

Web API Design with Spring Boot Week 16 Coding Assignment


Points possible: 75

URL to GitHub Repository: <https://github.com/adrianedirisinghe1989/Week-13-16-SpringBoot>


URL to Public Link of your Video: <https://www.youtube.com/watch?v=5KuV7U4Mfts>

Instructions :

1. Follow the **Coding Steps** below to complete this assignment.

- In Spring Tool Suite (STS), or an IDE of your choice, write the code that accomplishes the objectives listed below. Ensure that the code compiles and runs as directed.
- Use your existing repo or create a new repository on GitHub for this week's assignment and push your completed code to the repo, including your entire Maven Project Directory (e.g., jeep-sales) and any additional files (e.g. .sql files) that you create. In addition, screenshot your ERD and push the screenshot to your GitHub repo.
- Include the screenshots into this Assignment Document indicated by: 
- Create a video showcasing your work:
 - In this video: record and present your project verbally while showing the results of the working project.
 - Easy way to Create a video: Start a meeting in Zoom, share your screen, open Eclipse with the code and your Console window, start recording & record yourself describing and running the program showing the results.
 - Your video should be a maximum of 5 minutes.
 - Upload your video with a public link.
 - Easy way to Create a Public Video Link: Upload your video recording to YouTube with a public link.


2. In addition, please include the following in your Coding Assignment Document:

- The requested screenshots, indicated by: 
- The URL for this week's GitHub repository.
- The URL of the public link of your video.

3. Save the Coding Assignment Document as a .pdf and do the following:

- Push the .pdf to the GitHub repo for this week.
- Upload the .pdf to the LMS in your Coding Assignment Submission.

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Here's a friendly tip: as you watch the videos, code along with the videos. This will help you with the homework. When a screenshot is required, look for the icon:  You will keep adding to this project throughout this part of the course. When it comes time for the final project, use this project as a starter.

Project Resources: <https://github.com/promineotech/Spring-Boot-Course-Student-Resources>

Coding Steps:

For this week's homework you need to copy source code from the supplied resources.

For this week's homework you need to copy source code from the Source folder in the supplied resources. Wait until the instructions tell you to copy the resources or you will get errors.


- 1) Select some options for a Jeep order:
 - a) Use the `data.sql` file or the jeep database tables to select options for a Jeep order. Select any one of each of the following for the order:
 - i) color
 - ii) customer
 - iii) engine
 - iv) model
 - v) tire(s)
 - b) Select one or more options from the options table as well. Keep in mind that some options may work better than others – but if you want to put 37-inch tires on your Jeep Renegade, so be it!
- 2) Create a new integration test class to test a Jeep order named `CreateOrderTest.java`. Create this class in `src/test/java` in the `com.promineotech.jeepp.controller` package.
 - a) Add the Spring Boot Test annotations: `@SpringBootTest`, `@ActiveProfiles`, and `@Sql`. They should have the same parameters as the test created in weeks 1 and 2.
 - b) Create a test method (annotated with `@Test`) named `testCreateOrderReturnsSuccess201`.
 - c) In the test class, create a method named `createOrderBody`. This method returns a type of `String`. In this method, return a JSON object with the IDs that you picked in Step 1a and 1b. For example:

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```
{
  "customer": "MORISON_LINA",
  "model": "WRANGLER",
  "trim": "Sport Altitude",
  "doors": 4,
  "color": "EXT_NACHO",
  "engine": "2_0_TURBO",
  "tire": "35_TOYO",
  "options": [
    "DOOR_QUAD_4",
    "EXT_AEV_LIFT",
    "EXT_WARN_WINCH",
    "EXT_WARN BUMPER_FRONT",
    "EXT_WARN BUMPER_REAR",
    "EXT_ARB_COMPRESSOR"
  ]
}
```

Make sure that the JSON is correct! If necessary, use a JSON formatter/validator like the one here: <https://jsonformatter.curiousconcept.com/>.

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Produce a screenshot of the createOrderBody() method. 

