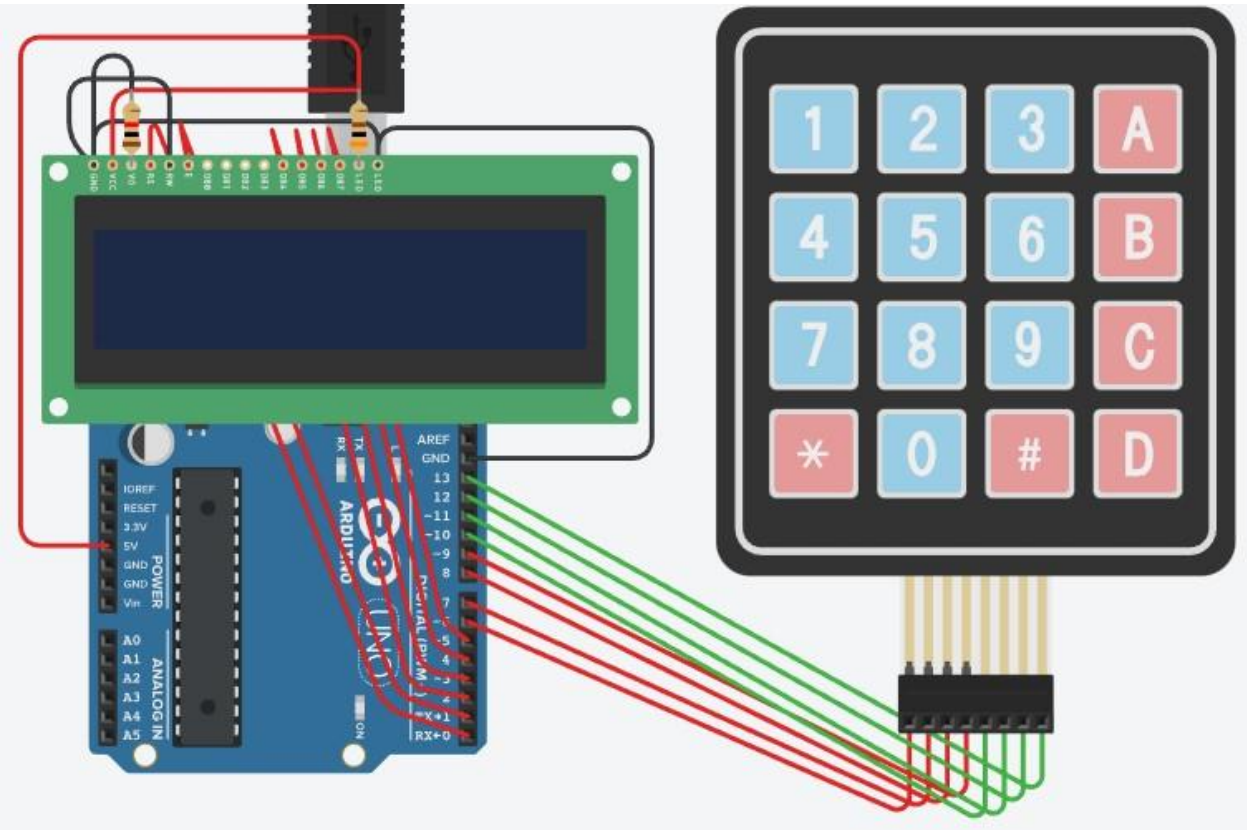
Write a program to interface LCD and keypad (4 X 4) , to exhibit the functionality of a basic calculator.

