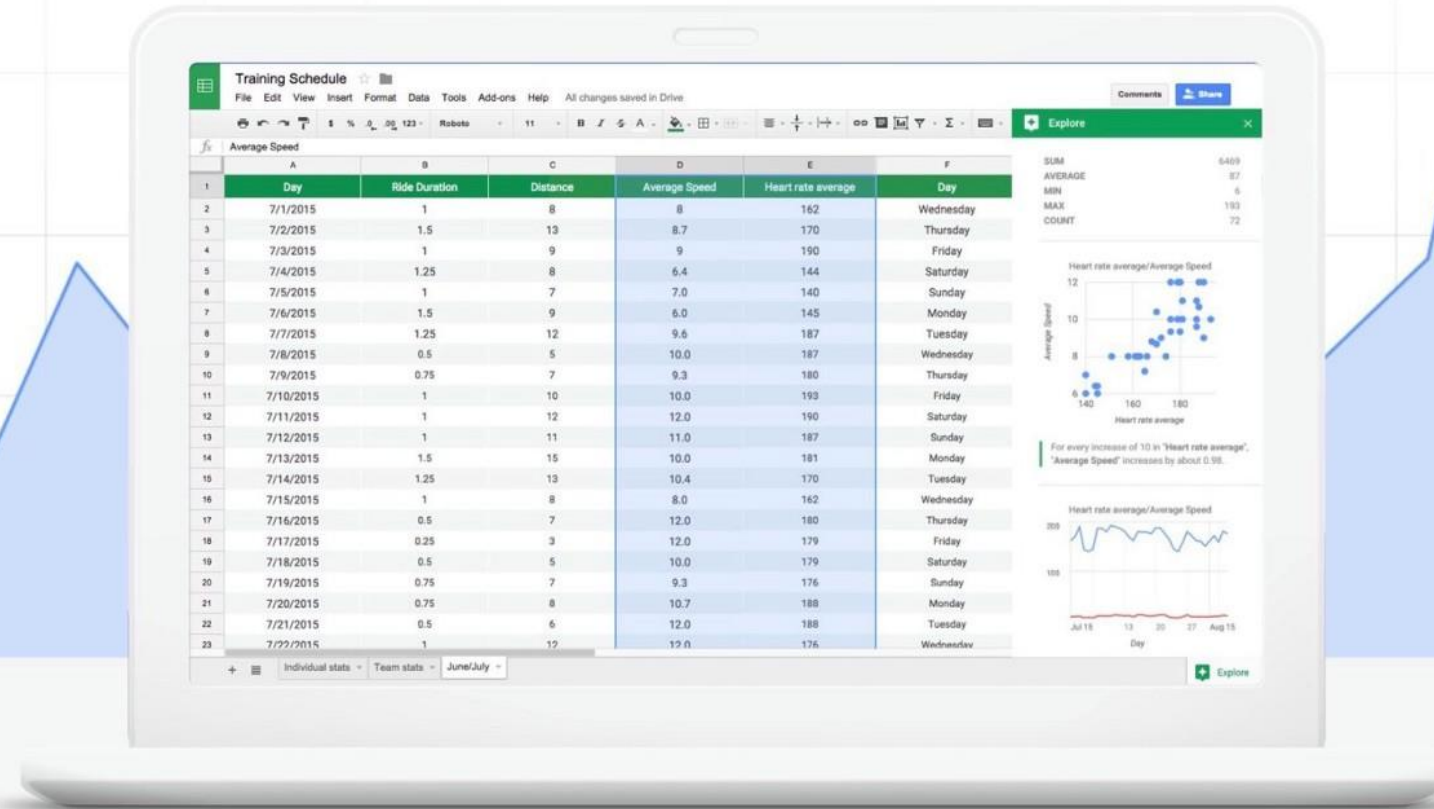


Google Spread Sheet



Google
Sheets



Data base หรือฐานข้อมูล คือ?



ฐานข้อมูล (Database) คือการรวบรวมและจัดเก็บข้อมูลในรูปแบบที่มีโครงสร้าง ทำให้สามารถเข้าถึงและจัดการข้อมูลได้อย่างมีประสิทธิภาพ ฐานข้อมูลมักใช้ในการเก็บข้อมูลในลักษณะที่เป็นระบบและสามารถสืบค้นข้อมูลได้อย่างง่ายดาย

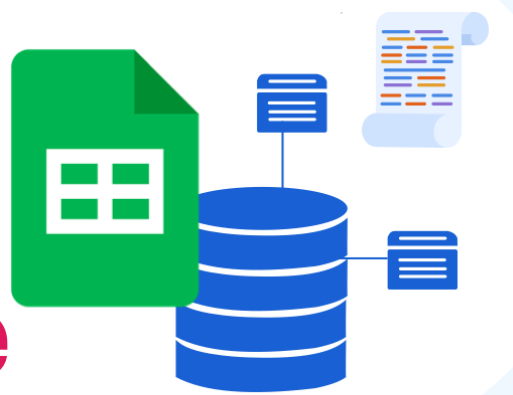
Google Spread Sheet คือ?



Google Spreadsheet หรือ Google Sheets คือโปรแกรมสเปรดชีตออนไลน์ที่พัฒนาโดย Google ซึ่งเป็นส่วนหนึ่งของ Google Drive และ Google Workspace (เดิมเรียกว่า G Suite) เราสามารถสร้าง แก้ไข และแชร์สเปรดชีตออนไลน์ได้ง่าย ๆ โดยมีฟังก์ชันคล้ายกับ Microsoft Excel แต่มีข้อได้เปรียบที่สามารถใช้งานและทำงานร่วมกับผู้อื่นได้แบบเรียลไทม์

Google Sheet เป็นฐานข้อมูลเบื้องต้น

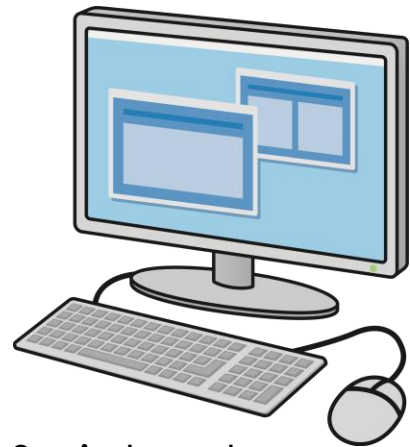
Google Sheets as Database



Google Sheet สามารถใช้งานเป็นฐานข้อมูลเบื้องต้นได้ เนื่องจากมีฟังก์ชันการจัดเก็บและการจัดการข้อมูลในรูปแบบตาราง (Spreadsheet) ที่สามารถใช้ในการบันทึกข้อมูล และสืบค้นข้อมูลพื้นฐานได้

1. การเก็บข้อมูล: สามารถสร้างแถวและคอลัมน์ในการบันทึกข้อมูล
2. การสืบค้นและการกรองข้อมูล
3. การคำนวณและวิเคราะห์ข้อมูล
4. การแชร์และทำงานร่วมกัน

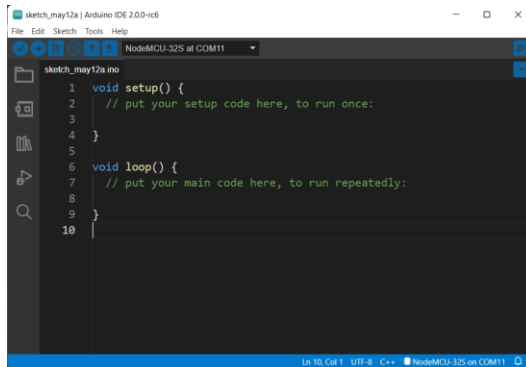
ลำดับขั้นตอนการทำงาน



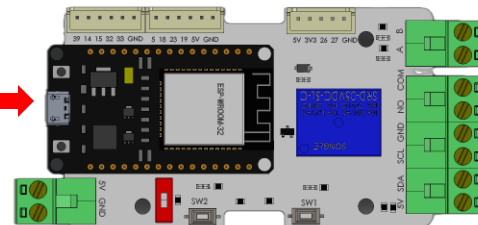
Script on browser



WiFi Router

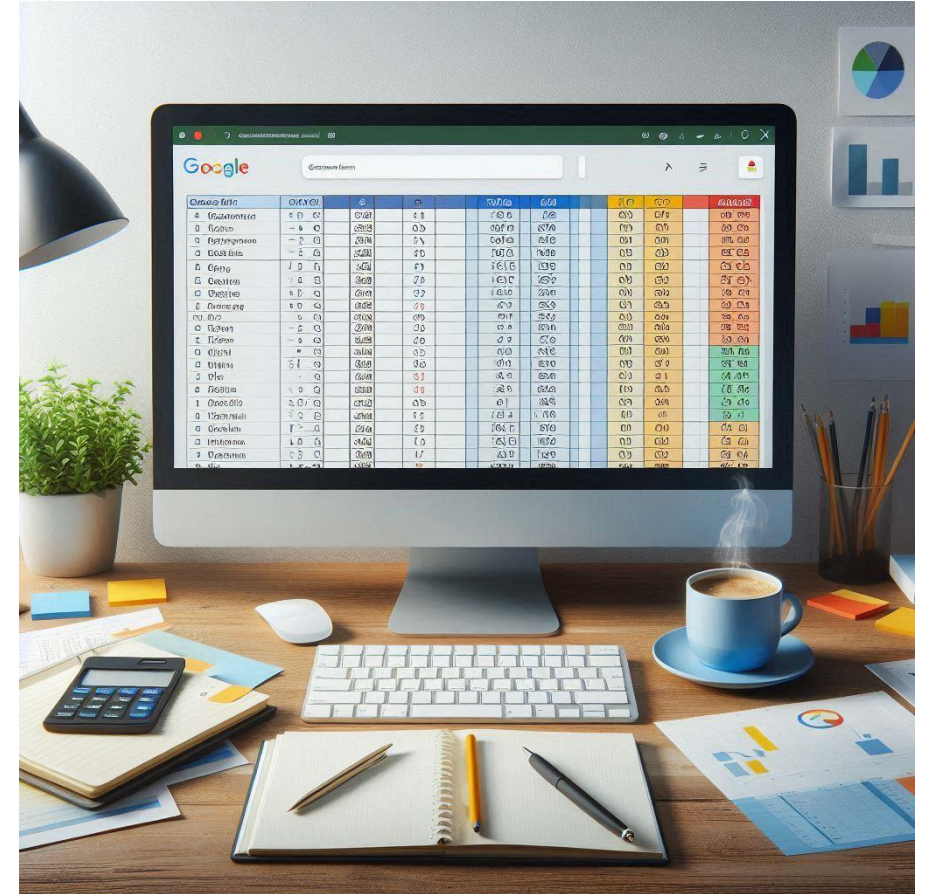


Source code on Arduino IDE



tiny32

Create Google Sheet on Web Browser



การสร้าง Google sheet บนเว็บเบราว์เซอร์

Log in with Google account

The screenshot shows the Google homepage in a web browser. The browser's address bar displays 'google.com'. The Google logo is centered on the page, with a search bar below it. Below the search bar are two buttons: 'Google Search' and 'I'm Feeling Lucky'. Below these buttons, it says 'Google offered in: ภาษาไทย'. On the right side of the page, there is a user profile dropdown menu. The menu shows a profile picture of a yellow circle with a lightbulb icon and the text 'Tenergy Connect' and 'tenergy.contact@gmail.com'. Below this, there is a button 'Manage your Google Account', a link 'Add another account', and a button 'Sign out'. At the bottom of the menu are links for 'Privacy Policy' and 'Terms of Service'. At the bottom of the page, there is a footer with links for 'About', 'Advertising', 'Business', and 'How Search works', and a URL: 'https://accounts.google.com/SignOutOptions?hl=en&continue=https://www.google.com/'.

