

I Have completed developer catalyst in trialhead and I have finished 2 superbades they are

1.APEX SPECIALIST

2.Process Automation Specialist

so in this pdf iam going to mention all the codes related apex specialist super badge and apex modules

APEX SPECIALIST

1-Automate record creation

MaintenanceRequestHelper

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

```

2. Synchronize Salesforce data with an external system

WarehouseCalloutService

```

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);
    }

}
}
}

```

3.Schedule synchronization

WarehouseSyncSchedule

```

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

        WarehouseCalloutService.runWarehouseEquipmentSync();
    }
}

```

4.Test automation logic

MaintenanceRequestHelperTest

```

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

```

5. Test callout logic

WarehouseCalloutService

```
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);
        }
    }
}

```

WarehouseCalloutServiceTest

@isTest

```

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

```

WarehouseCalloutServiceMock

@isTest

global class WarehouseCalloutServiceMock implements HttpCalloutMock {

global static HttpResponse respond(HttpRequest request){

```

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

```

```

    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;
}
}

```

6. **Test scheduling logic**

WarehouseSyncSchedule

```

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

```

```

        WarehouseCalloutService.runWarehouseEquipmentSync();
    }
}

```

WarehouseSyncScheduleTest

@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();

        CronTrigger a=[SELECT Id FROM CronTrigger where NextFireTime > today];
        System.assertEquals(jobID, a.Id,'Schedule ');

    }
}

```

HERE IT STARTS WITH APEX MODULES

Apex Triggers

1.

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.BillingPostalCode !=NULL)){
            account.ShippingPostalCode = account.BillingPostalCode;

```

```
    } }  
}
```

2.

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;  
    }  
}
```

Apex Testing

1.

Get Started with Apex Unit Tests

```
public class VerifyDate {  
    public static Date CheckDates(Date date1, Date date2) {  
        if(DateWithin30Days(date1,date2)) {  
            return date2;  
        } else {  
            return SetEndOfMonthDate(date1);  
        }  
    }  
    private static Boolean DateWithin30Days(Date date1, Date date2) {  
        if( date2 < date1) { return false; }  
        Date date30Days = date1.addDays(30); //create a date 30 days away from date1  
        if( date2 >= date30Days ) { return false; }  
        else { return true; }  
    }  
    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;  
    }  
}
```

2.

Test Apex Triggers

```
trigger RestrictContactByName on Contact (before insert, before update) {  
    For (Contact c : Trigger.New) {  
        if(c.LastName == 'INVALIDNAME') {  
            c.AddError("The Last Name '"+c.LastName+"' is not allowed for DML");  
        }  
    }  
}
```

```
}  
}  
}
```

3.

Create Test Data for Apex Tests

```
public class RandomContactFactory {  
    public static List<Contact> generateRandomContacts(Integer num,String lastName){  
List<Contact> contactList=new List<Contact>();  
        for(Integer i=1;i<=num;i++){  
            Contact ct=new Contact(FirstName='Test'+i,LastName=lastName);  
            contactList.add(ct);  
        }  
        return contactList;  
    }  
}
```

Asynchronous Apex

1.

Use Future Methods

```
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;  
}  
}
```

test class

@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);
    }
}

```

2.

Use Batch Apex

```

global class LeadProcessor implements Database.Batchable<sObject>, Database.Stateful {
    global Integer recordsProcessed = 0;    global Database.QueryLocator start(Database.BatchableContext bc) {
        return Database.getQueryLocator([SELECT ID, LeadSource FROM Lead]);
    }
    global void execute(Database.BatchableContext bc, List<Lead> scope) {
        for (Lead lead : scope) {
            lead.LeadSource = 'Dreamforce';
            recordsProcessed = recordsProcessed + 1;
            System.debug(lead.LeadSource);
        }
        update scope;
    }
    global void finish(Database.BatchableContext bc){
        System.debug(recordsProcessed + ' records processed. Shazam!');
    }
}

test class
@isTest
private class LeadProcessorTest {
    @TestSetup
    static void setup(){
        List<Lead> leads = new List<Lead>();
        for (Integer i = 0; i < 200; i++) {
            leads.add(new Lead(LastName='Lead ' + i, Company='Company Number ' + i, Status='Open -
Not Contacted'));
        }
        insert leads;
    }
    static testMethod void test() {        Test.startTest();
        LeadProcessor lp = new LeadProcessor();
        Id batchId = Database.executeBatch(lp);
        Test.stopTest();
        System.assertEquals(200, [select count() from lead where LeadSource = 'Dreamforce']);
    }
}

```


3.

Control Processes with Queueable Apex

