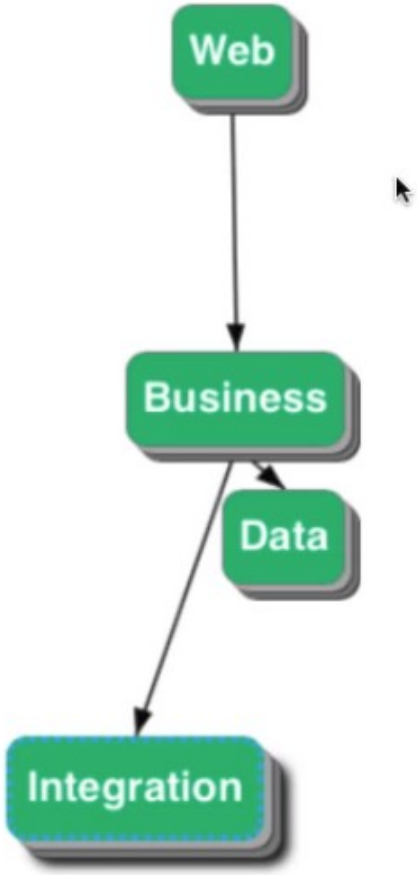
Mocking

When we are going to develop the application it is in Layer like web layer, Business layer, data layer and integration layer,
whenver we are wrting unit test for web layer then no need worry about business layer just it mockit out.
whenver we are writing the unit test for business layer then no need worry about business layer just mockit out.



Mocking enable as to write great unit test case.
Why we need Mocking
Simple Testing Results
Business Loginc class

```
public class SomeBussinessImpl {

	int sum=0;
	public int sumCalculate(List<Integer> list) {

		for(Integer value :list) {
		sum+=value;
		}
		return sum;
	}

}
```

Testing the SomeBusinessImpl class with different scenario

```
public class SomeBusinessTest {

	@Test
	public void CalculateSomeTest() {
		SomeBussinessImpl business = new SomeBussinessImpl();
		int actualResult=business.sumCalculate(Arrays.asList(new Integer[]
{1,2,3,4,5,6}));
		int expectedResult=21;
		assertEquals(expectedResult, actualResult);
	}


	@Test
	public void CalculateEmptyValueTest() {
		SomeBussinessImpl business = new SomeBussinessImpl();
		int actualResult=business.sumCalculate(Arrays.asList(new Integer[]
{}));
		int expectedResult=0;
		assertEquals(expectedResult, actualResult);
	}

	@Test
	public void CalculateOneValueTest() {
		SomeBussinessImpl business = new SomeBussinessImpl();
		int actualResult=business.sumCalculate(Arrays.asList(new Integer[]
{5}));
		int expectedResult=5;
		assertEquals(expectedResult, actualResult);
	}
}
```

Why we need Stub?
Stub means create depency calss object suppouse we have business layer and buniness layer is depened on Data layer but we don't want to test the data layer so how to solve the problem so we need to create a stub class and hardcode tha value of data layer and just passed to bussiness layer means just we are creating dummy object.

Business Layer

```
public class SomeBussinessImpl {
	private SomeDataService someDataService;

	public void setSomeDataService(SomeDataService someDataService) {
		this.someDataService = someDataService;
	}
	public int calculateFromDataService() {
		List<Integer> list = someDataService.retriveAllData();
		for (Integer value : list) {
			sum += value;
		}
		return sum;
	}

}
```

Data Layer

```
public interface SomeDataService {

	public	List<Integer> retriveAllData();

}
```

Test class create stub(create the object and passed the hardcoded values)

```
class SomeDataStub implements SomeDataService{

	@Override
	public List<Integer> retriveAllData() {
		return Arrays.asList(new Integer[] {1,2,3,4});
	}


}
```

Testing class logic

```
public class SomeBusinessTest {

	@Test
	public void CalculateUsingDataService() {
		SomeBussinessImpl business = new SomeBussinessImpl();
		// database dependency which doesn't need to test just create stub
		 business.setSomeDataService(new SomeDataStub());
		int actualResult=business.calculateFromDataService();
		int expectedResult=10;
		assertEquals(expectedResult, actualResult);
	}
}
```