```
1 package com.promineotech.jee.controller.support;
2
3 public class CreateOrderTestSupport extends BaseTest {
4
5     /**
6      *
7      * @return
8      */
9     protected String createOrderBody() {
10         //@formatter:off
11         return "{\n"
12             + "\"customer\": \"MORISON_LINA\", \n"
13             + "\"model\": \"WRANGLER\", \n"
14             + "\"trim\": \"Sport Altitude\", \n"
15             + "\"doors\": 4, \n"
16             + "\"color\": \"EXT_NACHO\", \n"
17             + "\"engine\": \"2.0_TURBO\", \n"
18             + "\"tire\": \"35_TOYO\", \n"
19             + "\"options\": [\n"
20             + "\"DOOR_QUAD_4\", \n"
21             + "\"EXT_AEV_LIFT\", \n"
22             + "\"EXT_WARN_WINCH\", \n"
23             + "\"EXT_WARN BUMPER_FRONT\", \n"
24             + "\"EXT_WARN BUMPER_REAR\", \n"
25             + "\"EXT_ARB_COMPRESSOR\", \n"
26             + "] \n"
27         + "}";
28         //@formatter:on
29     }
30 }
31
```

In the test method, assign the return value of the createOrderBody() method to a variable named body.

- d) In the test class, add an instance variable named serverPort to hold the port that Tomcat is listening on in the test. Annotate the variable with @LocalServerPort.
- e) Add another instance variable for an injected TestRestTemplate named restTemplate.

- f) In the test method, assign a value to a local variable named uri as follows:

```
String uri = String.format("http://localhost:%d/orders", serverPort);
```

- g) In the test method, create an HttpHeaders object and set the content type to "application/json" like this:

```
HttpHeaders headers = new HttpHeaders();
headers.setContentType(MediaType.APPLICATION_JSON);
```

Make sure to import the package org.springframework.http.HttpHeaders.

- h) Create an HttpEntity object and set the request body and headers:

```
HttpEntity<String> bodyEntity = new HttpEntity<>(body, headers);
```

- i) Send the request body and headers to the server. The Order class should have been copied earlier from the supplied resources. Ensure that you import com.promineotech.jee.entity.Order and not some other Order class.

```
ResponseEntity<Order> response = restTemplate.exchange(uri,
```

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```
HttpMethod.POST, bodyEntity, Order.class);
```

- j) Add the AssertJ assertions to ensure that the response is correct. Replace the expected values to match the JSON in step 2c.

```
assertThat(response.getStatusCode()).isEqualTo(HttpStatus.CREATED);

assertThat(response.getBody()).isNotNull();

Order order = response.getBody();

assertThat(order.getCustomer().getCustomerId()).isEqualTo("MORISON_LINA");
assertThat(order.getModel().getModelId()).isEqualTo(JeepModel.WRANGLER);
assertThat(order.getModel().getTrimLevel()).isEqualTo("Sport Altitude");
assertThat(order.getModel().getNumDoors()).isEqualTo(4);
assertThat(order.getColor().getColorId()).isEqualTo("EXT_NACHO");
assertThat(order.getEngine().getEngineId()).isEqualTo("2_0_TURBO");
assertThat(order.getTire().getTireId()).isEqualTo("35_TOYO");
assertThat(order.getOptions()).hasSize(6);
```

- k) Produce a screenshot of the test method. 

```
class CreateOrderTest extends CreateOrderTestSupport {
    /**
     *
     */
    @Test
    void testCreateOrderReturnSuccess201() {
        //Given: and order as JSON
        String body = createOrderBody();
        String uri = getBaseUriForOrders();

        HttpHeaders headers = new HttpHeaders();
        headers.setContentType(MediaType.APPLICATION_JSON);

        HttpEntity<String> bodyEntity = new HttpEntity<>(body);


        //When: the order is sent
        ResponseEntity<Order> response = getRestTemplate().exchange(uri, HttpMethod.POST,
            bodyEntity, Order.class);

        //Then: a 201 status is returned
        assertThat(response.getStatusCode()).isEqualTo(HttpStatus.CREATED);

        //And: the returned order is correct
        assertThat(response.getBody()).isNotNull();
        Order order = response.getBody();
        assertThat(order.getCustomer().getCustomerId()).isEqualTo("MORISON_LINA");
        assertThat(order.getModel().getModelId()).isEqualTo(JeepModel.WRANGLER);
        assertThat(order.getModel().getTrimLevel()).isEqualTo("Sport Altitude");
        assertThat(order.getModel().getNumDoors()).isEqualTo(4);
        assertThat(order.getColor().getColorId()).isEqualTo("EXT_NACHO");
        assertThat(order.getEngine().getEngineId()).isEqualTo("2_0_TURBO");
        assertThat(order.getTire().getTireId()).isEqualTo("35_TOYO");
        assertThat(order.getOptions()).hasSize(6);
    }
}
```

- 3) In the controller sub-package in src/main/java, create an interface named JeepOrderController. Add @RequestMapping("/orders") as a class-level annotation.

