```
Apex Triggers:
Get Started with Apex Triggers
AccountAddressTrigger:
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 Trigger:
ClosedOpportunityTrigger
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:
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
       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
       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
@isTest
private class TestVerifyDate {
  @isTest static void testCheckDates() {
    Date now = Date.today();
    Date lastOfTheMonth = Date.newInstance(now.year(), now.month(),
Date.daysInMonth(now.year(), now.month()));
    Date plus60 = Date.today().addDays(60);
```

```
Date d1 = VerifyDate.CheckDates(now, now);
    System.assertEquals(now, d1);
    Date d2 = VerifyDate.CheckDates(now, plus60);
    System.assertEquals(lastOfTheMonth, d2);
  }
}
Test Apex Trigger:
RestrictcontactByName:
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:
@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());
  }
}
RandomContactFactory:
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++){</pre>
      Contact cnt = new Contact(FirstName = 'Test' +i, LastName = lastname);
      Contacts.add(cnt);
    return contacts;
}
Asynchronous Apex:
Account Processor:
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:
@isTest
public 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.ld);
    insert newContact1;
    Contact newContact2 = new Contact(FirstName='Jane', LastName='Doe', AccountId
= newAccount.ld);
    insert newContact2;
    List<Id> accountIds = new List<ID>();
    accountIds.add(newAccount.ID);
    Test.startTest();
    AccountProcessor.countContacts(accountIds);
    Test.stopTest();
LeadProcessor
```

```
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
@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();
  }
}
DailyLeadProcessor:
public class DailyLeadProcessor implements Schedulable {
  Public void execute(SchedulableContext SC){
   List<Lead> LeadObj=[SELECT Id from Lead where LeadSource=null limit 200];
    for(Lead I:LeadObj){
      I.LeadSource='Dreamforce';
      update I;
    }
  }
}
DailyLeadProcessorTest:
@isTest
private class DailyLeadProcessorTest {
       static testMethod void testDailyLeadProcessor() {
             String CRON_EXP = '0\ 0\ 1\ *\ *\ ?';
             List<Lead> |List = new List<Lead>();
         for (Integer i = 0; i < 200; i++) {
                    IList.add(new Lead(LastName='Dreamforce'+i, Company='Test1
Inc.', Status='Open - Not Contacted'));
             insert IList;
             Test.startTest();
             String jobId = System.schedule('DailyLeadProcessor', CRON_EXP, new
DailyLeadProcessor());
```

```
}
}
Apex Integration service:
AnimalLocator:
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(reg);
      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');
  }
AnimalLocatorMock:
@isTest
global class AnimalLocatorMock implements HttpCalloutMock {
  // Implement this interface method
  global HTTPResponse respond(HTTPRequest request) {
    // Create a fake response
    HttpResponse response = new HttpResponse();
    response.setHeader('Content-Type', 'application/json');
    response.setBody('{"animals": ["majestic badger", "fluffy bunny", "scary bear",
"chicken", "mighty moose"]}');
    response.setStatusCode(200);
    return response;
  }
```

```
AnimalLocatorTest:
@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);
 }
}
ParkLocator:
public class ParkLocator {
  public static string[] country(string theCountry) {
    ParkService.ParksImplPort parkSvc = new ParkService.ParksImplPort(); // remove
space
    return parkSvc.byCountry(theCountry);
 }
}
ParkLocatorTest:
@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);
 }
}
ParkService:
//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;
    }
ParkServiceMoc:
@isTest
global class ParkServiceMock implements WebServiceMock {
 global void dolnvoke(
      Object stub,
      Object request,
      Map<String, Object> response,
      String endpoint,
      String soapAction,
      String requestName,
     String responseNS,
      String responseName,
     String responseType) {
    // start - specify the response you want to send
