1. Apex Triggers

(a)Get Started with Apex Triggers

```
trigger AccountAddressTrigger on Account (before insert, before update) {

    for(Account account:Trigger.New){
        if(account.Match_Billing_Address__c == True){
            account.ShippingPostalCode = account.BillingPostalCode;
        }
    }
}
```

(b) Bulk Apex Triggers

```
trigger ClosedOpportunityTrigger on Opportunity (after insert, after update) {
    List<Task> tasklist = new List<Task>();

    for(Opportunity opp: Trigger.New){
        if(opp.StageName == 'Closed Won'){
            tasklist.add(new Task(Subject = 'Follow Up Test Task', WhatId = opp.Id));
        }
    }

    if(tasklist.size()>0){
        insert tasklist;
    }
}
```

2. Apex Testing

(a) Get started with Apex Unit Tests

```
public class VerifyDate {

        //method to handle potential checks against two dates
        public static Date CheckDates(Date date1, Date date2) {
                //if date2 is within the next 30 days of date1, use date2.  Otherwise use
```

```
the end of the month
            if(DateWithin30Days(date1,date2)) {
                return date2;
            } else {
                return SetEndOfMonthDate(date1);
            }
        }

        //method to check if date2 is within the next 30 days of date1
        @TestVisible private static Boolean DateWithin30Days(Date date1, Date date2) {
            //check for date2 being in the past
        if( date2 < date1) { return false; }

        //check that date2 is within (>=) 30 days of date1
        Date date30Days = date1.addDays(30); //create a date 30 days away from date1
            if( date2 >= date30Days ) { return false; }
            else { return true; }
        }

        //method to return the end of the month of a given date
        @TestVisible private static Date SetEndOfMonthDate(Date date1) {
            Integer totalDays = Date.daysInMonth(date1.year(), date1.month());
            Date lastDay = Date.newInstance(date1.year(), date1.month(), totalDays);
            return lastDay;
        }

}
```

(b) Test Apex Triggers

```
trigger RestrictContactByName on Contact (before insert, before update) {

        //check contacts prior to insert or update for invalid data
        For (Contact c : Trigger.New) {
            if(c.LastName == 'INVALIDNAME') {   //invalidname is invalid
                c.AddError('The Last Name "'+c.LastName+'" is not allowed for DML');
            }
```

```
        }
}
//////////////////////////////////////////////////////////////////////////////////////////////
@isTest
public class TestRestrictContactByName {

   @isTest static void Test_insertupdateContact(){
      Contact cnt = new Contact();
      cnt.LastName = 'INVALIDNAME';

      Test.startTest();
      Database.SaveResult result = Database.insert(cnt, false);
      Test.stopTest();

      System.assert(!result.isSuccess());
      System.assert(result.getErrors().size() > 0);
      System.assertEquals('The Last Name "INVALIDNAME" is not allowed for DML',
result.getErrors()[0].getMessage());

   }
}
```

(c) Create Test Data for Apex Tests

```
public class RandomContactFactory {

   public static List<Contact> generateRandomContacts(Integer numcnt, string
lastname){
     List<Contact> contacts = new List<Contact>();
     for(Integer i=0;i<numcnt;i++){
        Contact cnt = new Contact(FirstName = 'Test '+i, LastName = lastname);
        contacts.add(cnt);
        }
         return contacts;
       }
}
```

3. Asynchronous Apex

(a) Use Future Methods

```
public class AccountProcessor {
  @future
   public static void countContacts(List<Id> accountIds){

      List<Account> accountsToUpdate = new List<Account>();

      List<Account> accounts = [Select Id, Name, (Select Id from Contacts) from Account Where
Id in :accountIds];

      For(Account acc:accounts){
         List<Contact> contactList = acc.Contacts;
         acc.Number_Of_Contacts__c = contactList.size();
         accountsToUpdate.add(acc);

      }
      update accountsToUpdate;

   }
}
//////////////////////////////////////////////////////////////////////////////////////////////
@IsTest
private class AccountProcessorTest {
          @IsTest
   private static void testCountContacts(){
     Account newAccount = new Account(Name='Test Account');
     insert newAccount;

      Contact newContact1 = new Contact(FirstName='John',LastName='Doe',AccountId =
newAccount.Id);
          insert newContact1;

      Contact newContact2 = new Contact(FirstName='Jane',LastName='Doe',AccountId =
newAccount.Id);
          insert newContact2;

      List<Id> accountIds = new List<Id>();
```

```
        accountIds.add(newAccount.Id);

        Test.startTest();
        AccountProcessor.countContacts(accountIds);
        Test.stopTest();

    }
}
```