Google

google.com

Gmail Images

Google

Tenergy Connect
tenergy.contact@gmail.com

Manage your Google Account

Add another account

Sign out

Privacy Policy • Terms of Service

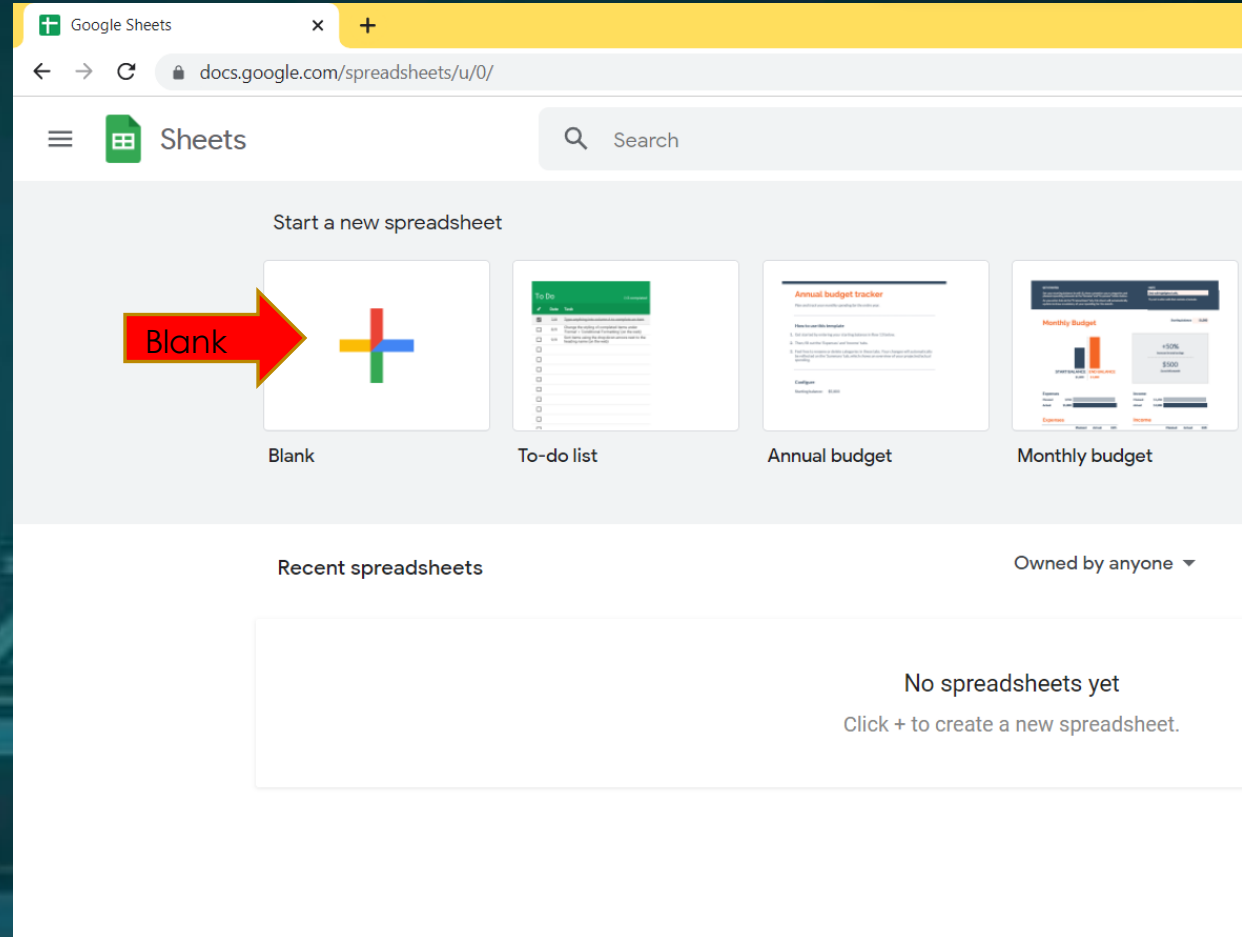
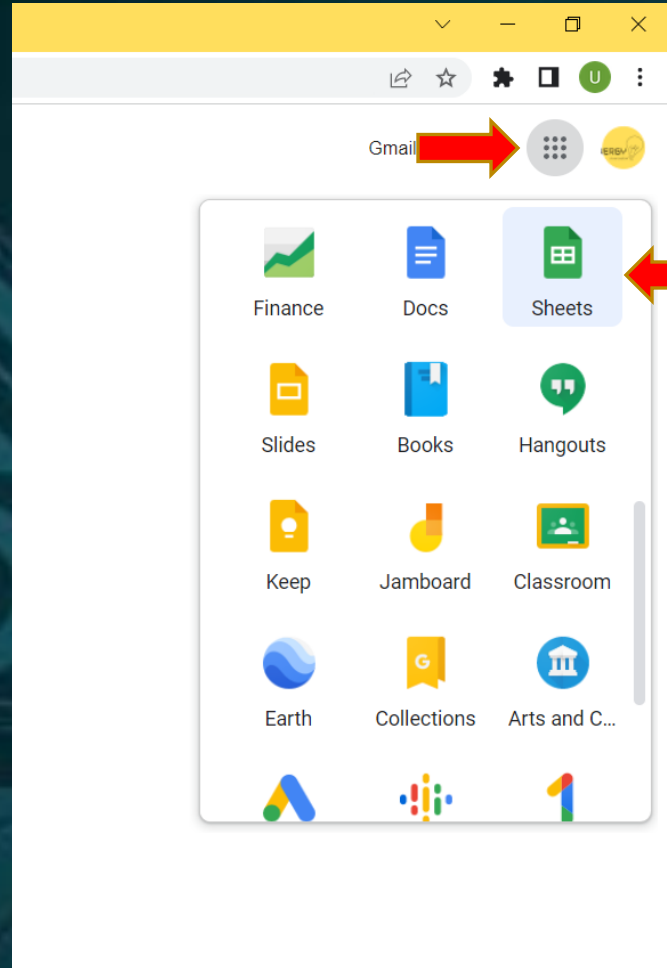
Thailand

About Advertising Business How Search works

https://accounts.google.com/SignOutOptions?hl=en&continue=https://www.google.com/