What is Problems with Stub

Suppose we want to test the API with different scenarios then we need to create multiple stub or change the value of Stub class every scenarios
Example
TestCase
1) first test the with actualValue 10 and expected value 10
2) actual value 20 and expected value 20
3) Empty value check
4) one value checked

In above test case need to created 4 stub or we need to change stub value Every time to test the API with different test case.
Like example
StubFirst for TestCase1

```
class SomeDataStub implements SomeDataService{

	@Override
	public List<Integer> retriveAllData() {
		return Arrays.asList(new Integer[] {1,2,3,4});
	}


}
```

Stub2 for TestCase 2

```
class SomeDataStub2 implements SomeDataService{

	@Override
	public List<Integer> retriveAllData() {
		return Arrays.asList(new Integer[] {1,2,3,4,10});
	}


}
```

Stub3 for TestCase 3

```
class SomeDataStub3 implements SomeDataService{

	@Override
	public List<Integer> retriveAllData() {
		return Arrays.asList(new Integer[] {});
	}


}
```

Stub4 for TestCase 4

```

class SomeDataStub4 implements SomeDataService{

	@Override
	public List<Integer> retriveAllData() {
		return Arrays.asList(new Integer[] {5});
	}
	}
```

Test Class wtih different TestCase

```
public class SomeBusinessTest {

	@Test
	public void CalculateUsingDataService() {
		SomeBussinessImpl business = new SomeBussinessImpl();
		 business.setSomeDataService(new SomeDataStub());
		int actualResult=business.calculateFromDataService();
		int expectedResult=10;
		assertEquals(expectedResult, actualResult);
	}


	@Test
	public void CalculateDiffValueTest() {
		SomeBussinessImpl business = new SomeBussinessImpl();
		 business.setSomeDataService(new SomeDataStub2());
		int actualResult=business.calculateFromDataService();
		int expectedResult=20;
		assertEquals(expectedResult, actualResult);
	}

	@Test
	public void CalculateEmptyValueTest() {
		SomeBussinessImpl business = new SomeBussinessImpl();
		 business.setSomeDataService(new SomeDataStub3());
		int actualResult=business.calculateFromDataService();
		int expectedResult=0;
		assertEquals(expectedResult, actualResult);
	}

	@Test
	public void CalculateOneValueTest() {
		SomeBussinessImpl business = new SomeBussinessImpl();
		 business.setSomeDataService(new SomeDataStub4());
		int actualResult=business.calculateFromDataService();
		int expectedResult=5;
		assertEquals(expectedResult, actualResult);
	}
}
```

So avoid the above stub problem we can go for Mock

Insted of creating stub we can use mock object or fake object to test the API, Mock means create a fake object or fake dependent object,

Step to create the mock objects

1) create the mock/fake object calling the static mock method wich is return the mock object

```
Exa:  SomeDataService SomeDataServiceMock=mock(SomeDataService.class);
```

2)we can use mockito when method to Registor the specific mock method and return the expected results.

```
Exa:  when(SomeDataServiceMock.retriveAllData()).thenReturn(Arrays.asList(new
Integer[] {1,2,3,4}));
```

