Hibernate/JPA

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Część I

Uruchomienie serwera Derby:

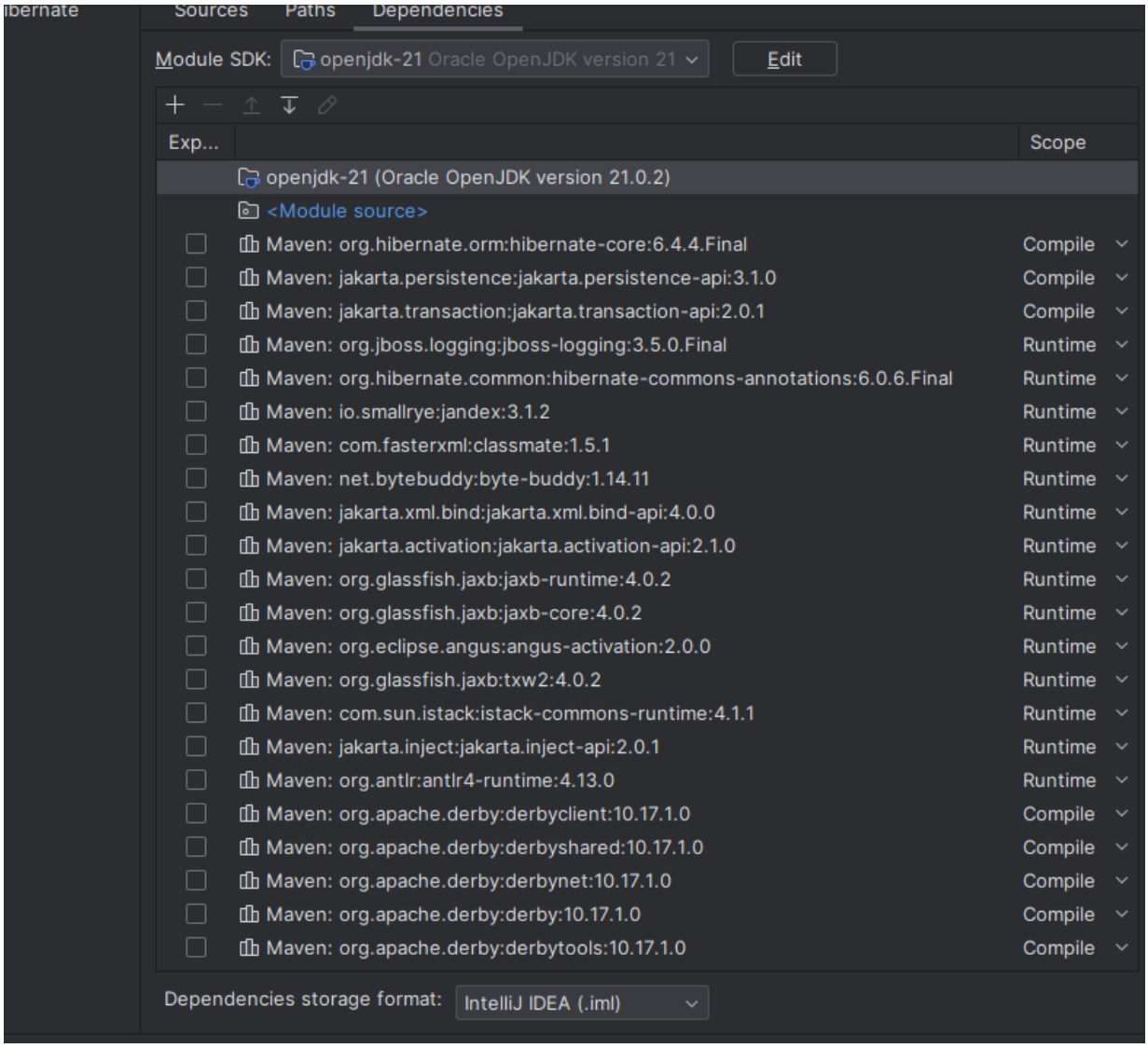
```
D:\db-derby-10.16.1.1-bin\bin>startNetworkServer
Wed Jun 12 15:06:48 CEST 2024 : Apache Derby Network Server - 10.16.1.1 -
(1901046) started and ready to accept connections on port 1527
```

