included with other input devices like paddles, joysticks, and mice or may be programmed to be on-screen for use with light pens or pointers.

byte: unit of computer memory consisting of eight bits. Able to store 256 different pieces of information. A single character such as the letter "A" requires one byte of storage on most computer systems.

C

cel: a single component of a frame of animation.

center of interest: that part of a drawing or painting which "draws the eye."

clip art: pre-drawn art that can be purchased to use in a graphic. Some clip art is copy righted and can be used with permission.

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clipboard: area of memory (or disk) used as temporary storage to support cut, copy, and paste operations. See cut, copy, and paste.

color model: a way of thinking about color. 816/Paint in super hi-res mode supports two color models in the palette dialog box: HSI and RGB. Either of these models can be used to mix the same color.

color cycle: type of pseudo-animation on computers with non-fixed palettes where the palette is changed "on the fly" to produce simulated movement. Commonly used in TV weather graphics.

color set: set of compatible colors in hi-res graphics mode. Due to the way the Apple II makes color, hi-res colors are best thought of as being in two sets: white 1, green, violet, and black 1 and white 2, orange, blue, and black 2. To avoid color shifts and other problems, don't try to mix colors from different sets too closely.

complementary color: one of a pair of primary or secondary colors opposed to the other member of the pair. Complementary color pairs in pigments are red and green, orange and blue, violet and yellow.

composite: refers to a type of video signal where color and brightness information is encoded into one signal. Broadcast and cable TV use composite signals. Compare with RGB.

composition: artwork.

contour drawing: type of drawing which shows edges of objects.

copy: place the currently selected object *onto* the clipboard without removing it from the screen. See cut and paste.

CRT: **C**athode **R**ay **T**ube. The electronic tube on which the computer's output appears.

cursor: the active location — the place where your drawing will happen — on the computer graphic screen. The location of the cursor is most often marked with a cross-hair or other representative mark. Graphics-based computers or environments sometimes have two cursors one (the pointer) representing the current position of the mouse or other pointing device and the other representing where the input will go. See pointer and insertion point.

cut: place the currently selected object *onto* the clipboard and remove it from the screen. See copy and paste.

D

data disk: formatted disk used to store user data. Apple 5 1/4" disks can store 140K of data and 3 1/2" disks can store 800K of user data.

desk accessory: a program on Apple IIGS which can be started and used while another program is operating.

dialog box: a window overlaying the screen which must be dismissed by pressing the appropriate button. Dialog boxes are used to obtain information from you. When you open, save,or load a picture in 816/Paint, you use the file dialog box to indicate the file name and disk location.

digital: discrete. Most modern computers are digital; they manipulate 1's and 0's. A woodcut is a digital medium; the block can either be cut, so that it does not leave ink on the paper, or not cut. See analog.

digitize: convert a drawing, photograph, video source, or other analog image into pixels.

digitizing tablet: see bit pad.

disk: magnetic storage medium for computers. Apple II computers support two sizes of floppy disks: 5 1/4" and 3 1/2".

diskette: floppy disk.

dither: "digital color mixing" Mixing a new color by placing pixels of different colors next to one and other. Dithering effectively reduces resolution depending on the coarseness of the dither. 816/Paint uses dithering to create a palette of 16 colors in super hi-res 640 mode as this graphics mode allows only 4 non-dithered colors.

document: data file. See application.

DOS: **D**isk **O**perating **S**ystem. A program which contains the instructions on how the disk is to be read, written to, and managed. See operating system.

dot-matrix printer: type of output device where characters or graphics are formed from a block of tiny dots.

double hi-res: graphics mode available on 128K Apple IIe and all Apple IIc and IIGS computers. The horizontal resolution in double hi-res is 560 pixels in monochrome and 280 in color. The vertical resolution is 192 lines.

drag: move a graphics object by selecting it with an input device and pulling it to the desired location.

draw program: generic name for object-oriented graphics programs.

dump: in graphics, usually refers to producing hardcopy as in "screen dump."

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E

edit: change a computer graphic image.

erase: delete portions of an image often by covering it with the background color.

F

fat bits: see zoom.

file: an organized collection of information. Although files can be stored in all types of memory, most references to files refer to files on floppy or fixed disks.

fill: placement of color within a bounded area.

finder: Apple IIGS application program which allows one to copy disk, rename files, launch other applications. It is normally the startup application on 512K or larger Apple IIGS computers. See launcher.

folder: subdirectory. Folders are logical subdivisions on a floppy disk which allow you to organize your files into meaningful arrangements.

foreground color: color or colors of the visible graphic objects appearing on the screen. See background color.

formal balance: fully symmetrical arrangement of objects in a drawing or painting. Compare with informal balance.

format: process of making a diskette usable by a particular computer system. Formatting writes information to the disk, dividing it into sections called tracks and sectors. Unformatted disks—those straight from the manufacturer—cannot be used by Apple computers. Also called initializing.

frame buffer: that portion of RAM which holds a computer graphic. The frame buffer need not be displayed while an image is being constructed or loaded. See page.

font: a collection of characters of the same typeface, size, and style. Most computer graphic display systems require a bit-map for each font used. The Apple IIGS can scale the bitmap to produce a font of the desired size albeit with jaggies.

futurism: art movement of the early 20th century characterized by dynamic images conveying the beauty of speed, energy, and the machine.

G

gesture drawing: type of drawing, made very fast, which attempts to convey movement.

graphics mode: display mode where every pixel on the screen is manipulatable. Compare with text mode.

graphics tablet: see bit pad.

grey scale: a series of shades of greys ranging from black to white.

H

handle: small boxes, circles, or other shapes shown by object oriented programs when the object in question is selected. Handles are used to manipulate the object, often for resizing or distorting it.

hardcopy: computer output on paper or other permanent medium as opposed to the "softcopy" of the CRT.

hard disk: a fast, high capacity disk which, unlike floppy disks, cannot be removed from the disk drive. Currently, ProDOS supports hard disks of up to 32 Megabytes of storage.

hardware: the physical components of a computer system as opposed to the software or program components. It's hardware if it breaks when you drop it.

hi-res: graphics mode available on all models of Apple II computers. Hi-res has a horizontal resolution of 280 pixels on a monochrome monitor but only 140 in color. The vertical resolution is 192 lines.

horizon line: in perspective, a line on which the vanishing points are located. Represents "eye level."

hue: color. See saturation and intensity.