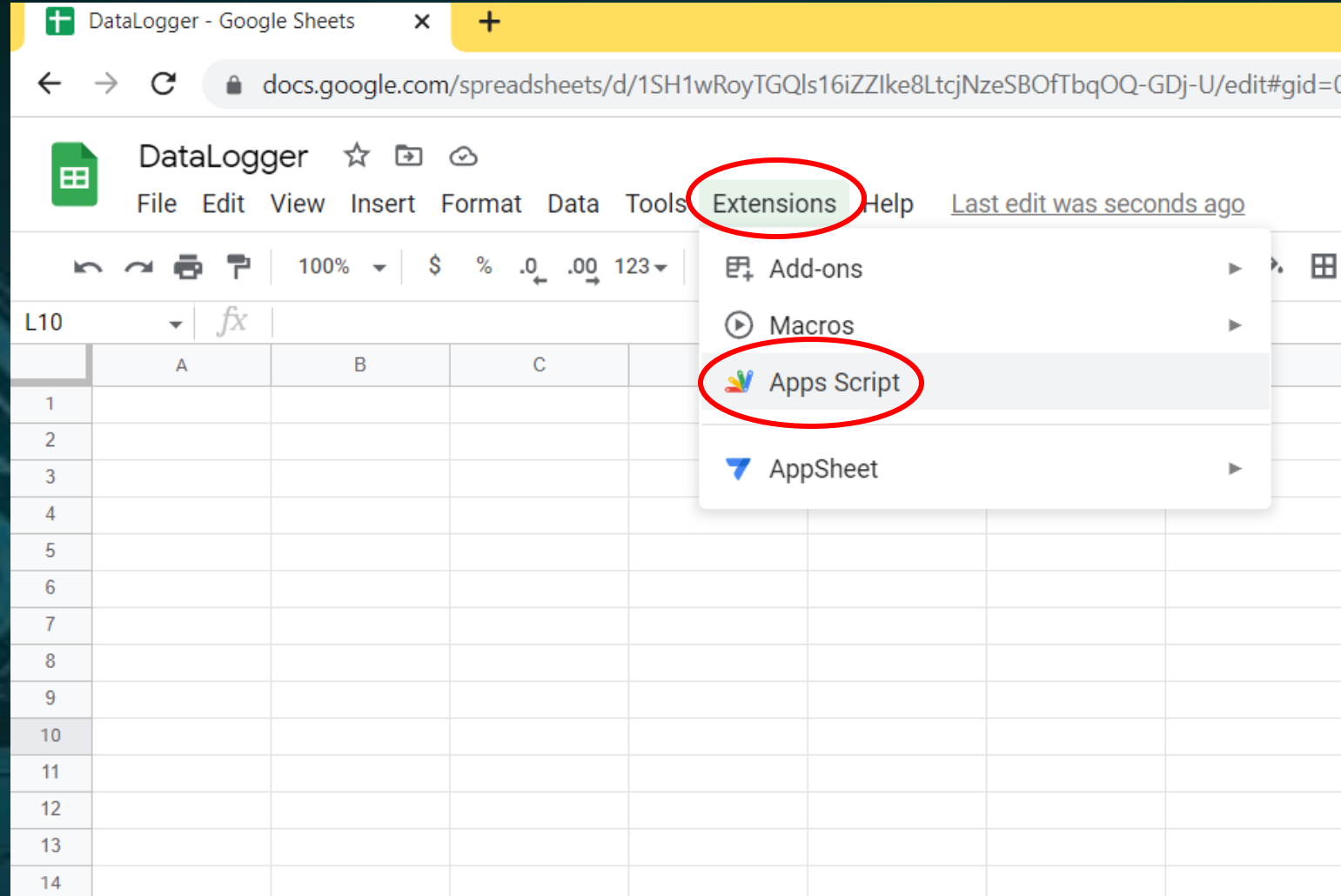
Create new google sheet



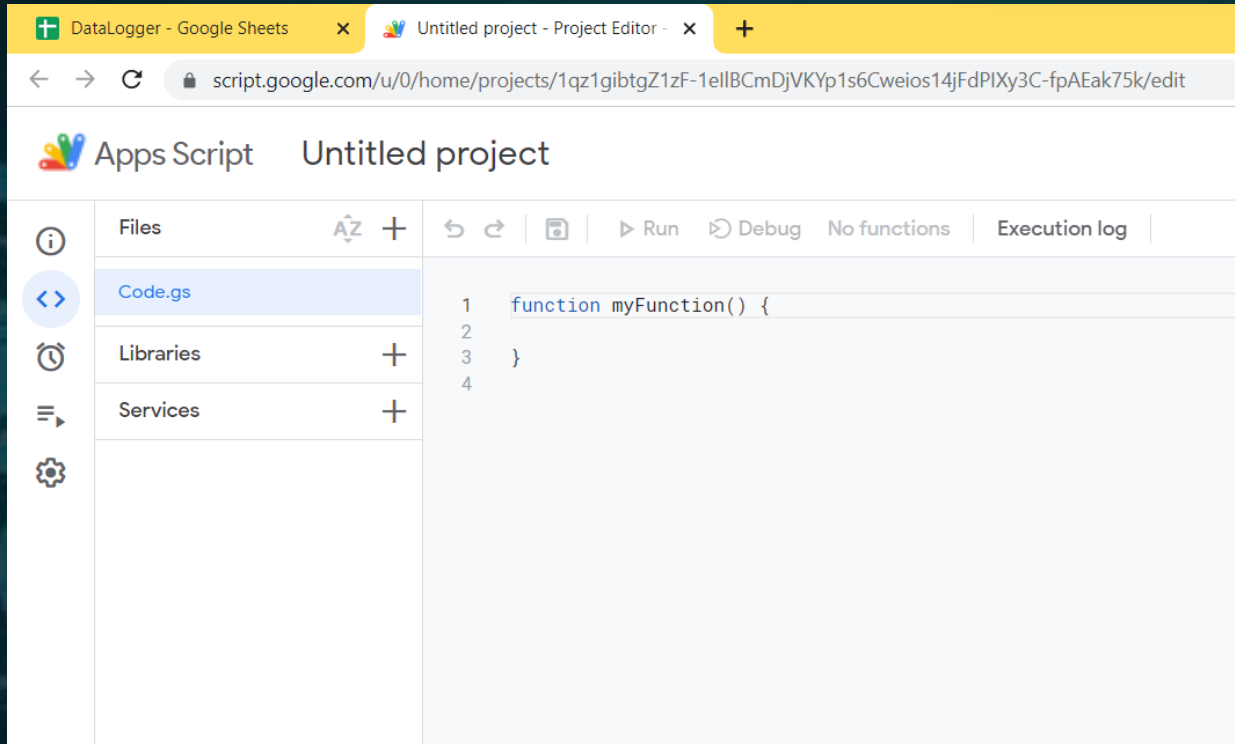
Change name of spread sheet

The screenshot shows the Google Sheets web interface. At the top, the browser tab is titled 'Untitled spreadsheet - Google Sheets'. The address bar shows the URL: docs.google.com/spreadsheets/d/1SH1wRoyTGQls16iZZIke8LtcjNzeSBOftbqQQ-GDj-U/edit#gid=0. The file name 'DataLogger' is displayed in the top left corner, next to a star icon. A red callout box with white Thai text 'เปลี่ยนชื่อไฟล์ เพื่อสะดวกในการจดจำ' (Change file name for convenience in remembering) has a red arrow pointing to the file name. The spreadsheet itself is empty, with columns labeled A through N and rows numbered 1 through 26. The bottom of the interface shows a tab labeled 'Sheet1'.

Add Apps Script



Edit Apps Script by copy and paste



```
var timeZone = "GMT+7"; //get yours at https://www.timeanddate.com/time/zones/
var dateTimeFormat = "dd/MM/yyyy HH:mm:ss";

var enableSendingEmails = true;
var emailAddress = ""; // comma separate for several emails
// 'bob@example.com';
// 'bob@example.com,admin@example.com';

function doGet(e) {
  var result = 'Ok'; // default result
  if (e.parameter == 'undefined') {
    result = 'No Parameters';
  } else {

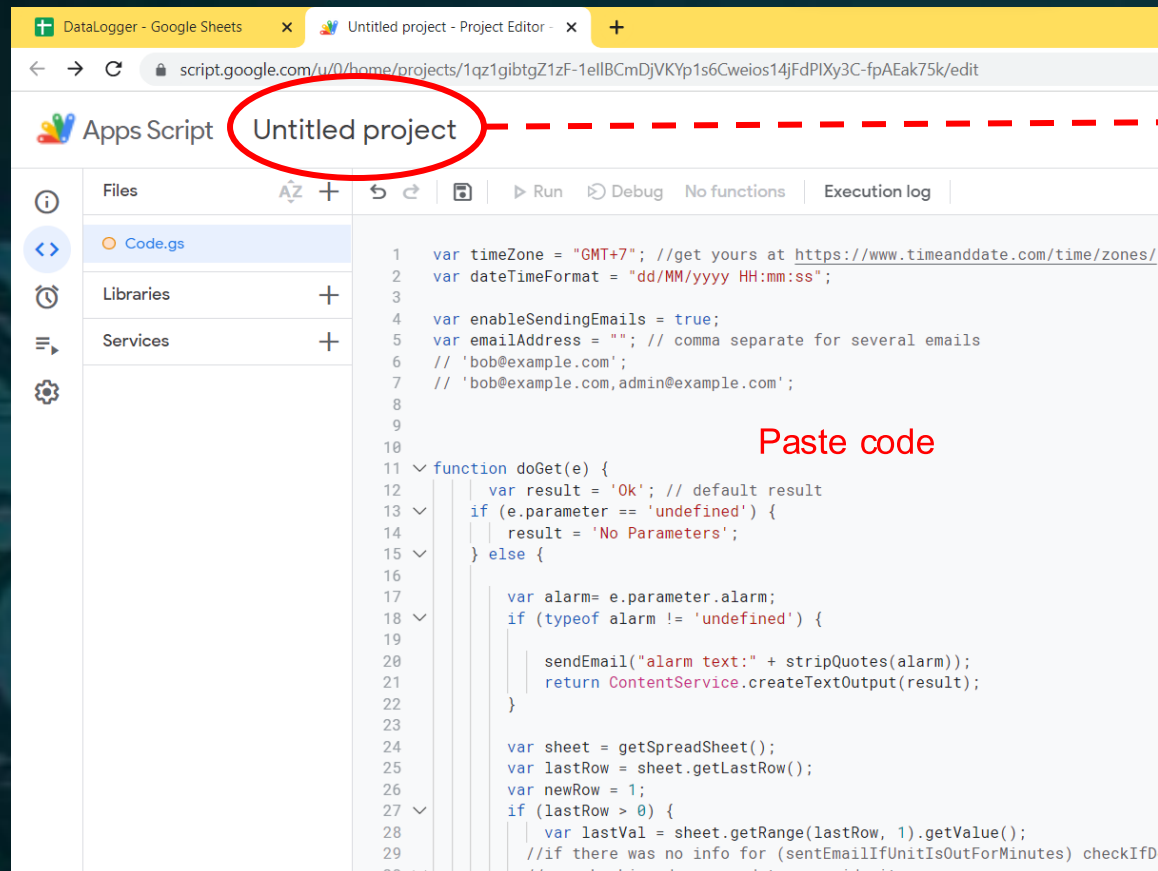
    var alarm= e.parameter.alarm;
    if (typeof alarm != 'undefined') {

      sendEmail("alarm text:" + stripQuotes(alarm));
      return ContentService.createTextOutput(result);
    }

    var sheet = getSpreadSheet();
    var lastRow = sheet.getLastRow();
    var newRow = 1;
    if (lastRow > 0) {
      var lastVal = sheet.getRange(lastRow, 1).getValue();
      //if there was no info for (sendEmailIfUnitIsOutForMinutes) checkIfDead() function will app
      // so checking do we need to override it
      if (lastVal == 'dead')
        newRow = lastRow; //to overwrite "dead" value
      else
        newRow = lastRow + 1;
    }
  }
}
```

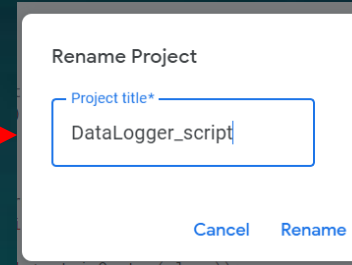
https://raw.githubusercontent.com/tenergyinnovation/loT_Training/Experiment/Apps_Script.gs

Rename Project

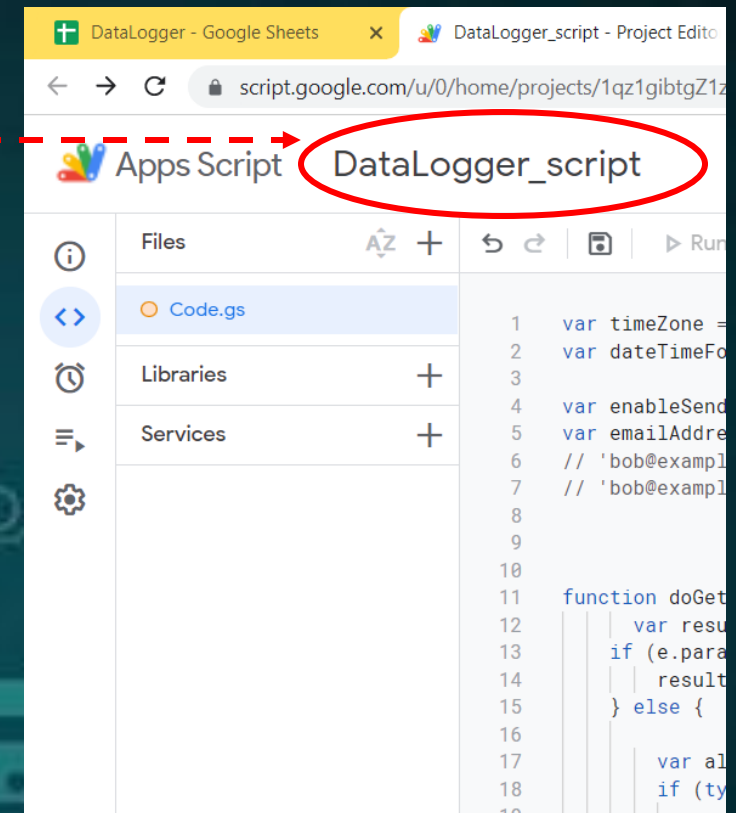


The screenshot shows the Google Apps Script Project Editor interface. The browser tab is 'DataLogger - Google Sheets'. The URL is 'script.google.com/u/0/home/projects/1qz1gibtgZ1zF-1ellBCmDjVKYp1s6Cweios14jFdPIXy3C-fpAEak75k/edit'. The 'Apps Script' logo is visible, and the project name 'Untitled project' is circled in red. A red dashed arrow points from the project name to the 'Rename Project' dialog box. The code editor shows a JavaScript function 'doGet(e)' that interacts with Google Sheets and sends emails. The text 'Paste code' is written in red in the center of the code editor.

```
1 var timeZone = "GMT+7"; //get yours at https://www.timeanddate.com/time/zones/
2 var dateTimeFormat = "dd/MM/yyyy HH:mm:ss";
3
4 var enableSendingEmails = true;
5 var emailAddress = ""; // comma separate for several emails
6 // 'bob@example.com';
7 // 'bob@example.com, admin@example.com';
8
9
10
11 function doGet(e) {
12   var result = 'Ok'; // default result
13   if (e.parameter == 'undefined') {
14     result = 'No Parameters';
15   } else {
16
17     var alarm= e.parameter.alarm;
18     if (typeof alarm != 'undefined') {
19
20       sendEmail("alarm text:" + stripQuotes(alarm));
21       return ContentService.createTextOutput(result);
22     }
23
24     var sheet = getSpreadSheet();
25     var lastRow = sheet.getLastRow();
26     var newRow = 1;
27     if (lastRow > 0) {
28       var lastVal = sheet.getRange(lastRow, 1).getValue();
29       //if there was no info for (sendEmailIfUnitIsOutForMinutes) checkIfD
30       //no checking do we need to override it
```