Plik pom.xml

Main.java pom.xml (Hibernate_Laby)

```xml
<?xml version="1.0" encoding="UTF-8"?>
<project xmlns="http://maven.apache.org/POM/4.0.0"
         xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
         xsi:schemaLocation="http://maven.apache.org/POM/4.0.0 http://maven.apache.org/xsd/maven-4.0.0.xsd">
    <modelVersion>4.0.0</modelVersion>

    <groupId>org.example</groupId>
    <artifactId>Hibernate_Laby</artifactId>
    <version>1.0-SNAPSHOT</version>

    <properties>
        <maven.compiler.source>17</maven.compiler.source>
        <maven.compiler.target>17</maven.compiler.target>
        <project.build.sourceEncoding>UTF-8</project.build.sourceEncoding>
    </properties>

    <dependencies>
        <dependency>
            <groupId>org.hibernate</groupId>
            <artifactId>hibernate-core</artifactId>
            <version>6.4.4.Final</version>
        </dependency>

        <dependency>
            <groupId>org.apache.derby</groupId>
            <artifactId>derbyclient</artifactId>
            <version>10.17.1.0</version>
        </dependency>
        <dependency>
            <groupId>org.apache.derby</groupId>
            <artifactId>derbynet</artifactId>
            <version>10.17.1.0</version>
        </dependency>
    </dependencies>

</project>
```

Oraz udało się pomyślnie zainstalować wszystkie zależności



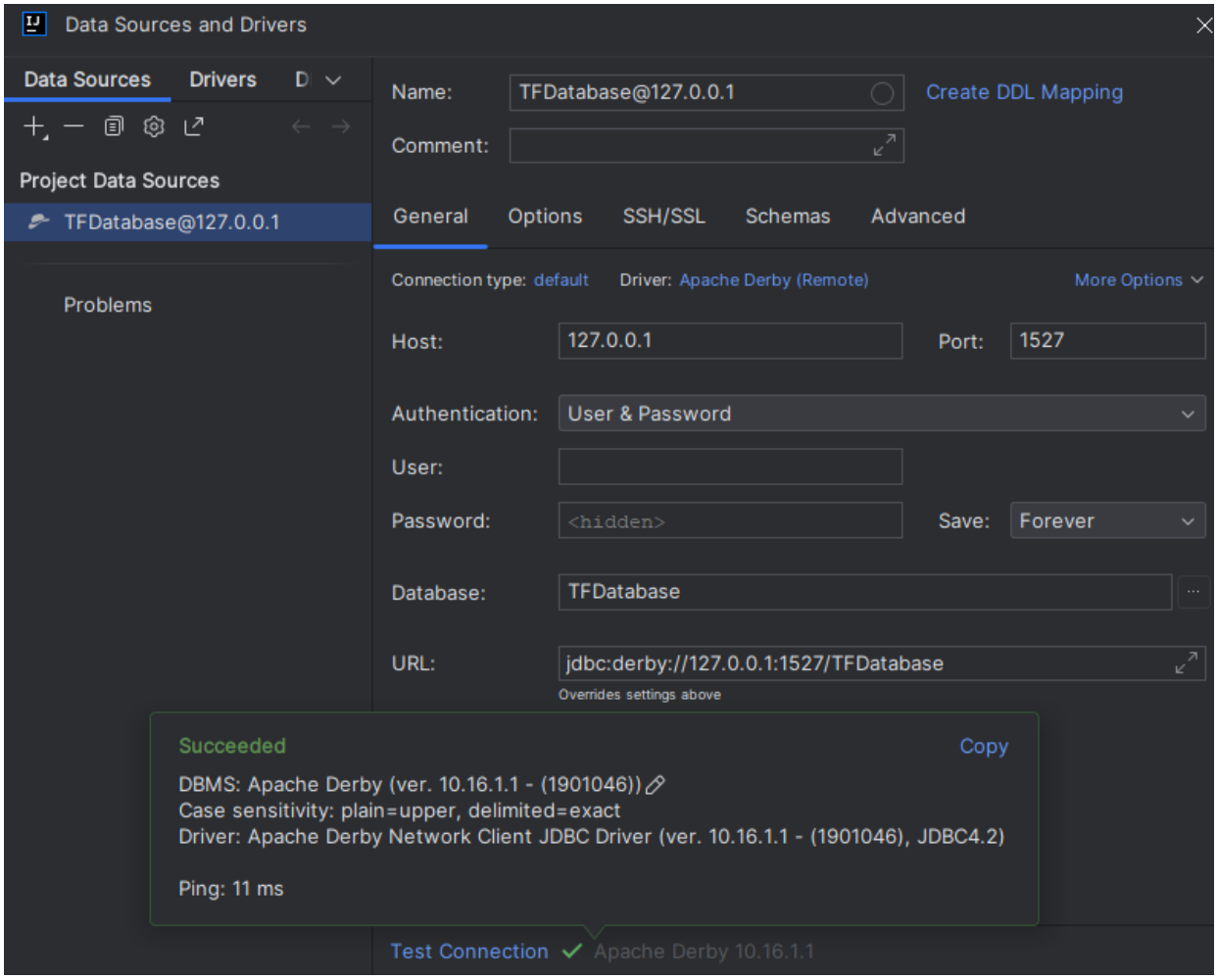
Plik konfiguracyjny

```xml
<?xml version='1.0' encoding='utf-8'?>
<!DOCTYPE hibernate-configuration PUBLIC
        "-//Hibernate/Hibernate Configuration DTD 3.0//EN"
        "http://www.hibernate.org/dtd/hibernate-configuration-3.0.dtd">
<hibernate-configuration>
    <session-factory>
        <property name="connection.driver_class">org.apache.derby.jdbc.ClientDriver</property>
        <property name="connection.url">jdbc:derby://127.0.0.1/TFDatabase</property>
        <property name="show_sql">true</property>
        <property name="format_sql">true</property>
        <property name="use_sql_comments">true</property>
        <property name="hbm2ddl.auto">update</property>
        <mapping class="org.example.Product"></mapping>
    </session-factory>
</hibernate-configuration>
```

