LAMPIRAN A

SOURCE CODE

```
#include <LCD3Wire.h>
#include <Keypad.h>

#define LCD_LINES 2
#define DOUT_PIN 11
#define STR_PIN  12
#define CLK_PIN  10

LCD3Wire lcd = LCD3Wire(LCD_LINES, DOUT_PIN, STR_PIN, CLK_PIN);

const byte ROWS = 4;
const byte COLS = 3;
char keys[ROWS][COLS] = {
  {'1','2','3'},
  {'4','5','6'},
  {'7','8','9'},
  {'*','0','#'}
};
byte rowPins[ROWS] = {9,A1,A2,A3};
byte colPins[COLS] = {A4,A5,0};
char letter;

Keypad keypad = Keypad( makeKeymap(keys), rowPins, colPins, ROWS, COLS);

void setup() {
  lcd.init();
  randomSeed(analogRead(A0));
  pinMode(13, OUTPUT);
  pinMode(2, OUTPUT);
  pinMode(3, OUTPUT);
  pinMode(4, OUTPUT);
  pinMode(5, OUTPUT);
  pinMode(6, OUTPUT);
  pinMode(7, OUTPUT);
  pinMode(8, OUTPUT);
  digitalWrite(13, LOW);
  digitalWrite(2, LOW);
  digitalWrite(3, LOW);
  digitalWrite(4, LOW);
  digitalWrite(5, LOW);
  digitalWrite(6, LOW);
  digitalWrite(7, LOW);
  digitalWrite(8, LOW);
}

void loop() {
  lcd.clear();
  lcd.cursorTo(1,1);
  lcd.printIn("Semaphore Code");
  lcd.cursorTo(2,2);
  lcd.printIn("Practice Set");
  delay(2000);
  lcd.clear();
  lcd.cursorTo(1,0);
  lcd.printIn("by:Daniel Yerimi");
  lcd.cursorTo(2,5);
  lcd.printIn("0927051");
  delay(2000);
  char mode = getMode();
  if(mode=='1') {
    lcd.clear();
    lcd.cursorTo(1,0);
    lcd.printIn("Practice Mode");
```

```
    delay(2000);
    practiceMode();
  } else if(mode=='2') {
    lcd.clear();
    lcd.cursorTo(1,0);
    lcd.printIn("Test Mode");
    delay(2000);
    testMode();
  } else if(mode=='3') {
    lcd.clear();
    lcd.cursorTo(1,0);
    lcd.printIn("Exam Mode");
    delay(2000);
    examMode();
  }
}

char getMode() {
  lcd.clear();
  lcd.cursorTo(1,0);
  lcd.printIn("Choose Mode:");
  delay(2000);
  lcd.clear();
  lcd.cursorTo(1,0);
  lcd.printIn("1. Practice");
  lcd.cursorTo(2,0);
  lcd.printIn("2. Test");
  delay(2000);
  lcd.clear();
  lcd.cursorTo(1,0);
  lcd.printIn("3. Exam");

  char init_key = keypad.getKey();
  while(1) {
    init_key = keypad.getKey();
    delay(100);
    if(init_key=='1' || init_key=='2' || init_key=='3') break;
  }
  return init_key;
}

int getCode(int idx, int count) {
  int code;
  if(idx==1 && count==1) {
    code = 1;
    letter = 'A';
  } else if(idx==1 && count==2) {
    code = 2;
    letter = 'B';
  } else if(idx==1 && count==3) {
    code = 3;
    letter = 'C';
  } else if(idx==2 && count==1) {
    code = 4;
    letter = 'D';
  } else if(idx==2 && count==2) {
    code = 5;
    letter = 'E';
  } else if(idx==2 && count==3) {
    code = 6;
    letter = 'F';
  } else if(idx==3 && count==1) {
    code = 7;
```

```
    letter = 'G';
  } else if(idx==3 && count==2) {
    code = 8;
    letter = 'H';
  } else if(idx==3 && count==3) {
    code = 9;
    letter = 'I';
  } else if(idx==4 && count==1) {
    code = 10;
    letter = 'J';
  } else if(idx==4 && count==2) {
    code = 11;
    letter = 'K';
  } else if(idx==4 && count==3) {
    code = 12;
    letter = 'L';
  } else if(idx==5 && count==1) {
    code = 13;
    letter = 'M';
  } else if(idx==5 && count==2) {
    code = 14;
    letter = 'N';
  } else if(idx==5 && count==3) {
    code = 15;
    letter = 'O';
  } else if(idx==6 && count==1) {
    code = 16;
    letter = 'P';
  } else if(idx==6 && count==2) {
    code = 17;
    letter = 'Q';
  } else if(idx==6 && count==3) {
    code = 18;
    letter = 'R';
  } else if(idx==7 && count==1) {
    code = 19;
    letter = 'S';
  } else if(idx==7 && count==2) {
    code = 20;
    letter = 'T';
  } else if(idx==7 && count==3) {
    code = 21;
    letter = 'U';
  } else if(idx==8 && count==1) {
    code = 22;
    letter = 'V';
  } else if(idx==8 && count==2) {
    code = 23;
    letter = 'W';
  } else if(idx==8 && count==3) {
    code = 24;
    letter = 'X';
  } else if(idx==9 && count==1) {
    code = 25;
    letter = 'Y';
  } else if(idx==9 && count==2) {
    code = 26;
    letter = 'Z';
  }
  return code;
}
```

```
void lightOn(int code) {
  if(code==1) { //A
    digitalWrite(5, HIGH);
    digitalWrite(6, HIGH);
  } else if(code==2) { //B
    digitalWrite(5, HIGH);
    digitalWrite(7, HIGH);
  } else if(code==3) { //C
    digitalWrite(5, HIGH);
    digitalWrite(8, HIGH);
  } else if(code==4) { //D
    digitalWrite(13, HIGH);
    digitalWrite(5, HIGH);
  } else if(code==5) { //E
    digitalWrite(2, HIGH);
    digitalWrite(5, HIGH);
  } else if(code==6) { //F
    digitalWrite(3, HIGH);
    digitalWrite(5, HIGH);
  } else if(code==7) { //G
    digitalWrite(4, HIGH);