HSI color model: method of color mixing where the user controls values for hue, saturation, and intensity. Compare with RGB color model.

I

icon: symbolic representation of a process or command choice. For example, a small image of a printer may signify hardcopy. Icons are pointed to with a mouse or other graphics input device and selected by clicking a button on the device.

impressionism: school of art originating in the late 1800's characterized by short brush strokes of bright colors in an attempt to capture the color and light of nature.

informal balance: arrangement of objects in a composition where balance is achieved with unlike objects.

initialize: see format.

I/O: **I**nput/**O**utput. the devices or processes involved in making the CPU talk or listen to the outside world.

insertion point: in the text mode of many graphics programs, the inser-

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tion point indicates where the characters being typed will appear. The insertion point is moved by moving the pointing device and clicking on the device's button.

intensity: brightness. The degree which a color is mixed with its complement.

interface: program or circuitry that enables one computer component to communicate with another. If referring to software, e.g. "the user interface," the screen design and method of interaction used by a program.

inverse: on most computer displays, text and graphics are displayed on a black background. Inverse, then, indicates text and graphics on a white background. In a graphics mode, often produced by complementing the graphic; in a text mode, often produced by altering an attribute bit or byte.

J

jaggies: see aliasing.

joystick: type of input device bearing a free-moving stick. Digital joysticks contain switches which enable software to determine if it has been moved up, down, left, right, or diagonally. Analog joysticks contain rheostats whose resistance is altered by the stick position and — after analog to digital conversion — the computer receives 2 numbers. In graphics, these two numbers are often used as X and Y coordinates. Apple computers normally support analog joysticks.

K

kern: decrease the amount of space between adjacent letters.

K: in computer terminology 1,024 units. Most often refers to bytes. Thus 100K is 10, 240 bytes.

L

lasso: selection tool to allow the selection of irregular shaped pieces of the screen. See marquee.

launcher: alternative startup application for the Apple IIGS. Uses less memory and disk space than the Finder. Unlike the Finder, the launcher only allows you to begin another program.

leading: the vertical space between lines of text and generally measured in points. Written with the font size over the leading size e.g. 10/12.

lo-res: graphics mode available on all Apple II computers which features a resolution of 40 x 48 pixels in 16 colors. Double lo-res (80 x 48) is also available in 80 column Apple IIe and all Apple IIc and IIGS computers.

M

marquee: selection tool to allow for the selection of rectangular pieces of the screen. See lasso.

memory: type of computer circuit that is able to retain information. The information may be programs or data. Memory is generally measured in number of bytes rounded to the nearest power of 2. Thus 65,536 bytes of memory is abbreviated to 64K. See ROM , RAM, and K.

menu: a list of possible actions. When a menu is shown, you must select among the possible alternatives. See command driven.

monitor: CRT.

monochrome: type of display where only one color is shown, often white, green, or amber. A black and white TV is a monochrome CRT.

mouse: input device consisting of a small box bearing one or more buttons. When slid over a surface, the mouse reports its movements to the computer. Optical mice use a light sensor and special reflective pad to determine movement. Mechanical mice use the rolling of a ball on the undersurface of the box to determine movement. The Apple II mouse is opto-mechanical that is, it uses a rolling ball to transmit movement to optical sensors and has one button.

N

negative space: "white space" The space surrounding objects. Compare with positive space.

O

object: a graphic or piece of a graphic which can be manipulated independent of the rest of the display.

operating system: the program which determines how the computer works: what disk formats it supports, how the keyboard works, and so on. The current operating system for Apple II computers is ProDOS although Apple DOS 3.3, an older system, is sometimes used.

P

packed picture: a compressed graphic image where the bit map has been concentrated by a specific algorithm. Often contiguous pixels of one color are combined so that the packed picture reads "20 red" pixels rather than "red, red, red.....". In order to reconstitute the bit map, one must employ an unpacking program which uses the reverse algorithm as the packer. Packed pictures take up less storage space than full bit maps but may display more slowly because they must be interpreted.

paddles: input devices similar to analog joysticks except that each paddle contains only one rheostat and therefore a pair of paddles are necessary to specify both X and Y coordinates.

page: an area of memory sufficient to hold an entire screen. The Apple's two hi-res graphics pages are 8 K long , the double hi-res page is 16 K long, and the super hi-res page is 32K long. See frame buffer.

page flipping: type of animation on the Apple II where one cel is loaded into hi-res page 1 and another into hi-res page 2. Under program control,

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the computer rapidly switches between showing page 1 and page 2 achieving the appearance of animation.

paint: create free-form graphic images.

paint program: a program which allows you to produce bit-mapped graphics. Compare with draw program.

palette: selection of colors available on the graphic screen. The standard Apple hi-res palette consists of 8 colors: green, violet, orange, blue, two whites, and two blacks. The Apple IIGS allows the user to create their own palettes from a larger selection of colors, however the number of colors displayed simultaneously is fixed by the hardware. In an entirely different context, palette may refer to a window containing a selection of tools available for use in a program.

paste: action which removes the object from the clipboard and places it into the current document. See cut and paste.

peripheral: any device attached to a computer system. Most peripherals function as I/O devices.

pixel: smallest dot on a computer graphic; "picture element."

point: move the pointer to an object and press the input device button once. Also called select. When used in type terminology refers to a unit of length equal to approximately 1/72 of an inch.

pointer: arrow or other shape which moves around the screen in response to the movement of a mouse or other input device. Object, tools, or commands can be selected with the pointer.

port: latch through which the computer can communicate to other components of the computer system. A game port, for example, usually allows joysticks or paddles to be connected to the computer system. Serial and parallel ports allow modems, printers, and other devices to be connected.

positive space: the space within an object. Compare with negative space.

primary colors: colors from which all other colors can be mixed.

printout: paper hardcopy.

program: a list of instructions that a computer can execute.

programming language: a computer program which enables one to control the computer by creating lists of instructions which, when submitted to the language compiler or interpreter, can be executed by the computer. Popular languages for graphics include Basic, C, Fortran, and

Pascal. All Apple II computers have a dialect of Basic, Applesoft, built-in.