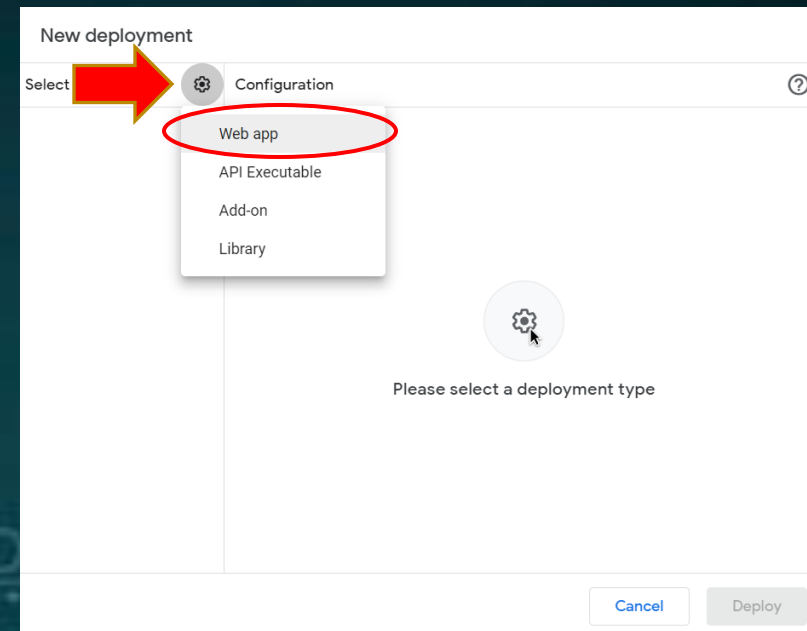
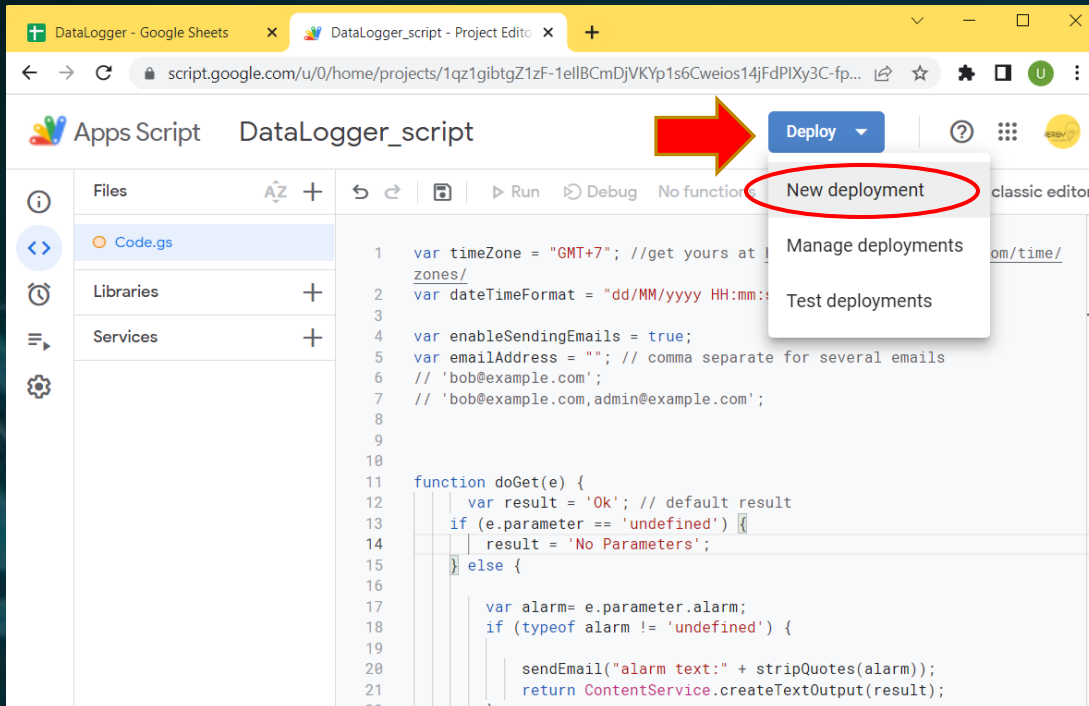
The 'Rename Project' dialog box is shown. It has a 'Project title*' label and a text input field containing 'DataLogger_script'. There are 'Cancel' and 'Rename' buttons at the bottom.



The screenshot shows the Google Apps Script Project Editor interface after the project has been renamed. The browser tab is 'DataLogger - Google Sheets'. The URL is 'script.google.com/u/0/home/projects/1qz1gibtgZ1zF-1ellBCmDjVKYp1s6Cweios14jFdPIXy3C-fpAEak75k/edit'. The 'Apps Script' logo is visible, and the project name 'DataLogger_script' is circled in red. A red dashed arrow points from the 'Rename Project' dialog box to the project name. The code editor shows the same JavaScript function 'doGet(e)' as in the previous screenshot.

```
1 var timeZone = "GMT+7"; //get yours at https://www.timeanddate.com/time/zones/
2 var dateTimeFormat = "dd/MM/yyyy HH:mm:ss";
3
4 var enableSendingEmails = true;
5 var emailAddress = ""; // comma separate for several emails
6 // 'bob@example.com';
7 // 'bob@example.com, admin@example.com';
8
9
10
11 function doGet(e) {
12   var result = 'Ok'; // default result
13   if (e.parameter == 'undefined') {
14     result = 'No Parameters';
15   } else {
16
17     var alarm= e.parameter.alarm;
18     if (typeof alarm != 'undefined') {
19
20       sendEmail("alarm text:" + stripQuotes(alarm));
21       return ContentService.createTextOutput(result);
22     }
23
24     var sheet = getSpreadSheet();
25     var lastRow = sheet.getLastRow();
26     var newRow = 1;
27     if (lastRow > 0) {
28       var lastVal = sheet.getRange(lastRow, 1).getValue();
29       //if there was no info for (sendEmailIfUnitIsOutForMinutes) checkIfD
30       //no checking do we need to override it
```


Save and Deploy Project

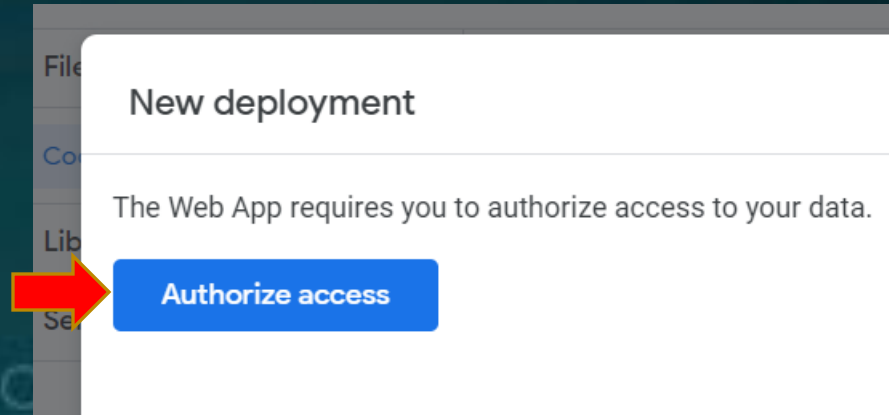


Authorize access

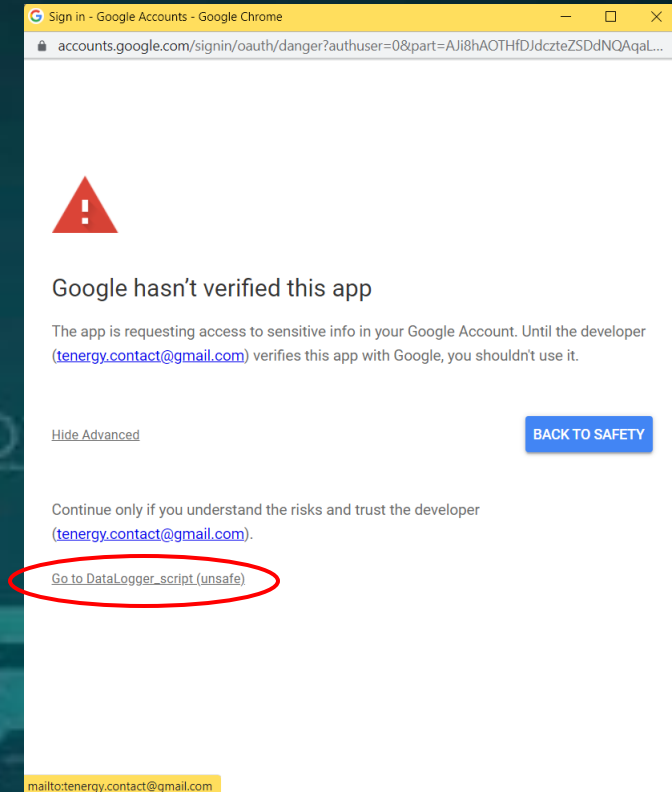
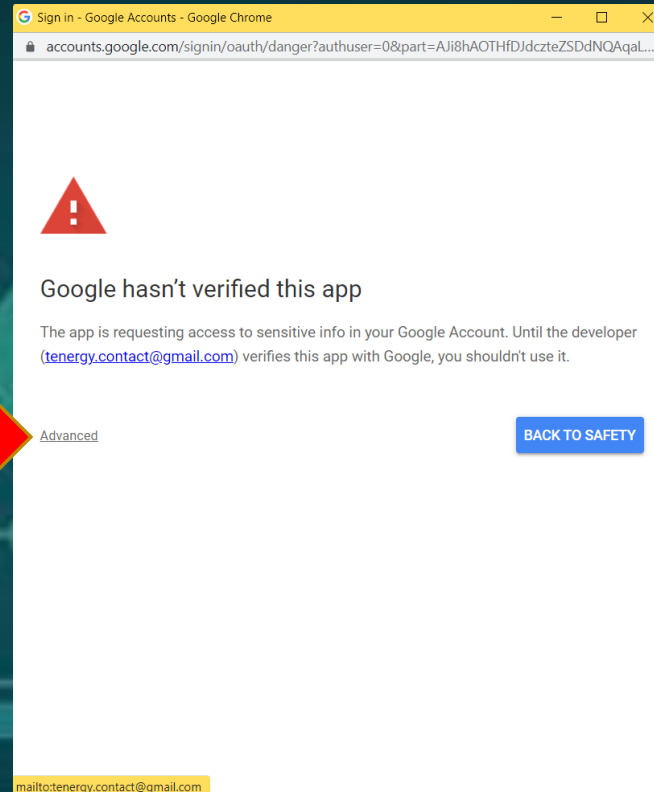
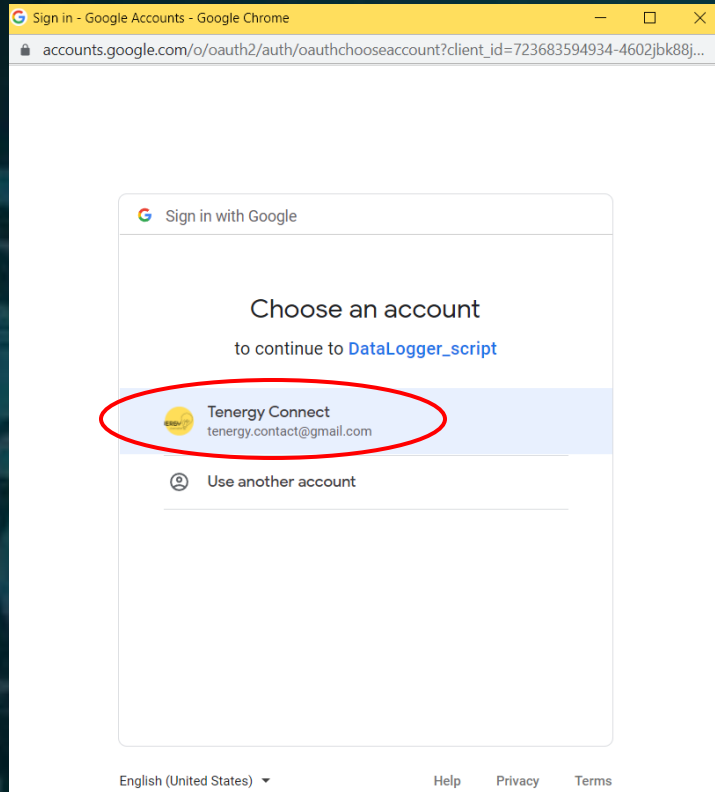
New deployment