    digitalWrite(5, HIGH);
  } else if(code==8) { //H
    digitalWrite(6, HIGH);
    digitalWrite(7, HIGH);
  } else if(code==9) { //I
    digitalWrite(6, HIGH);
    digitalWrite(8, HIGH);
  } else if(code==10) { //J
    digitalWrite(13, HIGH);
    digitalWrite(3, HIGH);
  } else if(code==11) { //K
    digitalWrite(13, HIGH);
    digitalWrite(6, HIGH);
  } else if(code==12) { //L
    digitalWrite(2, HIGH);
    digitalWrite(6, HIGH);
  } else if(code==13) { //M
    digitalWrite(3, HIGH);
    digitalWrite(6, HIGH);
  } else if(code==14) { //N
    digitalWrite(4, HIGH);
    digitalWrite(6, HIGH);
  } else if(code==15) { //O
    digitalWrite(7, HIGH);
    digitalWrite(8, HIGH);
  } else if(code==16) { //P
    digitalWrite(13, HIGH);
    digitalWrite(7, HIGH);
  } else if(code==17) { //Q
    digitalWrite(2, HIGH);
    digitalWrite(7, HIGH);
  } else if(code==18) { //R
    digitalWrite(3, HIGH);
    digitalWrite(7, HIGH);
  } else if(code==19) { //S
    digitalWrite(4, HIGH);
    digitalWrite(7, HIGH);
  } else if(code==20) { //T
    digitalWrite(13, HIGH);
    digitalWrite(8, HIGH);
  } else if(code==21) { //U
    digitalWrite(2, HIGH);
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    digitalWrite(8, HIGH);
  } else if(code==22) { //V
    digitalWrite(13, HIGH);
    digitalWrite(4, HIGH);
  } else if(code==23) { //W
    digitalWrite(2, HIGH);
    digitalWrite(3, HIGH);
  } else if(code==24) { //X
    digitalWrite(2, HIGH);
    digitalWrite(4, HIGH);
  } else if(code==25) { //Y
    digitalWrite(3, HIGH);
    digitalWrite(8, HIGH);
  } else if(code==26) { //Z
    digitalWrite(3, HIGH);
    digitalWrite(4, HIGH);
  }
}

void numberOn(int code) {
  if(code==1) {
    digitalWrite(5, HIGH);
    digitalWrite(6, HIGH);
  } else if(code==2) {
    digitalWrite(5, HIGH);
    digitalWrite(7, HIGH);
  } else if(code==3) {
    digitalWrite(5, HIGH);
    digitalWrite(8, HIGH);
  } else if(code==4) {
    digitalWrite(13, HIGH);
    digitalWrite(5, HIGH);
  } else if(code==5) {
    digitalWrite(2, HIGH);
    digitalWrite(5, HIGH);
  } else if(code==6) {
    digitalWrite(3, HIGH);
    digitalWrite(5, HIGH);
  } else if(code==7) {
    digitalWrite(4, HIGH);
    digitalWrite(5, HIGH);
  } else if(code==8) {
    digitalWrite(6, HIGH);
    digitalWrite(7, HIGH);
  } else if(code==9) {
    digitalWrite(6, HIGH);
    digitalWrite(8, HIGH);
  } else if(code==10) {
    digitalWrite(13, HIGH);
    digitalWrite(6, HIGH);
  }
}

void practiceMode() {
  lcd.clear();
  lcd.printIn("Input:");
  lcd.cursorTo(2,0);
  char key;
  boolean numberMode = false;
  int idx_init = 255;
  int idx_curr = 255;
  int num_idx_init = 255;
  int num_idx_curr = 255;
```

```
int counter = 0;
int num_counter = 0;
int num_code = 0;
int i, code;
while(1) {
  if(numberMode == false) {
    key = keypad.getKey();
    delay(100);
    if(key!=NO_KEY) {
      switch(key) {
        case '1': if(idx_init==255) idx_init = 1;
                  idx_curr = 1;
                  if(idx_curr==idx_init) {
                    if(counter<3) {
                      counter++;
                      code = getCode(idx_init, counter);
                      lcd.cursorTo(2,0);
                      lcd.print(letter);
                    }
                  }
                  break;
        case '2': if(idx_init==255) idx_init = 2;
                  idx_curr = 2;
                  if(idx_curr==idx_init) {
                    if(counter<3) {
                      counter++;
                      code = getCode(idx_init, counter);
                      lcd.cursorTo(2,0);
                      lcd.print(letter);
                    }
                  }
                  break;
        case '3': if(idx_init==255) idx_init = 3;
                  idx_curr = 3;
                  if(idx_curr==idx_init) {
                    if(counter<3) {
                      counter++;
                      code = getCode(idx_init, counter);
                      lcd.cursorTo(2,0);
                      lcd.print(letter);
                    }
                  }
                  break;
        case '4': if(idx_init==255) idx_init = 4;
                  idx_curr = 4;
                  if(idx_curr==idx_init) {
                    if(counter<3) {
                      counter++;
                      code = getCode(idx_init, counter);
                      lcd.cursorTo(2,0);
                      lcd.print(letter);
                    }
                  }
                  break;