3) pass the fake object to the business layer

```
Exa:    business.setSomeDataService(SomeDataServiceMock);
```

```
public class SomeBusinessTest {

	@Test
	public void CalculateUsingDataService() {
		SomeBussinessImpl business = new SomeBussinessImpl();
		SomeDataService SomeDataServiceMock=mock(SomeDataService.class);
	when(SomeDataServiceMock.retriveAllData()).thenReturn(Arrays.asList(new
	Integer[] {1,2,3,4}));
		 business.setSomeDataService(SomeDataServiceMock);
		int actualResult=business.calculateFromDataService();
		int expectedResult=10;
		assertEquals(expectedResult, actualResult);
	}
	@Test
	public void CalculateDiffValueTest() {
		SomeBussinessImpl business = new SomeBussinessImpl();
		SomeDataService SomeDataServiceMock=mock(SomeDataService.class);
	when(SomeDataServiceMock.retriveAllData()).thenReturn(Arrays.asList(new
	Integer[] {1,2,3,4,10}));
		 business.setSomeDataService(SomeDataServiceMock);
		int actualResult=business.calculateFromDataService();
		int expectedResult=20;
		assertEquals(expectedResult, actualResult);
	}
	@Test
	public void CalculateEmptyValueTest() {
		SomeBussinessImpl business = new SomeBussinessImpl();
		SomeDataService SomeDataServiceMock=mock(SomeDataService.class);
	when(SomeDataServiceMock.retriveAllData()).thenReturn(Arrays.asList(new
	Integer[] {}));
		 business.setSomeDataService(SomeDataServiceMock);
		int actualResult=business.calculateFromDataService();
		int expectedResult=0;
		assertEquals(expectedResult, actualResult);
	}
	@Test
	public void CalculateOneValueTest() {
		SomeBussinessImpl business = new SomeBussinessImpl();
		SomeDataService SomeDataServiceMock=mock(SomeDataService.class);
	when(SomeDataServiceMock.retriveAllData()).thenReturn(Arrays.asList(new
	Integer[] {5}));
		 business.setSomeDataService(SomeDataServiceMock);
		int actualResult=business.calculateFromDataService();
		int expectedResult=5;
		assertEquals(expectedResult, actualResult);
	}
}
```

To avoid the boilerplate/redendency code to create the mock objects

```
public class SomeBusinessTest {
	SomeBussinessImpl business = new SomeBussinessImpl();
	SomeDataService SomeDataServiceMock=mock(SomeDataService.class);

	@Before
	public void before() {
		business.setSomeDataService(SomeDataServiceMock);
	}

	@Test
	public void CalculateUsingDataService() {

	when(SomeDataServiceMock.retriveAllData()).thenReturn(Arrays.asList(new
	Integer[] {1,2,3,4}));
		int actualResult=business.calculateFromDataService();
		int expectedResult=10;
		assertEquals(expectedResult, actualResult);
	}


	@Test
	public void CalculateDiffValueTest() {

	when(SomeDataServiceMock.retriveAllData()).thenReturn(Arrays.asList(new
	Integer[] {1,2,3,4,10}));
		int actualResult=business.calculateFromDataService();
		int expectedResult=20;
		assertEquals(expectedResult, actualResult);
	}

	@Test
	public void CalculateEmptyValueTest() {

	when(SomeDataServiceMock.retriveAllData()).thenReturn(Arrays.asList(new
	Integer[] {}));
		int actualResult=business.calculateFromDataService();
		int expectedResult=0;
		assertEquals(expectedResult, actualResult);
	}

	@Test
	public void CalculateOneValueTest() {

	when(SomeDataServiceMock.retriveAllData()).thenReturn(Arrays.asList(new
	Integer[] {5}));
		int actualResult=business.calculateFromDataService();
		int expectedResult=5;
		assertEquals(expectedResult, actualResult);
	}
}
```

Again we need to make coding standard
@**Mock** annotation basic used for create the moc/fake object
@**InjectMocks** annotation are used to inject the mock/depended obj to target class.

```
@RunWith(MockitoJUnitRunner.class)
public class SomeBusinessTest {

	@InjectMocks
	SomeBussinessImpl business;
	@Mock
	SomeDataService SomeDataServiceMock;


	@Test
	public void CalculateUsingDataService() {

	when(SomeDataServiceMock.retriveAllData()).thenReturn(Arrays.asList(new
	Integer[] {1,2,3,4}));
		assertEquals(10, business.calculateFromDataService());
	}

	@Test
	public void CalculateDiffValueTest() {

	when(SomeDataServiceMock.retriveAllData()).thenReturn(Arrays.asList(new
	Integer[] {1,2,3,4,10}));
		assertEquals(20, business.calculateFromDataService());
	}

	@Test
	public void CalculateEmptyValueTest() {

	when(SomeDataServiceMock.retriveAllData()).thenReturn(Arrays.asList(new
	Integer[] {}));
		assertEquals(0, business.calculateFromDataService());
	}

	@Test
	public void CalculateOneValueTest() {

	when(SomeDataServiceMock.retriveAllData()).thenReturn(Arrays.asList(new
	Integer[] {5}));
		assertEquals(5, business.calculateFromDataService());
	}
}
```