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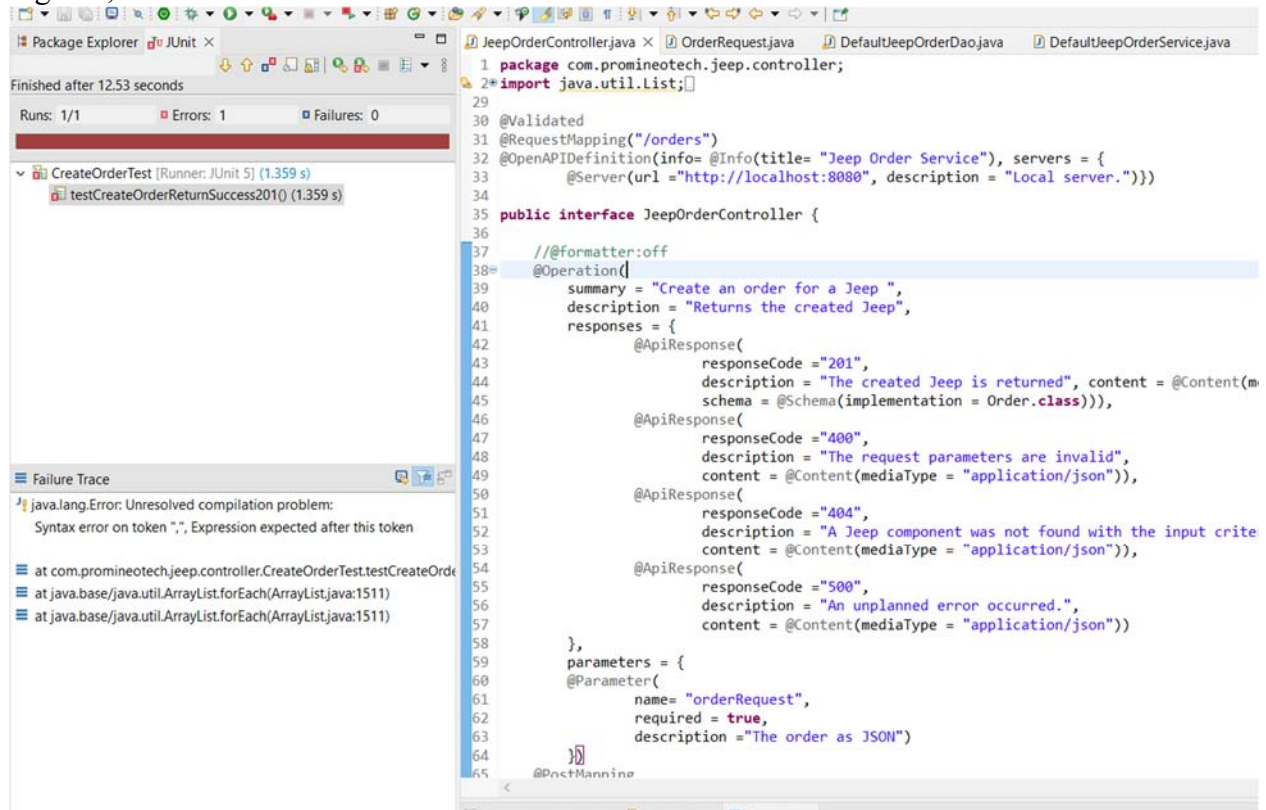
- Create a method in the interface to create an order (createOrder). It should return an object of type Order (see below). It should accept a single parameter of type OrderRequest as described in the video. Make sure it accepts an HTTP POST request and returns a status code of 201 (created).
- Add the @RequestBody annotation to the orderRequest parameter. Make sure to add the RequestBody annotation from the org.springframework.web.bind.annotation package.
- Produce a screenshot of the finished JeepOrderController interface showing no compile errors. 

```
1 package com.promineotech.jeepp.controller;
2 import java.util.List;
3
4 @Validated
5 @RequestMapping("/orders")
6 @OpenAPIDefinition(info= @Info(title= "Jeep Order Service"), servers = {
7     @Server(url ="http://localhost:8080", description = "Local server.")})
8
9 public interface JeepOrderController {
10
11     // @formatter:off
12     @Operation(
13         summary = "Create an order for a Jeep ",
14         description = "Returns the created Jeep",
15         responses = {
16             @ApiResponse(
17                 responseCode = "201",
18                 description = "The created Jeep is returned", content = @Content(mediaType = "application/json",
19                     schema = @Schema(implementation = Order.class))),
20             @ApiResponse(
21                 responseCode = "400",
22                 description = "The request parameters are invalid",
23                 content = @Content(mediaType = "application/json")),
24             @ApiResponse(
25                 responseCode = "404",
26                 description = "A Jeep component was not found with the input criteria",
27                 content = @Content(mediaType = "application/json")),
28             @ApiResponse(
29                 responseCode = "500",
30                 description = "An unplanned error occurred.",
31                 content = @Content(mediaType = "application/json"))
32         },
33         parameters = {
34             @Parameter(
35                 name= "orderRequest",
36                 required = true,
37                 description = "The order as JSON")
38         })
39     }
40
41     @PostMapping
42     @ResponseStatus(code= HttpStatus.CREATED )
43     Order createOrder(@Valid @RequestBody OrderRequest orderRequest);
44 }
```

- Create a class that implements JeepOrderController named DefaultJeepOrderController.
 - Add @RestController as a class-level annotation.
 - Add a log line to the implementing controller method showing the input request body (orderRequest)

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- c) Run the test to show a red status bar. Produce a screenshot that shows the test method, the log line, and the red JUnit status bar.



