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| **Pre-AP® Computer Science** | **Lab 10A**  **Practice/Perform Major Java Assignment** |
| **The "Fading Flags" Program** | **30 through 110 Point Versions** |
| **Assignment Purpose:**  This program requires knowledge of combining graphics with compound conditions. | |

This program will display various flags from around the world. The flags will be displayed in a special way. Thousands/Millions of dots will randomly appear on the screen. The location of each dot will determine its color. This will create the effect of a flag that is “fading in”. **if** statements needs to be used to check the coordinates to determine the proper colors. Most of these flags will have at least 3 vertical stripes or 3 horizontal stripes. In either case, the middle stripe(s) will require a *compound condition* in order to properly assign the color.

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| Before the program begins, you are asked to enter the “Execution Type”. This is important to assure the proper effect without waiting forever for the output.    If the dots are bigger, it takes less of them to fill the screen. This is ideal for older, slower computers. If you have a faster computer you can get a better fading effect by using smaller dots.  NOTE: Regardless of the speed of your computer, all students need to enter **1** when they are getting this lab assignment graded. |  |

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| **Lab10A Student Version** | **Do not copy this file, which is provided.** |
| // Lab10Ast.java  // This is the student, starting file of Lab 10A which draws a title page and 3 flags.  // Students need to create 16 more flags. They will not know which flags these are ahead of time.  // Students start with a grade of 30. Each flag will be worth 5 points for a maximum grade of 110.  import javax.swing.\*;  import java.awt.\*;  import java.applet.\*;  public class Lab10Ast extends Applet  {  private static int numDots, speed;  private static Font countryName;  public void init()  {  speed = enterIntGUI("Enter Execution Type: \n 1 = Giant Dots \n 2 = Big Dots \n 3 = Small Dots \n 4 = Tiny Dots\n\nNOTE: Enter 1 when getting lab graded.");  switch (speed)  {  case 1 : numDots = 10000; break;  case 2 : numDots = 100000; break;  case 3 : numDots = 1000000; break;  case 4 : numDots = 5000000; break;  default : numDots = 10000;  }  countryName = new Font("Algerian",Font.BOLD,48);  }  public void paint(Graphics g)  {  titlePage(g,"John Smith",7);  flagOfLibya(g);  flagOfMonaco(g);  flagOfItaly(g);  }  public static int enterIntGUI(String prompt) // Allows GUI keyboard input of an integer in a graphics program.  {  String tempString = JOptionPane.showInputDialog(prompt);  int temp = Integer.parseInt(tempString);  return temp;  }  public static void drawDot(Graphics g, int x, int y)  {  switch (speed)  {  case 1 : Expo.fillRectangle(g,x-5,y-5,x+5,y+5); break;  case 2 : Expo.fillRectangle(g,x-2,y-2,x+2,y+2); break;  case 3 : Expo.fillRectangle(g,x,y,x+1,y+1); break;  case 4 : Expo.drawPixel(g,x,y); break;  default : Expo.fillRectangle(g,x-5,y-5,x+5,y+5);  }  }  public static void titlePage(Graphics g, String name, int period)  {  Expo.setBackground(g,Expo.gold);  Expo.setColor(g,Expo.white);  Expo.fillRectangle(g,100,100,900,550);  Expo.setColor(g,Expo.red);  Font title = new Font("Algerian",Font.BOLD,48);  g.setFont(title);  g.drawString("Flags of the World",225,240);  Expo.setColor(g,Expo.blue);  g.drawString("by: "+name,225,340);  Expo.setColor(g,Expo.green);  g.drawString("Period: "+period,225,440);  Expo.delay(3000); // Wait 3 second before showing first flag.  }  public static void showName(Graphics g, String name)  {  FontMetrics metrics = g.getFontMetrics(countryName);  int nameWidth = metrics.stringWidth(name);  int boxWidth = nameWidth + 20;  int xName = 950 - nameWidth;  int xBox = xName - 10;  Expo.setColor(g,Expo.white);  Expo.fillRectangle(g,xBox,50,xBox+boxWidth,120);  Expo.setColor(g,Expo.black);  Expo.drawRectangle(g,xBox,50,xBox+boxWidth,120);  for (int j = 1; j <= 5; j++)  {  Expo.drawLine(g,xBox+j,120+j,xBox+boxWidth+j,120+j);  Expo.drawLine(g,xBox+boxWidth+j,50+j,xBox+boxWidth+j,120+j);  }  Expo.drawRectangle(g,xBox+1,51,xBox+boxWidth+1,121);  g.setFont(countryName);  g.drawString(name,xName,100);  Expo.delay(2000); // Wait 2 second before showing next flag.  }  public static void fiftyStars(Graphics g) // provided for the USA Flag  {  // 30 Stars (5 rows of 6)  for (int x = 35; x < 420; x += 70)  for (int y = 35; y < 350; y += 70)  Expo.fillStar(g,x,y,20,5);  // 20 Stars (4 rows of 5)  for (int x = 70; x <= 350; x += 70)  for (int y = 70; y <= 280; y += 70)  Expo.fillStar(g,x,y,20,5);  }  public static void flagOfLibya (Graphics g)  {  Expo.setBackground(g,Expo.black);  for (int d = 1; d <= numDots; d++)  {  int x = Expo.random(0,1000); // random x value of each dot  int y = Expo.random(0,650); // random y value of each dot  Expo.setColor(g,Expo.green); // The Libyan flag is the simplest in the world.  // It is a solid green rectangle.  drawDot(g,x,y);  }  showName(g,"Libya");  }  public static void flagOfMonaco (Graphics g)  {  Expo.setBackground(g,Expo.black);  for (int d = 1; d <= numDots; d++)  {  int x = Expo.random(0,1000); // random x value of each dot  int y = Expo.random(0,650); // random y value of each dot  if (y < 325) // top stripe  Expo.setColor(g,Expo.red);  else // bottom stripe  Expo.setColor(g,Expo.white);  drawDot(g,x,y);  }  showName(g,"Monaco");  }  public static void flagOfItaly (Graphics g)  {  Expo.setBackground(g,Expo.black);  for (int d = 1; d <= numDots; d++)  {  int x = Expo.random(0,1000); // random x value of each dot  int y = Expo.random(0,650); // random y value of each dot  if (x < 333) // left stripe  Expo.setColor(g,Expo.green);  if (x >= 333 && x < 667) // middle stripe requires compound condition  Expo.setColor(g,Expo.white);  if (x >= 667) // right stripe  Expo.setColor(g,Expo.red);  drawDot(g,x,y);  }  showName(g,"Italy");  }  } | |

