APEX TRIGGERS:

GET STARTED WITH APEX TRIGGERS:

AccountAddressTrigger.apxt:

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

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

}
```

BULK APEX TRIGGERS:

ClosedOpportunityTrigger.apxt

```
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;
    }

}
```

APEX TESTING

GET STARTED WITH APEX UNIT TEST:

VerifyDate.apxc

```
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;
        }
```

```
}
```

TestVerifyDate.apxc

```
@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('12/01/2019'));
        System.assertEquals(false, flag);
    }

    @isTest static void Test_DateWithin30Days_case2(){
        Boolean flag =
VerifyDate.DateWithin30Days(date.parse('01/01/2020'),date.parse('02/02/2020'));
        System.assertEquals(false, flag);
    }

    @isTest static void Test_DateWithin30Days_case3(){
        Boolean flag =
VerifyDate.DateWithin30Days(date.parse('01/01/2020'),date.parse('01/15/2020'));
        System.assertEquals(true, flag);
    }

    @isTest static void Test_SetEndOfMonthDate(){
        Date returndate = VerifyDate.SetEndOfMonthDate(date.parse('01/01/2020'));
```

```
    }

}
```

TEST APEX TRIGGERS:

RestrictContactByName.apxt

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

    //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');
            }

        }

}
```

CREATE TEST DATA FOR APEX TESTS:

RandomContactFactory.apxc

```
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;
```

```
    }

}
```

ASYNCHRONOUS APEX

USE FUTURE METHODS:

AccountProcessor.apxc

```
public class AccountProcessor {

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

        List<Account> accList = [Select Id, Number_of_Contacts__c,(Select Id from Contacts) from
Account where Id in :accountIds];


        For(Account acc: accList){

            acc.Number_of_Contacts__c = acc.Contacts.size();
        }

        update accList;
    }

}
```

AccountProcessorTest.apxc

```
@isTest
public class AccountProcessorTest {
```

```
    public static testmethod void testAccountProcessor(){

        Account a = new Account();
        a.Name = 'Test Account';
        insert a;

        Contact con = new Contact();
        con.FirstName = 'Binary';
        con.LastName = 'Programming';
        con.AccountId = a.Id;

        insert con;

        List<Id> accListId = new List<Id>();
        accListId.add(a.Id);

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

        Account acc = [Select Number_of_Contacts__c from Account where Id =: a.Id];
        System.assertEquals(Integer.valueOf(acc.Number_Of_Contacts__c),1);

    }

}
```

USE BATCH APEX:

LeadProcessor.apxc

```
public without sharing class LeadProcessor implements Database.Batchable<sObject> {

    public Database.QueryLocator start(Database.BatchableContext dbc){
        return Database.getQueryLocator([SELECT Id,Name FROM Lead]);
    }

    public void execute(Database.BatchableContext dbc, List<Lead> leads){
```

```
        for(Lead l : leads){
            l.LeadSource = 'Dreamforce';
        }
        update leads;
    }

    public void finish(Database.BatchableContext dbc){
        System.debug('Done');
    }

}
```

LeadProcessorTest.apxc

```
@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();
    }

}
```

CONTROL PROCESSES WITH QUEUEABLE APEX:

AddPrimaryContact.apxc

```
public without sharing class AddPrimaryContact implements Queueable {

   private Contact contact;
   private String state;

   public AddPrimaryContact (Contact inputcontact,String inputState){
      this.contact = inputcontact;
      this.state = inputState;
   }

   public void execute(QueueableContext context){
      List<Account> accounts = [SELECT Id FROM Account WHERE BillingState =: state LIMIT
200 ];

      List<Contact> contacts = new List<Contact>();

      for (Account acc : accounts) {
         contact contactClone = contact.clone();
         contactClone.AccountId = acc.Id;
         contacts.add(contactClone);
      }

      insert contacts;
   }

}
```

AddPrimaryContactTest.apxc

```
@isTest
private class AddPrimaryContactTest {

   @isTest
   private static void testQueueableClass(){
      List<Account> accounts = new List<Account>();
      for(Integer i=0; i<500; i++){
```

```
            Account acc = new Account(Name='Test Account');
            if(i<250){
                acc.BillingState = 'NY';
            } else{
                acc.BillingState = 'CA';
            }
            accounts.add(acc);
        }
        insert accounts;

        Contact contact = new Contact(Firstname = 'Simon', LastName = 'Connock');
        insert contact;

        Test.startTest();
        Id jobId =System.enqueueJob(new AddPrimaryContact(contact,'CA'));
        Test.stopTest();

        List<Contact> contacts = [SELECT Id FROM contact WHERE Contact.Account.BillingState =
'CA'];
        System.assertEquals(200, contacts.size(), 'ERROR: incorrect number of contact records
found');

    }

}
```

