Apex Specialist Superbadge :

APEX SPECIALIST :

Challenge 2 : Automate Record Creation

MaintenanceRequest.cls

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

MaintenanceRequestHelper.cls

```
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);
                }
            }
        }

        //When an existing maintenance request of type Repair or Routine Maintenance is closed,
        //create a new maintenance request for a future routine checkup.
        if (!validIds.isEmpty()){
            Map<Id,Case> closedCases = 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>();

            //calculate the maintenance request due dates by using the maintenance cycle defined on
the related equipment records.
            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'));
        }

        List<Case> newCases = new List<Case>();
        for(Case cc : closedCases.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 multiple pieces of equipment are used in the maintenance request,
            //define the due date by applying the shortest maintenance cycle to today's date.
            If (maintenanceCycles.containskey(cc.Id)){
                nc.Date_Due__c = Date.today().addDays((Integer) maintenanceCycles.get(cc.Id));
            } else {
                nc.Date_Due__c = Date.today().addDays((Integer)
cc.Equipment__r.maintenance_Cycle__c);
            }

            newCases.add(nc);
        }

        insert newCases;

        List<Equipment_Maintenance_Item__c> clonedList = new
List<Equipment_Maintenance_Item__c>();
        for (Case nc : newCases){
            for (Equipment_Maintenance_Item__c clonedListItem :
closedCases.get(nc.ParentId).Equipment_Maintenance_Items__r){
                Equipment_Maintenance_Item__c item = clonedListItem.clone();
                item.Maintenance_Request__c = nc.Id;
                clonedList.add(item);
            }
        }
        insert clonedList;
```

```
    }
  }
}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);
        }
      }
    }

    //When an existing maintenance request of type Repair or Routine Maintenance is closed,
    //create a new maintenance request for a future routine checkup.
    if (!validIds.isEmpty()){
      Map<Id,Case> closedCases = 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>();

      //calculate the maintenance request due dates by using the maintenance cycle defined on
the related equipment records.
      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'));
      }

      List<Case> newCases = new List<Case>();
      for(Case cc : closedCases.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 multiple pieces of equipment are used in the maintenance request,
            //define the due date by applying the shortest maintenance cycle to today's date.
            If (maintenanceCycles.containskey(cc.Id)){
                nc.Date_Due__c = Date.today().addDays((Integer) maintenanceCycles.get(cc.Id));
            } else {
                nc.Date_Due__c = Date.today().addDays((Integer)
cc.Equipment__r.maintenance_Cycle__c);
            }

            newCases.add(nc);
        }

        insert newCases;

        List<Equipment_Maintenance_Item__c> clonedList = new
List<Equipment_Maintenance_Item__c>();
        for (Case nc : newCases){
            for (Equipment_Maintenance_Item__c clonedListItem :
closedCases.get(nc.ParentId).Equipment_Maintenance_Items__r){
                Equipment_Maintenance_Item__c item = clonedListItem.clone();
                item.Maintenance_Request__c = nc.Id;
                clonedList.add(item);
            }
        }
        insert clonedList;
    }
  }
}
```

Challenge-3 : Synchronize Salesforce data with an external system

WarehouseCalloutService.cls

```
public with sharing class WarehouseCalloutService implements Queueable {
  private static final String WAREHOUSE_URL = 'https://th-superbadge-
apex.herokuapp.com/equipment';

  //Write a class that makes a REST callout to an external warehouse system to get a list of
equipment that needs to be updated.
```

```
   //The callout’s JSON response returns the equipment records that you upsert in Salesforce.

   @future(callout=true)
   public static void runWarehouseEquipmentSync(){
      System.debug('go into runWarehouseEquipmentSync');
      Http http = new Http();
      HttpRequest request = new HttpRequest();

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

      List<Product2> product2List = new List<Product2>();
      System.debug(response.getStatusCode());
      if (response.getStatusCode() == 200){
         List<Object> jsonResponse =
(List<Object>)JSON.deserializeUntyped(response.getBody());
         System.debug(response.getBody());

         //class maps the following fields:
         //warehouse SKU will be external ID for identifying which equipment records to update
within Salesforce
         for (Object jR : jsonResponse){
            Map<String,Object> mapJson = (Map<String,Object>)jR;
            Product2 product2 = new Product2();
            //replacement part (always true),
            product2.Replacement_Part__c = (Boolean) mapJson.get('replacement');
            //cost
            product2.Cost__c = (Integer) mapJson.get('cost');
            //current inventory
            product2.Current_Inventory__c = (Double) mapJson.get('quantity');
            //lifespan
            product2.Lifespan_Months__c = (Integer) mapJson.get('lifespan');
            //maintenance cycle
            product2.Maintenance_Cycle__c = (Integer) mapJson.get('maintenanceperiod');
            //warehouse SKU
            product2.Warehouse_SKU__c = (String) mapJson.get('sku');

            product2.Name = (String) mapJson.get('name');
            product2.ProductCode = (String) mapJson.get('_id');
            product2List.add(product2);
         }

         if (product2List.size() > 0){
            upsert product2List;
            System.debug('Your equipment was synced with the warehouse one');
```

```
        }
    }
}

public static void execute (QueueableContext context){
    System.debug('start runWarehouseEquipmentSync');
    runWarehouseEquipmentSync();
    System.debug('end runWarehouseEquipmentSync');
}

}
```