RAM: Random Access Memory. The active, working memory of the computer where your data, the current program, the operating system, and, in most micro systems, the frame buffer resides.

resolution: the number of dots that can be displayed on a computer graphic screen. The greater the resolution, the finer the image. Generally given as number of number of horizontal pixels x number of vertical lines.

RGB: red, green, blue. Refers to the three electron guns at the rear of a color CRT and the separate signal required to drive them. See composite.

RGB color model: way of mixing color where the user alters the red, green, and blue components. Compare with HSI color model.

ROM: Read Only Memory. Type of computer memory which retains its information when the power is off and cannot be easily changed by the user. Generally used to store basic input output (BIOS), diagnostic, and startup routines.

rubberbanding: method of specifying lines, boxes, or other geometric figures by flashing the object's outline until the user indicates the position and size are correct.

S

san serif: type design which does not have serifs.

saturation: purity. A fully saturated color contains no white.

scan line: horizontal line of the raster scan.

scale: alter an object's size.

scrapbook: a desk accessory which allows the storage of multiple graphics or text snippets.

scroll: movement of the entire display (or display window) in one direction.

scroll bars: gizmos on the windows of graphics oriented operating systems which allow movement through the document.

secondary colors: colors created by the mixing of two primary colors.

selection: object which will receive the next operation or command. In object-oriented programs, one generally points at the object and clicks. In bit map programs, special tools often called a selection marquee or lasso allow one to isolate a portion of the bit map for special functions such as inverting.

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serif: in the design of type, the small line at the top and bottom of certain letterforms. This book is set in a serif typeface. Compare with san-serif.

slot: the connector located inside the computer's case which enables peripherals and additional memory to be added to the system. The slot contains a direct connection to the computer's bus. Apple IIe and IIGS computers have 8 slots.

shade: variations of a color produced by adding or removing black from the basic color.

shape: a small block or vector shape used in animation or as brushes in a paint program.

software: the program component of a computer system. Without software the hardware cannot function.

stylus: a pen-shaped object with which one draws on a graphic or touch tablet.

super hi-res: graphics display mode available on Apple IIGS computers. Super hi-res 320 mode has a resolution of 320 x 200 whereas super hi-res 640 mode has a resolution of 640 x 200.

surrealism: school of art developed in the 20th century emphasizing subconscious and/or nonrational themes. Characterized by unexpected juxtaposition of objects and distortion.

symmetry: the correspondence of size, form, and arrangement of parts on the opposite sides of a line, plane, or point.

system disk: a disk containing all files, programs and data, which are needed to startup a computer may also contain application programs. Sometimes called boot disk.

system software: the programs necessary to make a computer system work. DOS is the most visible component of the system software. Compare with application.

T

text mode: display mode where information is displayed as ASCII or other characters from a ROM or RAM based character table. Compare with graphics mode.

touch tablet: a graphics input device consisting of a pressure-sensitive membrane. Pressure on the membrane surface with a finger or a stylus generates position information. Most often touch tablets connect to a computer's joystick port and are treated by computer software much like joysticks. See digitizing tablet.

touch screen: an input device consisting of a transparent membrane on the surface of a CRT or of special ultrasonic or infrared devices which border the CRT. The touch screen senses the position of a finger or stylus on the surface of the CRT and reports it back to the computer. Software can then use this information to position a cursor.

typeface: character design. See font.

typestyle: character modifications such as bold, italic, and so on. Many computer graphics programs can produce typestyles by applying the appropriate algorithm to the plain font's bit map.

U

undo: restore the document to the state prior to the action just taken.

update: revise the display to reflect current state or activity. Video circuitry refreshes the display 30 times a second.

V

vanishing point: in perspective, the point toward which parallel lines appear to converge.

W

window: a rectangle on the screen that contains a document. All editing and other actions to that document occur within the window. Special windows, dialog boxes and alerts, are used to convey information to you. On the Apple, only one window—the one in front—is active. See dialog boxes and alerts.

Z

zoom: enlargement of a portion of the display often to enable editing of individual pixels. Sometimes called "Fat Bits."