SCHEDULE JOBS USING APEX SCHEDULER:

DailyLeadProcessor.apxc

```
public without sharing class DailyLeadProcessor implements Schedulable {

    public void execute(SchedulableContext ctx){

        List<Lead>leads = [SELECT Id,LeadSource FROM Lead WHERE LeadSource = null LIMIT
200];
        for(Lead l:leads){
            l.LeadSource = 'Dreamforce';
```

```
        }

        update leads;
    }

}
```

DailyLeadProcessorTest.apxc

```
@isTest
public class DailyLeadProcessorTest {

    private static string CRON_EXP = '0 0 0 ? * * *';

    @isTest
    private static void testSchedulableClass(){

        List<Lead> leads = new List<Lead>();
        for(Integer i=0; i<500; i++){
            if(i<250){
                leads.add(new Lead(LastName = 'Cannock', Company = 'Salesforce'));
            } else{
                leads.add(new Lead(LastName = 'Cannock', Company = 'Salesforce',LeadSource =
'Other'));
            }
        }
        insert leads;

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

        List<Lead> updatedLeads = [SELECT Id, LeadSource FROM Lead WHERE LeadSource =
'Dreamforce'];
        System.assertEquals(200, updatedLeads.size(),'ERROR: At least  1 record not updated
correctly');

        List<CronTrigger> cts = [SELECT Id, TimesTriggered,NextFireTime FROM CronTrigger
WHERE Id =: jobId];
        System.debug('Next Fire Time' + cts[0].NextFiretime);
    }
```

}

APEX INTEGRATION SERVICES

APEX REST CALLOUTS:

AnimalLocator.apxc

```
public class AnimalLocator {
        public class cls_animal {
                public Integer id;
                public String name;
                public String eats;
                public String says;
        }
public class JSONOutput{
        public cls_animal animal;

        //public JSONOutput parse(String json){
        //return (JSONOutput) System.JSON.deserialize(json, JSONOutput.class);
        //}
}
```

```
   public static String getAnimalNameById (Integer id) {
      Http http = new Http();
      HttpRequest request = new HttpRequest();
      request.setEndpoint('https://th-apex-http-callout.herokuapp.com/animals/' + id);
      //request.setHeader('id', String.valueof(id)); -- cannot be used in this challenge :)
      request.setMethod('GET');
      HttpResponse response = http.send(request);
      system.debug('response: ' + response.getBody());
      //Map<String,Object> map_results = (Map<String,Object>)
JSON.deserializeUntyped(response.getBody());
      jsonOutput results = (jsonOutput) JSON.deserialize(response.getBody(), jsonOutput.class);
      //Object results = (Object) map_results.get('animal');
```

```
                    system.debug('results= ' + results.animal.name);
        return(results.animal.name);
    }

}
```

AnimalLocatorMock.apxc

```
@IsTest
global class AnimalLocatorMock implements HttpCalloutMock {

    global HTTPresponse respond(HTTPrequest request) {
        Httpresponse response = new Httpresponse();
        response.setStatusCode(200);
        //-- directly output the JSON, instead of creating a logic
        //response.setHeader('key, value)
        //Integer id = Integer.valueof(request.getHeader('id'));
        //Integer id = 1;
        //List<String> lst_body = new List<String> {'majestic badger', 'fluffy bunny'};
        //system.debug('animal return value: ' + lst_body[id]);
        response.setBody('{"animal":{"id":1,"name":"chicken","eats":"chicken food","says":"cluck
cluck"}}');
        return response;
    }

}
```

AnimalLocatorTest.apxc

```
@IsTest
public class AnimalLocatorTest {
    @isTest
    public static void testAnimalLocator() {
        Test.setMock(HttpCalloutMock.class, new AnimalLocatorMock());
        //Httpresponse response = AnimalLocator.getAnimalNameById(1);
        String s =  AnimalLocator.getAnimalNameById(1);
        system.debug('string returned: ' + s);
    }
```