Challenge 4 : Schedule synchronization

WarehouseSyncShedule.cls

```
global with sharing class WarehouseSyncSchedule implements Schedulable{
    global void execute(SchedulableContext ctx){
        System.enqueueJob(new WarehouseCalloutService());
    }
}
```

Challenge 5 : Test automation logic

MaintenanceRequest.cls

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

MaintenanceRequestHelper.cls

```
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);
                }
```

```
        }
    }

    //When an existing maintenance request of type Repair or Routine Maintenance is closed,
    //create a new maintenance request for a future routine checkup.
    if (!validIds.isEmpty()){
        Map<Id,Case> closedCases = 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>();

        //calculate the maintenance request due dates by using the maintenance cycle defined on
the related equipment records.
        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'));
        }

        List<Case> newCases = new List<Case>();
        for(Case cc : closedCases.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 multiple pieces of equipment are used in the maintenance request,
            //define the due date by applying the shortest maintenance cycle to today's date.
            //If (maintenanceCycles.containskey(cc.Id)){
                nc.Date_Due__c = Date.today().addDays((Integer) maintenanceCycles.get(cc.Id));
            //} else {
            //    nc.Date_Due__c = Date.today().addDays((Integer)
cc.Equipment__r.maintenance_Cycle__c);
```

```
            //}

            newCases.add(nc);
        }

        insert newCases;

        List<Equipment_Maintenance_Item__c> clonedList = new
List<Equipment_Maintenance_Item__c>();
        for (Case nc : newCases){
            for (Equipment_Maintenance_Item__c clonedListItem :
closedCases.get(nc.ParentId).Equipment_Maintenance_Items__r){
                Equipment_Maintenance_Item__c item = clonedListItem.clone();
                item.Maintenance_Request__c = nc.Id;
                clonedList.add(item);
            }
        }
        insert clonedList;
    }
  }
}
```