        case '5': if(idx_init==255) idx_init = 5;
                  idx_curr = 5;
                  if(idx_curr==idx_init) {
                    if(counter<3) {
                      counter++;
                      code = getCode(idx_init, counter);
                      lcd.cursorTo(2,0);
                      lcd.print(letter);
                    }
```

```
          }
          break;
case '6': if(idx_init==255) idx_init = 6;
          idx_curr = 6;
          if(idx_curr==idx_init) {
            if(counter<3) {
              counter++;
              code = getCode(idx_init, counter);
              lcd.cursorTo(2,0);
              lcd.print(letter);
            }
          }
          break;
case '7': if(idx_init==255) idx_init = 7;
          idx_curr = 7;
          if(idx_curr==idx_init) {
            if(counter<3) {
              counter++;
              code = getCode(idx_init, counter);
              lcd.cursorTo(2,0);
              lcd.print(letter);
            }
          }
          break;
case '8': if(idx_init==255) idx_init = 8;
          idx_curr = 8;
          if(idx_curr==idx_init) {
            if(counter<3) {
              counter++;
              code = getCode(idx_init, counter);
              lcd.cursorTo(2,0);
              lcd.print(letter);
            }
          }
          break;
case '9': if(idx_init==255) idx_init = 9;
          idx_curr = 9;
          if(idx_curr==idx_init) {
            if(counter<2) {
              counter++;
              code = getCode(idx_init, counter);
              lcd.cursorTo(2,0);
              lcd.print(letter);
            }
          }
          break;
case '*': lcd.clear();
          lcd.printIn("Input:");
          lcd.cursorTo(2,0);
          idx_init = 255;
          idx_curr = 255;
          counter  = 0;
          break;
case '#': if(idx_init!=255 && counter>0) {
            code = getCode(idx_init, counter);
            lightOn(code);
            delay(2000);
            for(i=2; i<=8; i++) digitalWrite(i, LOW);
            digitalWrite(13, LOW);
            lcd.clear();
            lcd.printIn("Input:");
            lcd.cursorTo(2,0);
            idx_init = 255;
```

```
                idx_curr = 255;
                counter  = 0;
              }
              break;
      case '0': if(idx_init==255) idx_init = 0;
              idx_curr = 0;
              if(idx_curr==idx_init) {
                numberMode = true;
                lcd.clear();
                idx_init = 255;
                idx_curr = 255;
                counter  = 0;
                lcd.printIn("Number Mode");
                digitalWrite(13, HIGH);
                digitalWrite(2, HIGH);
                delay(1000);
                lcd.clear();
                lcd.printIn("Input:");
                lcd.cursorTo(2,0);
                digitalWrite(13, LOW);
                digitalWrite(2, LOW);
              }
              break;
      default:  break;
    }
  }
} else if(numberMode==true) {
  key = keypad.getKey();
  delay(100);
  if(key!=NO_KEY) {
    switch(key) {
      case '1': if(num_counter<1) {
                  num_counter++;
                  num_idx_curr = 1;
                  num_code = 1;
                  lcd.print(key);
                }
                break;
      case '2': if(num_counter<1) {
                  num_counter++;
                  num_idx_curr = 2;
                  num_code = 2;
                  lcd.print(key);
                }
                break;
      case '3': if(num_counter<1) {
                  num_counter++;
                  num_idx_curr = 3;
                  num_code = 3;
                  lcd.print(key);
                }
                break;
      case '4': if(num_counter<1) {
                  num_counter++;
                  num_idx_curr = 4;
                  num_code = 4;
                  lcd.print(key);
                }
                break;
      case '5': if(num_counter<1) {
                  num_counter++;
                  num_idx_curr = 5;
                  num_code = 5;
```

```
            lcd.print(key);
          }
          break;
case '6': if(num_counter<1) {
            num_counter++;
            num_idx_curr = 6;
            num_code = 6;
            lcd.print(key);
          }
          break;
case '7': if(num_counter<1) {
            num_counter++;
            num_idx_curr = 7;
            num_code = 7;
            lcd.print(key);
          }
          break;
case '8': if(num_counter<1) {
            num_counter++;