Select type	Configuration
Web app	<p>Description</p> <p>New description</p> <p>Initial project</p> <p>Web app</p> <p>Execute as</p> <p>Me (tenergy.contact@gmail.com)</p> <p>The web app will be authorized to run using your account data.</p> <p>Who has access</p> <p>Anyone</p> <p>This can also be used a library. Learn more</p>

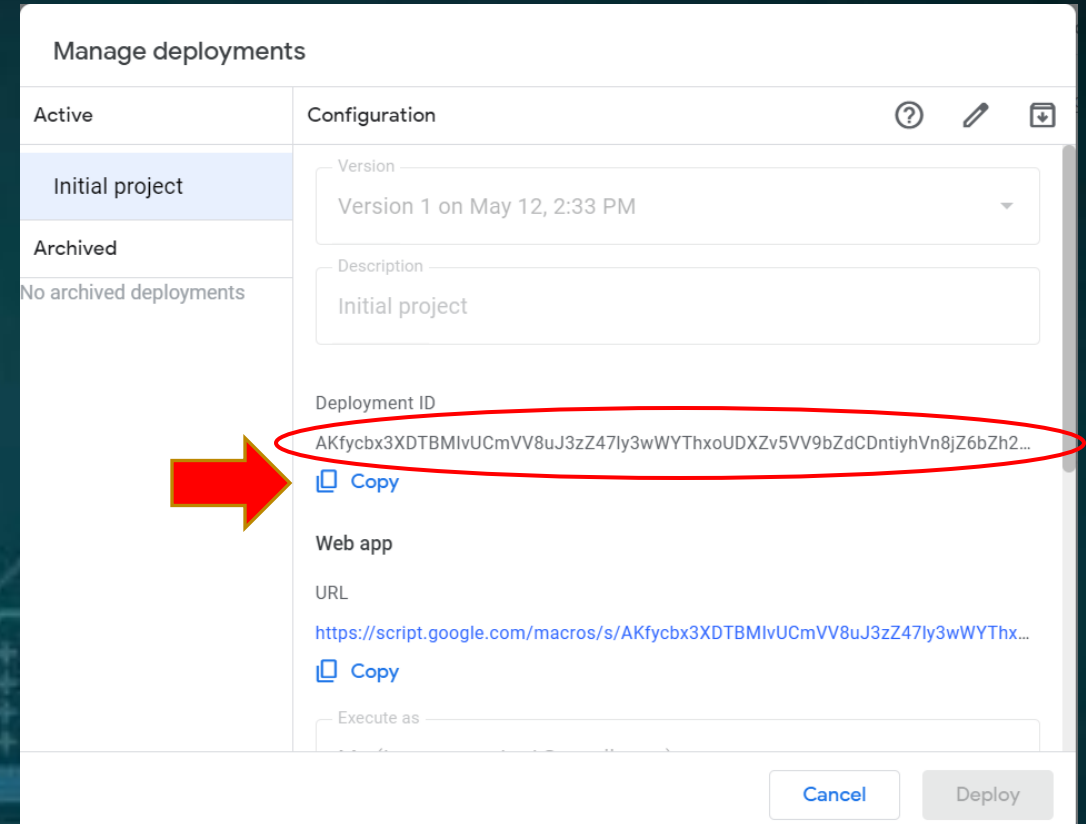
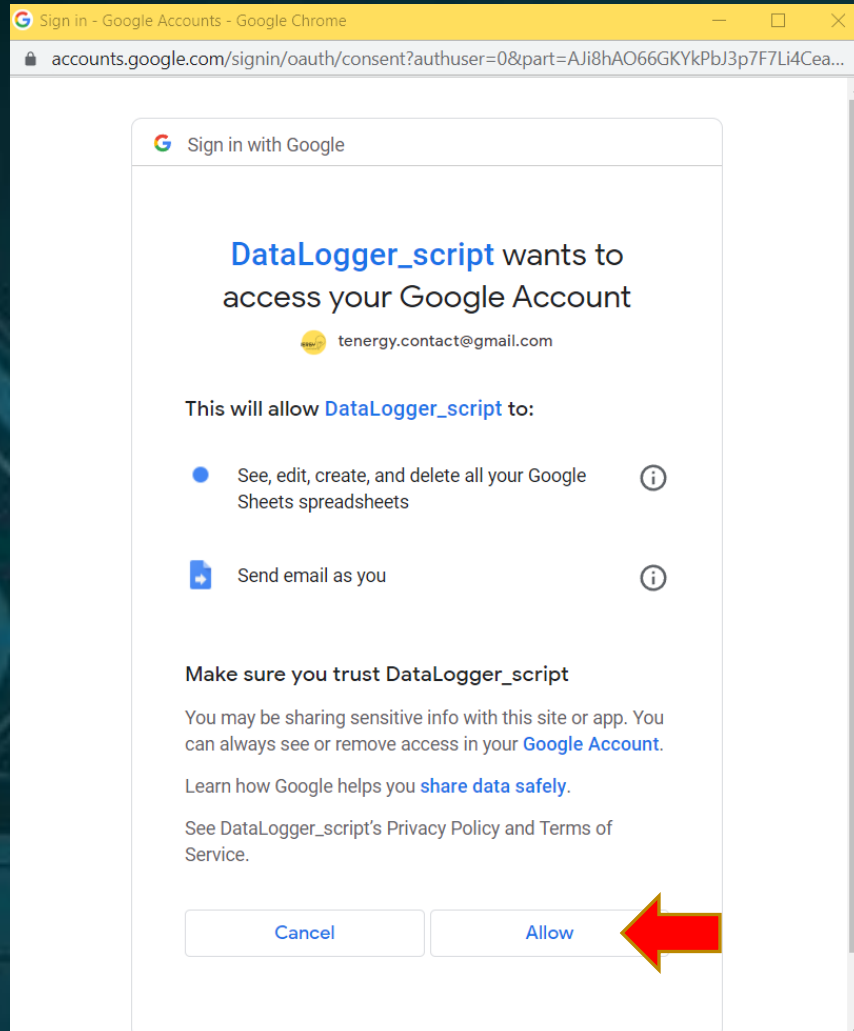
Deploy



