


Web API Design with Spring Boot Week 4 Coding Assignment

Points possible: 70

Category	Criteria	% of Grade
Functionality	Does the code work?	25
Organization	Is the code clean and organized? Proper use of white space, syntax, and consistency are utilized. Names and comments are concise and clear.	25
Creativity	Student solved the problems presented in the assignment using creativity and out of the box thinking.	25
Completeness	All requirements of the assignment are complete.	25

Instructions: In Eclipse, or an IDE of your choice, write the code that accomplishes the objectives listed below. Ensure that the code compiles and runs as directed. Take screenshots of the code and of the running program (make sure to get screenshots of all required functionality) and paste them in this document where instructed below. Create a new repository on GitHub for this week's assignments and push this document, with your Java project code, to the repository. Add the URL for this week's repository to this document where instructed and submit this document to your instructor when complete.

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 - EXT_SNAZZBERRY
 - ii) Customer – MAYNARD_TORBJORG
 - iii) Engine - 3_6_HYBRID
 - iv) Model – RENEGADE
 - v) tire(s) - 37_COOPER
- 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! - DOOR_FISHBONE_4 , WHEEL_QUAD_MOAB
- 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.jeepl.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 b. For example:

```
{
  "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/>.

Produce a screenshot of the `createOrderBody()` method. 

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.jeepp.entity.Order` and not some other `Order` class.

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


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

a) 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).

b) Add the `@RequestBody` annotation to the `orderRequest` parameter. Make sure to add the `RequestBody` annotation from the `org.springframework.web.bind.annotation` package.


- c) Produce a screenshot of the finished `JeepOrderController` interface showing no compile errors. 
- 4) Create a class that implements `JeepOrderController` named `DefaultJeepOrderController`.
 - a) Add `@RestController` as a class-level annotation.
 - b) Add a log line to the implementing controller method showing the input request body (`orderRequest`)
 - 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)`
 - 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. 
- 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);
```

- 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). 
- 9) In the `jeep.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 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. 

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 `SqlParams` 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)
```

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. 

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. 

Screenshots of Code:

```
private String createOrderBody() {
    return "{\n"
        + "  \"customer\": \"MAYNARD_TORBJORG\",\n"
        + "  \"model\": \"RENEGADE\",\n"
        + "  \"trim\": \"Islander\",\n"
        + "  \"doors\": 4,\n"
        + "  \"color\": \"EXT_SNAZZBERRY\",\n"
        + "  \"engine\": \"3_6_HYBRID\",\n"
        + "  \"tire\": \"37_COOPER\",\n"
        + "  \"options\": [\n"
        + "    \"DOOR_FISHBONE_4\",\n"
        + "    \"WHEEL_QUAD_MOAB\"\n"
        + "  ]\n"
        + "}";
}
```

2c.

2k.

```
@Test
void testCreateOrderReturnsSuccess201() {
    //Given: an order as JSON
    String body = createOrderBody();
    String uri = String.format("http://localhost:%d/orders", serverPort);