            num_idx_curr = 8;
            num_code = 8;
            lcd.print(key);
          }
          break;
case '9': if(num_counter<1) {
            num_counter++;
            num_idx_curr = 9;
            num_code = 9;
            lcd.print(key);
          }
          break;
case '0': if(num_idx_curr==num_idx_init) {
            if(num_counter<2) {
              num_counter++;
              if(num_counter==2) {
                numberMode = false;
                lcd.clear();
                num_idx_curr = 255;
                num_idx_init = 255;
                num_code = 0;
                num_counter=0;
                lcd.printIn("Letter Mode");
                digitalWrite(13, HIGH);
                digitalWrite(3, HIGH);
                delay(1000);
                lcd.clear();
                lcd.printIn("Input:");
                lcd.cursorTo(2,0);
                digitalWrite(13, LOW);
                digitalWrite(3, LOW);
                break;
              }
              num_code = 9 + num_counter;
              lcd.print(key);
            }
          }
          break;
case '*': lcd.clear();
          lcd.printIn("Input:");
          lcd.cursorTo(2,0);
          num_idx_curr = 255;
          num_idx_init = 255;
          num_code = 0;
```

```
                    num_counter=0;
                    break;
          case '#': if(num_counter>0){
                      if(num_code!=0) {
                        numberOn(num_code);
                        delay(2000);
                        for(i=2; i<=8; i++) digitalWrite(i, LOW);
                        digitalWrite(13, LOW);
                        lcd.clear();
                        lcd.printIn("Input:");
                        lcd.cursorTo(2,0);
                        num_idx_curr = 255;
                        num_idx_init = 255;
                        num_code = 0;
                        num_counter=0;
                      }
                    }
                    break;
          default:  break;
        }
      }
    }
  };
}

void testMode() {
  int i, code, question_code, idx, idx_question, count_question;
  boolean isAnswered = false;
  boolean numberMode = false;
  char key;
  int temp = 1;
  int idx_init = 255;
  int idx_curr = 255;
  int num_idx_init = 255;
  int num_idx_curr = 255;
  int counter = 0;
  int num_counter = 0;
  int num_code = 0;
  while(1) {
    idx = random(36) + 1;
    if(idx<=26) {
      if((idx%3) != 0) {
        idx_question = idx/3 + 1;
        count_question = idx%3;
      } else {
        idx_question = idx/3 + 1;
        count_question = idx%3 + 3;
      }
      question_code = getCode(idx_question, count_question);
      lightOn(question_code);
    } else {
      digitalWrite(13, HIGH);
      digitalWrite(2, HIGH);
      delay(1000);
      digitalWrite(13, LOW);
      digitalWrite(2, LOW);
      idx_question = idx-26;
      numberOn(idx_question);
    }
    lcd.clear();
    lcd.printIn("Input:");
    lcd.cursorTo(2,0);
    while(isAnswered==false) {
```

```
if(numberMode == false) {
  key = keypad.getKey();
  delay(100);
  if(key!=NO_KEY) {
    switch(key) {
      case '1': if(idx_init==255) idx_init = 1;
                idx_curr = 1;
                if(idx_curr==idx_init) {
                  if(counter<3) {
                    counter++;
                    code = getCode(idx_init, counter);
                    lcd.cursorTo(2,0);
                    lcd.print(letter);
                  }
                }
                break;
      case '2': if(idx_init==255) idx_init = 2;
                idx_curr = 2;
                if(idx_curr==idx_init) {
                  if(counter<3) {
                    counter++;
                    code = getCode(idx_init, counter);
                    lcd.cursorTo(2,0);
                    lcd.print(letter);
                  }
                }
                break;
      case '3': if(idx_init==255) idx_init = 3;
                idx_curr = 3;
                if(idx_curr==idx_init) {
                  if(counter<3) {
                    counter++;
                    code = getCode(idx_init, counter);
                    lcd.cursorTo(2,0);
                    lcd.print(letter);
                  }
                }
                break;
      case '4': if(idx_init==255) idx_init = 4;
                idx_curr = 4;
                if(idx_curr==idx_init) {
                  if(counter<3) {
                    counter++;
                    code = getCode(idx_init, counter);