```
public class AddPrimaryContact implements Queueable {
    public contact c;
    public String state;
    public AddPrimaryContact(Contact c, String state) {
        this.c = c;
        this.state = state;
    }
    public void execute(QueueableContext qc) {
        system.debug('this.c = '+this.c+' this.state = '+this.state);
        List<Account> acc_lst = new List<account>([select id, name, BillingState from account where
account.BillingState = :this.state limit 200]);
        List<contact> c_lst = new List<contact>();
        for(account a: acc_lst) {
            contact c = new contact();
            c = this.c.clone(false, false, false, false);
            c.AccountId = a.Id;
            c_lst.add(c);
        }
        insert c_lst;
    }
}

test class
@IsTest
public class AddPrimaryContactTest {
    @IsTest
    public static void testing() {
        List<account> acc_lst = new List<account>();
        for (Integer i=0; i<50;i++) {
            account a = new account(name=string.valueOf(i),billingstate='NY');
            system.debug('account a = '+a);
            acc_lst.add(a);
        }
        for (Integer i=0; i<50;i++) {
            account a = new account(name=string.valueOf(50+i),billingstate='CA');
            system.debug('account a = '+a);
            acc_lst.add(a);
        }
        insert acc_lst;
        Test.startTest();
        contact c = new contact(lastname='alex');
        AddPrimaryContact apc = new AddPrimaryContact(c,'CA');
        system.debug('apc = '+apc);
    }
}
```

```

        System.enqueueJob(apc);
        Test.stopTest();
        List<contact> c_lst = new List<contact>([select id from contact]);
        Integer size = c_lst.size();
        system.assertEquals(50, size);
    }
}
4.

```

Schedule Jobs Using the Apex Scheduler

```

global class DailyLeadProcessor implements Schedulable{
    global void execute(SchedulableContext ctx){
        List<Lead> leads = [SELECT Id, LeadSource FROM Lead WHERE LeadSource = ''];
        if(leads.size() > 0){
            List<Lead> newLeads = new List<Lead>();
            for(Lead lead : leads){
                lead.LeadSource = 'DreamForce';
                newLeads.add(lead);
            }
            update newLeads;
        }
    }
}

test class@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 lead = new Lead(LastName = 'Test ' + i, LeadSource = '', Company = 'Test Company ' + i,
Status = 'Open - Not Contacted');
            leads.add(lead);
        }
        insert leads;
        Test.startTest();
        String jobId = System.schedule('Update LeadSource to DreamForce', CRON_EXP, new
DailyLeadProcessor());
        Test.stopTest();
    }
}

```

Apex Integration Services

1.

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');
}
}

test class
@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 );
    }
}

mock class
@isTest
global class AnimalLocatorMock implements HttpCalloutMock {

    global HTTPResponse respond(HTTPRequest request) {

        HttpResponse response = new HttpResponse();
        response.setHeader('Content-Type', 'application/json');
        response.setBody('{"animals": ["majestic badger", "fluffy bunny", "scary bear", "chicken",
"mighty moose"]}');
        response.getStatusCode(200);
        return response;
    }
}

```

2.

Apex SOAP Callouts

parklocater class

```

public class ParkLocator {
    public static string[] country(string theCountry) {
        ParkService.ParksImplPort parkSvc = new ParkService.ParksImplPort(); // remove space
    }
}

```

```

        return parkSvc.byCountry(theCountry);
    }
}

park service class
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;
}
}
}
test class@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);
    }
}
mock class
@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();
        response_x.return_x = new List<String>{'Yellowstone', 'Mackinac National Park', 'Yosemite'};

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

```

3.

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;
}

test class
@isTest
private class AccountManagerTest {
    private static testMethod void getAccountTest1() {
        Id recordId = createTestRecord();
        RestRequest request = new RestRequest();
        request.requestUri = 'https://na1.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 TestAcc = new Account(
            Name='Test record');
        insert TestAcc;
        Contact TestCon= new Contact(
            LastName='Test',
            AccountId = TestAcc.id);
        return TestAcc.Id;
    }
}

```