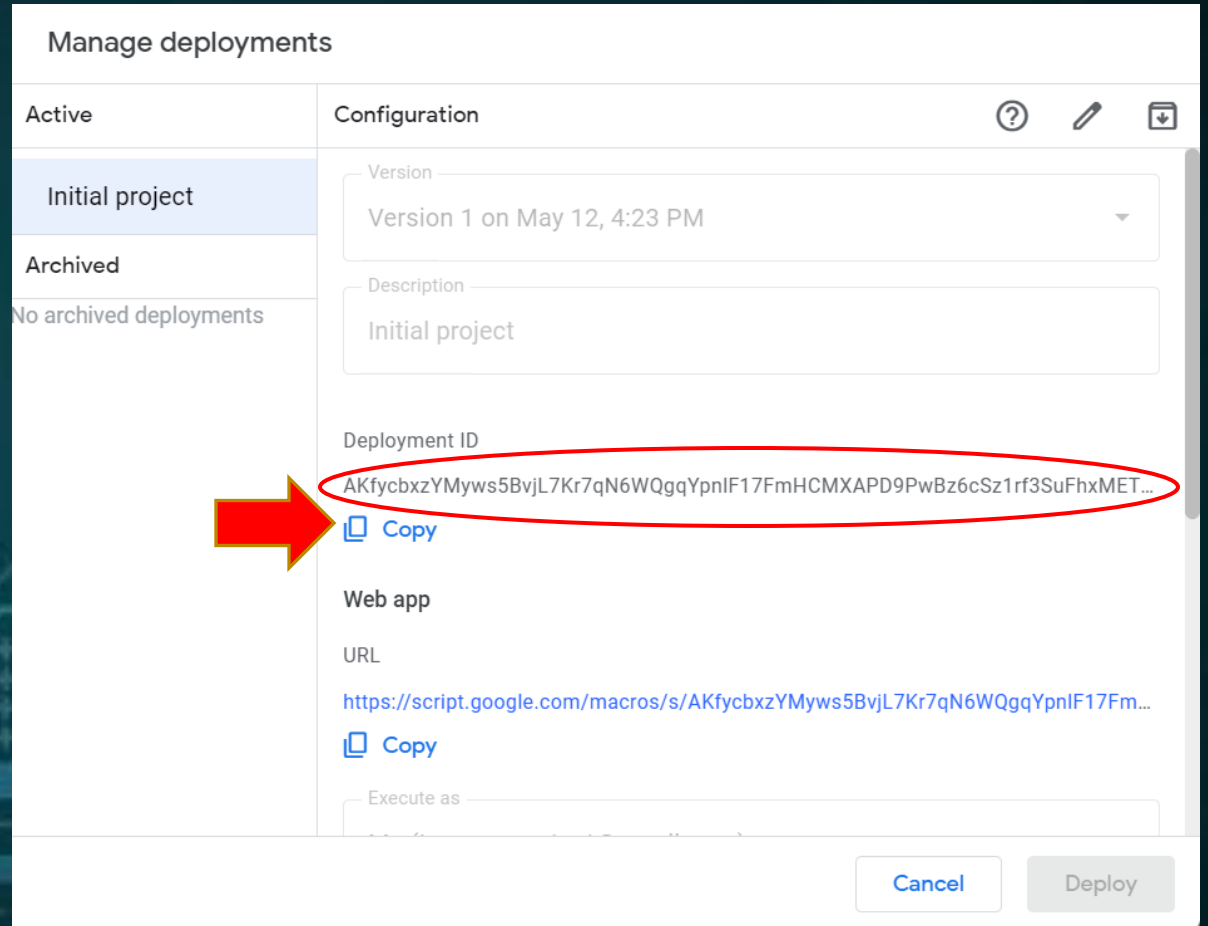
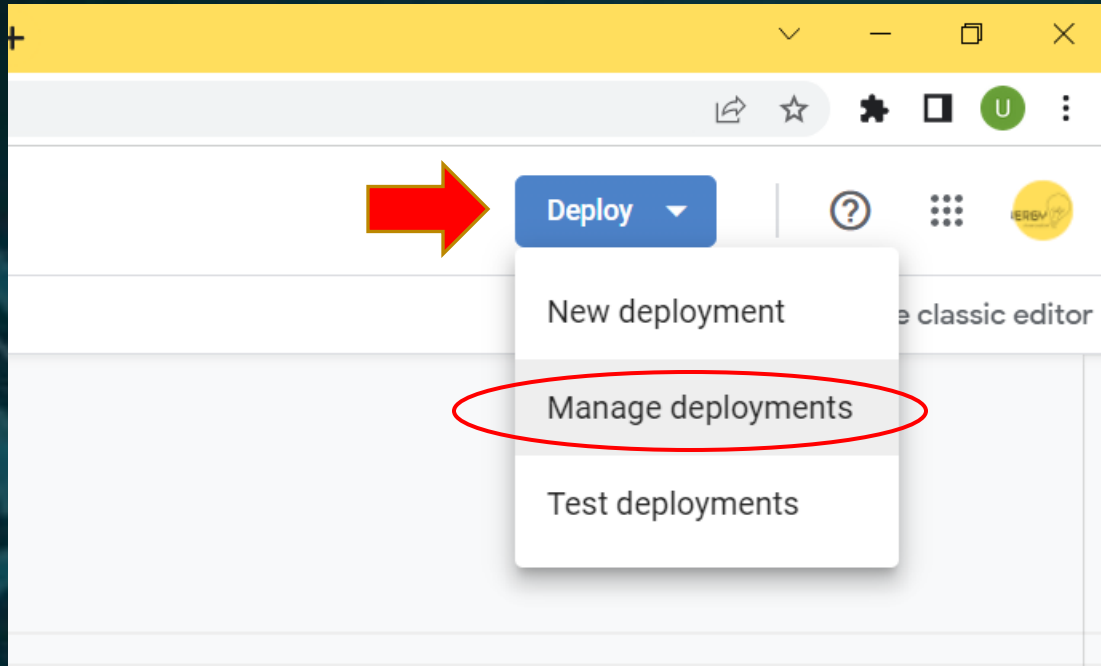
Authorize access



Copy Deployment ID

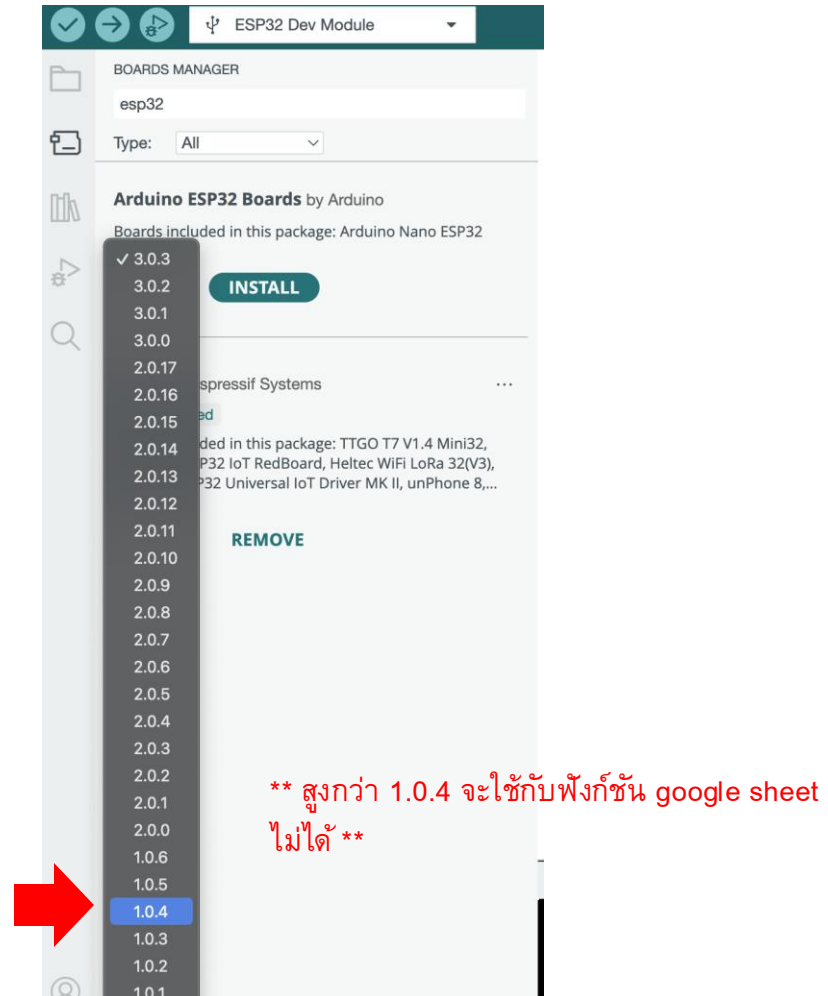
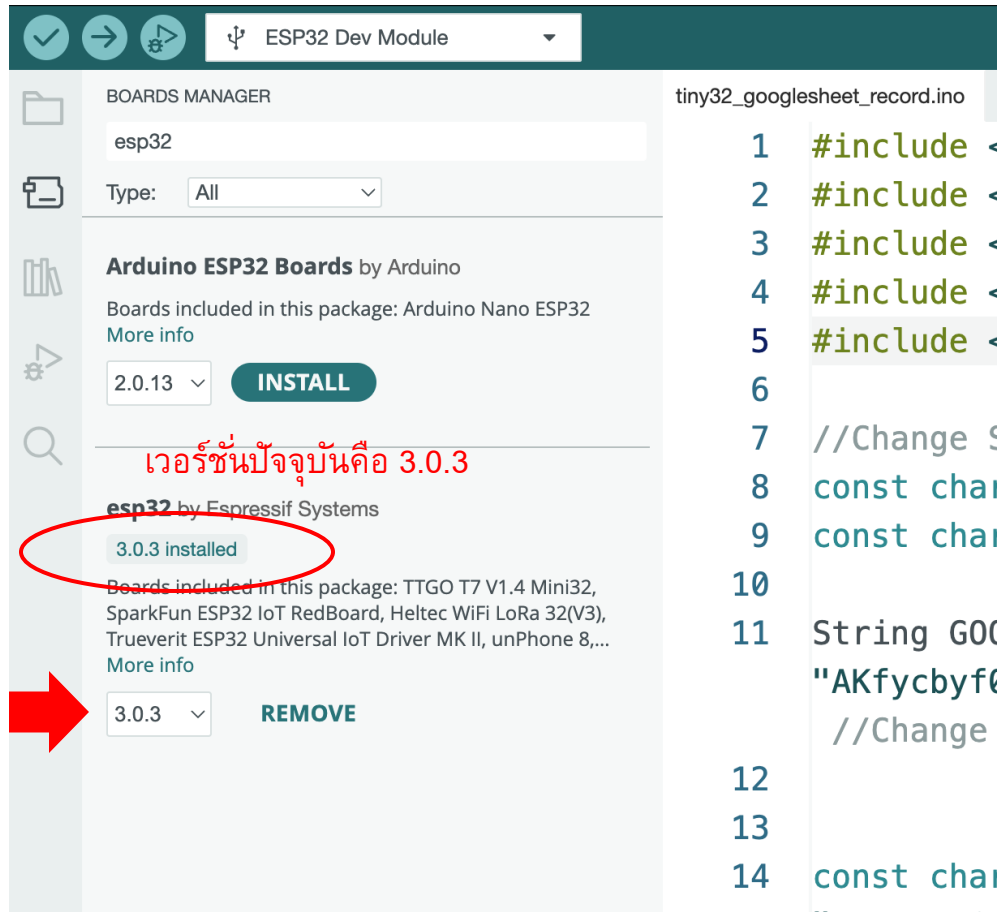


Where is Deployment ID?