- 5) Find the Maven dependency `spring-boot-starter-validation` by looking it up at <https://mvnrepository.com/>. Add this repository to the project POM file (pom.xml).
- 6) Add the class-level annotation `@Validated` to the `JeepOrderController` interface.
- 7) Add Bean Validation annotations to the `OrderRequest` class as shown in the video.
- a) Use these annotations for String types:
 - i) `@NotNull`
 - ii) `@Length(max = 30)`
 - iii) `@Pattern(regexp = "[\\w\\s]*")`
 - b) Use these annotations for integer types:
 - i) `@Positive`
 - ii) `@Min(2)`


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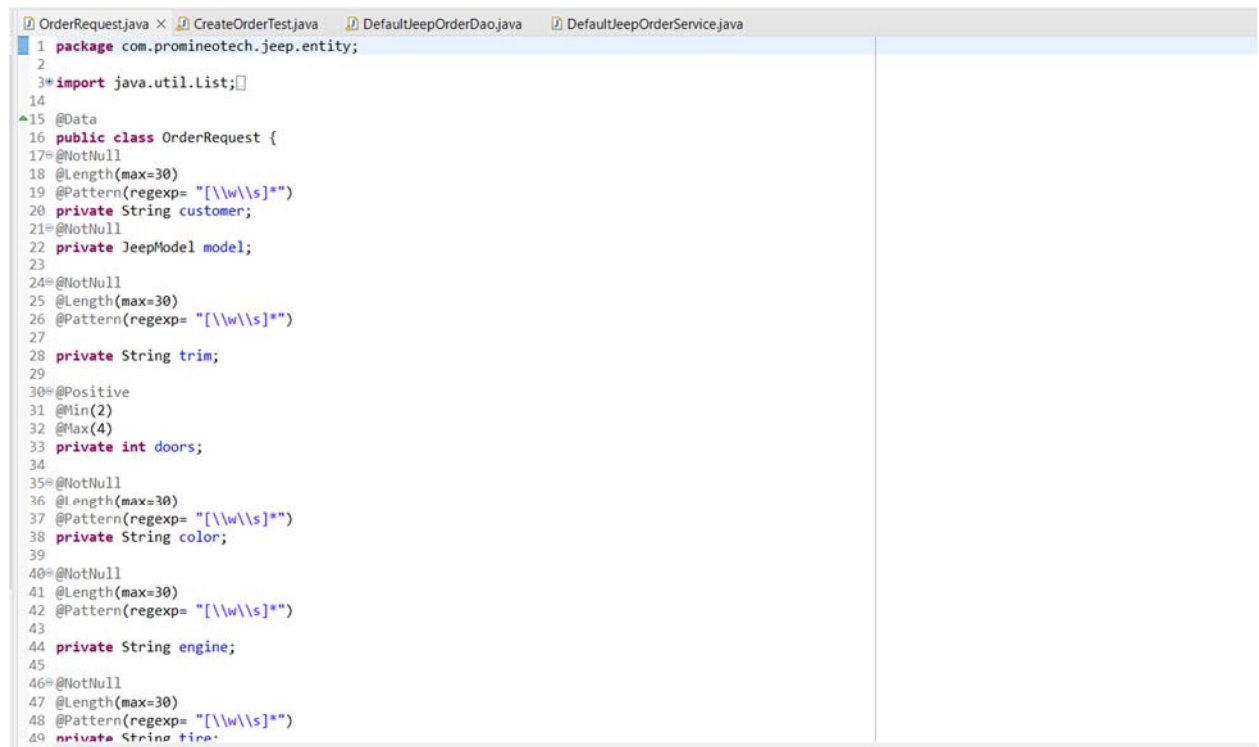
iii) @Max(4)

- c) Add @NotNull to the enum type.
- d) Add validation to the list element (type String) by adding the validation annotations *inside* the generic definition. So, to add the String validation to the options, you would do this:

```
private List<@NotNull @Length(max = 30) @Pattern(regexp = "[\\w\\s]*") String> options;
```

Do not apply a @NotNull annotation to the List because if you have no options the List may be null.