Mocking with java.util.list interface mock/fake object

```
public class ListMockTest {

	List mock = Mockito.mock(List.class);

	@Test
	public void testSize() {
		when(mock.size()).thenReturn(5);
		assertEquals(5, mock.size());
	}

	@Test
	public void returnDiffValue() {

		when(mock.size()).thenReturn(5).thenReturn(10);
		assertEquals(5, mock.size());
		assertEquals(10, mock.size());
	}

	@Test
	public void testWithParameters() {
		when(mock.get(0)).thenReturn("index 0 hi");
		assertEquals("index 0 hi", mock.get(0));
		assertEquals(null, mock.get(1));
	}

	@Test
	public void returnWithGenericParamets() {
		//Mockito.anyInt()  Arguments matchers
		when(mock.get(Mockito.anyInt())).thenReturn("specific value");
		assertEquals("specific value", mock.get(0));
		assertEquals("specific value", mock.get(1));
	}
	@Test
	public void verifyingMethod() {
		//STUB
		String value1= mock.get(0);
		String value2= mock.get(1);
		//Verify
		verify(mock).get(0);
		verify(mock,times(2)).get(Mockito.anyInt());
		verify(mock,atLeastOnce()).get(Mockito.anyInt());
		verify(mock,atMost(2)).get(Mockito.anyInt());
		verify(mock,never()).get(2);

	}



}
```

Mock verify the method calls.

How you can verify the specifc method is called in mockito

Example

```
public int calculateFromDataService() {
            List<Integer> list = someDataService.retriveAllData();
            for (Integer value : list) {
                  sum += value;
            }
            //someDataService.storeSumValue(sum)
            return sum;
      }
}
```

In these example how can verify the storeSumValue() is executed or not

```
@Test
      public void verifyingMethod() {
            //STUB
            String value1= mock.get(0);
            String value2= mock.get(1);

            //Verify
            verify(mock).get(0);
            verify(mock,times(2)).get(Mockito.anyInt());
            verify(mock,atLeastOnce()).get(Mockito.anyInt());
            verify(mock,atMost(2)).get(Mockito.anyInt());
            verify(mock,never()).get(2);

      }
```

Mocks verify Method arguments

argument capture are used for verify the what data we are passing in method arguments in these example

mock.add("first args") add method we are passing first args.

```
@Test
public void argumentCapture() {
       mock.add("first args");
       ArgumentCaptor<String> captor=ArgumentCaptor.forClass(String.class);
       verify(mock).add(captor.capture());
       assertEquals("first args", captor.getValue());
      //capture the value which are passed in arguments

}
```

Multiple arguments verify from methods calls

```
      @Test
      public void multipleArgumentCapture() {
            mock.add("first args");
            mock.add("second args");

      ArgumentCaptor<String> captor= ArgumentCaptor.forClass(String.class);
            verify(mock,times(2)).add(captor.capture());
            assertEquals("first args", captor.getAllValues().get(0));
            assertEquals("second args",captor.getAllValues().get(1));
}
```

Spy(spying)

Spy is used for orignal behaviour return. Means it treat as orignal not mock/fake object .
Example

```
1) create ArrayList spy = Mockito.spy(ArrayList.class);
2)it return original behaviour
3)if we call get(1) it will throws ArrayIndexOutOfBoud exception because array
list doesn't have elements.but not in mock,mock return default behaviour(null).
      System.out.println("--first time get---"+mocks.get(0));
4)when can override the orignal behaviour of spy like
      when(spy.size()).thenReturn(5); // now it will return 5
```

```java
      @Test
      public void spying() {
            ArrayList spy = Mockito.spy(ArrayList.class);
            //System.out.println("--first time get---" + spy.get(0));
            //System.out.println("--first time size---" + spy.size());
            spy.add("Index 0");
            spy.add("Index 1");
            System.out.println("--second time get---" + spy.get(0));
            System.out.println("--second time size---" + spy.size());
            when(spy.size()).thenReturn(5);
            System.out.println("--third time get---" + spy.get(0));
            System.out.println("--third time size---" + spy.size());
            verify(spy).add("Index 1");

      }
```