MaintenanceRequestHelperTest.cls

```
@isTest
public with sharing class MaintenanceRequestHelperTest {

  // createVehicle
  private static Vehicle__c createVehicle(){
    Vehicle__c vehicle = new Vehicle__C(name = 'Testing Vehicle');
    return vehicle;
  }

  // createEquipment
  private static Product2 createEquipment(){
    product2 equipment = new product2(name = 'Testing equipment',
                                      lifespan_months__c = 10,
                                      maintenance_cycle__c = 10,
                                      replacement_part__c = true);
    return equipment;
  }

  // createMaintenanceRequest
  private static Case createMaintenanceRequest(id vehicleId, id equipmentId){
```

```
        case cse = new case(Type='Repair',
                            Status='New',
                            Origin='Web',
                            Subject='Testing subject',
                            Equipment__c=equipmentId,
                            Vehicle__c=vehicleId);
        return cse;
    }

    // createEquipmentMaintenanceItem
    private static Equipment_Maintenance_Item__c createEquipmentMaintenanceItem(id
equipmentId,id requestId){
        Equipment_Maintenance_Item__c equipmentMaintenanceItem = new
Equipment_Maintenance_Item__c(
            Equipment__c = equipmentId,
            Maintenance_Request__c = requestId);
        return equipmentMaintenanceItem;
    }

    @isTest
    private static void testPositive(){
        Vehicle__c vehicle = createVehicle();
        insert vehicle;
        id vehicleId = vehicle.Id;

        Product2 equipment = createEquipment();
        insert equipment;
        id equipmentId = equipment.Id;

        case createdCase = createMaintenanceRequest(vehicleId,equipmentId);
        insert createdCase;

        Equipment_Maintenance_Item__c equipmentMaintenanceItem =
createEquipmentMaintenanceItem(equipmentId,createdCase.id);
        insert equipmentMaintenanceItem;

        test.startTest();
        createdCase.status = 'Closed';
        update createdCase;
        test.stopTest();

        Case newCase = [Select id,
                        subject,
                        type,
                        Equipment__c,
                        Date_Reported__c,
```

```
                    Vehicle__c,
                    Date_Due__c
                   from case
                   where status ='New'];

        Equipment_Maintenance_Item__c workPart = [select id
                                    from Equipment_Maintenance_Item__c
                                    where Maintenance_Request__c =:newCase.Id];
        list<case> allCase = [select id from case];
        system.assert(allCase.size() == 2);

        system.assert(newCase != null);
        system.assert(newCase.Subject != null);
        system.assert(newCase.Type, 'Routine Maintenance');
        SYSTEM.assertEquals(newCase.Equipment__c, equipmentId);
        SYSTEM.assertEquals(newCase.Vehicle__c, vehicleId);
        SYSTEM.assertEquals(newCase.Date_Reported__c, system.today());
    }

    @isTest
    private static void testNegative(){
        Vehicle__C vehicle = createVehicle();
        insert vehicle;
        id vehicleId = vehicle.Id;

        product2 equipment = createEquipment();
        insert equipment;
        id equipmentId = equipment.Id;

        case createdCase = createMaintenanceRequest(vehicleId,equipmentId);
        insert createdCase;

        Equipment_Maintenance_Item__c workP =
createEquipmentMaintenanceItem(equipmentId, createdCase.Id);
        insert workP;

        test.startTest();
        createdCase.Status = 'Working';
        update createdCase;
        test.stopTest();

        list<case> allCase = [select id from case];

        Equipment_Maintenance_Item__c equipmentMaintenanceItem = [select id
                                    from Equipment_Maintenance_Item__c
                                    where Maintenance_Request__c = :createdCase.Id];
```

```
        system.assert(equipmentMaintenanceItem != null);
        system.assert(allCase.size() == 1);
    }

    @isTest
    private static void testBulk(){
        list<Vehicle__C> vehicleList = new list<Vehicle__C>();
        list<Product2> equipmentList = new list<Product2>();
        list<Equipment_Maintenance_Item__c> equipmentMaintenanceItemList = new
list<Equipment_Maintenance_Item__c>();
        list<case> caseList = new list<case>();
        list<id> oldCaseIds = new list<id>();

        for(integer i = 0; i < 300; i++){
            vehicleList.add(createVehicle());
            equipmentList.add(createEquipment());
        }
        insert vehicleList;
        insert equipmentList;

        for(integer i = 0; i < 300; i++){
            caseList.add(createMaintenanceRequest(vehicleList.get(i).id, equipmentList.get(i).id));
        }
        insert caseList;

        for(integer i = 0; i < 300; i++){
            equipmentMaintenanceItemList.add(createEquipmentMaintenanceItem(equipmentList.ge
t(i).id, caseList.get(i).id));
        }
        insert equipmentMaintenanceItemList;

        test.startTest();
        for(case cs : caseList){
            cs.Status = 'Closed';
            oldCaseIds.add(cs.Id);
        }
        update caseList;
        test.stopTest();

        list<case> newCase = [select id
                              from case
                              where status ='New'];
```

```
        list<Equipment_Maintenance_Item__c> workParts = [select id
                                                         from Equipment_Maintenance_Item__c
                                                         where Maintenance_Request__c in: oldCaseIds];

        system.assert(newCase.size() == 300);

        list<case> allCase = [select id from case];
        system.assert(allCase.size() == 600);
    }
}
```

