**Level 1: LED Trailing Effects**

2. Locate on-line documentation that describes the C language “for” loop.

1. The index is the starting point of the for loop.
2. When the 2nd argument in the for loop is no longer true.
3. A for loop is different because it will only loop a certain amount of times before it stops, you state how much it needs to loop and increment. A while loop will keep on executing the code inside it until the first argument is no longer true. A do loop is like a while but, the code is always ran at least once and the statement is executed at the end.

3. Research the “<” Comparitor.

1. ==, !=, <, >, <=, >=

b)

1. **int** BASE = 2;
3. **void** setup() {
4. **for** (**int** i = BASE; i <= 8; i ++) {
5. pinMode(i, OUTPUT);
6. }
7. }
9. **void** loop() {
11. **for** (**int** i = BASE; i <= 8; i ++) {
12. digitalWrite(i, LOW);
13. delay(200);
14. }
16. **for** (**int** i = BASE; i <= 8; i ++) {
17. digitalWrite(i, HIGH);
18. delay(200);
19. }
21. }

4. Research the “++” incrementor operator.

1. The ++ increments the number by 1, += adds to the number (ex. Int x = 4 += 3, x is 7)

b)

1. **int** BASE = 2;
3. **void** setup() {
4. **for** (**int** i = BASE; i <= 8; i += 1) {
5. pinMode(i, OUTPUT);
6. }
7. }
9. **void** loop() {
11. **for** (**int** i = BASE; i <= 8; i += 1) {
12. digitalWrite(i, LOW);
13. delay(200);
14. }
16. **for** (**int** i = BASE; i <= 8; i += 1) {
17. digitalWrite(i, HIGH);
18. delay(200);
19. }
21. }

**Level 2: Traffic Light**

2. An if statement can be used to check which color is currently on to check, for example if it’s green you know that yellow is next so you can do checks.

3.

1. **int** red = 2;
2. **int** yellow = 3;
3. **int** green = 4;
5. **void** setup() {
6. // put your setup code here, to run once:
7. **for** (**int** i = 2; i <= 4; i++) {
8. pinMode(i, OUTPUT);
9. }
10. }
12. **void** blink(**int** light, **int** len) {
13. **if** (light != yellow) {
14. digitalWrite(light, HIGH);
15. delay(len);
16. digitalWrite(light, LOW);
17. delay(len);
18. } **else** {
19. delay(len);
20. digitalWrite(light, HIGH);
21. delay(len);
22. digitalWrite(light, LOW);
23. }
24. }
26. **void** loop() {
27. // put your main code here, to run repeatedly:
28. blink(green, 5000);
29. **for** (**int** i = 0; i < 3; i++) {
30. blink(yellow, 500);
31. }
32. delay(500);
33. blink(red, 5000);
34. }

**Level 3: Traffic Controller**

1. **enum** Lights {
2. RED = 2,
3. YELLOW = 3,
4. GREEN = 4
5. };
7. //Set the starting light / current light.
8. **int** currentLight = 2;
10. //How long should the light be for each color
11. **int** redStayColor = 5;
12. **int** yellowStayColor = 2;
13. **int** greenStayColor = 10;
15. **void** setup() {
16. **for** (**int** i = 2; i <= 4; i++) {
17. pinMode(i, OUTPUT);
18. }
20. //Setup the serial monitor
21. Serial.begin(9600);
22. **while** (!Serial);
23. Serial.println("Setting up Traffic Control");
24. }
26. String getLightNameFromInt(**int** number) {
27. **switch** (number) {
28. **case** 2:
29. **return** "Red";
30. **break**;
31. **case** 3:
32. **return** "Yellow";
33. **break**;
34. **case** 4:
35. **return** "Green";
36. **break**;
37. }
38. **return** "No Light";
39. }
41. **void** forceSwitch(**int** light) {
42. currentLight = light;
43. }
45. **void** lightUp(**int** light) {
46. digitalWrite(light, HIGH);
47. currentLight = light;
48. }
50. **void** lightDown(**int** light) {
51. digitalWrite(light, LOW);
52. }
54. **void** loop() {
56. //Turn on/off the Red Light
57. lightUp(RED);
58. Serial.println("Red Light has been turned on");
59. delay(1000 \* redStayColor);
60. lightDown(RED);
61. Serial.println("Red Light has been turned off");
63. //Turn on/off the Yellow Light
64. lightUp(YELLOW);
65. Serial.println("Yellow Light has been turned on");
66. delay(1000 \* yellowStayColor);
67. lightDown(YELLOW);
68. Serial.println("Yellow Light has been turned off");
70. //Turn on/off the Green Light
71. lightUp(GREEN);
72. Serial.println("Green Light has been turned on");
73. delay(1000 \* greenStayColor);
74. lightDown(GREEN);
75. Serial.println("Green Light has been turned off");
77. }

**Level 4: Fading**

1. **int** pin = 5;
2. **int** increment = 5;
4. **void** setup() {
5. // put your setup code here, to run once:
6. Serial.begin(9600);
7. **while** (!Serial);
8. Serial.println("Enter an number increment to fade the light, use 0 for default.");
9. }
11. **void** loop() {
12. // put your main code here, to run repeatedly:
14. **if** (Serial.available()) {
15. boolean valid = **false**;
17. **while** (!valid) {
18. **char** input = Serial.read();
20. **if** (input == '0') {
21. increment = 5;
22. Serial.print("Using default value: 5");
23. valid = **true**;
24. } **else** **if** (input > '0') {
25. **int** led = input - '0';
26. **if** (led > 0 and led < 255) {
27. increment = led;
28. Serial.print("Using custom value of: ");
29. Serial.print(increment);
30. valid = **true**;
31. }
32. }
33. }
34. }
36. **for** (**int** fade = 0; fade >= 0; fade -= increment) {
37. analogWrite(pin, fade);
38. delay(30);
39. }
41. **for** (**int** fade = 0; fade <= 255; fade += increment) {
42. analogWrite(pin, fade);
43. delay(30);
44. }
46. }