----------Unit testing with Spring boot and mockito ----------

Controller layer test--> so how we can test only controller not other layer ?
So we using @RunWith(SpringRunner.class) and @WebMvcTest annotation that is basically used to test specific Controller
and passed the controller class name which controller you are going to test
example

```
@RestController
public class HelloWorldController {
	@GetMapping("/hello-world")
	public String getHelloWorld() {

		return "Hello world";
	}
}
```

Test class
RequestBuilder basically used to http request and mocMvc.perform() used for request and get the result MvcResult have the response we can extract the results also.

```
@RunWith(SpringRunner.class)
@WebMvcTest(HelloWorldController.class)
public class HelloControllerTest {
	//Spring bean
	@Autowired
	MockMvc mockMvc;

	@Test
	public void helloWorldBasicTest() throws Exception {
		RequestBuilder reqBuilder = MockMvcRequestBuilders.get("/hello-
world").accept(MediaType.APPLICATION_JSON);
		MvcResult result = mockMvc.perform(reqBuilder).andReturn();
		assertEquals("Hello world",
result.getResponse().getContentAsString());

	}

}
```

MockMvc have some method like andExpect which is used for check status code, contenttype, data match with json etc.

```
@Test
public void helloWorldBasicTest() throws Exception {
		RequestBuilder reqBuilder = MockMvcRequestBuilders.get("/hello-
world").accept(MediaType.APPLICATION_JSON);
		MvcResult result = mockMvc.perform(reqBuilder)
				.andExpect(status().isOk())
				.andExpect(content().string("Hello world"))
				.andReturn();


	}
```

Get method testing with Real world example

Bean class

```
public class Item {

	private int id;
	private String name;
	private int price;
	private int quantity;

	public Item() {}

	public Item(int id, String name, int price, int quantity) {
		super();
		this.id = id;
		this.name = name;
		this.price = price;
		this.quantity = quantity;
	}
}
```

Controller class

```
@RestController
public class ItemController {


	@GetMapping("/get-items")
	public Item getItem() {

		return new Item(1,"omega",10,120);
	}
}
```

Test Class
Junit test compare with json response

```
@RunWith(SpringRunner.class)
@WebMvcTest(ItemController.class)
public class ItemControllerTest {

	@Autowired
	MockMvc mockMvc;

	@Test
	public void getItem() throws Exception {
		RequestBuilder reqBuilder = MockMvcRequestBuilders.get("/get-
items").accept(MediaType.APPLICATION_JSON);


mockMvc.perform(reqBuilder).andExpect(status().isOk()).andExpect(content().json(
"{\"id\":1,\"name\":\"omega\",\"price\":10,\"quantity\":120}"));
	}
```

```
	@Test
	public void getItemSimple() throws Exception {

		RequestBuilder reqBuilder = MockMvcRequestBuilders.get("/get-
items").accept(MediaType.APPLICATION_JSON);
		MvcResult result =
mockMvc.perform(reqBuilder).andExpect(status().isOk()).andReturn();


assertEquals("{\"id\":1,\"name\":\"omega\",\"price\":10,\"quantity\":120}",
result.getResponse().getContentAsString());
	}

}
```

JSONAssert.*assertEquals()*

JSONAssert is very important to debbuge and identify the error in json data and also simplify compare the the objects.