- e) Produce a screenshot of this class with the annotations. 



```
1 package com.promineotech.jee.entity;
2
3 import java.util.List;
4
5 @Data
6 public class OrderRequest {
7     @NotNull
8     @Length(max=30)
9     @Pattern(regexp= "[\\w\\s]*")
10    private String customer;
11
12    @NotNull
13    private JeepModel model;
14
15    @NotNull
16    @Length(max=30)
17    @Pattern(regexp= "[\\w\\s]*")
18    private String trim;
19
20    @Positive
21    @Min(2)
22    @Max(4)
23    private int doors;
24
25    @NotNull
26    @Length(max=30)
27    @Pattern(regexp= "[\\w\\s]*")
28    private String color;
29
30    @NotNull
31    @Length(max=30)
32    @Pattern(regexp= "[\\w\\s]*")
33    private String engine;
34
35    @NotNull
36    @Length(max=30)
37    @Pattern(regexp= "[\\w\\s]*")
38    private String type;
```

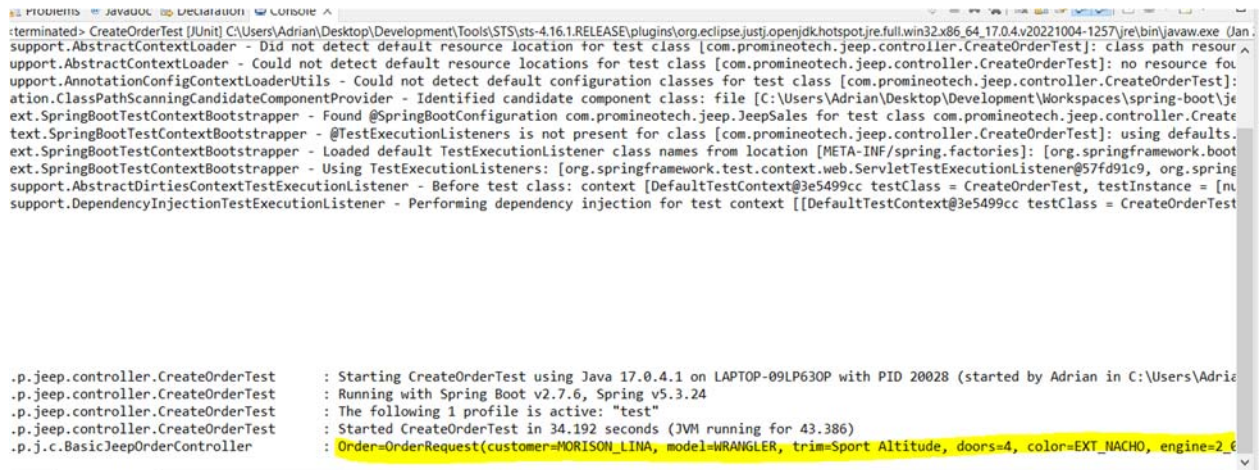
- 8) In the jeep.service sub-package, create the empty (no methods yet) order service interface (named JeepOrderService) and implementation (named DefaultJeepOrderService).

- a) Inject the interface into the order controller implementation class.
- b) Add the @Service annotation to the service implementation class.
- c) Create the createOrder method in the interface and implementing service. The method signature should look like this:

```
Order createOrder(OrderRequest orderRequest);
```