ส่วนของโค้ดบน **Arduino IDE**

คอมไพเลอร์ต้องเป็น esp32 Version 1.0.4

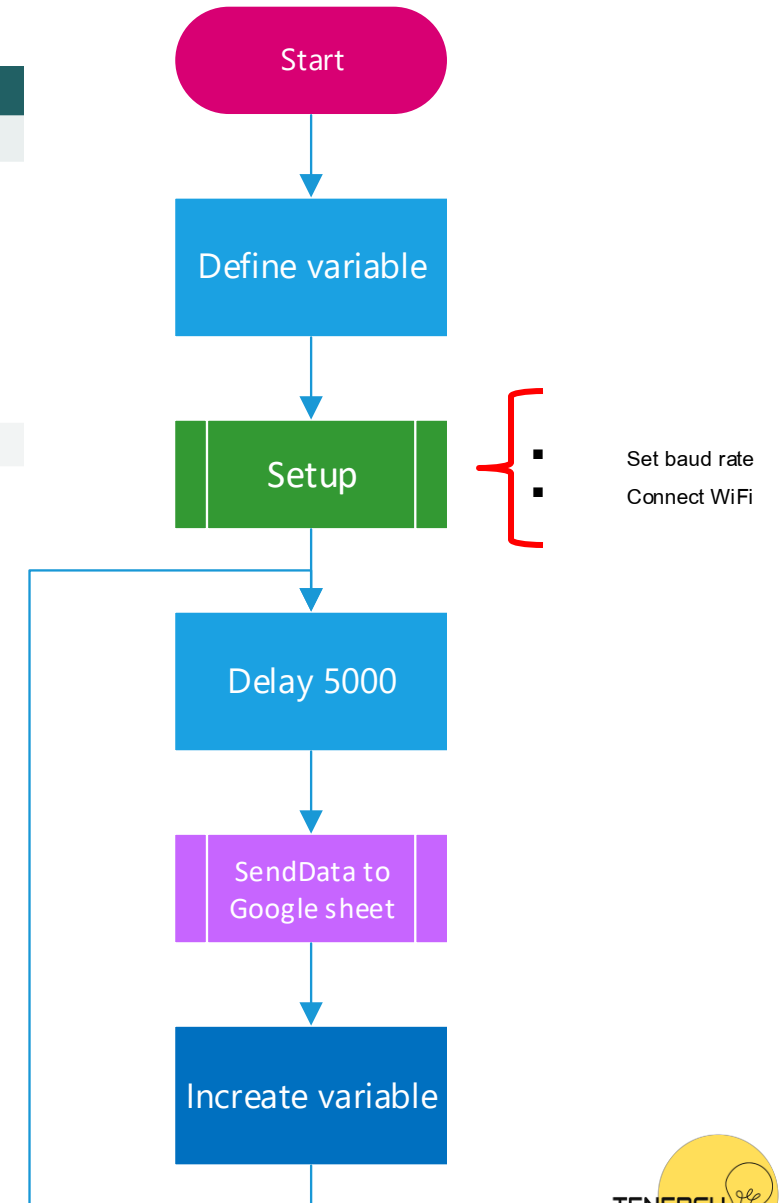


Example: tiny32_googleSheet_record

```
ESP32 Dev Module
tiny32_googleSheet_record.ino
1  #include <Arduino.h>
2  #include <WiFi.h>
3  #include <HTTPClient.h>
4  #include <WiFiClientSecure.h>
5  #include <tiny32_v3.h>
6
7  //Change SSID and password of WiFi router here
8  const char * ssid = "TENERGY-IOT";
9  const char * password = "L0vemel0vemydog";
10
11  String GOOGLE_SCRIPT_ID =
12  "AKfycbyf0hzoy0_0UoFTrn-cJeygosmdtm2cJj-FYEVWHiAQgQ4RJCM5DiC8fxI70sydhC_Y";
13  Change Deployment ID here
14
15  const char * root_ca=\\
16  "-----BEGIN CERTIFICATE-----\\n" \\
17  "MIIDUjCCAqKgAwIBAgILBAAAAAABD4Ym5g0wDQYJKoZIhvcNAQEFBQAwTDEgMB4G\\n" \\
18  "A1UECXMxR2xvYmFsU2lubiBSb290IENBIC0gUjIxExEzARBgNVBAoTCKdsb2JhbFNp\\n" \\
19  "Z24xExEzARBgNVBAMTCkdsb2JhbFNpZ24wHhcNMjYxMjE1MDgwMDAwWhcNMjExMjE1\\n" \\
20  "MDAwMDAwWiRMMSAwHgYDVQ0IExdHhG9iYWxTaWduTE1vbnR0a0FndIERSSMiFTMBRG\\n" \\
```

/**เปลี่ยน ssid , password

/**เปลี่ยน GOOGLE_SCRIPT_ID




https://raw.githubusercontent.com/tenergyinnovation/loT_Training/Experiment/tiny32_googleSheet_record.ino

ผลการรันโปรแกรมบน Serial monitor

```
7 //change SSID and password of WiFi router here
Output Serial Monitor x
Message (Enter to send message to 'ESP32 Dev Module' on 'COM4') New Line 115200 baud
11:43:16.250 -> ot+3i9DAgBkcRcAtjOj4LaR0VknFBbVPFd5uRHg5h6h+u/N5GJG79G+dwfCMNYxd
11:43:16.250 -> AfvDbbnvRG15RjF+Cv6pgsH/76tuIMRQyV+dTzsXjAzlAcmgQWpzU/qlULRuJQ/7
11:43:16.250 -> TBj0/VLZjmmx6BEP3ojY+x1J96relc8geMJgEtslQIxq/H5COEBkEveegeGTLg==
11:43:16.293 -> -----END CERTIFICATE-----
11:43:16.293 ->
11:43:21.487 -> https://script.google.com/macros/s/AKfycbyf0hzoyO_OUoFTrn-cJeygosmdtm2cJj-FYEVWHiaQgQ4RJCM5DiC8fxI7OsydhC_Y/exec?Row_B=3&Row_C=15&Row_D=30&Row_E=0.30&Row_F=0.3&Row_G=0.66Ma
11:43:25.399 -> MDgwMDAwWjBMMSAwHgYDVQQLExdHbG9iYWxTaWduIFJvb3QgQ0EgLSBSMjETMBEG
11:43:25.399 -> A1UEChMKR2xvYmFsU2lnbjETMBEGA1UEAxMKR2xvYmFsU2lnbjCCASIwDQYJKoZI
11:43:25.399 -> hvCNAQEBBQADggEPADCCAQoCggEBAKbPJA6+Lm8omUVcXks+IVSbc9N/hHD6ErPL
11:43:25.400 -> v4dfxn+G07IwXNb9rF73OX4YJYJkhD10FPe+3t+c4isUoh7SqbKSaZeqKeMWhG8
11:43:25.432 -> eoLrvzps6yWJQeXSpkqBy+0Hne/ig+1AnwblrjFuTosvNYSuetZfeLQBoZfXklq
11:43:25.432 -> tTleidTsvHgMCJiEbKjNS7sgfQx5TfC4LcshytVsW33hoCmEofnT1EnLJGKRILzd
11:43:25.432 -> C9XZzPnqJworc5HGnRusyMvo4KD0L5CLTfuwNhv2GXqF4G3yYROIXJ/gkwpRl4pa
11:43:25.432 -> zq+r1feqCapgvdzZX99yqWATXgABYUr6P6TqBwMhAo6CygPCm48CAWEAAaOBnDCB
11:43:25.432 -> mTAOBgNVHQ8BAf8EBAMCAQYwDwYDVR0TAQH/BAUwAwEB/zAdBgNVHQ4EFgQUm+IH
11:43:25.432 -> V2ccHsBqBt5ZtJot39wZhi4wNgYDVR0fBC8wLTArOCmgJ4YlaHR0cDovL2Nybc5n
11:43:25.464 -> bG9iYWxzaWduLm5ldC9yb290LXIyLmNybdAfBgNVHSMEGDAWgBSb4gdXZxwewGoG
11:43:25.464 -> 3lm0mi3f3BmGLjANBgkqhkiG9w0BAQUFAAOCAQEAmYFTxxol4aR7OBKuEQLq4Gs
11:43:25.464 -> J0/WwbgcQ3izDJr86iw8bmEbTUsp9Z8FHSbBuOmDAGJftqkIk7mpM0sYmsL4h4hO
11:43:25.464 -> 291xNBrBVNpGP+DTKqttVCL1OmLNIG+6KYnX3ZHu01yiPgFbQfXf5WRDLenVOavS
11:43:25.464 -> ot+3i9DAgBkcRcAtjOj4LaR0VknFBbVPFd5uRHg5h6h+u/N5GJG79G+dwfCMNYxd
11:43:25.464 -> AfvDbbnvRG15RjF+Cv6pgsH/76tuIMRQyV+dTzsXjAzlAcmgQWpzU/qlULRuJQ/7
11:43:25.506 -> TBj0/VLZjmmx6BEP3ojY+x1J96relc8geMJgEtslQIxq/H5COEBkEveegeGTLg==
11:43:25.506 -> -----END CERTIFICATE-----
11:43:25.506 ->
11:43:30.668 -> https://script.google.com/macros/s/AKfycbyf0hzoyO_OUoFTrn-cJeygosmdtm2cJj-FYEVWHiaQgQ4RJCM5DiC8fxI7OsydhC_Y/exec?Row_B=4&Row_C=20&Row_D=40&Row_E=0.40&Row_F=0.4&Row_G=0.88Ma
```

ผลการรันโปรแกรมบน Google Sheet


DataLogger

☆
📄
☁

File Edit View Insert Format Data Tools Extensions Help
Last edit was made seconds ago by Tenergy_Connect

↶
↷
🖨
📑

100%
\$
%
.0
.00
123

Default (Ari...
10

B
I
🔗
A
🔍
📊
📈
☰
⬇

118
fx

	A	B	C	D	E	F	G	H
1	Date	Row_B	Row_C	Row_D	Row_E	Row_F	Row_G	
2	12/05/2022 17:32:16	2	10	20	0.2	0.2	0.44	
3	12/05/2022 17:32:25	3	15	30	0.3	0.3	0.66	
4	12/05/2022 17:32:35	4	20	40	0.4	0.4	0.88	
5	12/05/2022 17:32:45	5	25	50	0.5	0.6	1.1	
6	12/05/2022 17:32:54	6	30	60	0.6	0.7	1.32	
7	12/05/2022 17:33:03	7	35	70	0.7	0.8	1.54	
8	12/05/2022 17:33:12	8	40	80	0.8	0.9	1.76	
9	12/05/2022 17:33:22	9	45	90	0.9	1	1.98	
10	12/05/2022 17:33:31	10	50	100	1	1.1	2.2	
11	12/05/2022 17:33:39	11	55	110	1.1	1.2	2.42	
12	12/05/2022 17:33:49	12	60	120	1.2	1.3	2.64	
13	12/05/2022 17:33:58	13	65	130	1.3	1.4	2.86	
14	12/05/2022 17:34:08	14	70	140	1.4	1.5	3.08	
15	12/05/2022 17:34:17	15	75	150	1.5	1.7	3.3	
16	12/05/2022 17:34:26	16	80	160	1.6	1.8	3.52	
17	12/05/2022 17:34:35	17	85	170	1.7	1.9	3.74	
18	12/05/2022 17:34:44	18	90	180	1.8	2	3.96	
19	12/05/2022 17:34:54	19	95	190	1.9	2.1	4.18	
20	12/05/2022 17:35:04	20	100	200	2	2.2	4.4	
21	12/05/2022 17:35:13	21	105	210	2.1	2.3	4.62	
22	12/05/2022 17:35:22	22	110	220	2.2	2.4	4.84	

คำสั่งที่น่าสนใจ

```
7 //Change SSID and password of WiFi router here
8 const char * ssid = "TENERGY-IOT";
9 const char * password = "L0veme10vemydog";
10
```

- SSID
- Password

```
--
42 /*** Define Object variable ***/
43 WiFiClientSecure client;
44 tiny32_v3 mcu;
45
```

ประกาศตัวแปร Object ของ WiFi Client

```
59 WiFi.mode(WIFI_STA);
60 WiFi.begin(ssid, password);
--
```

- กำหนดโหมดการทำงานของ WiFi
- เชื่อมต่อ WiFi

```
65 while (WiFi.status() != WL_CONNECTED) {
66     vTaskDelay(500);
67     Serial.print(".");
68 }
```