Advantage

1)Simplify identify the error in json data

2) not need to specify the escap character to create json object

3) we can use strict compare also

Example:

```
public class JsonAssertTest {
	String
actualResult="{\"id\":1,\"name\":\"omega\",\"price\":10,\"quantity\":120}";
	@Test
	public void testAssert() throws JSONException {
		String
expected="{\"id\":1,\"name\":\"omega\",\"price\":10,\"quantity\":120}";
		JSONAssert.assertEquals(expected, actualResult,true);
		//removed some content form expected json
		String expectedCh="{\"id\":1,\"name\":\"omega\"}";
		JSONAssert.assertEquals(expectedCh, actualResult,false);
	}
	@Test
	public void testAssertStrictTrue() throws JSONException {
		//removed some content form expected json
		String expectedCh="{\"id\":1,\"name\":\"omega\"}";
		// strict true means actual expected result must be same
		JSONAssert.assertEquals(expectedCh, actualResult,true);
	}

	@Test
	public void testAssertWithOutEscapChar() throws JSONException {
		String actualResult="{id:1,name:omega,price:10,quantity:120}";
		String expectedCh="{id:1,name:omega}";
		JSONAssert.assertEquals(expectedCh, actualResult,false);
	}

}
```

Now Example for Mock real Time example if your testing the controller then we can not depends on BusinessService such senarious Mocking will be come on picture.

So let mock the business service and test the ItemController
Note- when we are going to test Controller then no need to check bussiness logic of business service just mock or just create fake object and return then to avoid dependecy of other layer.

Example

Bean class

```
public class Item {

	private int id;
	private String name;
	private int price;
	private int quantity;

	public Item() {}

	public Item(int id, String name, int price, int quantity) {
		super();
		this.id = id;
		this.name = name;
		this.price = price;
		this.quantity = quantity;
	}
}
```

Service class

```
public interface ItemService {

	public Item getItem();
}
```

ServiceImpl Class

```
@Service
public class ItemServiceImpl implements ItemService{

	@Override
	public Item getItem() {
		return new Item(1,"omega",10,120);
	}

}
```

Controller class

```
@RestController
public class ItemController {

	@Autowired
	ItemService itemSerive;
	@GetMapping("/item-from-bussiness-service")
	public Item getItemFromService() {
		return itemSerive.getItem();
	}

}
```

TestClass

MockBean create the mock object of dependent class

```
@RunWith(SpringRunner.class)
@WebMvcTest(ItemController.class)
public class ItemControllerTest {

	@Autowired
	MockMvc mockMvc;

	@MockBean
	ItemServiceImpl itemServiceImpl;

	@Test
	public void testItemFromBusinessService() throws Exception {
		when(itemServiceImpl.getItem()).thenReturn(new
			Item(1,"omega",10,120));

		RequestBuilder reqBuilder = MockMvcRequestBuilders.get("/item-from-
		bussiness-service").accept(MediaType.APPLICATION_JSON);
		MvcResult result =
	mockMvc.perform(reqBuilder).andExpect(status().isOk()).andReturn();
		JSONAssert.assertEquals("{id:1,name:omega,price:10,quantity:120}",
	result.getResponse().getContentAsString(),false);
	}

}
```

TestCase for Controller

Entity

```
@Entity
public class Item {

	@Id
	private int id;
	private String name;
	private int price;
	private int quantity;

	@Transient
	int value;

	public Item() {}

	public Item(int id, String name, int price, int quantity) {
		super();
		this.id = id;
		this.name = name;
		this.price = price;
		this.quantity = quantity;
	}
}
```

Service

```
public interface ItemBeanService {

	public ItemBean getItem();
}
```

ServiceImpl

```
@Service
public class ItemServiceImpl implements ItemService{

	@Autowired
	ItemRepository itemRepository;

	@Override
	public List<Item> getAllItems() {
		List<Item> items = itemRepository.findAll();
		for(Item item:items) {
			System.out.println("--call service---"+item.getName()+"
"+item.getPrice()*item.getQuantity());
			item.setValue(item.getPrice()*item.getQuantity());
		}
		return items;
	}



}
```

Repository

```
public interface ItemRepository extends JpaRepository<Item,Integer>{


}
```

Controller

```
@RestController
@RequestMapping("/api")
public class ItemController {

	@Autowired
	ItemService itemService;

	@GetMapping("/get-items")
	public List<Item> getItems() {
		return itemService.getAllItems();

	}
}
```

TestController

for testing the MVC controller need following annotation on top of TestClass

```
@RunWith(SpringRunner.class)
@WebMvcTest(ItemController.class) //name the controller class which you want to test it load only that class not that depended class like service,repository etc.
```

Here we have to create mock object of bussiness layer we don't want to test the bussiness layer just want to test Controller layer

So create mockMvc object using **@MockMvc** anotation, with help of mockMvc we can call http request etc.

