# Using Bitmaps

For this assignment, you will be drawing lots of bitmaps. Remember that the `BasicBlit` and `RotateBlit` procedures take pointers to the bitmaps (e.g. `OFFSET brady2small`).
You can grab the bitmaps on the assignment page or you are free to import your own from elsewhere. You can take any existing ppm (binary) and convert it into an `EECS205BITMAP` using the `ppm2asm.exe` program provided. It's a command line program. Copy it to your working directory and open a command prompt. Type `ppm2asm brady2small.ppm` and you should get a new .asm file that has the bitmap. Note that this program only works on ppm files...cannot handle .jpg .gif or anything else. However, you should be able to find applications/utilities that can convert from these other formats to ppm. I use either GIMP or ImageMagick.

Paste Into Your .asm
Once you have a bitmap, you have to figure out how to get it into your program. The first option is is simple but ugly. Just cut and paste the bitmap definition into the `.DATA` section in `game.asm` (or wherever you draw bitmaps).

Creating Bitmap .asm Files
This is a little more work, but is probably worth it. As you may have noticed, `ppm2asm` creates a single .asm file which contains the bitmap structure. You can add these .asm files to your build or you can combine many of them in a single .asm which has all the bitmaps. The process is basically the same. You will need to do five main things: 1) add appropriate header info to the new source file, 2) add extern declarations to the include file, 3) set the appropriate transparency color,4) add an `END` to the new source file, and 5) modify the makefile so that it assembles and links appropriately.

The header info is easy. Just grab it from game.asm or something. You'll need all the `.586`, `.model`, all that garbage… Also, very important, you will need the includes and the `.DATA` and whatnot.

Stick an extern declaration in game.inc (and make sure you include that from any other .asm files that will use the bitmaps). So, if you had a picture of the golden boy and a goat, it might look like this:

```
EXTERNDEF brady2small:EECS205BITMAP
```

For the transparency, you want to set the third item of the bitmap's initializer. The correct value for this is probably going to be whatever you find in the color array around the edges of the image.For example, with the `brady2small` image, you'd probably notice that the value `1ch` appears a lot, especially at the top/bottom of the image. This is probably the value that we should choose as the transparency. As you probably remember, this is the third item of the bitmap structure, so you can easily change it by setting the appropriate initializer:

```
brady2small EECS205BITMAP <71, 124, 01ch,, offset brady2small + sizeof brady2small>
```

OK. It should be trivial to add an `END` to the...wait for it...end of the source file.

The last thing to do is to modify the makefile (make.bat). This is easy. Again, continuing with the example, you can add a line to assemble the new source file. Stick it in with all of the other similarly structured lines:

```
ml  /c  /coff  /Cp brady2small.asm || goto :error
```

And then modify the linker command. You want to include the source filename with .obj replacing .asm, so it looks something like:

```
link /SUBSYSTEM:WINDOWS  /LIBPATH:c:\masm32\lib  game.obj blit.obj
lines.obj stars.obj brady2small.obj  libgame.obj || goto :error
```

Important: Make sure that the first object file in the list is `game.obj`