                    lcd.cursorTo(2,0);
                    lcd.print(letter);
                  }
                }
                break;
      case '5': if(idx_init==255) idx_init = 5;
                idx_curr = 5;
                if(idx_curr==idx_init) {
                  if(counter<3) {
                    counter++;
                    code = getCode(idx_init, counter);
                    lcd.cursorTo(2,0);
                    lcd.print(letter);
                  }
                }
                break;
      case '6': if(idx_init==255) idx_init = 6;
                idx_curr = 6;
                if(idx_curr==idx_init) {
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```
            if(counter<3) {
              counter++;
              code = getCode(idx_init, counter);
              lcd.cursorTo(2,0);
              lcd.print(letter);
            }
          }
          break;
case '7': if(idx_init==255) idx_init = 7;
          idx_curr = 7;
          if(idx_curr==idx_init) {
            if(counter<3) {
              counter++;
              code = getCode(idx_init, counter);
              lcd.cursorTo(2,0);
              lcd.print(letter);
            }
          }
          break;
case '8': if(idx_init==255) idx_init = 8;
          idx_curr = 8;
          if(idx_curr==idx_init) {
            if(counter<3) {
              counter++;
              code = getCode(idx_init, counter);
              lcd.cursorTo(2,0);
              lcd.print(letter);
            }
          }
          break;
case '9': if(idx_init==255) idx_init = 9;
          idx_curr = 9;
          if(idx_curr==idx_init) {
            if(counter<2) {
              counter++;
              code = getCode(idx_init, counter);
              lcd.cursorTo(2,0);
              lcd.print(letter);
            }
          }
          break;
case '*': lcd.clear();
          lcd.printIn("Input:");
          lcd.cursorTo(2,0);
          idx_init = 255;
          idx_curr = 255;
          counter  = 0;
          break;
case '#': if(idx_init!=255 && counter>0) {
            code = getCode(idx_init, counter);
            if(code==question_code) {
              lcd.clear();
              lcd.printIn("Correct!");
              delay(1000);
              isAnswered=true;
            } else {
              lcd.clear();
              lcd.printIn("Wrong!");
              delay(1000);
              if(temp==3) isAnswered=true;
              temp++;
            }
            if(isAnswered==true) {
```

```
                    for(i=2; i<=8; i++) digitalWrite(i, LOW);
                    digitalWrite(13, LOW);
                  }
                  lcd.clear();
                  lcd.printIn("Input:");
                  lcd.cursorTo(2,0);
                  idx_init = 255;
                  idx_curr = 255;
                  counter  = 0;
                }
                break;
      case '0': if(idx_init==255) idx_init = 0;
                idx_curr = 0;
                if(idx_curr==idx_init) {
                  numberMode = true;
                  lcd.clear();
                  idx_init = 255;
                  idx_curr = 255;
                  counter  = 0;
                  lcd.printIn("Number Mode");
                  delay(1000);
                  lcd.clear();
                  lcd.printIn("Input:");
                  lcd.cursorTo(2,0);
                }
                break;
      default:  break;
    }
  }
} else if(numberMode==true) {
  key = keypad.getKey();
  delay(100);
  if(key!=NO_KEY) {
    switch(key) {
      case '1': if(num_counter<1) {
                  num_counter++;
                  num_idx_curr = 1;
                  num_code = 1;
                  lcd.print(key);
                }
                break;
      case '2': if(num_counter<1) {
                  num_counter++;
                  num_idx_curr = 2;
                  num_code = 2;
                  lcd.print(key);
                }
                break;
      case '3': if(num_counter<1) {
                  num_counter++;
                  num_idx_curr = 3;
                  num_code = 3;
                  lcd.print(key);
                }
                break;
      case '4': if(num_counter<1) {
                  num_counter++;
                  num_idx_curr = 4;
                  num_code = 4;
                  lcd.print(key);
                }
                break;
      case '5': if(num_counter<1) {
```

```
            num_counter++;
            num_idx_curr = 5;