@MockBean used to create the mock object.

```
	@Autowired
	MockMvc mockMvc;
	@MockBean
	ItemServiceImpl itemServiceImpl;
```

Example

```
@RunWith(SpringRunner.class)
@WebMvcTest(ItemController.class)
public class ItemControllerTest {
	@Autowired
	MockMvc mockMvc;
	@MockBean
	ItemServiceImpl itemServiceImpl;

	@Test
	public void getItemFromDB() throws Exception {
		List<Item> items = new ArrayList<>();
		items.add(new Item(1,"omega",10,120));
		when(itemServiceImpl.getAllItems()).thenReturn(items);

		RequestBuilder reqBuilder = MockMvcRequestBuilders.get("/api/get-items").accept(MediaType.APPLICATION_JSON);
		MvcResult result = mockMvc.perform(reqBuilder).andExpect(status().isOk()).andReturn();
		JSONAssert.assertEquals("[{id:1,name:omega,price:10,quantity:120}]", result.getResponse().getContentAsString(),false);

	}

}
```

Test the Business Layer

for testing the bussiness layer required following annotation

```
@RunWith(MockitoJUnitRunner.class)
@InjectMocks  // inject the depened object to target class
@Mock // create mock object of depended class
```

In below example we don't worry about data layer just create mock object of data layer and performs the business operation without call data layer.

```
@RunWith(MockitoJUnitRunner.class)
public class ItemServiceTest {

	@InjectMocks
	ItemServiceImpl itemServiceImpl;

	@Mock
	ItemRepository itemRepository;

	@Test
	public void getItemsFromBusiness() {
		List<Item> items = new ArrayList<>();
		items.add(new Item(1,"item1",10,120));
		items.add(new Item(2,"item2",10,60));
		when(itemRepository.findAll()).thenReturn(items);

		List<Item>testItems = itemServiceImpl.getAllItems();

		System.out.println("---first Index
value--"+testItems.get(0).getValue());
		assertEquals(1200, testItems.get(0).getValue());
		System.out.println("---second Index
value--"+testItems.get(1).getValue());
		assertEquals(600, testItems.get(1).getValue());

	}


}
```

Test the data/persistent Layer.

For testing repository we can use following anotation

```
@DataJpaTest   to test the spring repository it test only inmemory database
@RunWith(SpringRunner.class)
```

```
@RunWith(SpringRunner.class)
@DataJpaTest
public class ItemRepositoryTest {

	@Autowired
	ItemRepository itemRepository;

	@Test
	public void saveItem() {
		List<Item> items = new ArrayList<>();
		items.add(new Item(1,"item1",10,120));
		items.add(new Item(2,"item2",10,60));
		items.add(new Item(4,"item4",30,30));
		itemRepository.saveAll(items);

	}
	@Test
	public void findAll() {

		List<Item> items=itemRepository.findAll();
		items.forEach(item->{
			System.out.println(" id "+item.getId()+" name "+item.getName()
+" price "+item.getPrice());

		});

	}

}
```

Integration Test(Controller,Service,Data Layer)