Challenge-6 : Test callout logic

WarehouseCalloutService.cls

```
public with sharing class WarehouseCalloutService implements Queueable {
    private static final String WAREHOUSE_URL = 'https://th-superbadge-
apex.herokuapp.com/equipment';

    //Write a class that makes a REST callout to an external warehouse system to get a list of
equipment that needs to be updated.
    //The callout's JSON response returns the equipment records that you upsert in Salesforce.

    @future(callout=true)
    public static void runWarehouseEquipmentSync(){
        System.debug('go into runWarehouseEquipmentSync');
        Http http = new Http();
        HttpRequest request = new HttpRequest();

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

        List<Product2> product2List = new List<Product2>();
        System.debug(response.getStatusCode());
        if (response.getStatusCode() == 200){
            List<Object> jsonResponse =
(List<Object>)JSON.deserializeUntyped(response.getBody());
            System.debug(response.getBody());

            //class maps the following fields:
            //warehouse SKU will be external ID for identifying which equipment records to update
within Salesforce
            for (Object jR : jsonResponse){
                Map<String,Object> mapJson = (Map<String,Object>)jR;
                Product2 product2 = new Product2();
```

```
            //replacement part (always true),
            product2.Replacement_Part__c = (Boolean) mapJson.get('replacement');
            //cost
            product2.Cost__c = (Integer) mapJson.get('cost');
            //current inventory
            product2.Current_Inventory__c = (Double) mapJson.get('quantity');
            //lifespan
            product2.Lifespan_Months__c = (Integer) mapJson.get('lifespan');
            //maintenance cycle
            product2.Maintenance_Cycle__c = (Integer) mapJson.get('maintenanceperiod');
            //warehouse SKU
            product2.Warehouse_SKU__c = (String) mapJson.get('sku');

            product2.Name = (String) mapJson.get('name');
            product2.ProductCode = (String) mapJson.get('_id');
            product2List.add(product2);
        }

        if (product2List.size() > 0){
            upsert product2List;
            System.debug('Your equipment was synced with the warehouse one');
        }
    }
}

public static void execute (QueueableContext context){
    System.debug('start runWarehouseEquipmentSync');
    runWarehouseEquipmentSync();
    System.debug('end runWarehouseEquipmentSync');
}

}
```

WarehouseCalloutServiceMock.cls

```
@isTest
global class WarehouseCalloutServiceMock implements HttpCalloutMock {
    // implement http mock callout
    global static HttpResponse respond(HttpRequest request) {

        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"},{"_id":"55d6622672
6b611100aaf742","replacement":true,"quantity":183,"name":"Cooling
```

```
Fan","maintenanceperiod":0,"lifespan":0,"cost":300,"sku":"100004"},{"_id":"55d66226726b611
100aaf743","replacement":true,"quantity":143,"name":"Fuse
20A","maintenanceperiod":0,"lifespan":0,"cost":22,"sku":"100005"}]');
        response.setStatusCode(200);

        return response;
    }
}
```

WarehouseCalloutServiceTest.cls

```
@IsTest
private class WarehouseCalloutServiceTest {
    // implement your mock callout test here
          @isTest
    static void testWarehouseCallout() {
        test.startTest();
        test.setMock(HttpCalloutMock.class, new WarehouseCalloutServiceMock());
        WarehouseCalloutService.execute(null);
        test.stopTest();

        List<Product2> product2List = new List<Product2>();
        product2List = [SELECT ProductCode FROM Product2];

        System.assertEquals(3, product2List.size());
        System.assertEquals('55d66226726b611100aaf741', product2List.get(0).ProductCode);
        System.assertEquals('55d66226726b611100aaf742', product2List.get(1).ProductCode);
        System.assertEquals('55d66226726b611100aaf743', product2List.get(2).ProductCode);
    }
}
```

Challenge 7 : Test scheduling logic

WarehouseCalloutServiceMock.cls

```
@isTest
global class WarehouseCalloutServiceMock implements HttpCalloutMock {
    // implement http mock callout
    global static HttpResponse respond(HttpRequest request) {

        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"},{"_id":"55d6622672
```

```
6b611100aaf742","replacement":true,"quantity":183,"name":"Cooling
Fan","maintenanceperiod":0,"lifespan":0,"cost":300,"sku":"100004"},{"_id":"55d66226726b611
100aaf743","replacement":true,"quantity":143,"name":"Fuse
20A","maintenanceperiod":0,"lifespan":0,"cost":22,"sku":"100005"}]');
        response.setStatusCode(200);

        return response;
    }
}
```