(c) Use Batch Apex

```
global class LeadProcessor implements Database.Batchable<sObject> {
    global Integer count = 0;

    global Database.QueryLocator start(Database.BatchableContext bc){
        return Database.getQueryLocator('SELECT ID, LeadSource FROM Lead');
    }

    global void execute(Database.BatchableContext bc, List<Lead> L_list){
        List<lead> L_list_new = new List<lead>();

        for(lead L:L_list){
            L.leadsource = 'Dreamforce';
            L_list_new.add(L);
            count +=1;
     }
        update L_list_new;
    }

    global void finish(Database.BatchableContext bc){
        system.debug('count = ' + count);
    }

}
//////////////////////////////////////////////////////////////////////////////////////
@isTest
public class LeadProcessorTest {

    @isTest
    public static void testit(){
        List<lead> L_list = new List<lead>();
```

```
        for(Integer i=0; i<200; i++){
          Lead L = new lead();
           L.LastName = 'name' + i;
           L.Company = 'Company';
           L.Status = 'Random Status';
           L_list.add(L);
        }
        insert L_list;

        Test.startTest();
        LeadProcessor lp = new LeadProcessor();
        Id batchId = Database.executeBatch(lp);
        Test.stopTest();

    }
}
```

(d) Control Process with Queueable Apex

```
public class AddPrimaryContact implements Queueable{

    private Contact con;
    private String state;

    public AddPrimaryContact(Contact con, String state){
        this.con = con;
        this.state = state;
    }

    public void execute(QueueableContext context){
        List<Account> accounts = [Select Id, Name, (Select FirstName, LastName, Id from contacts)
                                  from Account where BillingState = :state Limit 200];
                        List<Contact> primaryContacts = new List<Contact>();

        for(Account acc:accounts){
            Contact c = con.clone();
            c.AccountId = acc.Id;
            primaryContacts.add(c);
        }
```

```
        if(primaryContacts.size() > 0){
           insert primaryContacts;

        }
    }

}
//////////////////////////////////////////////////////////////////////////////////////////
@isTest
public class AddPrimaryContactTest {

    static testmethod void testQueueable(){
        List<Account> testAccounts = new List<Account>();
        for(Integer i=0;i<50;i++){
          testAccounts.add(new Account(Name='Account '+i,Billingstate='CA'));
        }
        for(Integer j=0;j<50;j++){
           testAccounts.add(new Account(Name='Account '+j,Billingstate='NY'));
        }
        insert testAccounts;

        Contact testContact = new Contact(FirstName = 'John', LastName = 'Doe');
                    insert testContact;

        AddPrimaryContact addit = new addPrimaryContact(testContact, 'CA');

            Test.startTest();
        system.enqueueJob(addit);
                    Test.stopTest();

        System.assertEquals(50,[Select count() from Contact where accountId in (Select Id from
Account where BillingState='CA' )]);
    }
}
```

(e) Schedule Job Using the Apex Scheduler

```
global class DailyLeadProcessor implements Schedulable{
    global void execute(SchedulableContext ctx){
        List<lead> leadstoupdate = new List<lead>();
        List<Lead> leads = [Select id From Lead Where LeadSource = NULL Limit 200];
```

```
        for(Lead l:leads){
            l.LeadSource = 'Dreamforce';
            leadstoupdate.add(l);
        }
        update leadstoupdate;
        }
}
//////////////////////////////////////////////////////////////////////////////////////
@isTest
private class DailyLeadProcessorTest {

            public static String CRON_EXP = '0 0 0 2 6 ? 2022';
    static testmethod void testScheduledJob(){
        List<Lead> leads = new List<lead>();
        for (Integer i=0; i<200; i++){
            Lead l = new Lead(
             FirstName = 'First ' + i,
               LastName = 'LastName',
               Company = 'The Inc'
            );
            leads.add(l);
        }
        insert leads;

        Test.startTest();

        String jobId = System.schedule('ScheduledApexTest',CRON_EXP,new DailyLeadProcessor());
        Test.stopTest();

        List<Lead> checkleads = new List<Lead>();
        checkleads = [Select Id From Lead Where LeadSource = 'Dreamforce' and Company = 'The
Inc'];

        System.assertEquals(200, checkleads.size(), 'Leads were not created');
        }
}
```