Plik Main

```java
public class Main {
    5 usages
    private static SessionFactory sessionFactory = null;

    public static void main(String[] args) {
        sessionFactory = getSessionFactory();
        Session session = sessionFactory.openSession();

        session.close();
    }

    1 usage
    private static SessionFactory getSessionFactory() {
        if (sessionFactory == null) {
            Configuration configuration = new Configuration();
            sessionFactory = configuration.configure().buildSessionFactory();
        }
        return sessionFactory;
    }
}
```

I udało się połączyć z bazą danych



Stworzyłem klasę Product i spróbuje dodać coś do bazy

Product.java

```java
package org.example;

import jakarta.persistence.Entity;
import jakarta.persistence.GeneratedValue;
import jakarta.persistence.GenerationType;
import jakarta.persistence.Id;

4 usages
@Entity
public class Product {

    @Id
    @GeneratedValue(strategy = GenerationType.AUTO)
    private int productID;
    1 usage
    private String productName;
    1 usage
    private int unitsOnStock;

    public Product() {

    }

    1 usage
    public Product(String productName, int unitsOnStock) {
        this.productName = productName;
        this.unitsOnStock = unitsOnStock;
    }
}
```

Main.java

```java
package org.example;

import org.hibernate.Session;
import org.hibernate.SessionFactory;
import org.hibernate.Transaction;
import org.hibernate.cfg.Configuration;

public class Main {
    5 usages
    private static SessionFactory sessionFactory = null;

    public static void main(String[] args) {
        sessionFactory = getSessionFactory();
        Session session = sessionFactory.openSession();

        Product product = new Product( productName: "Rower", unitsOnStock: 2);
        Transaction tx = session.beginTransaction();
        session.save(product);
        tx.commit();

        session.close();
    }

    1 usage
    private static SessionFactory getSessionFactory() {
        if (sessionFactory == null) {
            Configuration configuration = new Configuration();
            sessionFactory = configuration.configure().buildSessionFactory();
        }
        return sessionFactory;
    }
}
```

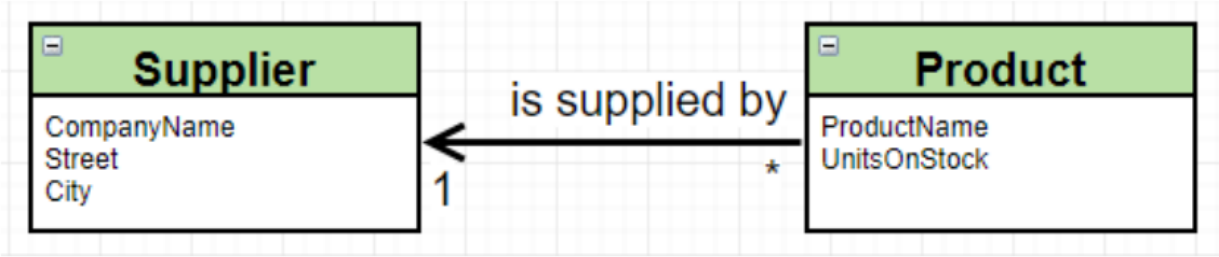
Po uruchomieniu Maina, nowy produkt "Rower" pojawił się w bazie danych