WarehouseSyncShedule.cls

```
global with sharing class WarehouseSyncSchedule implements Schedulable {
    // implement scheduled code here
    global void execute (SchedulableContext ctx){
        System.enqueueJob(new WarehouseCalloutService());
    }
}
```

WarehouseSyncSheduleTest.cls

```
@isTest
public with sharing class WarehouseSyncScheduleTest {
    // implement scheduled code here
    //
    @isTest static void test() {
        String scheduleTime = '00 00 00 * * ? *';
        Test.startTest();
        Test.setMock(HttpCalloutMock.class, new WarehouseCalloutServiceMock());
        String jobId = System.schedule('Warehouse Time to Schedule to test', scheduleTime, new
WarehouseSyncSchedule());
        CronTrigger c = [SELECT State FROM CronTrigger WHERE Id =: jobId];
        System.assertEquals('WAITING', String.valueOf(c.State), 'JobId does not match');

        Test.stopTest();
    }
}
```

Apex Testing

Challenge : Get Started with Apex Unit Tests

VerifyDate.cls

```
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; }
        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
        //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;
        }
}
```

TestVerifyDate .cls

```
@isTest
private class TestVerifyDate {

    @isTest static void Test_CheckDates_case1(){
        Date D = VerifyDate.CheckDates(date.parse('01/01/2020'), date.parse('01/05/2020'));
        System.assertEquals(date.parse('01/05/2020'), D);
    }
     @isTest static void Test_CheckDates_case2(){
        Date D = VerifyDate.CheckDates(date.parse('01/01/2020'), date.parse('05/05/2020'));
        System.assertEquals(date.parse('01/31/2020'), D);
    }
    @isTest static void Test_DateWithin30Days_case1(){
        Boolean flag = VerifyDate.DateWithin30Days(date.parse('01/01/2020'),
date.parse('12/30/2019'));
        System.assertEquals(false, flag);
    }
     @isTest static void Test_DateWithin30Days_case2(){
        Boolean flag = VerifyDate.DateWithin30Days(date.parse('01/01/2020'),
date.parse('02/02/2019'));
        System.assertEquals(false, flag);
    }
     @isTest static void Test_DateWithin30Days_case3(){
        Boolean flag = VerifyDate.DateWithin30Days(date.parse('01/01/2020'),
date.parse('01/15/2019'));
        System.assertEquals(false, flag);
    }
    @isTest static void Test_SetEndOfMonthDate(){
        Date returndate = VerifyDate.SetEndOfMonthDate(date.parse('01/01/2020'));
    }
}
```

Challenge : Test Apex Triggers

RestrictContactByName.cls

```
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');
                }

        }
```

```
}
```

TestRestrictContactByName .cls

```
@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());
    }
}
```

Challenge : Create Test Data for Apex Tests

RandomContactFactory .cls

```
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;

    }
}
```

Apex Triggers

Challenge : Get Started with Apex Triggers

AccountAddressTrigger.cls

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

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

Challenge : Bulk Apex Triggers

ClosedOpportunityTrigger.cls

```
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;
    }
}
```

Asynchronous Apex :

Challenge : Use Future Methods

AccountProcessor .cls

```
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;
   }
}
```

AccountProcessorTest .cls

```
@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();
   }
}
```

Challenge : Use Batch Apex

LeadProcessor .cls

```
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);
   }
}
```

LeadProcessorTest.cls

```
@isTest
public class LeadProcessorTest {

   @isTest
   public static void testify(){
      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();
```

```
    }
}
```

Challenge : Control Processes with Queueable Apex

AddPrimaryContact.cls

```
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;
        }
    }
}
```

AddPrimaryContactTest.cls

```
@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')]);
    }
}
```

Challenge : Schedule Jobs Using the Apex Scheduler

DailyLeadProcessor .cls

```
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;
    }

}
```

DailyLeadProcessorTest .cls

```
@isTest
private class DailyLeadProcessorTest {

    public static String CRON_EXP = '0 0 0 15 3 ? 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();

        DailyLeadProcessor ab = new DailyLeadProcessor();
        String jobId = System.schedule('jobName', '0 5 * * * ?', ab);
        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');
    }
}
```