4. Apex Integration Services

(a) Apex REST Callouts

```
public class AnimalLocator {
   public static String getAnimalNameById(Integer x){
      Http http = new Http();
      HttpRequest req = new HttpRequest();
      req.setEndpoint('https://th-apex-http-callout.herokuapp.com/animals/' + x);
      req.setMethod('GET');
      Map<String, Object> animal= new Map<String, Object>();
      HttpResponse res = http.send(req);
         if (res.getStatusCode() == 200) {
      Map<String, Object> results = (Map<String,
Object>)JSON.deserializeUntyped(res.getBody());
     animal = (Map<String, Object>) results.get('animal');
      }
return (String)animal.get('name');
   }

}
//////////////////////////////////////////////////////////////////////////////////////
@isTest
private class AnimalLocatorTest{
   @isTest static void AnimalLocatorMock1() {
      Test.setMock(HttpCalloutMock.class, new AnimalLocatorMock());
      string result = AnimalLocator.getAnimalNameById(3);
      String expectedResult = 'chicken';
      System.assertEquals(result,expectedResult );
   }
}
//////////////////////////////////////////////////////////////////////////////////////
@isTest
global class AnimalLocatorMock implements HttpCalloutMock {
    // Implement this interface method
   global HTTPResponse respond(HTTPRequest request) {
      // Create a fake response
      HttpResponse response = new HttpResponse();
      response.setHeader('Content-Type', 'application/json');
      response.setBody('{"animals": ["majestic badger", "fluffy bunny", "scary bear", "chicken",
"mighty moose"]}');
```

```
        response.setStatusCode(200);
        return response;
    }
}
```

(b) Apex SOAP Callouts

```
//Generated by wsdl2apex

public class ParkService {
    public class byCountryResponse {
        public String[] return_x;
        private String[] return_x_type_info = new String[]{'return','http://parks.services/',null,'0','-
1','false'};
        private String[] apex_schema_type_info = new String[]{'http://parks.services/','false','false'};
        private String[] field_order_type_info = new String[]{'return_x'};
    }
    public class byCountry {
        public String arg0;
        private String[] arg0_type_info = new String[]{'arg0','http://parks.services/',null,'0','1','false'};
        private String[] apex_schema_type_info = new String[]{'http://parks.services/','false','false'};
        private String[] field_order_type_info = new String[]{'arg0'};
    }
    public class ParksImplPort {
        public String endpoint_x = 'https://th-apex-soap-service.herokuapp.com/service/parks';
        public Map<String,String> inputHttpHeaders_x;
        public Map<String,String> outputHttpHeaders_x;
        public String clientCertName_x;
        public String clientCert_x;
        public String clientCertPasswd_x;
        public Integer timeout_x;
        private String[] ns_map_type_info = new String[]{'http://parks.services/', 'ParkService'};
        public String[] byCountry(String arg0) {
            ParkService.byCountry request_x = new ParkService.byCountry();
            request_x.arg0 = arg0;
            ParkService.byCountryResponse response_x;
            Map<String, ParkService.byCountryResponse> response_map_x = new Map<String,
ParkService.byCountryResponse>();
            response_map_x.put('response_x', response_x);
            WebServiceCallout.invoke(
              this,
```

```
            request_x,
            response_map_x,
            new String[]{endpoint_x,
            '',
            'http://parks.services/',
            'byCountry',
            'http://parks.services/',
            'byCountryResponse',
            'ParkService.byCountryResponse'}
          );
          response_x = response_map_x.get('response_x');
          return response_x.return_x;
      }
   }
}
////////////////////////////////////////////////////////////////////////////////////////
public class ParkLocator {
   public static string[] country(string theCountry) {
      ParkService.ParksImplPort  parkSvc = new  ParkService.ParksImplPort();
      return parkSvc.byCountry(theCountry);
   }

}
////////////////////////////////////////////////////////////////////////////////////////
@isTest
private class ParkLocatorTest {
   @isTest static void testCallout() {
      Test.setMock(WebServiceMock.class, new ParkServiceMock ());
      String country = 'United States';
      List<String> result = ParkLocator.country(country);
      List<String> parks = new List<String>{'Yellowstone', 'Mackinac National Park', 'Yosemite'};
       System.assertEquals(parks, result);
   }
}
////////////////////////////////////////////////////////////////////////////////////////
@isTest
global class ParkServiceMock implements WebServiceMock {
  global void doInvoke(
        Object stub,
        Object request,
        Map<String, Object> response,
```

```
        String endpoint,
        String soapAction,
        String requestName,
        String responseNS,
        String responseName,
        String responseType) {
      // start - specify the response you want to send
      ParkService.byCountryResponse response_x = new ParkService.byCountryResponse();
      response_x.return_x = new List<String>{'Yellowstone', 'Mackinac National Park', 'Yosemite'};
      // end
      response.put('response_x', response_x);
  }
}
```