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- d) Call the `createOrder` method from the controller and return the value returned by the service.
- e) Add a log line in the `createOrder` method and log the `orderRequest` parameter.
- f) Run the test `CreateOrderTest` again. Produce a screenshot showing that the service layer `createOrder` method correctly prints the log line in the console. (e.g. prints out the `OrderRequest` in the console from within the Service Layer).



```
terminated> CreateOrderTest [JUnit] C:\Users\Adrian\Desktop\Development\Tools\STS\sts-4.16.1.RELEASE\plugins\org.eclipse.justi.openjdk.hotspot.jre.full.win32.x86_64_17.0.4.v20221004-1257\jre\bin\javaw.exe (Jan.
support.AbstractContextLoader - Did not detect default resource location for test class [com.promineotech.jee
support.AbstractContextLoader - Could not detect default resource locations for test class [com.promineotech.jee
support.AnnotationConfigContextLoaderUtils - Could not detect default configuration classes for test class [com.promineotech.jee.controller.CreateOrderTest]:
ation.ClassPathScanningCandidateComponentProvider - Identified candidate component class: file [C:\Users\Adrian\Desktop\Development\Workspaces\spring-boot\je
ext.SpringBootTestContextBootstrapper - Found @SpringBootConfiguration com.promineotech.jee.JeeSales for test class com.promineotech.jee.controller.Create
text.SpringBootTestContextBootstrapper - @TestExecutionListeners is not present for class [com.promineotech.jee.controller.CreateOrderTest]: using defaults.
ext.SpringBootTestContextBootstrapper - Loaded default TestExecutionListener class names from location [META-INF/spring.factories]: [org.springframework.boot
ext.SpringBootTestContextBootstrapper - Using TestExecutionListeners: [org.springframework.test.context.web.ServletTestExecutionListener@57fd91c9, org.spring
support.AbstractDirtiesContextTestExecutionListener - Before test class: context [DefaultTestContext@3e5499cc testClass = CreateOrderTest, testInstance = [nu
support.DependencyInjectionTestExecutionListener - Performing dependency injection for test context [[DefaultTestContext@3e5499cc testClass = CreateOrderTest

.p.jee.controller.CreateOrderTest : Starting CreateOrderTest using Java 17.0.4.1 on LAPTOP-09LP630P with PID 20028 (started by Adrian in C:\Users\Adria
.p.jee.controller.CreateOrderTest : Running with Spring Boot v2.7.6, Spring v5.3.24
.p.jee.controller.CreateOrderTest : The following 1 profile is active: "test"
.p.jee.controller.CreateOrderTest : Started CreateOrderTest in 34.192 seconds (JVM running for 43.386)
.p.j.c.BasicJeeOrderController : Order=OrderRequest(customer=MORISON_LINA, model=WRANGLER, trim=Sport Altitude, doors=4, color=EXT_NACHO, engine=2.4)
```

- 9) In the `jee.dao` sub-package, create the empty (no methods yet) DAO interface (named `JeepOrderDao`) and implementation (named `DefaultJeepOrderDao`).
 - a) Inject the DAO interface into the order service implementation class.
 - b) Add the `@Component` annotation to the DAO implementation class.
- 10) Replace the entire content of `JeepOrderDao.java` with the source found in `JeepOrderDao.source`. The source file is found in the Source folder of the supplied project resources.
- 11) *** The next steps require you to copy source code from the Source directory in the supplied resources. Please follow the instructions EXACTLY. Some steps require you to replace ALL the source in a file. Some steps require you to ADD source to a file.
- 12) Copy the contents of the file `DefaultJeepOrderDao.source` into `DefaultJeepOrderDao.java`. The source file is found in the Source folder of the supplied project resources.

In Eclipse, click the "Source" menu and select "Organize Imports". Pick packages from your

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project where applicable. Make sure you pick the import `java.util.Optional`, `java.util.List`, and `org.springframework.jdbc.core.RowMapper`.

- 13) Copy the *contents* of the file `DefaultJeepOrderService.source` into `DefaultJeepOrderService.java`. Add the source after the `createOrder()` method, but *inside* the class body. The source file is found in the Source folder of the supplied project resources.


In Eclipse, click the "Source" menu and select "Organize Imports". Pick packages from your project where applicable.

- 14) In `DefaultJeepOrderService.java`, work with the method `createOrder`.

- a) Add the `@Transactional` annotation to the `createOrder` method.
- b) In the `createOrder` method call the copied methods: `getCustomer`, `getModel`, `getColor`, `getEngine`, `getTire` and `getOption`, assigning the return values of these methods to variables of the appropriate types.
- c) Calculate the price, including all options.

- 15) In `JeepOrderDao.java` and `DefaultJeepOrderDao.java`, add the method:

```
Order saveOrder(Customer customer, Jeep jeep, Color color, Engine engine, Tire
    tire, BigDecimal price, List<Option> options);
```

- a) Call the `jeepOrder.Dao.saveOrder` method from the `jeepOrderSalesService.createOrder` service. Produce a screenshot of the `jeepOrderSalesService.createOrder` method. 

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```
CreateOrderTest.java  DefaultJeepOrderDao.java  DefaultJeepOrderService.java ×
4*import java.math.BigDecimal;
19
20
21 @Service
22 public class DefaultJeepOrderService implements JeepOrderService {
23
24     @Autowired
25     private JeepOrderDao jeepOrderDao;
26
27     @Transactional
28     @Override
29     public Order createOrder(OrderRequest orderRequest) {
30         Customer customer = getCustomer(orderRequest);
31         Jeep jeep = getModel(orderRequest);
32         Color color = getColor(orderRequest);
33         Engine engine = getEngine(orderRequest);
34         Tire tire = getTire(orderRequest);
35         List<Option> options = getOption(orderRequest);
36
37         BigDecimal price = jeep.getBasePrice().add(color.getPrice())
38             .add(engine.getPrice()).add(tire.getPrice());
39
40         for(Option option : options) {
41             price = price.add(option.getPrice());
42         }
43
44         return jeepOrderDao.saveOrder(customer, jeep, color, engine, tire, price, options);
45     }
```

b) Write the implementation of the saveOrder method in the DAO.

- i) Call the supplied generateInsertSql method, passing in the customer, jeep, color, engine, tire and price. Assign the return value of the method to a SqlParameter object.
- ii) Call the update method on the NamedParameterJdbcTemplate object, passing in a KeyHolder object as shown in the video. Create the KeyHolder like this:

```
KeyHolder keyHolder = new GeneratedKeyHolder();
```

Be sure to extract the order primary key from the KeyHolder object into a variable of type Long named orderPK.


- iii) Write a method named saveOptions as shown in the video. This method should have the following method signature:

```
private void saveOptions(List<Option> options, Long orderPK)
```

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For each option in the Options list, call the supplied `generateInsertSql` method passing the parameters option and order primary key (`orderPk`). Call the `update` method on the `NamedParameterJdbcTemplate` object.

iv) In the `saveOrder` method in the DAO implementation, return an `Order` object using the `Order.builder`. The `Order` should include `orderPk`, `customer`, `jeep` (model), `color`, `engine`, `tire`, `options` and `price`.

v) Produce a screenshot of the `saveOrder` method. 

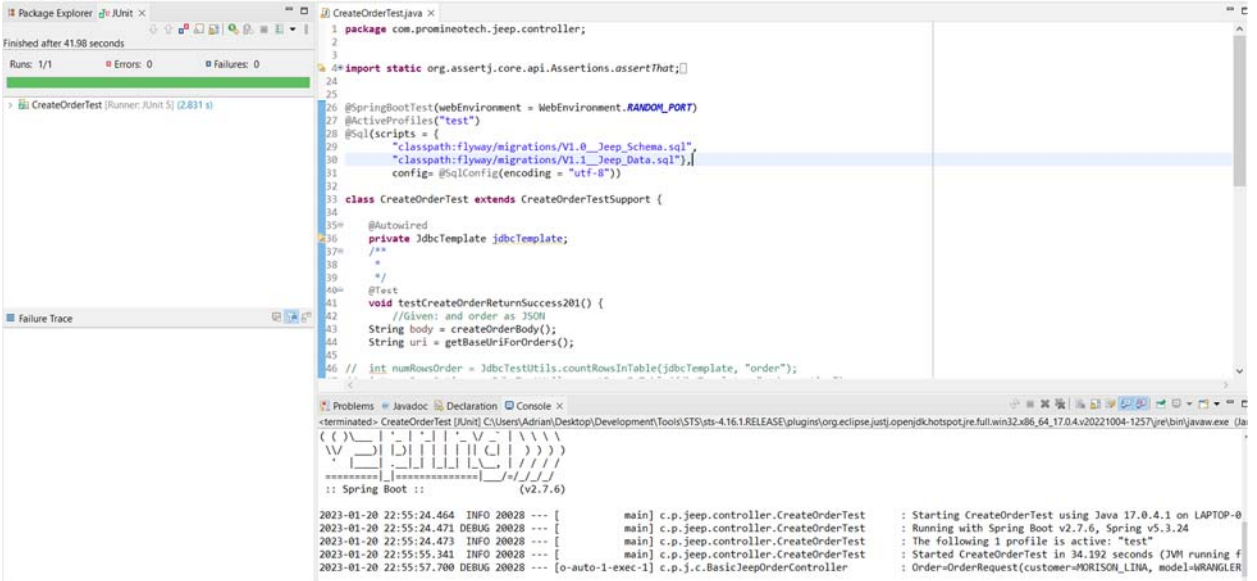
```
@Override
public Order saveOrder(Customer customer, Jeep jeep, Color color, Engine engine, Tire tire, BigDecimal price,
    List<Option> options) {
    SqlParams params = generateInsertSql(customer, jeep, color, engine, tire, price);