Apex Integration Services

Challenge : Apex REST Callouts

AnimalLocator .cls

```
public class AnimalLocator {
    public static string getAnimalNameById(Integer id) {
       Http http = new Http();
       HttpRequest req = new HttpRequest();
       req.setEndpoint('https://th-apex-http-callout.herokuapp.com/animals/'+id);
       req.setMethod('GET');
        Map<String,Object> animals = new Map<String,Object>();
       HttpResponse res = http.send(req);
       // If the request is successful, parse the JSON response.
       if(res.getStatusCode() == 200) {
           Map<String,Object> results = (Map<String,Object>)
           JSON.deserializeUntyped(res.getBody());
           animals = (Map<String,Object>)results.get('animal');
       }
        else{
             System.debug('The status code returned was not
expected:'+res.getStatusCode()+''+res.getStatus());
        }
       return (string)animals.get('name');

}
}
```

AnimalLocatorTest .cls

```
@isTest
private class AnimalLocatorTest{
   @isTest static void AnimalsCalloutsTest(){
   Test.setMock(HttpCalloutMock.class, new AnimalLocatorMock());
   String result = AnimalLocator.getAnimalNameById(1);
   String expectedValue = 'chicken';
   System.assertEquals(result,expectedValue);
  }
}
```

AnimalLocatorMock .cls

```
@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":{"id":1,"name":"chicken","eats":"chicken
food","says":"cluck cluck"}}');
        //response.setBody('{"animals":{"id":1,"name":"chicken"}}');
        response.setStatusCode(200);
        return response;
    }
}
```

AnimalsHttpCalloutMock .cls

```
@isTest
global class AnimalsHttpCalloutMock 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;
    }
}
```

Challenge : Apex SOAP Callouts

ParkService.cls

```
//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;
        }
    }
}
```

ParkLocator.cls

```
public class ParkLocator {
   public static List<String> country(String country){
      ParkService.ParksImplPort parkservice =
         new parkService.ParksImplPort();
      return parkservice.byCountry(country);
   }

}
```

ParkLocatorTest.cls

```
@isTest
private class ParkLocatorTest {
   @isTest static void testCallout() {
      // This causes a fake response to be generated
      Test.setMock(WebServiceMock.class, new ParkServiceMock());
      // Call the method that invokes a callout
      String country = 'United States';
      List<String> result = ParkLocator.country(country);
      List<String> parks = new List<String>();
            parks.add('yosemite');
            parks.add('Yellowstone');
            parks.add('Another Park');
      // Verify that a fake result is returned
      System.assertEquals(parks, result);
   }
}
```

ParkServiceMock.cls

```
@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
      List<String> parks = new List<String>();
```

```
            parks.add('yosemite');
            parks.add('Yellowstone');
            parks.add('Another Park');
        ParkService.byCountryResponse response_x =
            new ParkService.byCountryResponse();
        response_x.return_x = parks;
        // end
        response.put('response_x', response_x);
    }

}
```

Challenge : Apex Web Services

AccountManager .cls

```
@RestResource(urlMapping = '/Accounts/*/contacts')
global with sharing class AccountManager {
    @HttpGet
    global static Account getAccount(){
        RestRequest request = RestContext.request;
        string accountId = request.requestURI.substringBetween('Accounts/','/contacts');
        Account result = [SELECT Id,Name, (Select Id, Name from Contacts) from Account where
Id=:accountId Limit 1];
        return result;
    }

}
```

AccountManagerTest .cls

```
@isTest
public class AccountManagerTest {
    @isTest static void testGetContactByAccountId(){
        Id recordId = createTestRecord();
        RestRequest request = new RestRequest();
        request.requestUri =  'https://yourInstance.my.salesforce.com/services/apexrest/Accounts/'
                    + recordId+'/contacts';
         request.httpMethod = 'GET';
         RestContext.request = request;
         Account thisAccount = AccountManager.getAccount();
         System.assert(thisAccount != null);
         System.assertEquals('Test record', thisAccount.Name);
    }
```

```
    static Id createTestRecord(){
        Account accountTest = new Account(
        Name = 'Test record');
        insert accountTest;

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

        return accountTest.Id;

    }

}
```