@SpringbootTest annotation is used to execute the whole application not specific class, because @SpringBootTest search the @SpringBootApplication class and load the spring context and excecute that.
`@SpringBootTest(webEnvironment=WebEnvironment.RANDOM_PORT) Spring used ramdom port number to executed the API`
we can check all layer communication is working fine.
We can not test real database or interface becuase if test with real database and some one change the database then test restlt is failed for testing use inmemory database.

```
@RunWith(SpringRunner.class)
@SpringBootTest(webEnvironment=WebEnvironment.RANDOM_PORT)
public class ItemControllerIntegrationTest {

	@Autowired
	TestRestTemplate restTemplate;

	@Test
	public void integrationTest() throws JSONException {
		String response= restTemplate.getForObject("/get-items",
String.class);
		System.out.println(response);
		JSONAssert.assertEquals("{id:1,name:omega,price:10,quantity:120}",
response, false);
	}


}
```

Note: Also we can used mock for any Layer to create the fake object for example we don't want to test the real database record so then created the mock object to annotated with @MockBean annotation

How to create different propeties for test db or in memory db cofiguration?

/src/test/ create new folder **resources** in these folder create properties file to configure in memory database.

Example:
/src/test/resources have application.properties

Here we can override application.properties value in test propeties
database name password may be different for both propeties

`@TestPropertySource(locations="{classPath:test-configurarion.propeties}")`
these annotation is used for if you have multiple propeties file and we wan to used in specific propetis in specific class

Example:

```
@RunWith(SpringRunner.class)
@SpringBootTest(webEnvironment=WebEnvironment.RANDOM_PORT)

public class ItemControllerIntegrationTest {

	@Autowired
	TestRestTemplate restTemplate;

	@MockBean
	ItemRepository repository;

	@Test
	public void integrationTest() throws JSONException {
		String response= restTemplate.getForObject("/get-items",
String.class);
		System.out.println(response);
		JSONAssert.assertEquals("{id:1,name:omega,price:10,quantity:120}",
response, false);
	}

}
```

----------2nd exa. Integration Testing----------

```java
@RunWith(SpringRunner.class)
@SpringBootTest(webEnvironment=WebEnvironment.RANDOM_PORT)
@AutoConfigureMockMvc
public class IntegrationTesting {

	@Autowired
	MockMvc mockMvc;

	@MockBean
	ItemRepository repository;

	  ObjectMapper objectMapper = new ObjectMapper();


	@Test
	public void testPostMethod() throws JsonProcessingException, Exception {
		Item item = new Item(110,"test",20,20);
		  String inputJson = objectMapper.writeValueAsString(item);
		   RequestBuilder reqBuilder =
	MockMvcRequestBuilders.post("/api/save-item").

	contentType(MediaType.APPLICATION_JSON).content(inputJson);
			MvcResult result = mockMvc.perform(reqBuilder)
					.andExpect(status().isOk())
					.andReturn();



	}

	@Test
	public void getMethodTest() throws Exception {
	RequestBuilder reqBuilder = MockMvcRequestBuilders.get("/get-items").
				contentType(MediaType.APPLICATION_JSON);
			MvcResult result = mockMvc.perform(reqBuilder)
					.andExpect(status().isOk())
					.andReturn();
			String resp=result.getResponse().getContentAsString();
			Item item = objectMapper.readValue(resp, Item.class);

	}
```

How to test RestApi for different type http method like
1)GET
2)POST
3)DELETE
4)PUT

Example Test the application with Post methods

```
@RunWith(SpringRunner.class)
@WebMvcTest(ItemController.class)
public class TestPostMethod {
       @Autowired
       MockMvc mvc;
      @MockBean
      ItemService itemService;

      @Test
      public void testPostMethod() throws JsonProcessingException, Exception {

            Item item = new Item(110,"test",20,20);

            when(itemService.saveItem(item)).thenReturn(true);

              String inputJson = mapToJson(item);
               RequestBuilder reqBuilder =
MockMvcRequestBuilders.post("/api/save-item").

contentType(MediaType.APPLICATION_JSON).content(inputJson);
                  MvcResult result = mvc.perform(reqBuilder)
                              .andExpect(status().isOk())
                              .andReturn();
                  System.out.println(result.getResponse().getContentAsString());


      }
      //Convert Object to Json
       protected String mapToJson(Object obj) throws JsonProcessingException {
            ObjectMapper objectMapper = new ObjectMapper();
            return objectMapper.writeValueAsString(obj);
        }

}
```