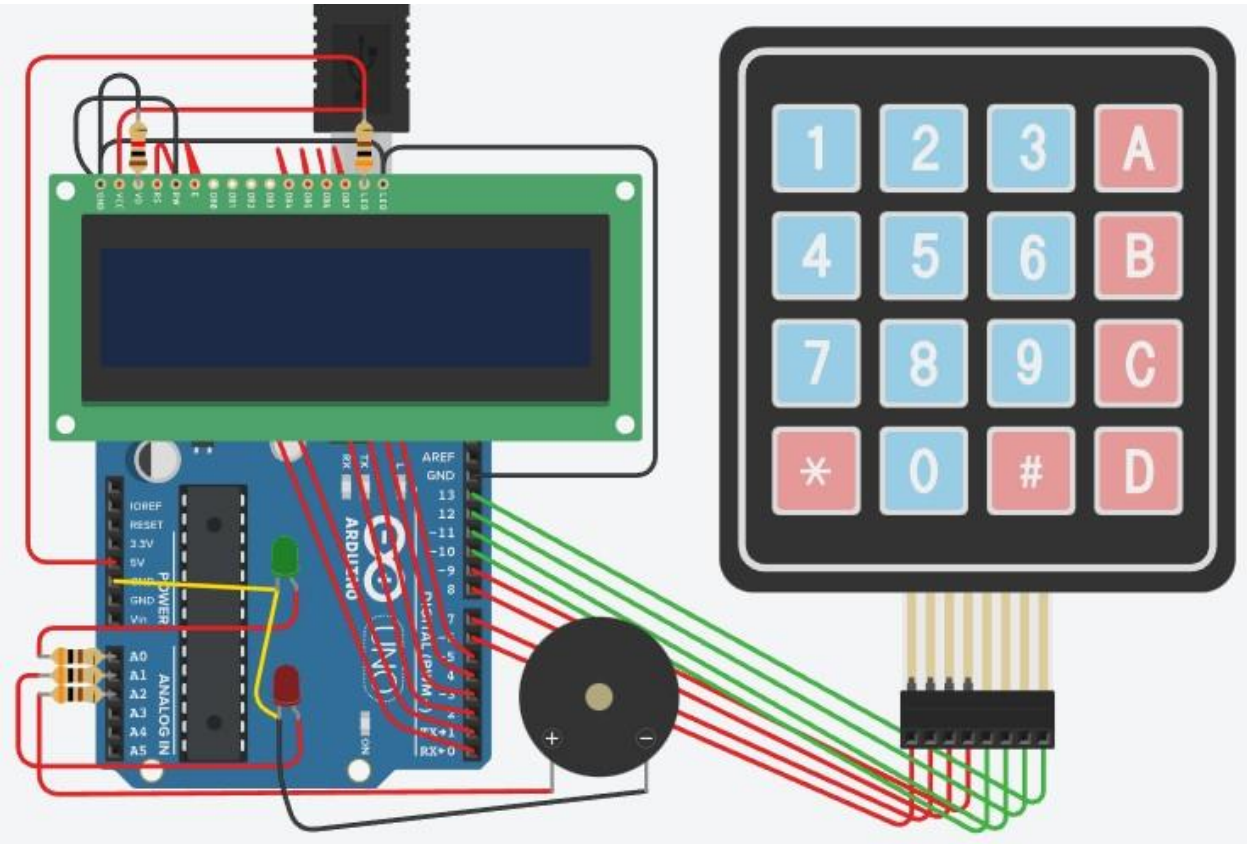



```
#include <Keypad.h>
#include <LiquidCrystal.h>
LiquidCrystal lcd(0, 1, 2, 3, 4, 5);
byte row = 4; byte col = 4; char
keys[4][4] = {   { '1', '2', '3',
'+' },
  { '4', '5', '6', '-' },
  { '7', '8', '9', '*' },
  { 'C', '0', 'E', '/' }
}; byte rowpin[4] = { 6, 7, 8, 9 };
byte colpin[4] = { 10, 11, 12, 13 };
Keypad mykeypad = Keypad(makeKeymap(keys), rowpin, colpin, row, col);
 long num1 =
0; long num2 =
0; double
total = 0;
void setup() {
lcd.begin(16,
```

```
2);
lcd.print("Ent
er a Number");
delay(1000);
lcd.clear(); }
void loop() {
char value =
mykeypad.getKe
y();   switch
(value) {
case '0' ...