}

APEX SOAP CALLOUTS:

ParkService.apxc

```
//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;
      }
    }
}

ParkServiceMock.apxc

@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) {
      ParkService.byCountryResponse response_x = new ParkService.byCountryResponse();
      List<String> lstOfDummyParks = new List<String> {'Park1','Park2','Park3'};
      response_x.return_x = lstOfDummyParks;

      response.put('response_x', response_x);
    }
}
```

ParkLocatorTest.apxc

```
@isTest
private class ParkLocatorTest{
   @isTest
   static void testParkLocator() {
      Test.setMock(WebServiceMock.class, new ParkServiceMock());
      String[] arrayOfParks = ParkLocator.country('India');

      System.assertEquals('Park1', arrayOfParks[0]);
   }
}
```

APEX WEB SERVICES:

AccountManager.apxc

```
@RestResource(urlMapping='/Accounts/*/contacts')
global with sharing 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;
   }
}
```

AccountManagerTest.apxc

```
@IsTest
private class AccountManagerTest{
   @isTest static void testAccountManager(){
      Id recordId = getTestAccountId();
```

```
        // Set up a test request
        RestRequest request = new RestRequest();
        request.requestUri =
            'https://ap5.salesforce.com/services/apexrest/Accounts/'+ recordId +'/contacts';
        request.httpMethod = 'GET';
        RestContext.request = request;

        // Call the method to test
        Account  acc = AccountManager.getAccount();

        // Verify results
        System.assert(acc != null);
    }

    private static Id getTestAccountId(){
        Account acc = new Account(Name = 'TestAcc2');
        Insert acc;

        Contact con = new Contact(LastName = 'TestCont2', AccountId = acc.Id);
        Insert con;

        return acc.Id;
    }
}
```

APEX SPECIALIST SUPERBADGE

AUTOMATE RECORD CREATION:

MaintenanceRequest.apxt

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

MaintenanceRequestHelper.apxc

```
@istest
public with sharing class MaintenanceRequestHelperTest {

    private static final string STATUS_NEW = 'New';
    private static final string WORKING = 'Working';
    private static final string CLOSED = 'Closed';
    private static final string REPAIR = 'Repair';
    private static final string REQUEST_ORIGIN = 'Web';
    private static final string REQUEST_TYPE = 'Routine Maintenance';
    private static final string REQUEST_SUBJECT = 'Testing subject';

    PRIVATE STATIC Vehicle__c createVehicle(){
        Vehicle__c Vehicle = new Vehicle__C(name = 'SuperTruck');
        return Vehicle;
    }

    PRIVATE STATIC Product2 createEq(){
        product2 equipment = new product2(name = 'SuperEquipment',
                                          lifespan_months__C = 10,
                                          maintenance_cycle__C = 10,
                                          replacement_part__c = true);
        return equipment;
    }

    PRIVATE STATIC Case createMaintenanceRequest(id vehicleId, id equipmentId){
        case cs = new case(Type=REPAIR,
                           Status=STATUS_NEW,
                           Origin=REQUEST_ORIGIN,
                           Subject=REQUEST_SUBJECT,
                           Equipment__c=equipmentId,
                           Vehicle__c=vehicleId);
        return cs;
    }

    PRIVATE STATIC Equipment_Maintenance_Item__c createWorkPart(id equipmentId,id
requestId){
        Equipment_Maintenance_Item__c wp = new
```

```
Equipment_Maintenance_Item__c(Equipment__c = equipmentId,
                                              Maintenance_Request__c = requestId);
    return wp;
  }


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

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

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

    Equipment_Maintenance_Item__c workP =
createWorkPart(equipmentId,somethingToUpdate.id);
    insert workP;

    test.startTest();
    somethingToUpdate.status = CLOSED;
    update somethingToUpdate;
    test.stopTest();

    Case newReq = [Select id, subject, type, Equipment__c, Date_Reported__c, Vehicle__c,
Date_Due__c
            from case
            where status =:STATUS_NEW];

    Equipment_Maintenance_Item__c workPart = [select id
                                from Equipment_Maintenance_Item__c
                                where Maintenance_Request__c =:newReq.Id];

    system.assert(workPart != null);
    system.assert(newReq.Subject != null);
    system.assertEquals(newReq.Type, REQUEST_TYPE);
    SYSTEM.assertEquals(newReq.Equipment__c, equipmentId);
```

```
    SYSTEM.assertEquals(newReq.Vehicle__c, vehicleId);
    SYSTEM.assertEquals(newReq.Date_Reported__c, system.today());
}

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

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

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

    Equipment_Maintenance_Item__c workP = createWorkPart(equipmentId, emptyReq.Id);
    insert workP;

    test.startTest();
    emptyReq.Status = WORKING;
    update emptyReq;
    test.stopTest();

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

    Equipment_Maintenance_Item__c workPart = [select id
                                              from Equipment_Maintenance_Item__c
                                              where Maintenance_Request__c = :emptyReq.Id];

    system.assert(workPart != null);
    system.assert(allRequest.size() == 1);
}

@istest
private static void testMaintenanceRequestBulk(){
    list<Vehicle__C> vehicleList = new list<Vehicle__C>();
    list<Product2> equipmentList = new list<Product2>();
    list<Equipment_Maintenance_Item__c> workPartList = new
```

```
list<Equipment_Maintenance_Item__c>();
        list<case> requestList = new list<case>();
        list<id> oldRequestIds = new list<id>();

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

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

        for(integer i = 0; i < 300; i++){
           workPartList.add(createWorkPart(equipmentList.get(i).id, requestList.get(i).id));
        }
        insert workPartList;

        test.startTest();
        for(case req : requestList){
           req.Status = CLOSED;
           oldRequestIds.add(req.Id);
        }
        update requestList;
        test.stopTest();

        list<case> allRequests = [select id
                                  from case
                                  where status =: STATUS_NEW];

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

        system.assert(allRequests.size() == 300);
    }
}
```