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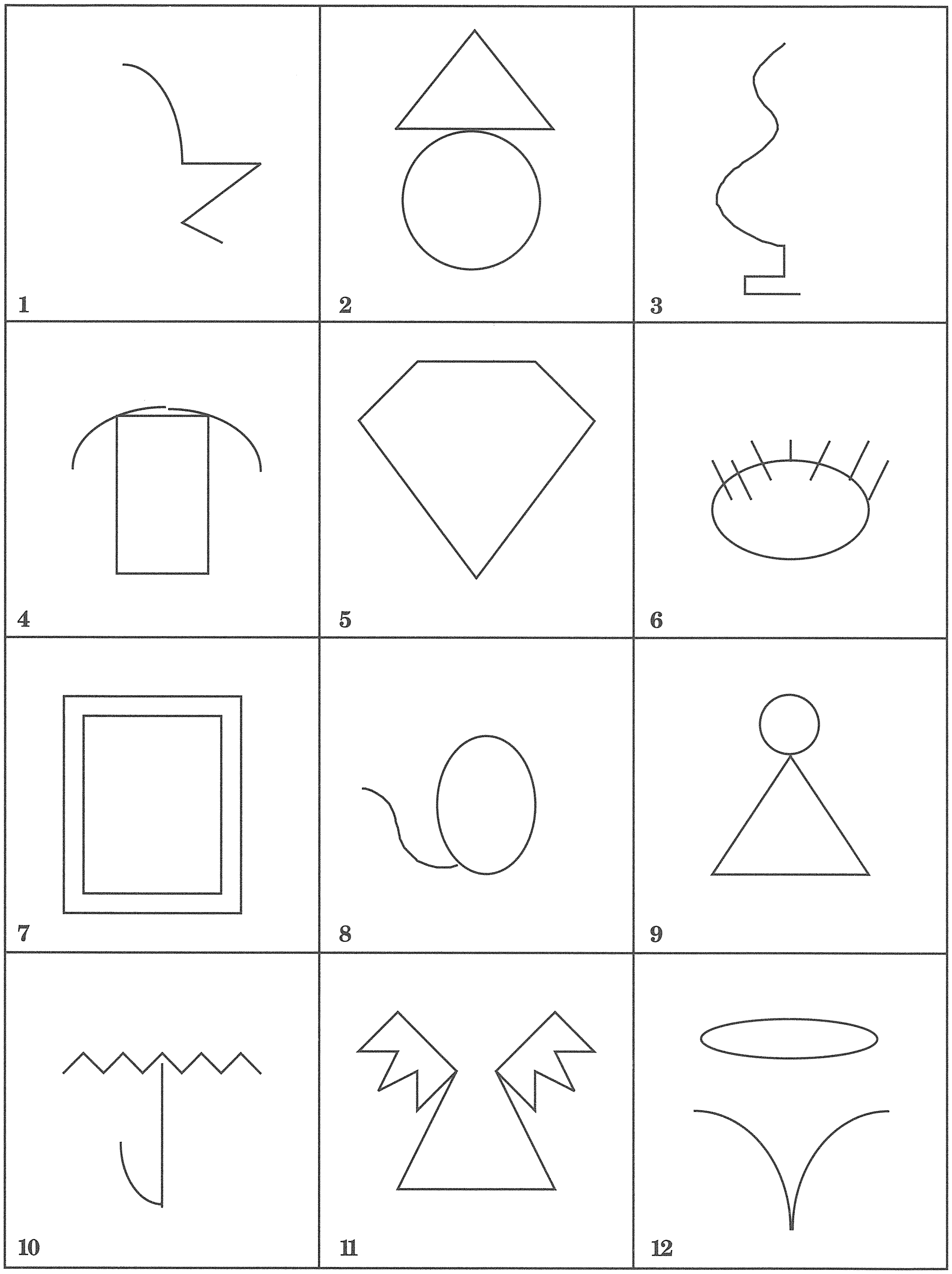
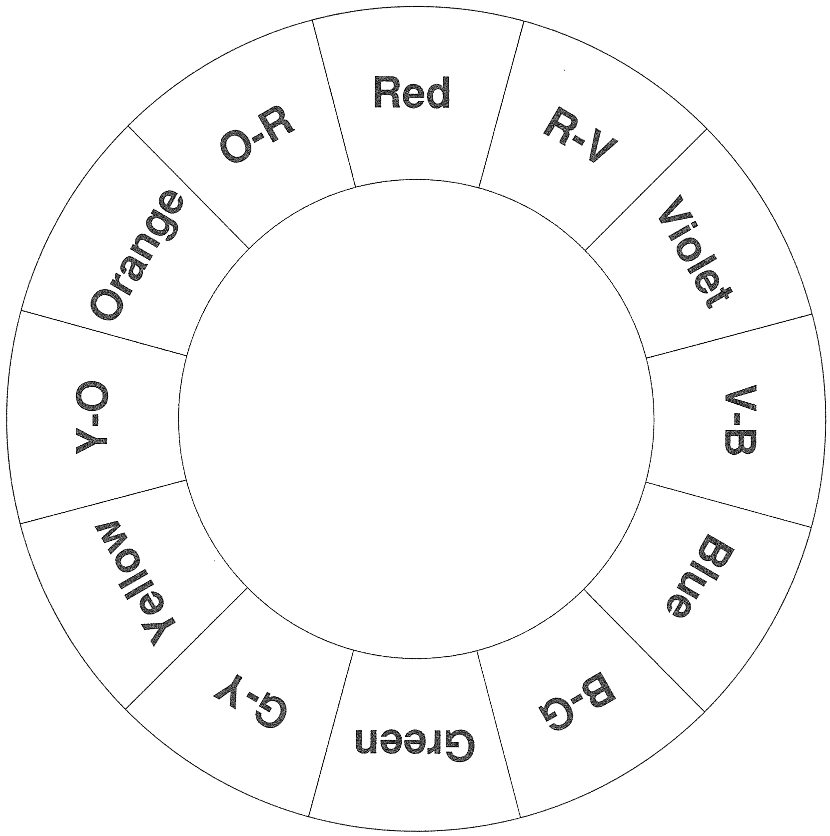
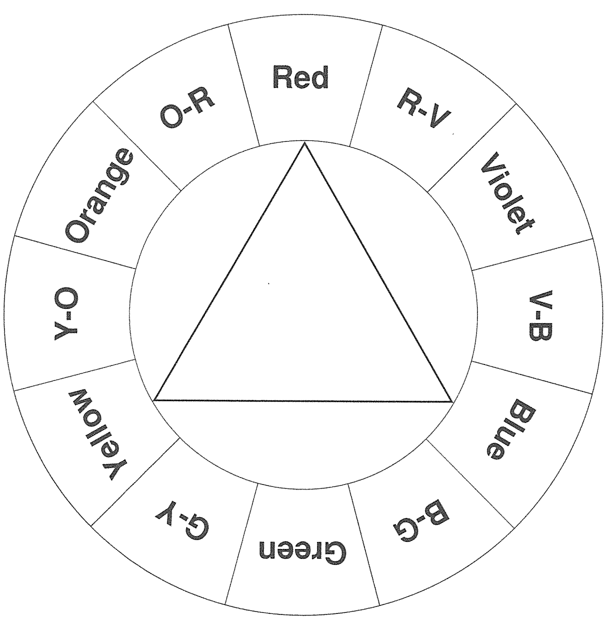
Handout #1: Design with Lines 2



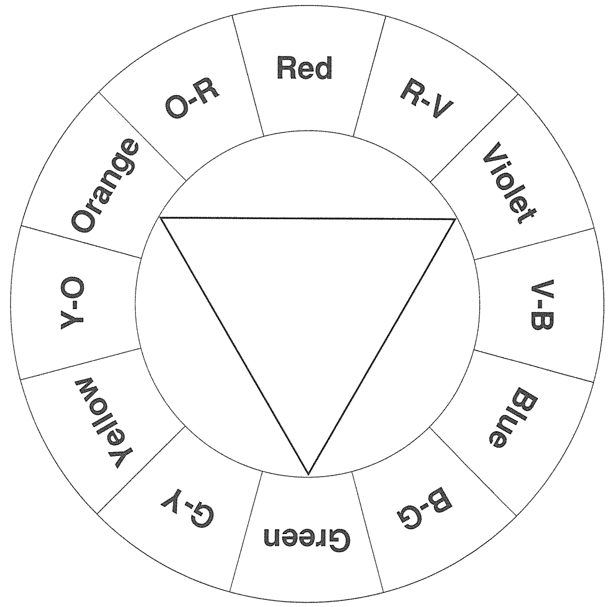
Which of the 816/Paint drawing tools would you use to create these lines? Recreate this handout using 816/Paint and then, use the line tools to turn these "scribbles" into pictures.