            num_code = 5;
            lcd.print(key);
          }
          break;
case '6': if(num_counter<1) {
            num_counter++;
            num_idx_curr = 6;
            num_code = 6;
            lcd.print(key);
          }
          break;
case '7': if(num_counter<1) {
            num_counter++;
            num_idx_curr = 7;
            num_code = 7;
            lcd.print(key);
          }
          break;
case '8': if(num_counter<1) {
            num_counter++;
            num_idx_curr = 8;
            num_code = 8;
            lcd.print(key);
          }
          break;
case '9': if(num_counter<1) {
            num_counter++;
            num_idx_curr = 9;
            num_code = 9;
            lcd.print(key);
          }
          break;
case '0': if(num_idx_curr==num_idx_init) {
            if(num_counter<2) {
              num_counter++;
              if(num_counter==2) {
                lcd.clear();
                num_idx_curr = 255;
                num_idx_init = 255;
                num_code = 0;
                num_counter=0;
                lcd.printIn("Letter Mode");
                delay(1000);
                lcd.clear();
                lcd.printIn("Input:");
                lcd.cursorTo(2,0);
                break;
              }
              num_code = 9 + num_counter;
              lcd.print(key);
            }
          }
          break;
case '*': lcd.clear();
          lcd.printIn("Input:");
          lcd.cursorTo(2,0);
          num_idx_curr = 255;
          num_idx_init = 255;
          num_code = 0;
          num_counter=0;
          break;
```

```
            case '#': if(num_counter>0){
                        if(num_code!=0) {
                          if(num_code==idx_question) {
                            lcd.clear();
                            lcd.printIn("Correct!");
                            delay(1000);
                            isAnswered=true;
                          } else {
                            lcd.clear();
                            lcd.printIn("Wrong!");
                            delay(1000);
                            if(temp==3) isAnswered=true;
                            temp++;
                          }
                          if(isAnswered==true) {
                            for(i=2; i<=8; i++) digitalWrite(i, LOW);
                            digitalWrite(13, LOW);
                          }
                          lcd.clear();
                          lcd.printIn("Input:");
                          lcd.cursorTo(2,0);
                          num_idx_curr = 255;
                          num_idx_init = 255;
                          num_code = 0;
                          num_counter=0;
                        }
                      }
                      break;
            default:  break;
          }
        }
      }
    };
    temp = 1;
    isAnswered = false;
    numberMode = false;
  };
}

void examMode() {
  int code, question_code, idx, idx_question, count_question;
  boolean isAnswered = false;
  boolean numberMode = false;
  char key;
  int i = 0;
  int no = 0;
  int correct = 0;
  int wrong = 0;
  int idx_init = 255;
  int idx_curr = 255;
  int num_idx_init = 255;
  int num_idx_curr = 255;
  int counter = 0;
  int num_counter = 0;
  int num_code = 0;
  lcd.clear();
  lcd.cursorTo(1,1);
  lcd.printIn("Answer 10");
  lcd.cursorTo(2,3);
  lcd.printIn("Questions!");
  delay(1000);
  while(no<10) {
    idx = random(36) + 1;
```

```
if(idx<=26) {
  if((idx%3) != 0) {
    idx_question = idx/3 + 1;
    count_question = idx%3;
  } else {
    idx_question = idx/3 + 1;
    count_question = idx%3 + 3;
  }
  question_code = getCode(idx_question, count_question);
  lightOn(question_code);
} else {
  digitalWrite(13, HIGH);
  digitalWrite(2, HIGH);
  delay(1000);
  digitalWrite(13, LOW);
  digitalWrite(2, LOW);
  idx_question = idx-26;
  numberOn(idx_question);
}
lcd.clear();
lcd.printIn("Input:");
lcd.cursorTo(2,0);
while(isAnswered==false) {
    if(numberMode == false) {
      key = keypad.getKey();
      delay(100);
      if(key!=NO_KEY) {
      switch(key) {
        case '1': if(idx_init==255) idx_init = 1;
                  idx_curr = 1;
                  if(idx_curr==idx_init) {
                    if(counter<3) {
                      counter++;
                      code = getCode(idx_init, counter);
                      lcd.cursorTo(2,0);
                      lcd.print(letter);
                    }
