

1A

BITMAP COMPUTER GRAPHICS

Vocabulary:

Bitmap: A map that stores information about many pixels (for example, the color and position of each pixel). The map is used on a computer to generate a picture.

Pixel: A single point in a bitmap-based computer graphic.

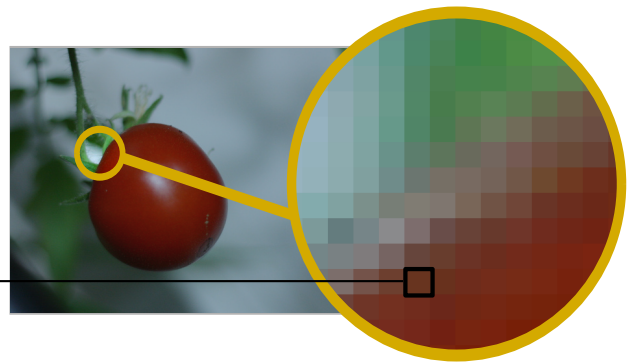
Bitmaps are one type of graphic that a computer can store and display. **Vectors** are another type of computer graphic. We'll talk about those later. Let's talk about bitmaps!

DID YOU KNOW?

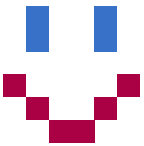
Does your parent or teacher have a digital camera? Did you know that when a digital camera takes photos, it uses bitmaps to do it?

If you look very, very closely at a photo on a computer, you can see the individual pixels that make it up. Take for example, this photo of a tomato. Look what happens when we zoom in on it:

These squares are called **pixels**!



HOW BITMAPS WORK



Here's an example of a smiley face graphic you might see on a computer. How does the computer store and display this graphic? We give the computer instructions on how to build the graphic, pixel by pixel, kind of like a patchwork quilt. We call this patchwork quilt a **bitmap**. To see how we might instruct a computer to draw this smiley face, see the grid and pixel instructions below:

In a bitmap graphic, the computer doesn't understand that the face has two blue eyes and a red mouth. It only understands that the B1, B2, E1, and E2 pixels are blue, and that the A4, B5, C6, D6, E5, and F4 pixels are red.

	A	B	C	D	E	F
1		B1			E1	
2		B2			E2	
3						
4	A4					F4
5		B5			E5	
6			C6	D6		

SMILEY FACE BITMAP

Blue pixels:

B1, B2, E1, E2

Red pixels:

A4, B5, C6, D6, E5, F4

CREATE YOUR OWN BITMAPS!

Using your graph paper and colored pencils, create your own bitmaps using a 6 x 6 grid! Then, think about how you would instruct a computer to re-create your bitmaps. Which pixels would you tell the computer to make red? Which ones would you tell the computer to make blue?

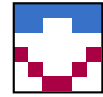
Here's some examples to give you some ideas! We'll tell you how to make these on the next page.



1B

BITMAP COMPUTER GRAPHICS

Here's the instructions to create the bitmap examples we gave you on page 1A!

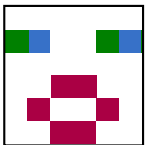


Give these characters a try on your own!

Label the the squares on your graph paper with letters on the top, and numbers along the left side, inside of the boxes, like on the graph paper below. Next, fill in the squares for each color as indicated below on your graph paper. We show you an example of how to do one of the characters below!

	A	B	C	D	E	F		A	B	C	D	E	F		A	B	C	D	E	F		A	B	C	D	E	F
1							1							1							1						
2	Blue	Green			Green	Blue	2							2							2						
3							3							3							3						
4				Red	Red		4							4							4						
5		Red			Red		5							5							5						
6			Red				6							6							6						

Bitmap instructions:



Blue pixels:

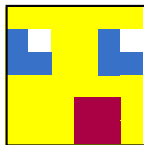
A2, F2

Green pixels:

B2, E2

Red pixels:

B5, C4, C6, D4, D6, E5



Blue pixels:

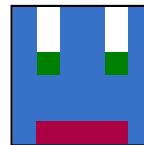
A2, A3, B3, E2, E3, F3

Red pixels:

D5, D6, E5, E6

Yellow pixels:

A1, A4, A5, A6, B1, B4, B5, B6, C1, C2, C3, C4, C5, C6, D1, D2, D3, D4, E1, E4, F1, F4, F5, F6



Green pixels:

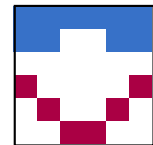
B3, E3

Red pixels:

B6, C6, D6, E6

Blue pixels:

A1, A2, A3, A4, A5, A6, B4, B5, C1, C2, C3, C4, C5, D1, D2, D3, D4, D5, E4, E5, F1, F2, F3, F4, F5, F6



Blue pixels:

A1, A2, B1, B2, C1, D1, E1, E2, F1, F2

Red pixels:

A4, B5, C6, D6, E5, F4

2A

VECTOR COMPUTER GRAPHICS

Vocabulary:

Vector: A type of computer graphic that defines a graphic based on points, lines, curves, and shapes.

Node: A point in a vector file. If you connect two nodes together, you get a line!

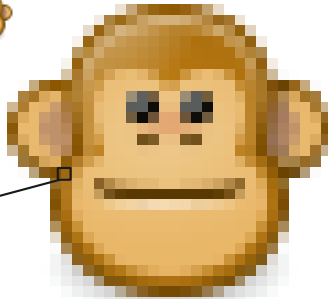
Vectors are another type of computer graphic that we can use to create computer graphics. Unlike bitmaps, vectors do not store information about individual pixels in a graphic. Let's learn more about vectors!

DID YOU KNOW?

When you zoom in on a bitmap graphic, the image will start turning into large blocks - pixels. If you keep zooming and zooming, the graphic won't look smooth and clear anymore. With vectors, you can keep zooming and the graphic does not lose any quality. To see how this works, compare the bitmap monkey and the vector monkey below. It's the same image, but one is created using bitmap, the other using vector:

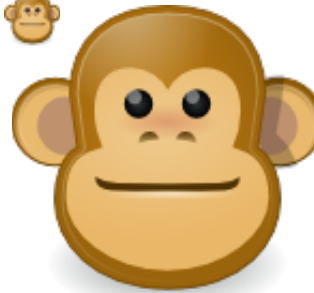
Bitmap Monkey

32x32 pixels



This is a pixel!

Vector Monkey



HOW VECTORS WORK

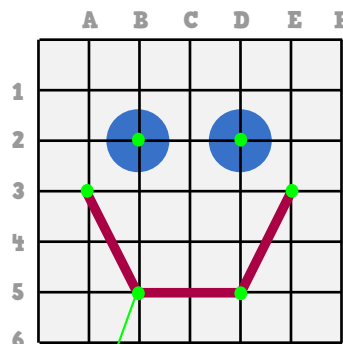


Here's another example of a smiley face graphic you might see on a computer. How does the computer store and display this graphic? We give the computer instructions on how to build the graphic based on points, lines, and shapes. It's a little bit like **connect-the-dots** - we call the dots **nodes**. We tell the computer where the nodes should be. Then we tell it to connect the nodes with lines or shapes. To see we might tell computer to draw this smiley face, see the grid and pixel instructions below:

In a vector graphic, the computer doesn't know about pixels. We don't tell the computer how to fill in a grid of pixels like we do with a bitmap.

Instead, with vector graphics we tell the computer about important nodes. We tell it where those nodes are. Then we tell it what lines or shapes to draw at the nodes.

In this smiley face picture, the computer understands that there are two circles and three lines.



These green dots are **nodes**!

SMILEY FACE VECTOR

Nodes:

A3, B2, B5, D3, D5, E3

Circles:

Draw blue circles at B2 and D3.

Lines:

Draw a red line from A3 to B5.

Draw a red line from B5 to D5.