Handout 2: The Color Wheel





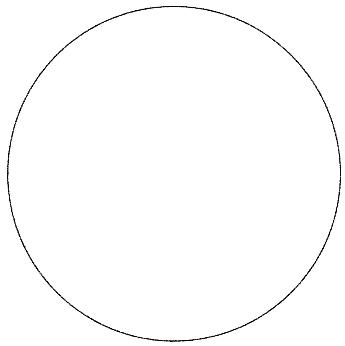
Primary Colors: Red, Yellow, and Blue

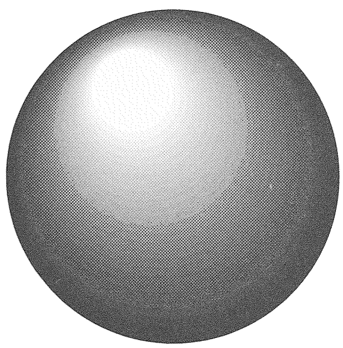


Secondary Coiors: Orange, Violet, and Green.

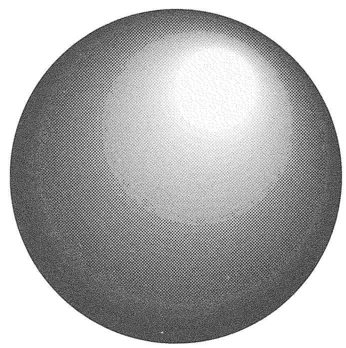
Handout 3: Light and Shade

Light and shade enhances images. It makes them appear three-dimensional.

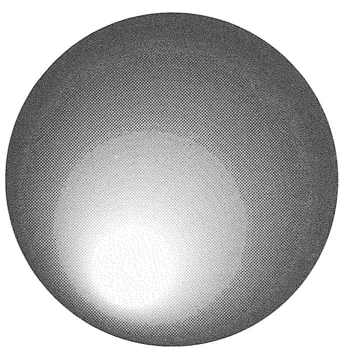




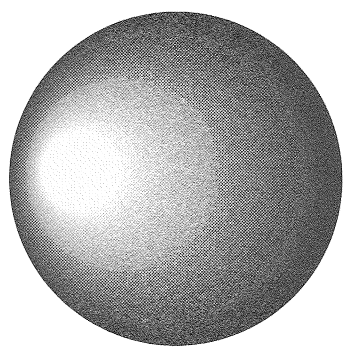
1



2



3



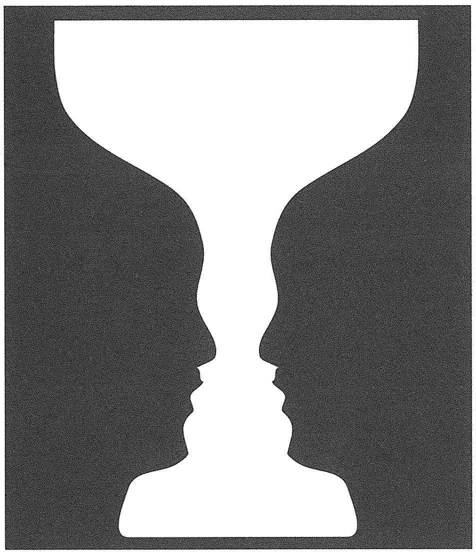
4

Light and shade adds volume to the circle, turning it into a sphere,

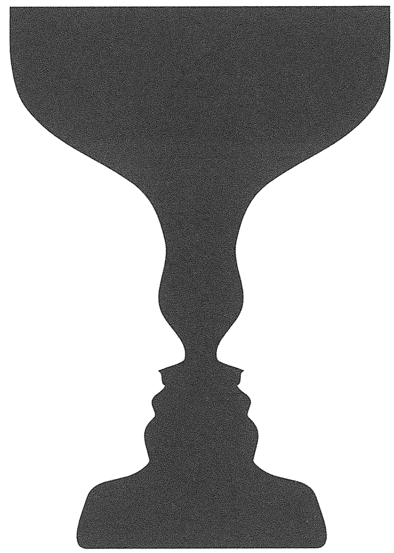
Look at ball #1. Is the light that's shining on it coming from above or below it? Is the light coming from the left or the rightof the sphere?

For each sphere, draw an arrow indicating where the light is coming from.