	PRODUCTID	PRODUCTNAME	UNITSONSTOCK
1	1	Rower	2

Część II

zad 1 - Dodanie dostawcy

I. Zmodyfikuj model wprowadzając pojęcie Dostawcy jak poniżej



a. Stworz nowego dostawce.

b. Znajdz poprzednio wprowadzony produkt i ustaw jego dostawce na właśnie dodanego.

c. Udokumentuj wykonane kroki oraz uzyskany rezultat (ogi wywołań sqlowych,describe table/schemat bazy danych, select * from….)

Na pocztek stworzyłem klasę Supplier

```java
@Entity
public class Supplier {

    @Id
    @GeneratedValue(strategy = GenerationType.AUTO)
    private int supplierID;
    2 usages
    private String companyName;
    2 usages
    private String street;
    2 usages
    private String city;

    public Supplier() {}
    1 usage
    public Supplier(String companyName, String street, String city) {
        this.companyName = companyName;
        this.street = street;
        this.city = city;
    }

    @Override
    public String toString() {
        return "Supplier{" +
                "supplierID=" + supplierID +
                ", companyName='" + companyName + '\'' +
                ", street='" + street + '\'' +
                ", city='" + city + '\'' +
                '}';
    }
}
```

oraz dodałem nowego dostawce

```java
Supplier supplier = new Supplier( companyName: "Firma1", street: "Krakowska", city: "Krakow");
Transaction tx = session.beginTransaction();
session.save(supplier);
tx.commit();
```

	SUPPLIERID	CITY	COMPANYNAME	STREET
1	1	Krakow	Firma1	Krakowska

Następnie stworzyłem relacje w tabeli Product oraz dodałeg settera by móc ustwić dostawcę dla isniejącego już produktu

```java
@ManyToOne
@JoinColumn(name = "supplierID")
private Supplier supplier;
```

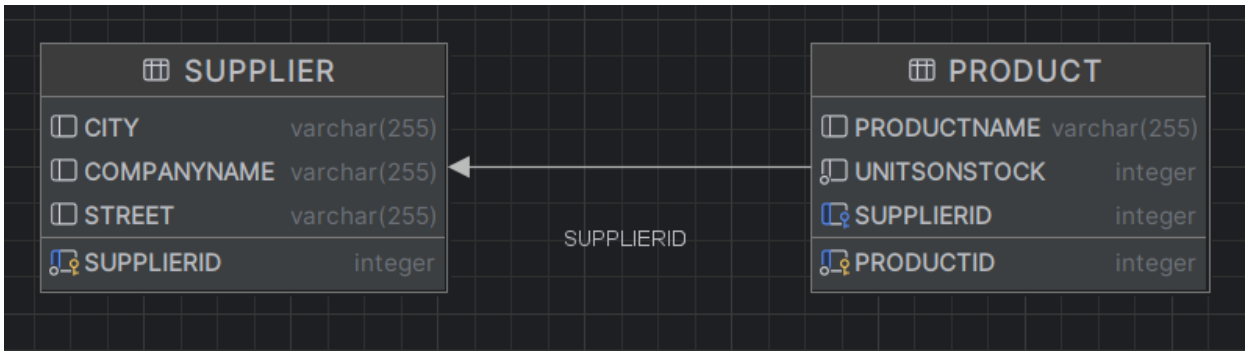
```java
1 usage
public void setSupplier(Supplier supplier) {
    this.supplier = supplier;
}

no usages
public Supplier getSupplier() {
    return supplier;
}
}
```

W Mainie pobrałem obiekty istniejącego dostawcy i produktu, a następnie ustawiłem dostawcę dla produktu

```
Supplier supplier = session.get(Supplier.class, o: 1);
Product product = session.get(Product.class, o: 1);
product.setSupplier(supplier);
Transaction tx = session.beginTransaction();
session.update(product);
tx.commit();
```