(c) Apex Web Services

```
@RestResource(urlMapping='/Accounts/*/contacts')
global class AccountManager {
   @HttpGet
   global static Account getAccount() {
      RestRequest req = RestContext.request;
      String accId = req.requestURI.substringBetween('Accounts/', '/contacts');
      Account acc = [SELECT Id, Name, (SELECT Id, Name FROM Contacts)
                     FROM Account WHERE Id = :accId];
      return acc;
   }
}
//////////////////////////////////////////////////////////////////////////////////////////////
@isTest
private class AccountManagerTest {

   private static testMethod void getAccountTest1() {
      Id recordId = createTestRecord();
      // Set up a test request
      RestRequest request = new RestRequest();
      request.requestUri = 'https://na1.salesforce.com/services/apexrest/Accounts/'+ recordId
+'/contacts' ;
      request.httpMethod = 'GET';
      RestContext.request = request;
      // Call the method to test
      Account thisAccount = AccountManager.getAccount();
      // Verify results
```

```
        System.assert(thisAccount != null);
        System.assertEquals('Test record', thisAccount.Name);

    }

    static Id createTestRecord() {
        // Create test record
        Account TestAcc = new Account(
          Name='Test record');
        insert TestAcc;
        Contact TestCon= new Contact(
        LastName='Test',
        AccountId = TestAcc.id);
        return TestAcc.Id;
    }
}
```

Apex SuperBadge Codes

1. MaintatenanceRequest.apxt

```
   trigger MaintenanceRequest on Case (before update, after update) {
    if(Trigger.isUpdate && Trigger.isAfter){
       MaintenanceRequestHelper.updateWorkOrders(Trigger.New, Trigger.OldMap);
    }
}
```

2. MaintatenanceRequestHepler.apxc

```
public with sharing class MaintenanceRequestHelper {
   public static void updateworkOrders(List<Case> updWorkOrders, Map<Id,Case>
nonUpdCaseMap) {
      Set<Id> validIds = new Set<Id>();


      For (Case c : updWorkOrders){
         if (nonUpdCaseMap.get(c.Id).Status != 'Closed' && c.Status == 'Closed'){
            if (c.Type == 'Repair' || c.Type == 'Routine Maintenance'){
               validIds.add(c.Id);



            }
         }
      }

      if (!validIds.isEmpty()){
         List<Case> newCases = new List<Case>();
         Map<Id,Case> closedCasesM = new Map<Id,Case>([SELECT Id, Vehicle__c,
Equipment__c, Equipment__r.Maintenance_Cycle__c,(SELECT
Id,Equipment__c,Quantity__c FROM Equipment_Maintenance_Items__r)
                                                FROM Case WHERE Id IN :validIds]);
         Map<Id,Decimal> maintenanceCycles = new Map<ID,Decimal>();
         AggregateResult[] results = [SELECT Maintenance_Request__c,
```

```
MIN(Equipment__r.Maintenance_Cycle__c)cycle FROM
Equipment_Maintenance_Item__c WHERE Maintenance_Request__c IN :ValidIds GROUP
BY Maintenance_Request__c];

      for (AggregateResult ar : results){
         maintenanceCycles.put((Id) ar.get('Maintenance_Request__c'), (Decimal)
ar.get('cycle'));
      }

         for(Case cc : closedCasesM.values()){
            Case nc = new Case (
               ParentId = cc.Id,
            Status = 'New',
               Subject = 'Routine Maintenance',
               Type = 'Routine Maintenance',
               Vehicle__c = cc.Vehicle__c,
               Equipment__c =cc.Equipment__c,
               Origin = 'Web',
               Date_Reported__c = Date.Today()

            );

            If (maintenanceCycles.containskey(cc.Id)){
               nc.Date_Due__c = Date.today().addDays((Integer)
maintenanceCycles.get(cc.Id));
            }

            newCases.add(nc);
         }

         insert newCases;

         List<Equipment_Maintenance_Item__c> clonedWPs = new
List<Equipment_Maintenance_Item__c>();
         for (Case nc : newCases){
            for (Equipment_Maintenance_Item__c wp :
closedCasesM.get(nc.ParentId).Equipment_Maintenance_Items__r){
```

```
                Equipment_Maintenance_Item__c wpClone = wp.clone();
                wpClone.Maintenance_Request__c = nc.Id;
                ClonedWPs.add(wpClone);

            }
        }
        insert ClonedWPs;
    }
  }
}
```