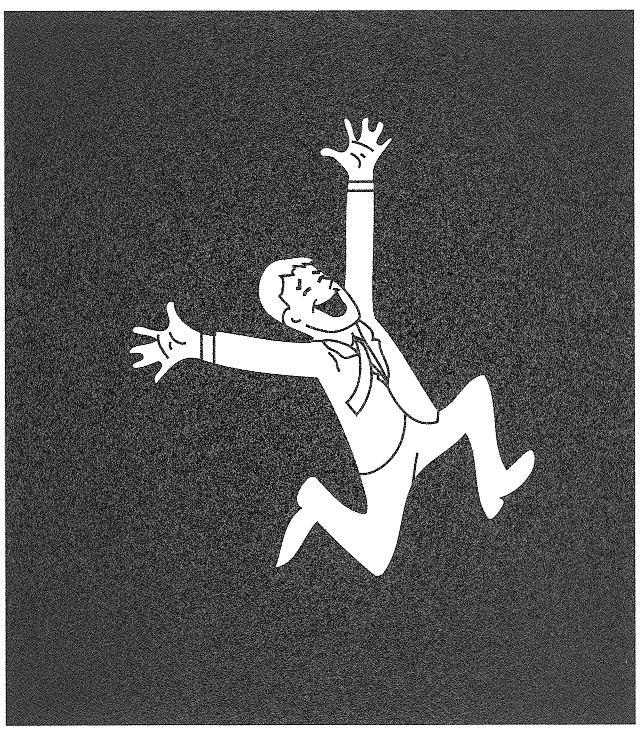
Handout 4: Negative Space

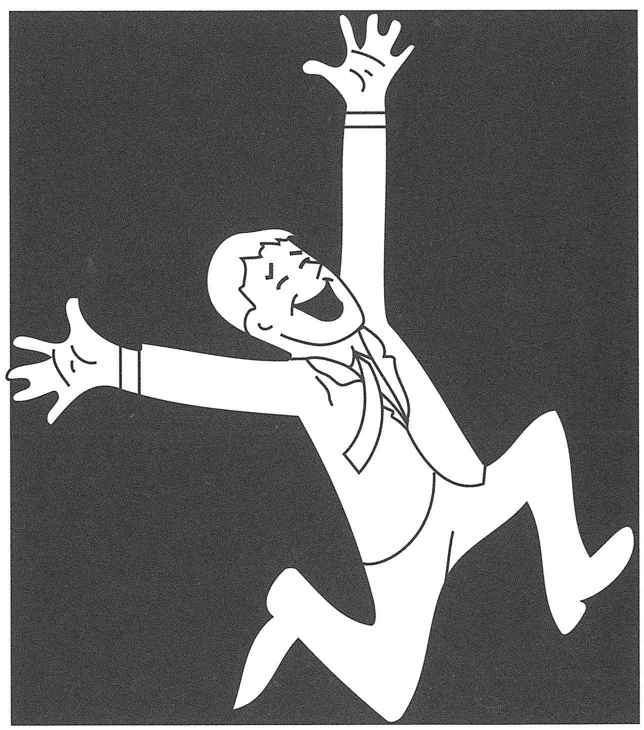


What do you see when you look at this picture?



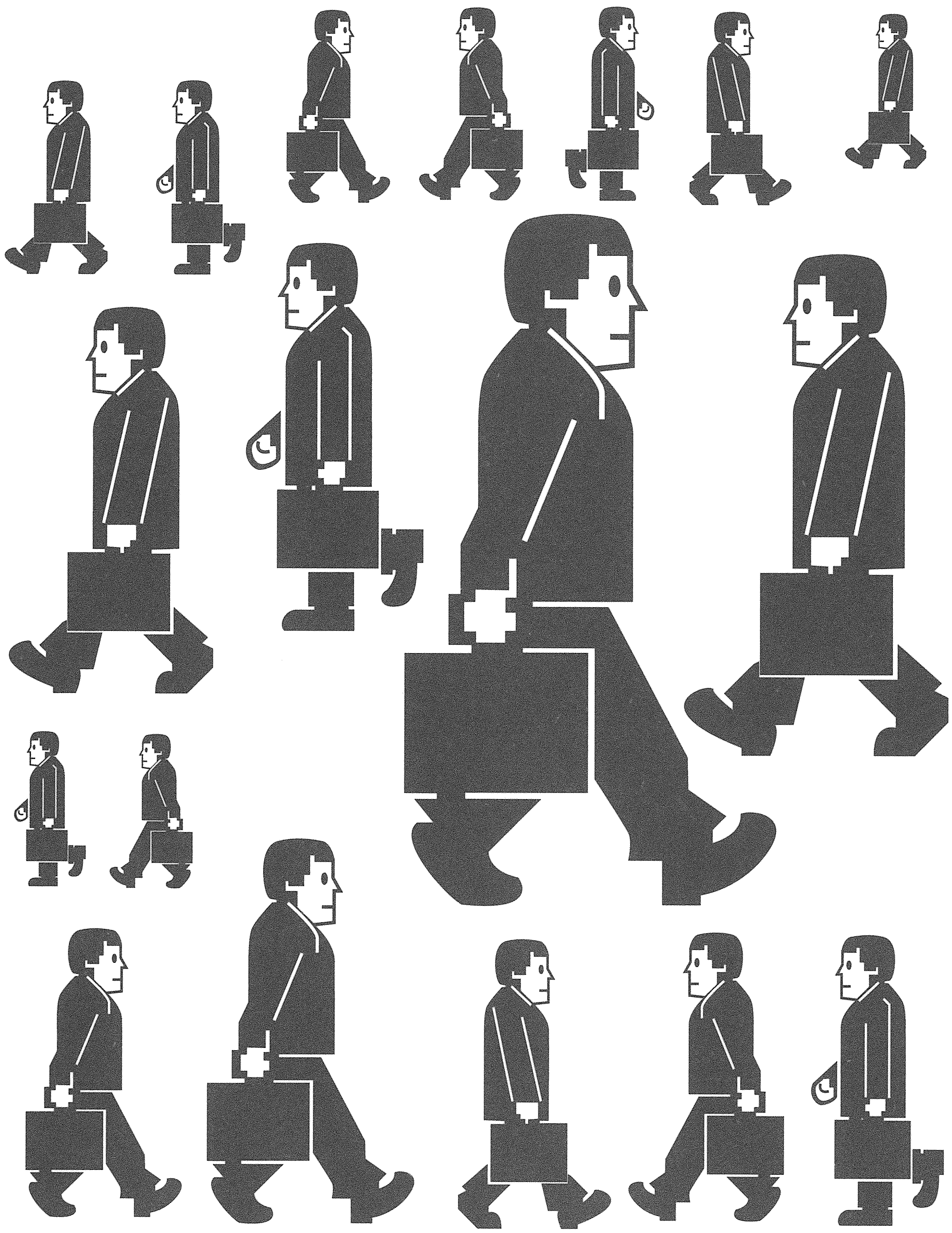
What do you see now?





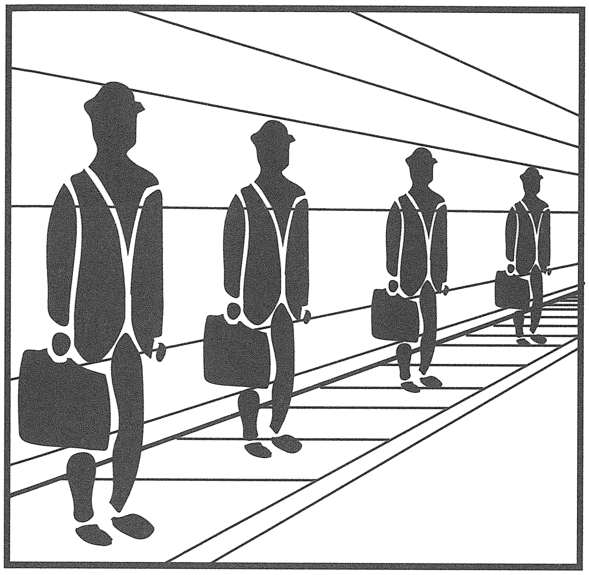
This is a happy man. In the first picture he is right in the middle of a large mass of boring negative space. In the second picture, his body touches the edges of the page and breaks up the negative space into interesting shapes.