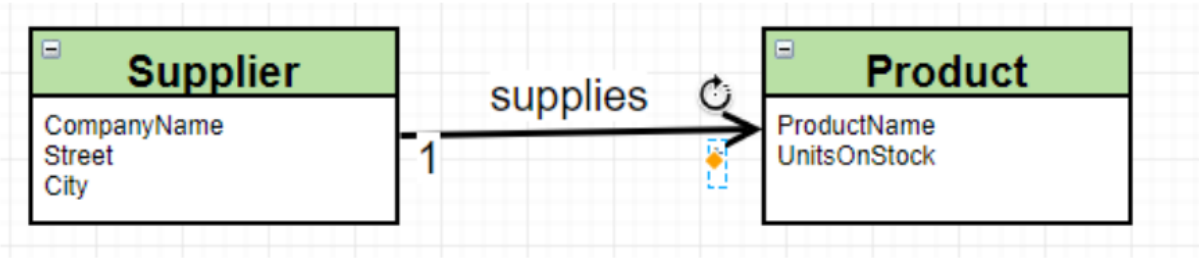
	PRODUCTID	PRODUCTNAME	UNITSONSTOCK	SUPPLIERID
1	1	Rower	2	1

diagram



zad 2 - Odwrócenie relacji

II. Odwróć relacje zgodnie z poniższym schematem



a. Zamodeluj powyższe w dwoch wariantach „z” i „bez” tabeli łącznikowej

b. Stworz kilka produktow

c. Dodaj je do produktow dostarczanych przez nowo stworzonego dostawcę

d. Udokumentuj wykonane kroki oraz uzyskane rezultaty w obu wariantach (logi wywołań sqlowych, describe table/schemat bazy danych, select * from….)

z tabelą łącznikową

W klasie Product zakomentowałem pole SupplierID i wszyskie miejsca w kodzie z nim związane:

```java
public class Product {

    @Id
    @GeneratedValue(strategy = GenerationType.AUTO)
    private int productID;
    2 usages
    private String productName;
    2 usages
    private int unitsOnStock;
//    @ManyToOne
//    @JoinColumn(name = "supplierID")
//    private Supplier supplier;


    public Product() {

    }

    3 usages
    public Product(String productName, int unitsOnStock) {
        this.productName = productName;
        this.unitsOnStock = unitsOnStock;
    }

//    public Product(String productName, int unitsOnStock, Supplier supplier) {
//        this.productName = productName;
//        this.unitsOnStock = unitsOnStock;
//        this.supplier = supplier;
//    }

    @Override
    public String toString() {
        return "Product{" +
                "productID=" + productID +
                ", productName='" + productName + '\'' +
                ", unitsOnStock=" + unitsOnStock +
//                ", supplier=" + supplier +
                '}';
    }
```

W klasie Supplier dodaje polę z kolekcją zawierającą produkty

```java
public class Supplier {

    @Id
    @GeneratedValue(strategy = GenerationType.AUTO)
    private int supplierID;
    2 usages
    private String companyName;
    2 usages
    private String street;
    2 usages
    private String city;
    1 usage
    @OneToMany
    private List<Product> products = new ArrayList<>();


    public Supplier() {}
    no usages
    public Supplier(String companyName, String street, String city) {
        this.companyName = companyName;
        this.street = street;
        this.city = city;
    }

    @Override
    public String toString() {
        return "Supplier{" +
                "supplierID=" + supplierID +
                ", companyName='" + companyName + '\'' +
                ", street='" + street + '\'' +
                ", city='" + city + '\'' +
                '}';
    }

    no usages
    public void addProduct(Product product) {
        products.add(product);
    }
}
```

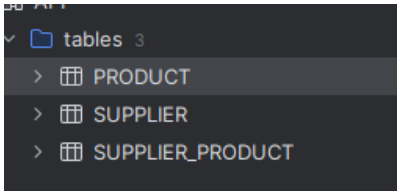
dodałem kilka nowych produktów

```java
Product product1 = new Product( productName: "trampki",  unitsOnStock: 5);
Product product2 = new Product( productName: "piłka",  unitsOnStock: 10);
Product product3 = new Product( productName: "monitor",  unitsOnStock: 3);


Transaction tx = session.beginTransaction();

session.save(product1);
session.save(product2);
session.save(product3);
tx.commit();
```

tworzę nowego dostawcę i dodaję do niego przed chwilą utworzone produkty

```
Supplier supplier = new Supplier( companyName: "Firma2",  street: "Krakowska_inna",  city: "Warszawa");
Product product1 = session.get(Product.class,  o: 1);
Product product2 = session.get(Product.class,  o: 3);

supplier.addProduct(product1);
supplier.addProduct(product2);
Transaction tx = session.beginTransaction();
session.save(supplier);
tx.commit();
```