3. WarehouseCalloutService.apxc

```
public with sharing class WarehouseCalloutService {

  private static final String WAREHOUSE_URL = 'https://th-superbadge-
apex.herokuapp.com/equipment';

  //@future(callout=true)
  public static void runWarehouseEquipmentSync(){

    Http http = new Http();
    HttpRequest request = new HttpRequest();

    request.setEndpoint(WAREHOUSE_URL);
    request.setMethod('GET');
    HttpResponse response = http.send(request);


    List<Product2> warehouseEq = new List<Product2>();

    if (response.getStatusCode() == 200){
      List<Object> jsonResponse =
(List<Object>)JSON.deserializeUntyped(response.getBody());
      System.debug(response.getBody());

      for (Object eq : jsonResponse){
```

```
            Map<String,Object> mapJson = (Map<String,Object>)eq;
            Product2 myEq = new Product2();
            myEq.Replacement_Part__c = (Boolean) mapJson.get('replacement');
            myEq.Name = (String) mapJson.get('name');
            myEq.Maintenance_Cycle__c = (Integer) mapJson.get('maintenanceperiod');
            myEq.Lifespan_Months__c = (Integer) mapJson.get('lifespan');
            myEq.Cost__c = (Decimal) mapJson.get('lifespan');
            myEq.Warehouse_SKU__c = (String) mapJson.get('sku');
            myEq.Current_Inventory__c = (Double) mapJson.get('quantity');
            warehouseEq.add(myEq);
        }

        if (warehouseEq.size() > 0){
            upsert warehouseEq;
            System.debug('Your equipment was synced with the warehouse one');
            System.debug(warehouseEq);
        }

    }
  }
}
```

4. WarehouseCalloutServiceTest.apxc

```
@isTest
private class WarehouseCalloutServiceTest {
  @isTest
  static void testWareHouseCallout(){
    Test.startTest();
    // implement mock callout test here
    Test.setMock(HTTPCalloutMock.class, new WarehouseCalloutServiceMock());
    WarehouseCalloutService.runWarehouseEquipmentSync();
    Test.stopTest();
    System.assertEquals(1, [SELECT count() FROM Product2]);
  }
}
```

5. WarehouseSyncSchedule.apxc

```
global class WarehouseSyncSchedule implements Schedulable {
   global void execute(SchedulableContext ctx) {

      WarehouseCalloutService.runWarehouseEquipmentSync();
   }
}
```

6. WarehouseSyncScheduleTest.apxc

```
@isTest
public class WarehouseSyncScheduleTest {

   @isTest static void WarehousescheduleTest(){
      String scheduleTime = '00 00 01 * * ?';
      Test.startTest();
      Test.setMock(HttpCalloutMock.class, new WarehouseCalloutServiceMock());
      String jobID=System.schedule('Warehouse Time To Schedule to Test',
scheduleTime, new WarehouseSyncSchedule());
      Test.stopTest();
      //Contains schedule information for a scheduled job. CronTrigger is similar to a
cron job on UNIX systems.
      // This object is available in API version 17.0 and later.
      CronTrigger a=[SELECT Id FROM CronTrigger where NextFireTime > today];
      System.assertEquals(jobID, a.Id,'Schedule ');



   }
}
```