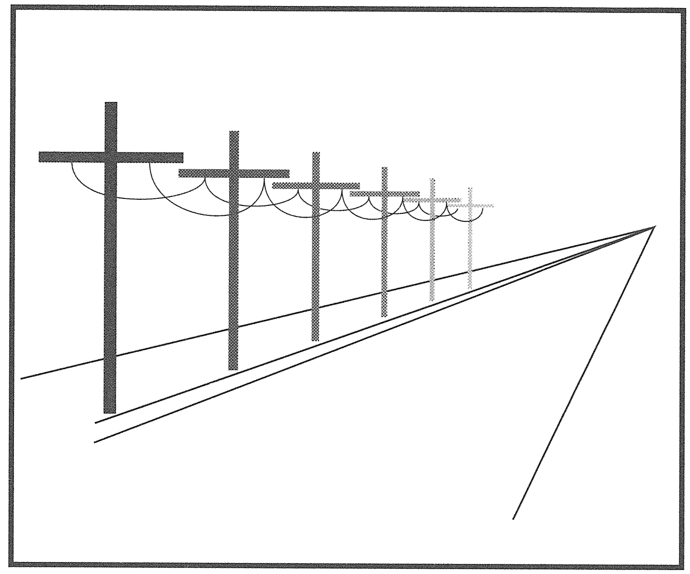
Handout 5: Near and Far

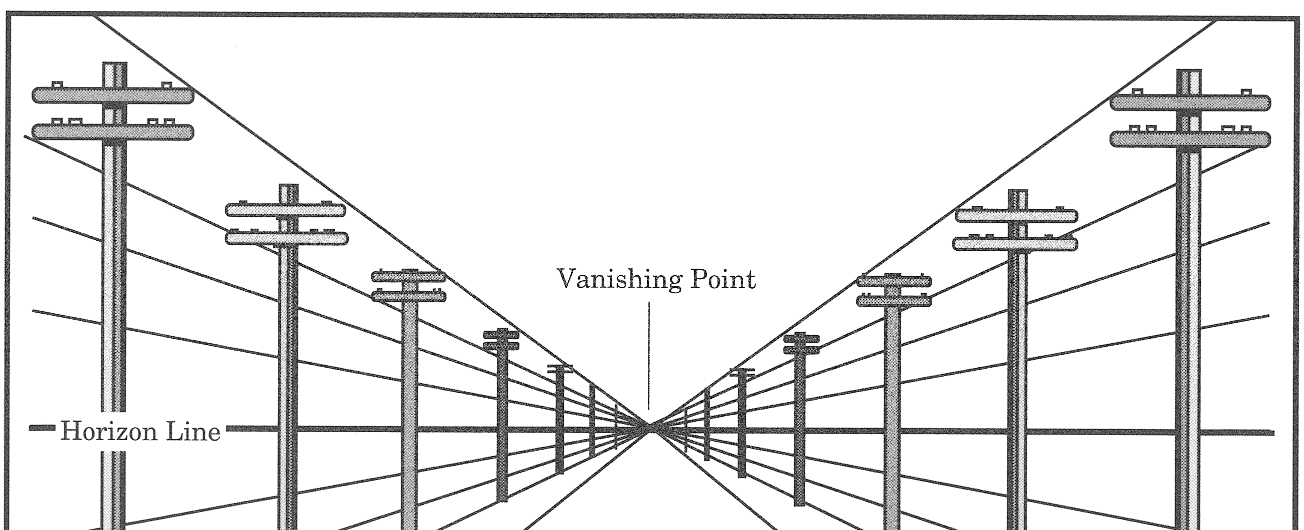


Create a composition that shows Near and Far.
Cut out the figures and arrange them on a sheet of construction paper. The people who are far away should be smaller and higher on your paper. The people who are close up should be bigger and lower on your paper. Where are these people? Complete your composition by adding your own elements using cut construction paper.

Handout 6: One-point Perspective







Handout 7: Posters

Posters should attract attention and be easy to read.

Sample Typefaces:

Avant Garde, Bookman, Helvetica, Times Roman, *Zapf Chancery.*

Index to Referenced Art

List of Referenced Art

Lesson	Artist	Title
Gesture Drawing	Edgar Degas	Any crayon studies
	Abraham Walkowitz	Isadore Duncan (study)
	Marsden Hartley	"Man in Chair"
	Marcel Duchamp	"Nude Descending a Staircase"
	Giacomo Balla	"Leash in Motion"
Discovering Shapes	Stuart Davis	"Colonial Cubism"
	Fernard Leger	"The City"
	Gino Severini	"Boulevard"
	Robert Delaunay	"Runners"
Showing Feelings	Edvard Munch	"The Cry"
	Schmidt-Rottluff	"Way to Emmaus"
	Jackson Pollack	"Sounds in the Grass"
	Adolph Gottlieb	"Blast"
	Jacob Lawrence	"Tombstones"
	Norton Juster	"The Love Story of the Dot and the Line"
The Color Wheel	Paul Cezanne	"Still Life With Oranges"
	Piet Mondrian	"Composition"
	Fritz Glarner	"Relational Painting"
	Claude Monet	"The Water-Lily Pond"
Design: Balance	Paul Cezanne	"Card Players"
	Paul Gauguin	"Old Woman at Arles"
	Graham Sutherland	"Origins of the Earth"
	Juan Miro	"Dog Barking at the Moon"
Design: Dominance	Marc Chagall	"Green Violinist"
	Rembrandt van Rijn	"The Night Watch"
Color Choices	Paul Gauguin	"Jacob Wrestling with the Angel"
	Giorgio de Chirico	"Melancholy and Mystery of a Street"
	Edward Hopper	"Early Sunday Morning"
Tone	Gustave Dore	line drawings, engravings
	Heath Robinson	line drawings, engravings
	Harold Nelson	line drawings, engravings