                  }
                  break;
        case '2': if(idx_init==255) idx_init = 2;
                  idx_curr = 2;
                  if(idx_curr==idx_init) {
                    if(counter<3) {
                      counter++;
                      code = getCode(idx_init, counter);
                      lcd.cursorTo(2,0);
                      lcd.print(letter);
                    }
                  }
                  break;
        case '3': if(idx_init==255) idx_init = 3;
                  idx_curr = 3;
                  if(idx_curr==idx_init) {
                    if(counter<3) {
                      counter++;
                      code = getCode(idx_init, counter);
                      lcd.cursorTo(2,0);
                      lcd.print(letter);
                    }
                  }
                  break;
        case '4': if(idx_init==255) idx_init = 4;
                  idx_curr = 4;
```

```
          if(idx_curr==idx_init) {
            if(counter<3) {
              counter++;
              code = getCode(idx_init, counter);
              lcd.cursorTo(2,0);
              lcd.print(letter);
            }
          }
          break;
case '5': if(idx_init==255) idx_init = 5;
          idx_curr = 5;
          if(idx_curr==idx_init) {
            if(counter<3) {
              counter++;
              code = getCode(idx_init, counter);
              lcd.cursorTo(2,0);
              lcd.print(letter);
            }
          }
          break;
case '6': if(idx_init==255) idx_init = 6;
          idx_curr = 6;
          if(idx_curr==idx_init) {
            if(counter<3) {
              counter++;
              code = getCode(idx_init, counter);
              lcd.cursorTo(2,0);
              lcd.print(letter);
            }
          }
          break;
case '7': if(idx_init==255) idx_init = 7;
          idx_curr = 7;
          if(idx_curr==idx_init) {
            if(counter<3) {
              counter++;
              code = getCode(idx_init, counter);
              lcd.cursorTo(2,0);
              lcd.print(letter);
            }
          }
          break;
case '8': if(idx_init==255) idx_init = 8;
          idx_curr = 8;
          if(idx_curr==idx_init) {
            if(counter<3) {
              counter++;
              code = getCode(idx_init, counter);
              lcd.cursorTo(2,0);
              lcd.print(letter);
            }
          }
          break;
case '9': if(idx_init==255) idx_init = 9;
          idx_curr = 9;
          if(idx_curr==idx_init) {
            if(counter<2) {
              counter++;
              code = getCode(idx_init, counter);
              lcd.cursorTo(2,0);
              lcd.print(letter);
            }
          }
```

```
                break;
      case '*': lcd.clear();
                lcd.printIn("Input:");
                lcd.cursorTo(2,0);
                idx_init = 255;
                idx_curr = 255;
                counter  = 0;
                break;
      case '#': if(idx_init!=255 && counter>0) {
                  isAnswered=true;
                  code = getCode(idx_init, counter);
                  if(code==question_code) {
                    correct++;
                    lcd.clear();
                    lcd.printIn("Correct!");
                    delay(1000);
                  } else {
                    wrong++;
                    lcd.clear();
                    lcd.printIn("Wrong!");
                    delay(1000);
                  }
                  for(i=2; i<=8; i++) digitalWrite(i, LOW);
                  digitalWrite(13, LOW);
                  lcd.clear();
                  if(no<9) {
                    lcd.printIn("Input:");
                    lcd.cursorTo(2,0);
                  }
                  idx_init = 255;
                  idx_curr = 255;
                  counter  = 0;
                }
                break;
      case '0': if(idx_init==255) idx_init = 0;
                idx_curr = 0;
                if(idx_curr==idx_init) {
                  numberMode = true;
                  lcd.clear();
                  idx_init = 255;
                  idx_curr = 255;
                  counter  = 0;
                  lcd.printIn("Number Mode");
                  delay(1000);
                  lcd.clear();
                  lcd.printIn("Input:");
                  lcd.cursorTo(2,0);
                }
                break;
      default:  break;
    }
  }
} else if(numberMode==true) {
  key = keypad.getKey();