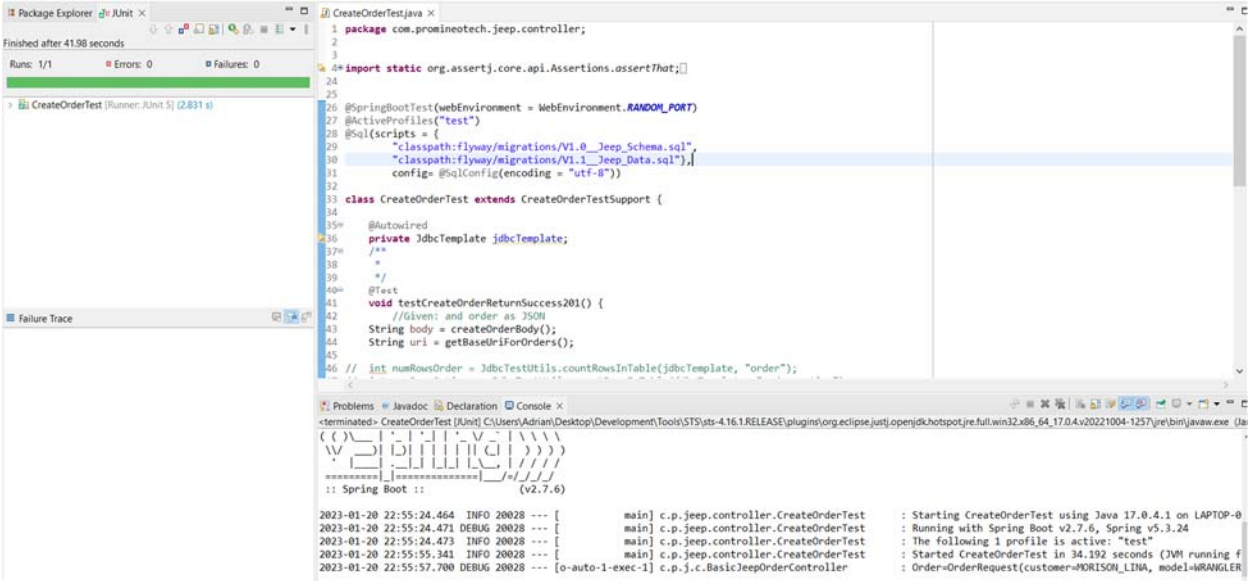
    KeyHolder keyHolder = new GeneratedKeyHolder();
    jdbcTemplate.update(params.sql, params.source, keyHolder);

    Long orderPk = keyHolder.getKey().longValue();
    saveOptions(options, orderPk);

    //@formatter:off
    return Order.builder()
        .orderPk(orderPk)
        .customer(customer)
        .model(jeep)
        .color(color)
        .engine(engine)
        .tire(tire)
        .options(options)
        .price(price)
        .build();
    //@formatter:on
}
```

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- c) Run the integration test in `CreateOrderTest`. Produce a screenshot of the test method that shows the green JUnit status bar, the console output, and the test class. 



The screenshot displays an IDE with the `CreateOrderTest` class open. The class is annotated with `@SpringBootTest` and `@ActiveProfiles("test")`. It includes a `@Sql` block for database migrations and a `@Test` method `testCreateOrderReturnSuccess201()` that uses `@Autowired` to inject a `JdbcTemplate` and performs a database query. The JUnit status bar at the top indicates 'Runs: 1/1', 'Errors: 0', and 'Failures: 0'. The console output shows the test execution details, including the Spring Boot version (v2.7.6) and the test results.

```
package com.promineotech.jee.controller;

import static org.assertj.core.api.Assertions.assertThat;

@SpringBootTest(webEnvironment = WebEnvironment.RANDOM_PORT)
@ActiveProfiles("test")
@Sql(scripts = {
    "classpath:flyway/migrations/V1.0_jeep_schema.sql",
    "classpath:flyway/migrations/V1.1_jeep_data.sql"},
    config = @SqlConfig(encoding = "utf-8"))
class CreateOrderTest extends CreateOrderTestSupport {

    @Autowired
    private JdbcTemplate jdbcTemplate;

    /**
     *
     */
    @Test
    void testCreateOrderReturnSuccess201() {
        //Given: and order as JSON
        String body = createOrderBody();
        String url = getBaseUrlForOrders();

        // int numRowsOrder = JdbcTemplateUtils.countRowsInTable(jdbcTemplate, "order");
    }
}
```

2023-01-20 22:55:24.464 INFO 20028 --- [main] c.p.jee.controller.CreateOrderTest : Starting CreateOrderTest using Java 17.0.4.1 on LAPTOP-0
2023-01-20 22:55:24.471 DEBUG 20028 --- [main] c.p.jee.controller.CreateOrderTest : Running with Spring Boot v2.7.6, Spring v5.3.24
2023-01-20 22:55:24.473 INFO 20028 --- [main] c.p.jee.controller.CreateOrderTest : The following 1 profile is active: "test"
2023-01-20 22:55:55.341 INFO 20028 --- [main] c.p.jee.controller.CreateOrderTest : Started CreateOrderTest in 34.192 seconds (JVM running f
2023-01-20 22:55:57.700 DEBUG 20028 --- [o-auto-1-exec-1] c.p.j.c.BasicJeepOrderController : Order=OrderRequest(customer=PORTISCH_LINA, model=WRANGLER