SYNCHRONIZATION SALESFORCE DATA WITH AN EXTERNAL SYSTEM:

WarehouseCalloutService.apxc

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

   //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(){
      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());

         //class maps the following fields: replacement part (always true), cost, current inventory,
lifespan, maintenance cycle, and warehouse SKU
         //warehouse SKU will be external ID for identifying which equipment records to update
within Salesforce
         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 = (Integer) mapJson.get('cost');
            myEq.Warehouse_SKU__c = (String) mapJson.get('sku');
            myEq.Current_Inventory__c = (Double) mapJson.get('quantity');
            myEq.ProductCode = (String) mapJson.get('_id');
            warehouseEq.add(myEq);
        }

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

    public static void execute (QueueableContext context){
      runWarehouseEquipmentSync();
    }

}
```

SCHEDULE SYNCHRONIZATION USING APEX CODE:

WarehouseSyncSchedule.apxc

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

TEST AUTOMATION LOGIC:

MaintenanceRequestHelperTest.apxc

```
@istest
public with sharing class MaintenanceRequestHelperTest {

    private static final string STATUS_NEW = 'New';
    private static final string WORKING = 'Working';
    private static final string CLOSED = 'Closed';
    private static final string REPAIR = 'Repair';
    private static final string REQUEST_ORIGIN = 'Web';
    private static final string REQUEST_TYPE = 'Routine Maintenance';
    private static final string REQUEST_SUBJECT = 'Testing subject';

    PRIVATE STATIC Vehicle__c createVehicle(){
        Vehicle__c Vehicle = new Vehicle__C(name = 'SuperTruck');
        return Vehicle;
    }

    PRIVATE STATIC Product2 createEq(){
        product2 equipment = new product2(name = 'SuperEquipment',
                                          lifespan_months__C = 10,
                                          maintenance_cycle__C = 10,
                                          replacement_part__c = true);
        return equipment;
    }

    PRIVATE STATIC Case createMaintenanceRequest(id vehicleId, id equipmentId){
        case cs = new case(Type=REPAIR,
                           Status=STATUS_NEW,
                           Origin=REQUEST_ORIGIN,
                           Subject=REQUEST_SUBJECT,
                           Equipment__c=equipmentId,
                           Vehicle__c=vehicleId);
        return cs;
    }

    PRIVATE STATIC Equipment_Maintenance_Item__c createWorkPart(id equipmentId,id
requestId){
        Equipment_Maintenance_Item__c wp = new
Equipment_Maintenance_Item__c(Equipment__c = equipmentId,
                                                    Maintenance_Request__c = requestId);
        return wp;
```