powstała nowa tabela



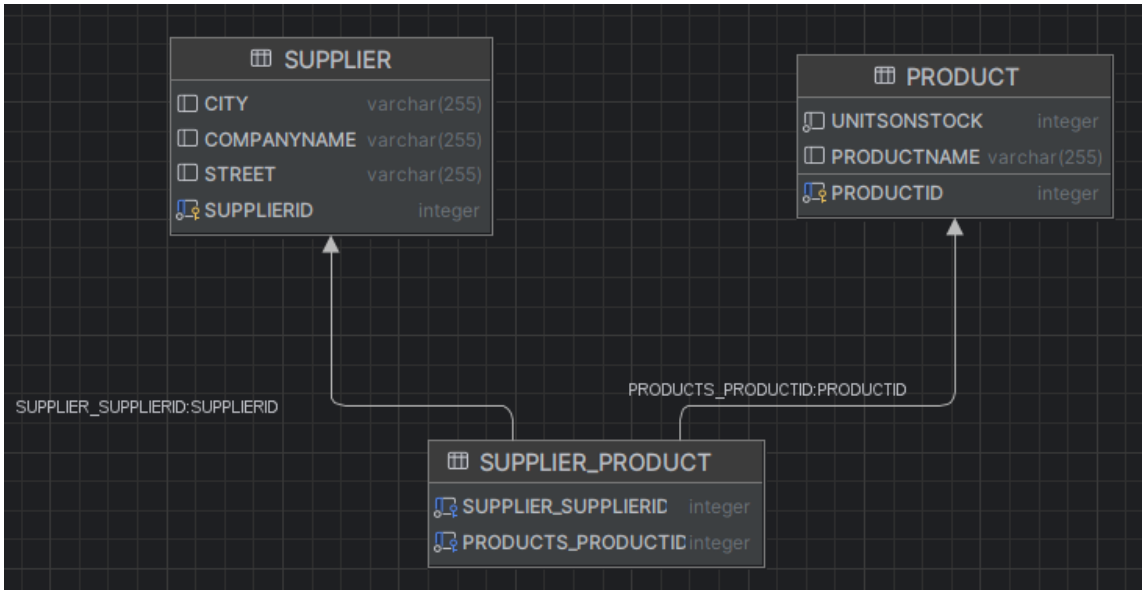
i tak się prezentują dane

	PRODUCTID	UNITSONSTOCK	PRODUCTNAME
1	1	5	trampki
2	2	10	piłka
3	3	3	monitor

	SUPPLIERID	CITY	COMPANYNAME	STREET
1	1	Krakow	Firma1	Krakowska
2	2	Warszawa	Firma2	Krakowska_inna

	SUPPLIER_SUPPLIERID	PRODUCTS_PRODUCTID
1	2	1
2	2	3

diagram



bez tabeli łącznikowej

Klasa Product pozostaje bez zmian

Natomiast klasa Supplier - dodaję adnotacje @JoinColumn

```
@OneToMany
@JoinColumn(name="supplierID")
private List<Product> products = new ArrayList<>();
```

Wyczyściłem baze danych i dodałem te same produkty co wcześniej:

```
Product product1 = new Product( productName: "trampki",  unitsOnStock: 5);
Product product2 = new Product( productName: "piłka",  unitsOnStock: 10);
Product product3 = new Product( productName: "monitor",  unitsOnStock: 3);


Transaction tx = session.beginTransaction();

session.save(product1);
session.save(product2);
session.save(product3);
tx.commit();
```

Stworzyłem dostawce i dodałem do jego listy produkty:

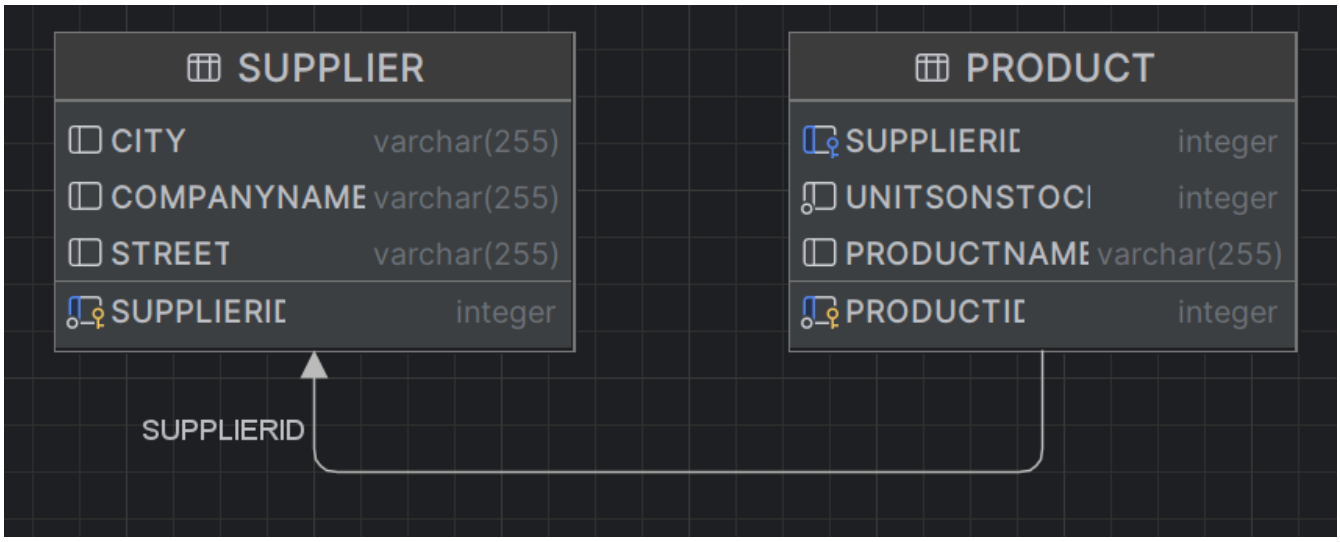
```
Supplier supplier = new Supplier( companyName: "Firma",  street: "kościuszki",  city: "Poznań");
Product product1 = session.get(Product.class,  o: 2);
Product product2 = session.get(Product.class,  o: 3);

supplier.addProduct(product1);
supplier.addProduct(product2);
Transaction tx = session.beginTransaction();
session.save(supplier);
tx.commit();
```

I oto efekt

	SUPPLIERID	CITY	COMPANYNAME	STREET
1	1	Poznań	Firma	kościuszki

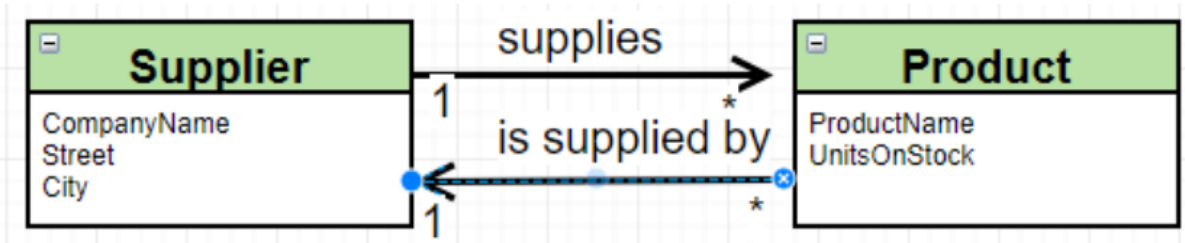
	PRODUCTID	SUPPLIERID	UNITSONSTOCK	PRODUCTNAME
1	1	<null>	5	trampki
2	2	1	10	piłka
3	3	1	3	monitor

Diagram:



zad 3 - Relacja dwustronna

III. Zamodeluj relację dwustronną jak poniżej:



a. Tradycyjnie: Stworz kilka produktow

b. Dodaj je do produktow dostarczanych przez nowo stworzonego dostawcę (pamiętaj o poprawnej obsłudze dwustronności relacji)

c. **Udokumentuj wykonane kroki oraz uzyskane rezultaty (logi wywołań sqlowych, describe table/schemat bazy danych, select * from….)**

Klasa Supplier:

```
@Entity
public class Supplier {

    @Id
    @GeneratedValue(strategy = GenerationType.AUTO)
    private int supplierID;
    private String companyName;
    private String street;
    private String city;
    @OneToMany(mappedBy = "supplier")
    private List<Product> products = new ArrayList<>();

    public Supplier() {}
    public Supplier(String companyName, String street, String city) {
        this.companyName = companyName;
        this.street = street;
        this.city = city;
    }

    @Override
    public String toString() {
        return "Supplier{" +
                "supplierID=" + supplierID +
```

```
                ", companyName='" + companyName + '\'' +
                ", street='" + street + '\'' +
                ", city='" + city + '\'' +
                '}';
    }

    public void addProduct(Product product) {
        products.add(product);
    }
}
```