  delay(100);
  if(key!=NO_KEY) {
    switch(key) {
      case '1': if(num_counter<1) {
                  num_counter++;
                  num_idx_curr = 1;
                  num_code = 1;
                  lcd.print(key);
                }
```

```
          break;
case '2': if(num_counter<1) {
            num_counter++;
            num_idx_curr = 2;
            num_code = 2;
            lcd.print(key);
          }
          break;
case '3': if(num_counter<1) {
            num_counter++;
            num_idx_curr = 3;
            num_code = 3;
            lcd.print(key);
          }
          break;
case '4': if(num_counter<1) {
            num_counter++;
            num_idx_curr = 4;
            num_code = 4;
            lcd.print(key);
          }
          break;
case '5': if(num_counter<1) {
            num_counter++;
            num_idx_curr = 5;
            num_code = 5;
            lcd.print(key);
          }
          break;
case '6': if(num_counter<1) {
            num_counter++;
            num_idx_curr = 6;
            num_code = 6;
            lcd.print(key);
          }
          break;
case '7': if(num_counter<1) {
            num_counter++;
            num_idx_curr = 7;
            num_code = 7;
            lcd.print(key);
          }
          break;
case '8': if(num_counter<1) {
            num_counter++;
            num_idx_curr = 8;
            num_code = 8;
            lcd.print(key);
          }
          break;
case '9': if(num_counter<1) {
            num_counter++;
            num_idx_curr = 9;
            num_code = 9;
            lcd.print(key);
          }
          break;
case '0': if(num_idx_curr==num_idx_init) {
            if(num_counter<2) {
              num_counter++;
              if(num_counter==2) {
                numberMode = false;
                lcd.clear();
```

```
                        num_idx_curr = 255;
                        num_idx_init = 255;
                        num_code = 0;
                        num_counter=0;
                        lcd.printIn("Letter Mode");
                        delay(1000);
                        lcd.clear();
                        lcd.printIn("Input:");
                        lcd.cursorTo(2,0);
                        break;
                      }
                      num_code = 9 + num_counter;
                      lcd.print(key);
                    }
                  }
                  break;
          case '*': lcd.clear();
                  lcd.printIn("Input:");
                  lcd.cursorTo(2,0);
                  num_idx_curr = 255;
                  num_idx_init = 255;
                  num_code = 0;
                  num_counter=0;
                  break;
          case '#': if(num_counter>0){
                    if(num_code!=0) {
                      isAnswered = true;
                      if(num_code==idx_question) {
                        correct++;
                        lcd.clear();
                        lcd.printIn("Correct!");
                        delay(1000);
                      } else {
                        wrong++;
                        lcd.clear();
                        lcd.printIn("Wrong!");
                        delay(1000);
                      }
                      for(i=2; i<=8; i++) digitalWrite(i, LOW);
                      digitalWrite(13, LOW);
                      lcd.clear();
                      if(no<9) {
                        lcd.printIn("Input:");
                        lcd.cursorTo(2,0);
                      }
                      num_idx_curr = 255;
                      num_idx_init = 255;
                      num_code = 0;
                      num_counter=0;
                    }
                  }
                  break;
          default:  break;
        }
      }
    }
  };
  isAnswered = false;
  numberMode = false;
  no++;
};
lcd.clear();
lcd.cursorTo(1,6);
```

```
  lcd.printIn("DONE");
  delay(2000);
  while(keypad.getKey() == NO_KEY) {
    lcd.clear();
    lcd.cursorTo(1,0);
    lcd.printIn("Correct: ");
    lcd.cursorTo(2,0);
    for(i=0; i<correct; i++) {
      lcd.print('o');
      delay(100);
    }
    if(keypad.getKey() != NO_KEY) break;
    delay(3000);
    if(keypad.getKey() != NO_KEY) break;
    lcd.clear();
    lcd.cursorTo(1,0);
    lcd.printIn("Wrong: ");
    lcd.cursorTo(2,0);
    for(i=0; i<wrong; i++) {
      lcd.print('x');
      delay(100);
    }
    if(keypad.getKey() != NO_KEY) break;
    delay(3000);
  };
}
```