'9':
lcd.setCursor(
0, 0);
num1 = num1 *
10 + (value -
'0');
lcd.print(num1
);
break;
case '+':
      num1 = (total != 0 ? total : num1);
lcd.print('+');       num2 =
secondNumber();       total = num1 +
num2;       lcd.setCursor(0, 2);
lcd.print(total);       num1 = num2 = 0;
break;     case '-':
      num1 = (total != 0 ? total : num1);
lcd.print('-');       num2 =
secondNumber();       total = num1 -
num2;       lcd.setCursor(0, 2);
lcd.print(total);       num1 = num2 = 0;
break;     case '*':
      num1 = (total != 0 ? total : num1);
lcd.print('*');       num2 =
secondNumber();       total = num1 *
num2;       lcd.setCursor(0, 2);
lcd.print(total);       num1 = num2 = 0;
break;     case '/':
      num1 = (total != 0 ? total : num1);       lcd.print('/');       num2
= secondNumber();       lcd.setCursor(0, 2);       num2 == 0 ?
lcd.print("Invalid") : total = (float)num1 / (float)num2;
lcd.print(total);       num1 = num2 = 0;       break;     case 'C':
      total = num1 = num2 = 0;
lcd.clear();       break;
  }
```

```
}  long secondNumber() {   while (1) {
char value = mykeypad.getKey();     if
(value >= '0' && value <= '9') {
num2 = num2 * 10 + (value - '0');
lcd.setCursor(7, 0);
lcd.print(num2);
    }     if (value == 'E')
break;
  }
  return num2;
}
```

Write a program using LCD, LEDs, Buzzer and keypad to simulate a password based security lock system. User enters 4-digit password and if the password is correct buzzer and Green LED is put on. But if the password is incorrect Red LED is put on. After three incorrect attempts Red LED along with buzzer blinks continuously.



```
#include <Keypad.h>
#include <LiquidCrystal.h>
LiquidCrystal lcd(0, 1, 2, 3, 4, 5);
byte row = 4; byte col = 4; char
keys[4][4] = {   { '1', '2', '3',
'A' },
  { '4', '5', '6', 'B' },
  { '7', '8', '9', 'C' },
  { '*', '0', 'E', 'D' }
}; byte rowpin[4] = { 6, 7, 8, 9
}; byte colpin[4] = { 10, 11,
12, 13 };
Keypad mykeypad = Keypad(makeKeymap(keys), rowpin, colpin, row, col);

String pass; int c =
0; int a = 0; void
setup() {
lcd.begin(16, 2);
lcd.print("UPCISS");
delay(1000);
lcd.clear();
} void loop() {   char key =
mykeypad.getKey();   if (key) {
pass = pass + key;     c++;     if
(c > 5) {       lcd.clear();
lcd.print("Access Denied");
c = 0;     }     lcd.print('*');
if (key == 'A') {
lcd.setCursor(1, 0);
lcd.clear();
lcd.print("Enter Password");
lcd.setCursor(3, 1);       pass =
"";
    } else if (key == '*') {
lcd.clear();       c = 0;
a = 0;       analogWrite(A1,
0);       analogWrite(A2,
0);
    }     if (key == 'E') {
lcd.setCursor(3, 1);
lcd.clear();       if (pass ==
"1234E") {         lcd.print("Access
Granted");         c = 0;
analogWrite(A0, 255);
analogWrite(A2, 255);
delay(200);
```

```
        analogWrite(A0, 0);
analogWrite(A2, 0);       } else {
lcd.print("Access Denied");
c = 0;          analogWrite(A1,
255);         analogWrite(A2, 255);
delay(200);          analogWrite(A1,
0);         analogWrite(A2, 0);
a++;       }       if (a == 3) {
analogWrite(A1, 255);
analogWrite(A2, 255);
      }
    }
  }
}
```