Draw a red line from D5 to E3.

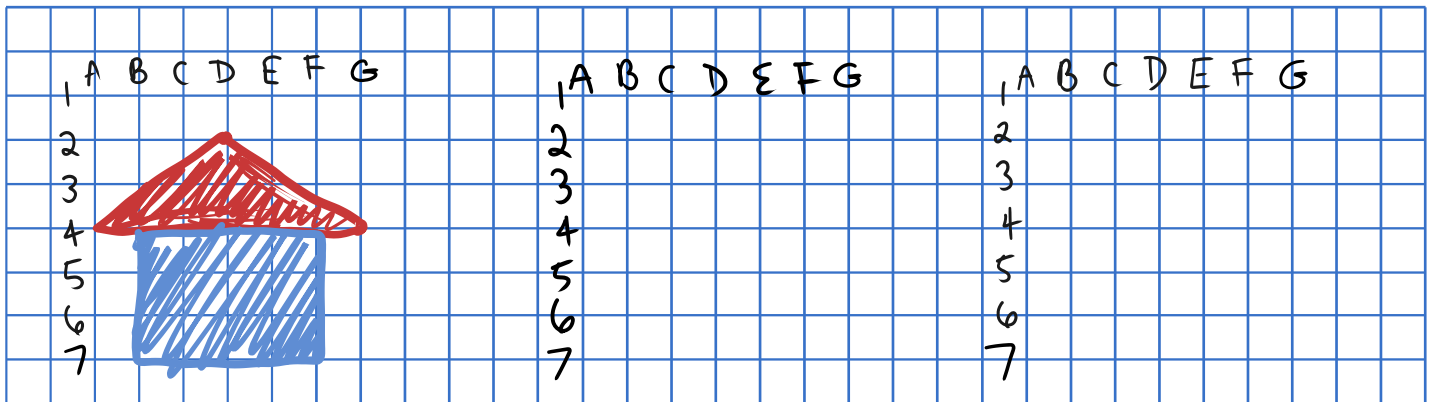
2B

VECTOR COMPUTER GRAPHICS

Create your own vector graphics on this worksheet!

Draw your own vector graphics!

Label the your graph paper with letters on the top, and numbers along the left side, but this time put the labels on the lines, not on the square, like on the graph paper below. Next, follow the instructions below to create a vector drawing. Use your ruler if you need it to connect nodes with a line! We did an example for you below.



Vector instructions:



Nodes:

A4, B4, B6, D2, F4, F6, G4

Roof:

Draw a red line from A4 to D2.
Draw a red line from D2 to G4.
Draw a red line from A4 to G4.
Fill shape in red.

House:

Draw a blue line from B4 to F4.
Draw a blue line from F4 to F6.
Draw a blue line from B6 to F6.
Draw a blue line from B4 to B6.
Fill shape in blue.



Nodes:

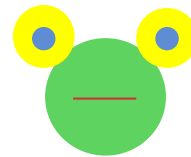
A7, C1, C4, C5, C7, D2, E1, E4, E5, E7, G7

Outer shape:

Draw a red line from A7 to C1.
Draw a red line from C1 to E1.
Draw a red line from E1 to G7.
Draw a red line from A7 to C7.
Draw a red line from E7 to G7.
Draw a red line from C7 to C5.
Draw a red line from C5 to E5.
Draw a red line from E5 to E7.

Inner shape:

Draw a red line from C4 to D2.
Draw a red line from D2 to E4.
Draw a red line from C4 to E4.



Nodes:

B3, C5, D5, E5, F3,

Eyes:

Draw a yellow circle that is 2 pixels wide, centered at node B3.
Draw a yellow circle that is 2 pixels wide, centered at node E3.
Draw a blue circle that is 1 pixel wide, centered at node B3.
Draw a blue circle that is 1 pixel wide, centered at node E3.

Face:

Draw a green circle that is 4 pixels wide, centered at node D5.

Mouth:

Draw a red line from C5 to E5.