7. WarehouseCalloutServiceMock.apxc

```
@isTest
global class WarehouseCalloutServiceMock implements HttpCalloutMock {
   // implement http mock callout
```

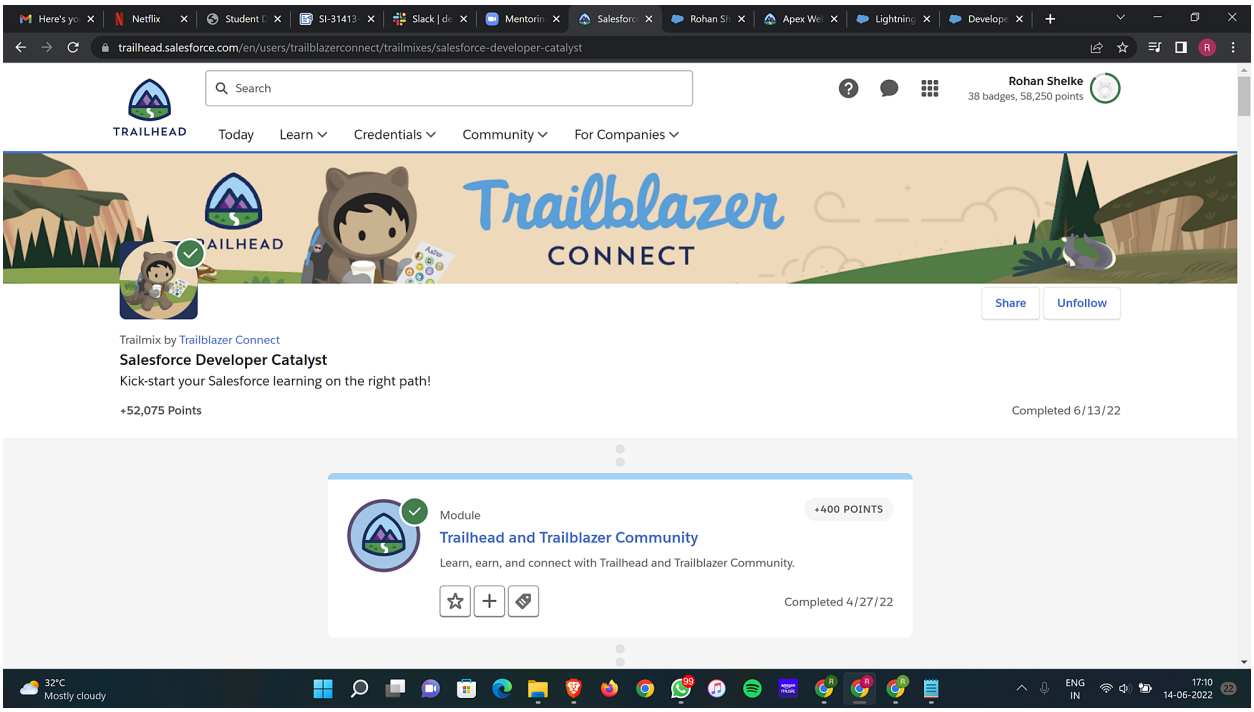
```
    global static HttpResponse respond(HttpRequest request){

        System.assertEquals('https://th-superbadge-apex.herokuapp.com/equipment',
request.getEndpoint());
        System.assertEquals('GET', request.getMethod());

        // Create a fake response
        HttpResponse response = new HttpResponse();
        response.setHeader('Content-Type', 'application/json');

response.setBody('[{"_id":"55d66226726b611100aaf741","replacement":false,"quantity":5
,"name":"Generator 1000
kW","maintenanceperiod":365,"lifespan":120,"cost":5000,"sku":"100003"}]');
        response.setStatusCode(200);
        return response;
    }
}
```

Screenshot of Completion of Developer Catalyst



Screenshot of Completion of SuperBadges