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

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

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

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

    Order order = response.getBody();
    assertThat(order.getCustomer().getCustomerId()).isEqualTo("MAYNARD_TORBJORG");
    assertThat(order.getModel().getModelId()).isEqualTo(JeepModel.RENEGADE);
    assertThat(order.getModel().getTrimLevel()).isEqualTo("Islander");
    assertThat(order.getModel().getNumDoors()).isEqualTo(4);
    assertThat(order.getColor().getColorId()).isEqualTo("EXT_SNAZZBERRY");
    assertThat(order.getEngine().getEngineId()).isEqualTo("3_6_HYBRID");
    assertThat(order.getTire().getTireId()).isEqualTo("37_COOPER");
    assertThat(order.getOptions()).hasSize(2);
}
```



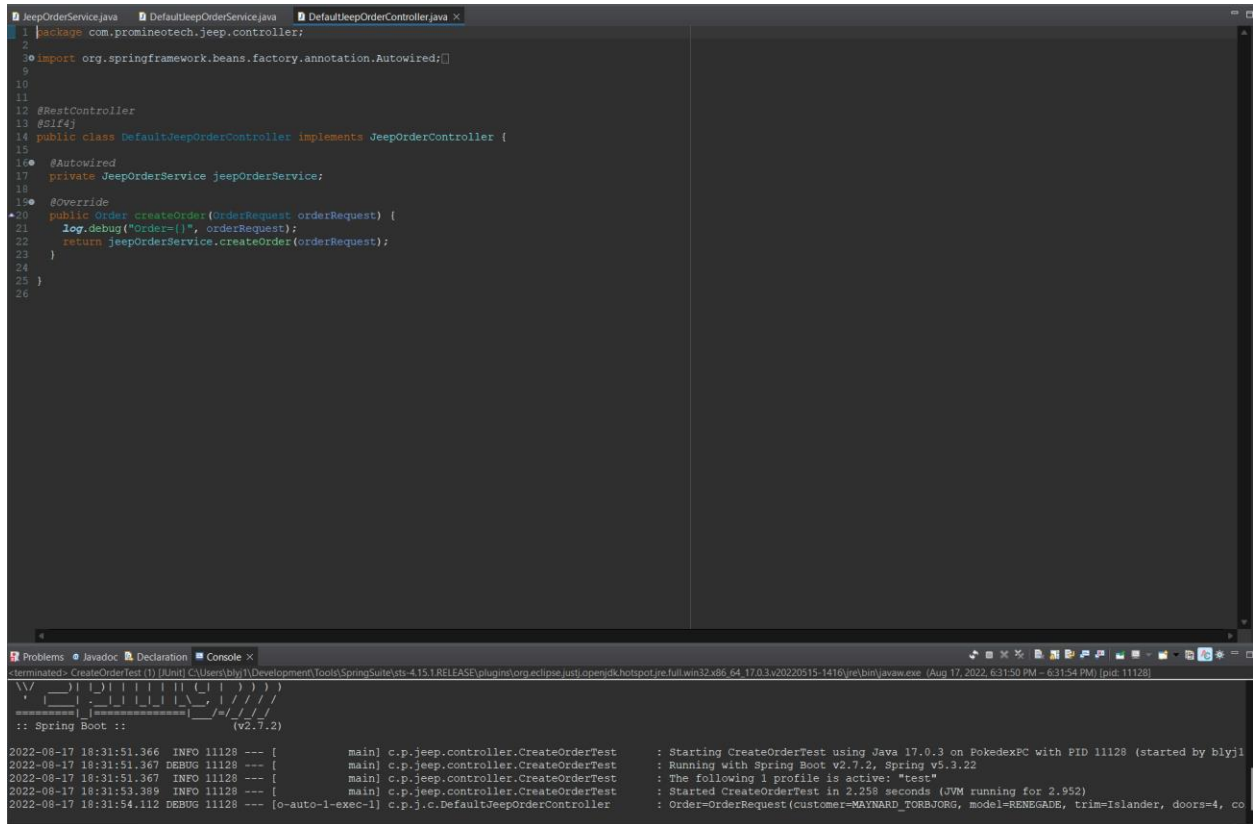
```

CreateOrderTest.java  JeepOrderController.java  OrderRequest.java ×
1 package com.promineotech.jeepp.entity;
2
3 import java.util.List;
4
11
12 @Data
13 public class OrderRequest {
14
15     @NotNull
16     @Length(max = 30)
17     @Pattern(regexp = "[\\w\\s]*")
18     private String customer;
19
20     @NotNull
21     private JeepModel model;
22
23     @NotNull
24     @Length(max = 30)
25     @Pattern(regexp = "[\\w\\s]*")
26     private String trim;
27
28     @Positive
29     @Min(2)
30     @Max(4)
31     private int doors;
32
33     @NotNull
34     @Length(max = 30)
35     @Pattern(regexp = "[\\w\\s]*")
36     private String color;
37
38     @NotNull
39     @Length(max = 30)
40     @Pattern(regexp = "[\\w\\s]*")
41     private String engine;
42
43     @NotNull
44     @Length(max = 30)
45     @Pattern(regexp = "[\\w\\s]*")
46     private String tire;
47
48     private List<@NotNull @Length(max = 30) @Pattern(
49         regexp = "[\\w\\s]*") String> options;
50 }
51

```

7e.

8f.



The screenshot shows an IDE with two tabs: 'JeepOrderService.java' and 'DefaultJeepOrderController.java'. The 'DefaultJeepOrderController.java' tab is active, showing the following code:

```
1 package com.promineotech.jeep.controller;
2
3 import org.springframework.beans.factory.annotation.Autowired;
4
5
6
7
8
9
10
11
12 @RestController
13 @Slf4j
14 public class DefaultJeepOrderController implements JeepOrderController {
15
16     @Autowired
17     private JeepOrderService jeepOrderService;
18
19     @Override
20     public Order createOrder(OrderRequest orderRequest) {
21         log.debug("Order={}", orderRequest);
22         return jeepOrderService.createOrder(orderRequest);
23     }
24 }
25
26
```

The console output shows the following logs:

```
<terminated> CreateOrderTest (1) [Unit] C:\Users\bly1\Development\Tools\SpringSuite\sts-4.15.1\RELEASE\plugins\org.eclipse.justi.openjdk.hotspot.jre.full.win32.x86_64.17.0.3.v20220515-1416\jre\bin\java.exe (Aug 17, 2022, 6:31:50 PM - 6:31:54 PM) [pid: 11128]
:: Spring Boot :: (v2.7.2)

