CS 145 Images and Imagination

Exam 1 Solutions

1. Color
   a. Read, green, blue
   b. Hue, saturation, brightness
   c. Each color component is stored in 1 byte (8 bits). Each bit can be either 0 or 1. If there 8 bits, then there are 2^8=256 possible combinations of 0's and 1's.

2. An algorithm:
   a. Finite sequence of precise instructions .
   b. Written in an unambiguous language.
   c. Whose execution occurs in a clearly defined step by step order.
   d. Whose execution requires no cleverness.
   e. Whose execution eventually comes to an end.

3. Lines and Loops:

   a.
```
line(width/2,0, width/2, height);
```
   or
```
line(50, 0, 50, 100);
```
   b.
```
for (int i=0; i < 50; i+=10  ) {
          line(i,0,i+50,100);
}
```
   c.
```
strokeWeight(1);
ellipseMode(CORNER);
for (int i = 0; i < width   ; i +=20   ) {
   for (int j = 0; j < height  ;  j += 20  ) {
        ellipse( i, j, 10,10 );
   }
}
```
   d. Change height to i:
```
for (int j = 0; j < i  ;  j += 20  ) {
```

4.
```
x = 14,  y = 21,  z = 14
```

5. Boolean Expressions:
   a. `x != 2*y`
   b. `x > -10  &&  x < 10`
   c. `x < -10  ||  x > 10`

6. Mod Function
   a. x/20 = (1 plus a remainder of 10). Thus x % 20 = 10
   b. `x % 2 = 0` if x is even and 1 if x is odd. Thus `(x%2)==1` is true for all odd integers.

7. if-else

```
if (x < 150) {
    fill(255,0,0);
}
else if (x < 200) {
   fill(0,0,255);
}
else {
   fill(255,255,0);
}
```

8. Scope:
    a. s: lines 1-16
    b. b: lines 5-10
    c. i: lines 6-9
    d. x: lines 12-16
    e. w: lines 14-16
9. Matrix Stack

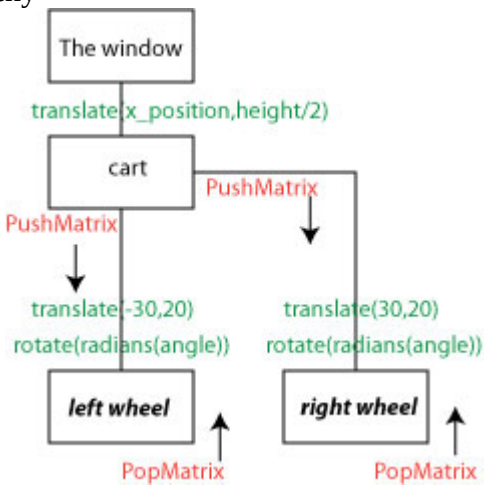
    a. translate(20,20)
    rotate(10)
    translate(10,20)
    rotate(5)
    translate(0,20);
    rotate(0)
    translate(width/2,height/2)

    b. rotate(10)
    rotate(5)
    rotate(0)
    translate(width/2,height/2)

    c. translate(20,20)

10. Hierarchy

    a.



b. Code:

```
float x_position = 0;
float angle = 0;

void setup() {
  size(200,150);
  rectMode(CENTER);
  ellipseMode(CENTER);
}

void draw() {
  background(150);

  translate(x_position, height/2);
  cart();
  pushMatrix();
  translate(-30, 20);
  rotate(radians(angle));
  wheel();  // left wheel
  popMatrix();
  pushMatrix();
  translate(30, 20);
  rotate(radians(angle));
  wheel();  // right wheel
  popMatrix();

  x_position += 1;
  angle += 5;
}

void cart() {
  rect(0,0,60,40);
}

void wheel() {
  ellipse(0,0,20,20);
  rect(0,0,20,6);
}
```