ทำการเชื่อมต่อ WiFi Router

คำสั่งที่น่าสนใจ

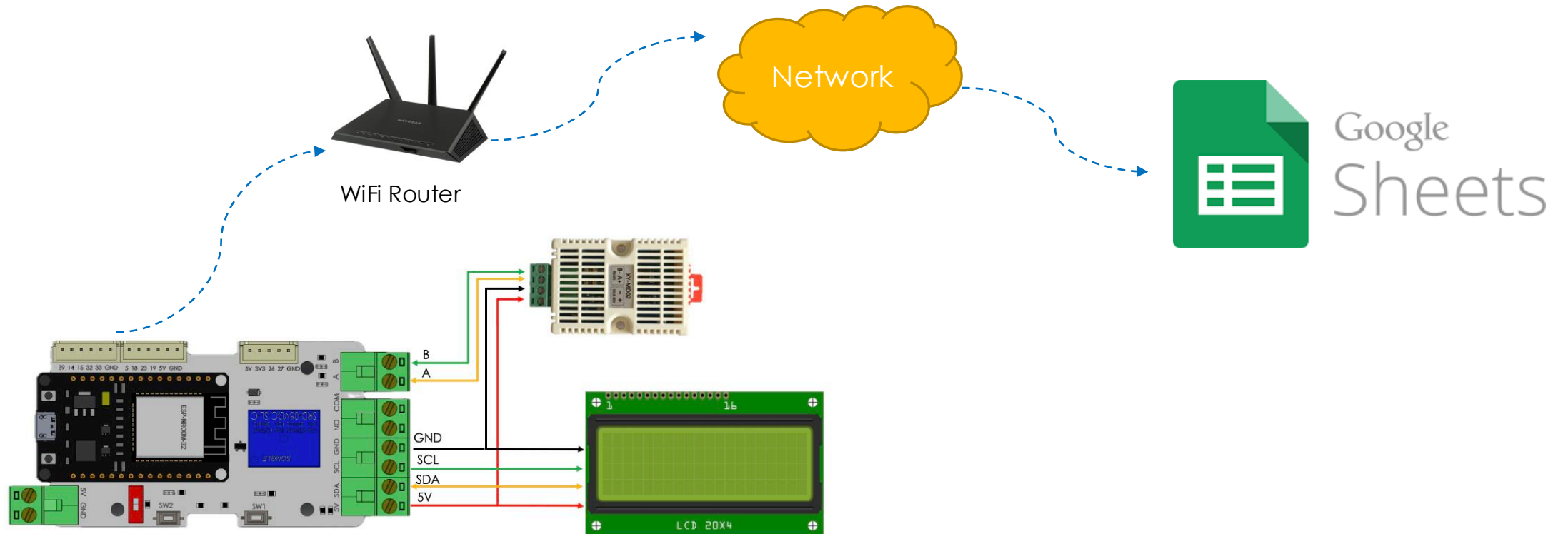
```
85 //Record data to google sheet
86 String DataString = "Row_B="; //label of row don't have space bar
   (ชื่อหัวข้อต้องไม่มีเว้นช่องว่าง) *
87 DataString += String(B_var);
88 DataString += "&Row_C="; //ใช้เครื่องหมาย & เป็นตัวแบ่ง row
89 DataString += String(C_var);
90 DataString += "&Row_D=";
91 DataString += String(D_var);
92 DataString += "&Row_E=";
93 DataString += String(E_var);
94 DataString += "&Row_F=";
95 DataString += String(F_var,1); //แสดงทศนิยม 1 ตำแหน่ง
96 DataString += "&Row_G=";
97 DataString += String(G_var,2); //แสดงทศนิยม 2 ตำแหน่ง
98 sendData(DataString);
๑๑
```

ทำการบันทึกค่าต่างๆไว้ในตัวแปร
String

{ เรียกใช้ฟังก์ชัน sendData โดยผ่านค่าตัวแปร String เข้าไปในฟังก์ชัน

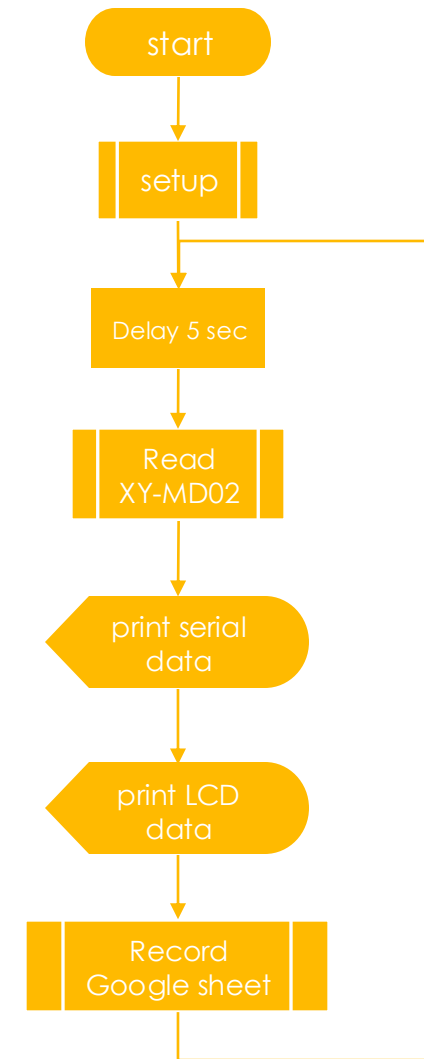
ตัวอย่างการประยุกต์ใช้งาน

บันทึกค่าอุณหภูมิ, ความชื้น ลงบน Google sheet
พร้อมแสดงค่าทางจอแสดงผล LCD16x2



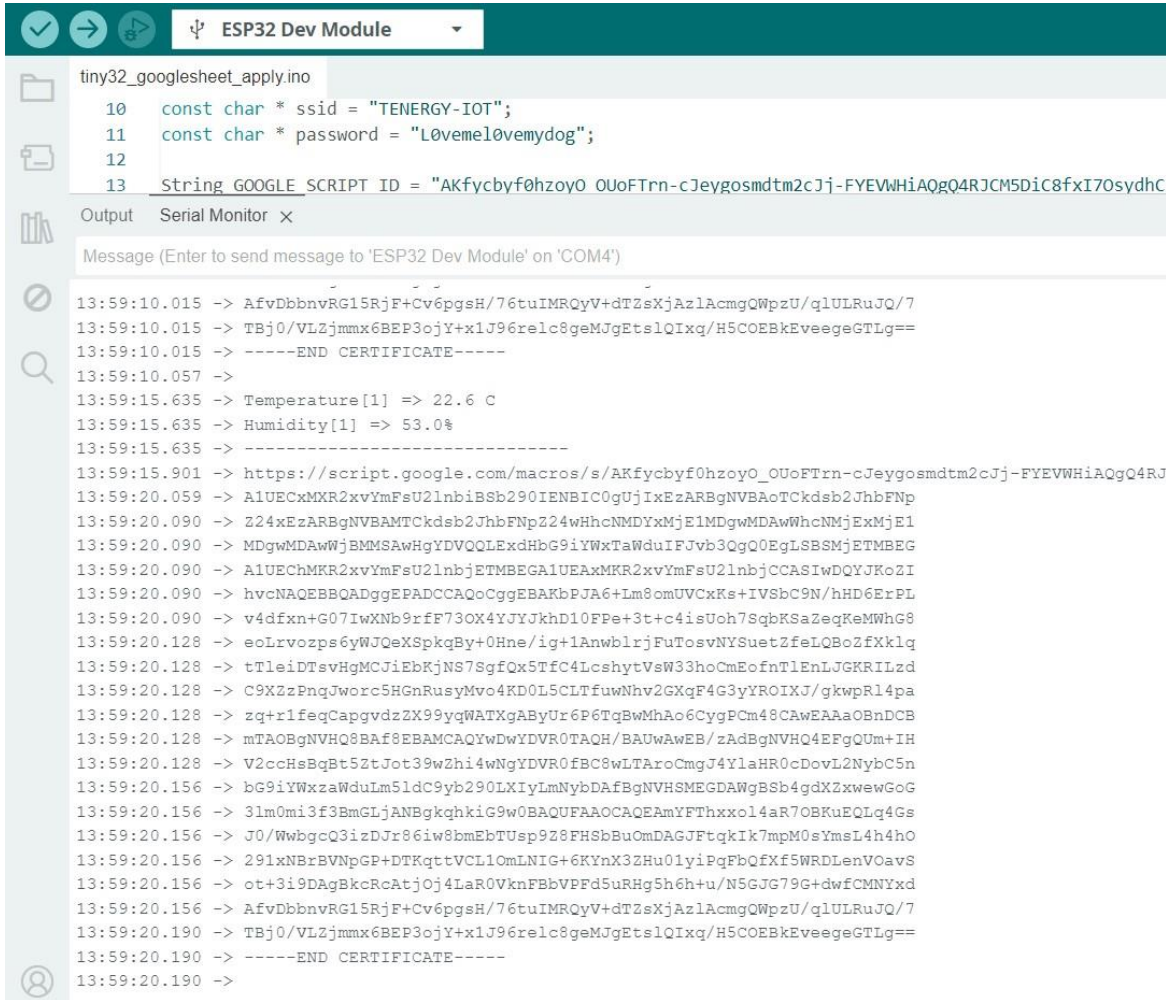
Example: example_23_tiny32_googleSheet_apply

```
ESP32 Dev Module
tiny32_googleSheet_apply.ino
46 tiny32_v3 mcu;
47 LiquidCrystal_I2C lcd(0x27,20,4); // set the LCD address to 0x27 for a 20chars
48 uint8_t id = 1; //Address of XY-MD02 sensor module, You can change here if it
   difference
49
50 float temperature, humidity;
51
52
53 void setup() {
54   Serial.begin(115200);
55   Serial.println("**** googlesheet_record_apply ****");
56   mcu.XY_MD02_begin(RXD2,TXD2); //กำหนด pin ที่ใช้ในการเชื่อมต่อ
57
58
59   WiFi.mode(WIFI_STA);
60   WiFi.begin(ssid, password);
61
62   Serial.println("Started");
63   Serial.print("Connecting");
64
65   while (WiFi.status() != WL_CONNECTED) {
66     vTaskDelay(500);
67     Serial.print(".");
```



https://raw.githubusercontent.com/teneryinnovation/IoT_Training/Experiment/tiny32_googleSheet_apply.ino

ผลการรันโปรแกรมบน Serial monitor และ google sheet



DataLogger ☆ 📁 ☁

ไฟล์ แก๊ส ดู แกรก รูปแบบ ข้อมูล เครื่องมือ ส่วนขยาย ความช่วยเหลือ

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E79 ▾ | fx

	A	B	C	D
1	Date	Temp	Humi	
2	02/08/2024 13:36:13	22.80	54.30	
3	02/08/2024 13:36:23	22.90	54.30	
4	02/08/2024 13:36:34	22.80	54.20	
5	02/08/2024 13:36:46	22.90	54.00	
6	02/08/2024 13:36:58	22.80	54.20	
7	02/08/2024 13:37:09	22.90	54.20	
8	02/08/2024 13:37:21	22.90	54.10	
9	02/08/2024 13:37:33	22.90	54.20	
10	02/08/2024 13:37:44	22.90	54.10	
11	02/08/2024 13:37:56	22.80	54.00	
12	02/08/2024 13:38:08	22.90	53.90	
13	02/08/2024 13:38:19	22.90	53.80	
14	02/08/2024 13:38:33	22.90	53.80	
15	02/08/2024 13:38:45	22.80	53.80	
16	02/08/2024 13:38:59	22.90	53.80	
17	02/08/2024 13:39:10	22.80	53.80	
18	02/08/2024 13:39:25	22.90	53.80	
19	02/08/2024 13:39:35	22.80	54.00	
20	02/08/2024 13:39:48	22.80	54.10	
21	02/08/2024 13:40:00	22.90	54.00	
22	02/08/2024 13:40:15	22.80	53.70	
23	02/08/2024 13:40:30	22.80	53.80	
24	02/08/2024 13:40:41	22.90	53.80	
25	02/08/2024 13:40:55	22.80	53.80	