2022-08-17 18:31:51.366 INFO 11128 --- [main] c.p.jeep.controller.CreateOrderTest : Starting CreateOrderTest using Java 17.0.3 on PokedexPC with PID 11128 (started by bly1)
2022-08-17 18:31:51.367 DEBUG 11128 --- [main] c.p.jeep.controller.CreateOrderTest : Running with Spring Boot v2.7.2, Spring v5.3.22
2022-08-17 18:31:51.367 INFO 11128 --- [main] c.p.jeep.controller.CreateOrderTest : The following 1 profile is active: "test"
2022-08-17 18:31:53.389 INFO 11128 --- [main] c.p.jeep.controller.CreateOrderTest : Started CreateOrderTest in 2.258 seconds (JVM running for 2.952)
2022-08-17 18:31:54.112 DEBUG 11128 --- [o-auto-1-exec-1] c.p.j.c.DefaultJeepOrderController : Order=OrderRequest(customer=MAYNARD_TORBJORG, model=RENEGADE, trim=Islander, doors=4, co
```

15a.



The screenshot shows a code editor with the following code:

```
@Transactional
@Override
public Order createOrder(OrderRequest orderRequest) {

    Customer customer = getCustomer(orderRequest);
    Jeep jeep = getModel(orderRequest);
    Color color = getColor(orderRequest);
    Engine engine = getEngine(orderRequest);
    Tire tire = getTire(orderRequest);
    List<Option> options = getOption(orderRequest);

    BigDecimal price = jeep.getBasePrice().add(color.getPrice())
        .add(engine.getPrice()).add(tire.getPrice());

    return jeepOrderDao.saveOrder(customer, jeep, color, engine, tire, price, options);
}
```

15b.

```
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);

    return Order.builder()
        .orderPK(orderPk)
        .customer(customer)
        .model(jeep)
        .color(color)
        .engine(engine)
        .tire(tire)
        .options(options)
        .price(price)
        .build();
}
```

15c.

The screenshot shows an IDE with a REST client test for the `saveOrder` endpoint. The test is named `testCreateOrderStatus201` and is located in `CreateOrderTest.java`. The test sends a POST request to `http://localhost:8080/orders` with a JSON body representing an order. The response is asserted to have a status of 201 (CREATED) and a body containing the expected order details.

```
void testCreateOrderStatus201() {
    //given: an order as JSON
    String body = createOrderBody();
    String url = UriComponentsBuilder.fromHttpUri("http://localhost:8080/orders").buildAndExpand().toUriString();

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

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

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

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

    //And: the returned order is correct
    assertEquals(response.getBody(), isNotNull());

    Order order = response.getBody();
    assertEquals(order.getCustomerId(), isNotNull());
    assertEquals(order.getModelId(), isNotNull());
    assertEquals(order.getModel(), isNotNull());
    assertEquals(order.getColor(), isNotNull());
    assertEquals(order.getEngine(), isNotNull());
    assertEquals(order.getTire(), isNotNull());
    assertEquals(order.getPrice(), isNotNull());
    assertEquals(order.getOptions(), isNotNull());
}
```

The test body is defined as follows:

```
protected String createOrderBody() {
    return "{\n"
        + "  \"customer\": \"MAINMAN DOORJOB\", \n"
        + "  \"model\": \"MAINMAN DOORJOB\", \n"
        + "  \"tire\": \"MAINMAN DOORJOB\", \n"
        + "  \"engine\": \"EXT_SMAZHERRY\", \n"
        + "  \"price\": \"3.99\", \n"
        + "  \"options\": [\n"
        + "    {\n"
        + "      \"name\": \"DOOR_FISHBONE_4\", \n"
        + "      \"price\": \"3.99\" \n"
        + "    }, \n"
        + "    {\n"
        + "      \"name\": \"WHEEL_QUAD_MOUNT\", \n"
        + "      \"price\": \"3.99\" \n"
        + "    } \n"
        + "  ] \n"
        + "}";
}
```

The console output shows the test results:

```
ollie.CreateOrderTest : Starting CreateOrderTest using Java 17.0.3 on PokedexPC with PID 11128 (started by blyji in C:\Users\blyji\Development\workspace\spring-boot\jeep-sales)
ollie.CreateOrderTest : Running with spring boot 2.7.2, spring 5.3.22
ollie.CreateOrderTest : The following 1 profile is active: "test"
ollie.CreateOrderTest : Started CreateOrderTest in 2.212 seconds (JVM running for 3.909)
ollie.CreateOrderTest : curl -XPOST http://localhost:8080/orders -H 'Content-Type: application/json' -d '{"customer": "MAINMAN DOORJOB", "model": "MAINMAN DOORJOB", "tire": "MAINMAN DOORJOB", "engine": "EXT_SMAZHERRY", "price": 3.99, "options": [{"name": "DOOR_FISHBONE_4", "price": 3.99}, {"name": "WHEEL_QUAD_MOUNT", "price": 3.99}]}'
```

Screenshots of Running Application:

URL to GitHub Repository:

<https://github.com/CoconutMacaron/Week-13-Spring-Assignment.git>