```
    }


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

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

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

        Equipment_Maintenance_Item__c workP =
createWorkPart(equipmentId,somethingToUpdate.id);
        insert workP;

        test.startTest();
        somethingToUpdate.status = CLOSED;
        update somethingToUpdate;
        test.stopTest();

        Case newReq = [Select id, subject, type, Equipment__c, Date_Reported__c, Vehicle__c,
Date_Due__c
                from case
                where status =:STATUS_NEW];

        Equipment_Maintenance_Item__c workPart = [select id
                                    from Equipment_Maintenance_Item__c
                                    where Maintenance_Request__c =:newReq.Id];

        system.assert(workPart != null);
        system.assert(newReq.Subject != null);
        system.assertEquals(newReq.Type, REQUEST_TYPE);
        SYSTEM.assertEquals(newReq.Equipment__c, equipmentId);
        SYSTEM.assertEquals(newReq.Vehicle__c, vehicleId);
        SYSTEM.assertEquals(newReq.Date_Reported__c, system.today());
    }
```

```
    @istest
    private static void testMaintenanceRequestNegative(){
        Vehicle__C vehicle = createVehicle();
        insert vehicle;
        id vehicleId = vehicle.Id;

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

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

        Equipment_Maintenance_Item__c workP = createWorkPart(equipmentId, emptyReq.Id);
        insert workP;

        test.startTest();
        emptyReq.Status = WORKING;
        update emptyReq;
        test.stopTest();

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

        Equipment_Maintenance_Item__c workPart = [select id
                                                  from Equipment_Maintenance_Item__c
                                                  where Maintenance_Request__c = :emptyReq.Id];

        system.assert(workPart != null);
        system.assert(allRequest.size() == 1);
    }

    @istest
    private static void testMaintenanceRequestBulk(){
        list<Vehicle__C> vehicleList = new list<Vehicle__C>();
        list<Product2> equipmentList = new list<Product2>();
        list<Equipment_Maintenance_Item__c> workPartList = new
list<Equipment_Maintenance_Item__c>();
        list<case> requestList = new list<case>();
        list<id> oldRequestIds = new list<id>();
```

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

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

        for(integer i = 0; i < 300; i++){
           workPartList.add(createWorkPart(equipmentList.get(i).id, requestList.get(i).id));
        }
        insert workPartList;

        test.startTest();
        for(case req : requestList){
           req.Status = CLOSED;
           oldRequestIds.add(req.Id);
        }
        update requestList;
        test.stopTest();

        list<case> allRequests = [select id
                                  from case
                                  where status =: STATUS_NEW];

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

        system.assert(allRequests.size() == 300);
    }
}
```

MaintenanceRequestHelper.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;
      }
   }
}
```

MaintenanceRequest.apxt

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

TEST CALLOUT LOGIC:

WarehouseCalloutService.apxc

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

    //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(){
        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());

            //class maps the following fields: replacement part (always true), cost, current inventory,
lifespan, maintenance cycle, and warehouse SKU
            //warehouse SKU will be external ID for identifying which equipment records to update
within Salesforce
            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 = (Integer) mapJson.get('cost');
                myEq.Warehouse_SKU__c = (String) mapJson.get('sku');
                myEq.Current_Inventory__c = (Double) mapJson.get('quantity');
                myEq.ProductCode = (String) mapJson.get('_id');
                warehouseEq.add(myEq);
```

```
        }

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

    public static void execute (QueueableContext context){
      runWarehouseEquipmentSync();
    }

}
```

WarehouseCalloutServiceTest.apxc

```
@isTest
private class WarehouseCalloutServiceTest {

    @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);
    }


}
```

WarehouseCalloutServiceMock.apxc

```
@isTest
global class WarehouseCalloutServiceMock implements HttpCalloutMock {
    global static HttpResponse respond(HttpRequest request){

        HttpResponse response = new HttpResponse();
        response.setHeader('Content-Type','application/json');
        response.setBody('[{"_id":"55d66226726b611100aaf740", "replacement":true, "quantity":194,
"maintenanceperiod":0, "lifespan":0, "cost":5, "sku":"100002"}]');
        response.setStatusCode(200);

        return response;
    }
}
```

TEST SCHEDULING LOGIC:

WarehouseSyncSchedule.apxc

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

WarehouseSyncScheduleTest.apxc

```
@isTest
public with sharing class WarehouseSyncScheduleTest {
    @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();
    }
}
```