Light and Shade	Rembrandt van Rijn	"Aristotle Contemplating The Bust of Homer"
	Rembrandt van Rijn	"The Man with the Golden Helmet"
	Rembrandt van Rijn	"Self Portrait as St. Paul"
	Rembrandt van Rijn	"The Night Watch"
Patterns	Gustave Klimt	"Portrait of Madame Fritz Riedler"
Seeing Shape	any	11x14 cityscape photo
Near and Far	Ben Shahn	"Miner's Women"
	Georges Seurat	"Bathers at Asnieres"
	Yves Tanguy	"Days of Slowness"
	Edward Hicks	any primitive
	Grandmas Moses	any primative
One Point Perspective	Carlo Crivelli	"Annunciation with Saint Emidius"
	Domenico Veneziano	"Annunciation"
Two Point Perspective	Vincent Van Gogh	"The Artist's Room at Arles"
Impressionism	Claude Monet	"Impression: Sunrise"
	Auguste Renoir	"Landscape Near Menton"
	Georges Seurat	"An Afternoon at La Grand Jatte"
Miniatures	Georgia O'Keefe	"Black Iris"
	Arthur Dove	"Plant Forms"
	Ben Shahn	"The Welders"
Variations	George Braques	"Musical Forms"
	Le Corbusier	"Still Life"
	Juan Gris	"The Violin"
	William Harnett	"The Old Violin"
Bizarre Relationships	Peter Blume	"The Eternal City"
	Salvadore Dali	"Persistance of Memory"
	Salvadore Dali	"Premonition of Civil War"
	Rene Magritte	"Therapeute"
Distortion	Pablo Picasso	"Guernica"
	Ernest Ludwig Kirchner	"Five Women in the Street"
	Oskar Kokoschka	"Tragedy of Man"
	Amedeo Modigliani	"Lolotte"
	El Greco	"Andrew and Francis"

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Fantastic Creatures	any	any mermaid
	any	any dragon
	any	any unicorn
Posters	Corita Kent	"Damn Everything but the Circus"
	Piet Mondrian	"Poem Picture"
	Juan Miro	"Snail, Woman, Flower, Stars"
	Jasper Johns	"Field Painting"
	Henri de Toulouse Lautrec	any poster
	Alphonse Mucha	any poster

About the Authors

Roberta Schwartz

Roberta Schwartz earned her Bachelors and Masters Degrees in Art Education but discovered, early on, that one month in front of a class of precocious adolescents will teach you more than all the education courses in the world.

She taught art to students who thought drawing was "neat" and to those who thought drawing was "stupid." She taught children who were "gifted" as well as those who were "learning disabled." Teamed with a member of the Science department, she received a grant and co-authored and taught an innovative team-teaching curriculum: Art and Science: An Environmental Study. She also wrote the curriculum for, and taught, a hugely successful program, "Calligraphy in the Classroom."

Over a period of twenty years in the Junior high school, serving as teacher, art department chairperson, advisor to the school yearbook, supervisor of the school greenhouse, supervisor of the school store, and grade dean, Roberta continued to learn.

During this time, Roberta also continued to wield the pen, pencil, and brush and, while weekdays were spent in the classroom, weekends were spent outdoors — exhibiting. Her endeavors in both areas brought her numerous ribbons and awards, but she is most proud of being cited as "Outstanding Art Educator" by the School Art League and appearing in the 1974 edition of "Outstanding Secondary Educators of America."

In 1983, Roberta took a sabbatical and bought her first computer, an Apple II. Traditional artists tools were put aside as she explored the extraordinary world of computer graphics. She was hooked; after intense soul searching, she decided not to return to the Junior high school.

You can take the educator out of the classroom but you can't take the classroom out of the educator… or something like that. Roberta currently teaches computer graphics and desktop publishing at the New School in New York City, is a Graphics Editor of *A+* Magazine, and is a freelance computer graphics writer and artist — specializing in graphics for educational software. Some of her more "prestigious" clients include Harcourt, Brace, Jovanovich, Bank Street College of Education, and Scholastic, Inc. Roberta is the co-author of *Apple Graphics: Tools and Techniques* (Prentice-Hall, (1986). She has written activity books for MacMillan, Inc, the U.S. Space Camp, and The Jewish Museum, and, in her "spare time," she writes articles for various computer magazines.

Michael Callery

Michael Callery started teaching in 1968 when he, as a first year graduate student, was foisted upon an unsuspecting class of freshman college students. After graduate school, he won a full-time teaching appointment at Manhattan College.

In the mid-1970's, Michael was given a semester off with the charter to bring his department into the computer age. Five years, and many Na-

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tional Science Foundation grants later, nearly every course in his department used micro or minicomputers as a regular part of the class work. The grants ranged from simple — developing computer exercises for beginning student — to complex — cross-disciplinary software development — but they shared a common characteristic: the recognition that the computer is just another tool, not an end in itself.

In the course of these grants, Michael developed significant curriculum development skills, recognized in 1981 by the winning of the Ohaus/National Science Teacher's Association national award for innovation in college science teaching. Curriculum development remains one of his greatest interests.

His maturing educational knowledge, combined with his computer skills, began to generate consulting jobs. With these jobs, Michael realized that although classroom teaching had its rewards, software development afforded the opportunity to reach beyond the classroom to a whole generation of students. Resigning his teaching position, he went on to create educational software for many major publishers including Harcourt, Brace, Jovanovich, Laidlaw, and CBS-Holt. He is a certified Apple developer.

Art has always been his avocation. For many years he supplemented his teaching income by creating hand painted tee-shirts, designing logos, creating playbills for off-off broadway productions, and other sundry art and design jobs. As computers played a greater and greater role in his life, computer graphics provided a natural way to combine his vocation and avocation.

Michael currently teaches computer graphics and desktop publishing at The New School in New York City; is a Graphics Editor for *A+* Magazine; owns and operates Callery Associates, a firm which develops educational software for the K-12 market; and has a thriving desktop publishing business. He is the author or co-author of several books including *Commodore Magic* (Dutton, 1984) and *Apple Graphics: Tools and Techniques* (Prentice-Hall, 1986) and over a hundred articles in various computer magazines.