**Student Version Output**

The student provided version starts with a title page, followed by 3 provided flags. The first flag is the simplest being only one solid color. The second is also very simple with just 2 stripes. Neither the first nor the second flag resemble anything you will do in this assignment. They are simply to “simple”. The third flag resembles some of the simpler flags that you will create in this assignment.

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|  | **Solid green** |
| **red**  **white** | **green / white / red** |

NOTE: When you do this lab for a grade, you should *comment out* the method calls to **flagOfLibya**, **flagOfManaco** and **flagOfItaly** in the **paint** method. This way, your teacher does not have to waste time looking at flags that do not even count toward your grade.

**30 through 110 Point Version Output**

You will be expected to produce several flags. You start with a grade of 30. Each flag will be worth 5 additional points. You will NOT KNOW which flags you will be assigned ahead of time. Below are examples of the types of flags you MIGHT be assigned. NOTE: Different classes may be assigned different flags. Different students within the same class may even be assigned different flags.

Some flags like these have 3 equal vertical stripes:

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| --- | --- | --- |
| **green / white / orange** | **blue / white / red** | **blue / yellow / red** |
| **black / yellow / red** | **darkGreen / gold / red** | **red / gold / darkGreen** |
| **darkGreen / white / pink** | **red / white / red** | **darkGreen / white / darkGreen** |

Some flags like these have 3 equal horizontal stripes:

NOTE: Some flags have stars, crowns, suns or other insignia. These are left off for this assignment.

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| **red**  **white**  **blue** | **darkRed**  **white**  **darkGreen** | **black**  **red**  **yellow** |
| **white**  **lightBlue**  **red** | **blue**  **white**  **red** | **blue**  **black**  **white** |
| **yellow**  **green**  **red** | **red**  **white**  **red** | **lightBlue**  **white**  **lightBlue** |

Some flags have more than 3 stripes or have stripes of different widths.

NOTE: Not all of these are “country” flags. Some are from states, regions, provinces or cities.

ALSO: Some of these flags are Navel Jacks or Naval Signal flags.

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| **red**  **white**  **red**  **white** | **darkRed**  **darkBlue**  **gold**  **darkGreen** | **red**  **white**  **darkBlue**  **yellow** |
| **darkBlue**  **white**  **red**  **white**  **darkBlue** | **red**  **white**  **blue**  **gold**  **black** | **gold**  **lightBlue**  **white**  **lightBlue**  **gold** |
| **blue and white** | **yellow and darkBlue** | **red and white** |

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| --- | --- | --- |
| **darkBlue**  **lightBlue**  **red**  **lightBlue**  **red**  **lightBlue**  **darkBlue** | **red and white** | **yellow and red** |
| **red**  **white**  **darkGreen**   |  |  | | --- | --- | | *NOTE: This insignia is normally in the center of the flag.* |  | | **lightBlue**  **gold**  **darkGreen**   |  |  | | --- | --- | | *NOTE: This insignia is normally in the top-right corner of the flag.* |  | |
| **Gold**  **blue**  **red** |
| **darkBlue**  **white**  **yellow**  **white**  **red** | **darkBlue**  **white**  **darkRed**  **white**  **darkBlue** | **darkRed**  **white**  **darkBlue**  **white**  **darkRed** |

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| **darkBlue / yellow**  **white / red** | **yellow / black**  **black / yellow** | **red / white**  **white / red** |
| **blue with yellow Cross** | **white with darkBlue Cross** | **red with white Cross** |

NOTE: To get credit for the *Bonus Flags* on the next 2 rows, you will need to insert an **Expo.fillStar** command right before the **showName** method call for each flag.

ALSO: A special **fiftyStars** method is provided in this program for the *USA* flag.

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**The Naval Jack of Cuba has a white stripe, a darkBlue stripe and a red canton.**

**The Piaui flag has darkGreen and gold stripes with a darkBlue canton.**

**The rest of the bonus flags have red and white stripes with a darkBlue canton.**

**Challenge Flags**

The following flags are included if you want a personal challenge. They can also be used to make this assignment more challenging for a more advanced class like Advanced Graphics

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| **Clockwise:**  **darkBlue, yellow, red, white, darkGreen** | **The triangle is black.**  **It has a yellow border above and below.**  **The sideways 'Y' is darkGreen.**  **It has a white border above and below.**  **The top trapezoid is red.**  **The bottom trapezoid is darkBlue.** |
| **white with red Circle** | **yellow Sun**  **lightBlue Earth**  **white Moon** |