    ParkService.byCountryResponse response_x = new
ParkService.byCountryResponse();
    response_x.return_x = new List<String>{'Yellowstone', 'Mackinac National Park',
'Yosemite'};
    // end
    response.put('response_x', response_x);
```

```
}
AccountManager:
@RestResource(urlMapping='/Accounts/*/contacts')
global class AccountManager {
  @HttpGet
  global static Account getAccount() {
    RestRequest req = RestContext.request;
    String accld = req.requestURI.substringBetween('Accounts/', '/contacts');
    Account acc = [SELECT Id, Name, (SELECT Id, Name FROM Contacts)
            FROM Account WHERE Id = :accld];
    return acc;
 }
}
AccountManagerTest:
@isTest
private class AccountManagerTest {
  private static testMethod void getAccountTest1() {
    Id recordId = createTestRecord();
    // Set up a test request
    RestRequest request = new RestRequest();
    request.requestUri = 'https://na1.salesforce.com/services/apexrest/Accounts/'+
recordId +'/contacts';
    request.httpMethod = 'GET';
    RestContext.request = request;
    // Call the method to test
    Account this Account = Account Manager.get Account();
    // Verify results
    System.assert(thisAccount != null);
    System.assertEquals('Test record', thisAccount.Name);
 }
```

```
// Helper method
    static Id createTestRecord() {
    // Create test record
    Account TestAcc = new Account(
     Name='Test record');
    insert TestAcc;
    Contact TestCon= new Contact(
    LastName='Test',
    AccountId = TestAcc.id);
    return TestAcc.Id;
 }
}
Apex Specialist:
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.ld)){
          nc.Date_Due__c = Date.today().addDays((Integer)
maintenanceCycles.get(cc.ld));
        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.ld;
          ClonedWPs.add(wpClone);
        }
      insert ClonedWPs;
    }
 }
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(newReg.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 casel:
    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.ld);
    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);
 }
}
trigger MaintenanceRequest on Case (before update, after update) {
  if(Trigger.isUpdate && Trigger.isAfter){
    MaintenanceRequestHelper.updateWorkOrders(Trigger.New, Trigger.OldMap);
  }
}
```

```
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 warehouseEg;
        System.debug('Your equipment was synced with the warehouse one');
        System.debug(warehouseEq);
      }
WarehouseCalloutServiceMock:
@isTest
global class WarehouseCalloutServiceMock implements HttpCalloutMock {
  // implement http mock callout
  global static HttpResponse respond(HttpRequest request){
    System.assertEquals('https://th-superbadge-apex.herokuapp.com/equipment',
request.getEndpoint());
    System.assertEquals('GET', request.getMethod());
    // Create a fake response
    HttpResponse response = new HttpResponse();
    response.setHeader('Content-Type', 'application/json');
response.setBody('[{"_id":"55d66226726b611100aaf741","replacement":false,"quantity":5
,"name":"Generator 1000
kW","maintenanceperiod":365,"lifespan":120,"cost":5000,"sku":"100003"}]');
    response.setStatusCode(200);
    return response;
 }
}
WarehouseCalloutServiceTest:
@isTest
      private class WarehouseCalloutServiceTest {
  @isTest
  static void testWareHouseCallout(){
    Test.startTest();
    // implement mock callout test here
```

```
Test.setMock(HTTPCalloutMock.class, new WarehouseCalloutServiceMock());
    WarehouseCalloutService.runWarehouseEquipmentSync();
    Test.stopTest();
    System.assertEquals(1, [SELECT count() FROM Product2]);
 }
}
WarehouseSyncSchedule:
global with sharing class WarehouseSyncSchedule implements Schedulable{
  global void execute(SchedulableContext ctx){
    System.enqueueJob(new WarehouseCalloutService());
 }
}
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();
    //Contains schedule information for a scheduled job. CronTrigger is similar to a
cron job on UNIX systems.
    // This object is available in API version 17.0 and later.
    CronTrigger a=[SELECT Id FROM CronTrigger where NextFireTime > today];
    System.assertEquals(jobID, a.Id,'Schedule');
 }
}
```