REMINDER

The Second **Exam** in this class will be on Friday, March 29

- Format will be mostly short exercises on databases, presentation software, and simple raster/vector graphics
- Topics will include:
  - Access Databases
  - PowerPoint
  - Graphics & Imaging
  - Intro to CAD

March 13, 2019
REMINDER

Exercise 16 is due TODAY, March 13

Exercise 17 is due Friday, March 15

Exercise 18 is due Wednesday, March 27
REMINDER

Spring Break is *Next Week*

March 19-23
Graphics and Imaging Programs

• Digital graphics - two flavors:
  – Raster
  – Vector

• Raster model is simpler

• Vector model is older.
Graphics and Imaging Programs

Raster Model

Dent, 1999
Graphics and Imaging Programs

• Raster Images
  – Simple data structure
  – Also called *bitmaps*
  – Consist of a rectangular array of *Picture Elements*, also known as *Pixels*. 
Graphics and Imaging Programs

• Color Systems
  – Each pixel has specific color channels assigned to it
  – RGB color model (Red/Green/Blue)
    one byte is needed for each color channel;
    a typical pixel consists of 3 bytes (24 bits)
  – RGB color is referred to as additive (colors mix to white)
  – Electronics displays
Graphics and Imaging Programs

• Color Systems
  – CMYK color model (Cyan/Magenta/Yellow/Black)
  – Referred to as subtractive (all colors mix to black)
  – Commonly used for printers
Graphics and Imaging Programs

Raster Images (bmp)

320X240
226 KB
76,800 pixels

160X120
57 KB
19,200 pixels
Graphics and Imaging Programs

Raster Images (bmp)

320X240
226 KB
76,800 pixels

80X60
15 KB
4,800 pixels
Graphics and Imaging Programs

Raster Images (bmp)

320X240
226 KB
76,800 pixels

40X30
4 KB
1,200 pixels
Graphics and Imaging Programs

Raster Images (bmp)

320X240
226 KB
76,800 pixels

20X15
1 KB
300 pixels
Graphics and Imaging Programs

Raster Images (bmp)

320X240
226 KB
76,800 pixels

4X3
<1 KB (~80 bytes)
12 pixels
Graphics and Imaging Programs

• File sizes may be very large

• Compression techniques are frequently applied (png, gif, jpg, sid, ecw)

• Compression can result in quality loss
  = lossy compression
Graphics and Imaging Programs

- Raster Editing Programs
  - Xnview ([www.xnview.com](http://www.xnview.com))
    - Capture
    - Slide show
    - Image functions (adjustments)
    - Filter functions (interesting effects)
    - Viewer controls
    - Burn text
Graphics and Imaging Programs

• Raster Editing Programs
  • MS Paint (bundled with MS Windows)
    - Build a raster image from scratch
    - Manipulate existing images
    - Change color patches
Graphics and Imaging Programs

• Raster Editing Programs
  • MS One Note
    - Basic viewer
    - Useful for note taking
    - Optical character recognition (OCR)-enabled
    - Good for screen shots
Graphics and Imaging Programs

• Raster Editing Programs
  - Multispec
    (https://engineering.purdue.edu/~biehl/MultiSpec/)
  - Basic satellite image viewer
  - Each GIS lab machine has a tutorial for this program on the desktop
Graphics and Imaging Programs

• Raster Editing Programs
  • Leica/ERDAS Imagine (http://erdas.com)
    - Costly
    - Intended for remote-sensing market
    - Windows-friendly, industry standard
    - Locally designed and engineered!
Graphics and Imaging Programs

Vector Model

Vector Data Model

<table>
<thead>
<tr>
<th>ID</th>
<th>Attribute A</th>
<th>Attribute B</th>
<th>Attribute C</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>5</td>
<td>15</td>
<td>2,080</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>10</td>
<td>1,999</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>11</td>
<td>2,119</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>12</td>
<td>1,852</td>
</tr>
</tbody>
</table>

Spreadsheet linked to base map

Dent, 1999