Klasa Product:

```
@Entity
public class Product {

    @Id
    @GeneratedValue(strategy = GenerationType.AUTO)
    private int productID;
    private String productName;
    private int unitsOnStock;
    @ManyToOne
    @JoinColumn(name = "supplierID")
    private Supplier supplier;


    public Product() {

    }

    public Product(String productName, int unitsOnStock) {
        this.productName = productName;
        this.unitsOnStock = unitsOnStock;
    }

    public Product(String productName, int unitsOnStock, Supplier supplier) {
        this.productName = productName;
        this.unitsOnStock = unitsOnStock;
        this.supplier = supplier;
    }

    @Override
    public String toString() {
        return "Product{" +
                "productID=" + productID +
                ", productName='" + productName + '\'' +
                ", unitsOnStock=" + unitsOnStock +
                ", supplier=" + supplier +
                '}';
    }

    public void setSupplier(Supplier supplier) {
        this.supplier = supplier;
    }

    public Supplier getSupplier() {
        return supplier;
    }
}
```

Ponownie usuwam dane z tabel i dodaje nowe produkty i dostawców:

```
public static void main(String[] args) {
    sessionFactory = getSessionFactory();
    Session session = sessionFactory.openSession();
```

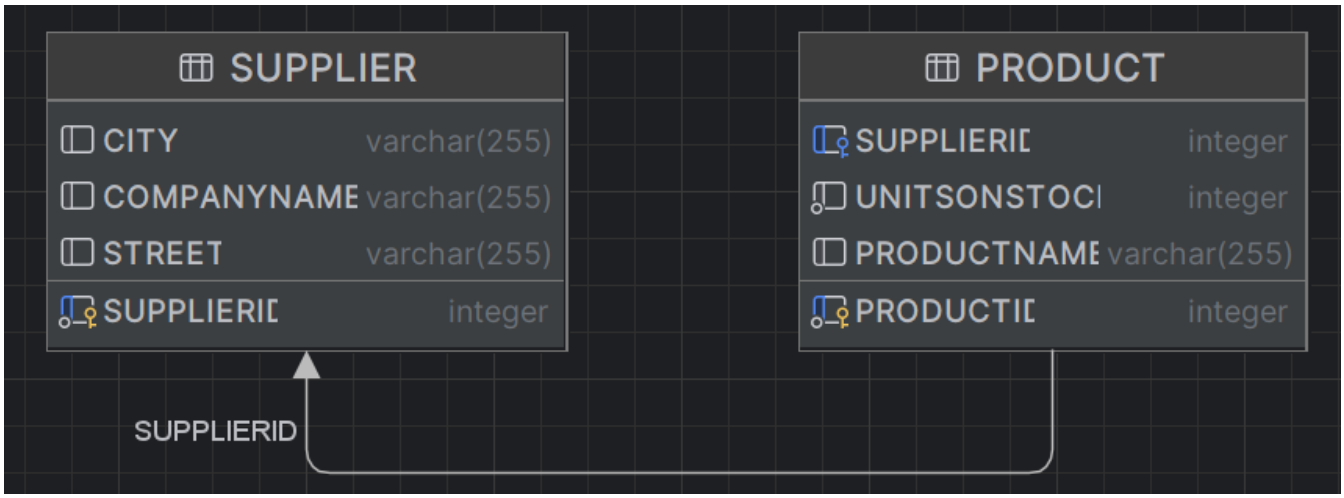
```
    Transaction tx = session.beginTransaction();

    Product product1 = new Product("trampki", 5);
    Product product2 = new Product("piłka", 10);
    Product product3 = new Product("monitor", 3);

    Supplier supplier1 = new Supplier("Firma1", "krakowska", "Poznań");
    Supplier supplier2 = new Supplier("Firma2", "warszawaska", "Kraków");
    product1.setSupplier(supplier1);
    product3.setSupplier(supplier1);
    product2.setSupplier(supplier2);

    supplier1.addProduct(product1);
    supplier1.addProduct(product3);
    supplier2.addProduct(product2);


    session.save(product1);
    session.save(product2);
    session.save(product3);
    session.save(supplier1);
    session.save(supplier2);
    tx.commit();

    session.close();
}
```

Efekt w tabelach:

	PRODUCTID	SUPPLIERID	UNITSONSTOCK	PRODUCTNAME
1	1	1	5	trampki
2	2	2	10	piłka
3	3	1	3	monitor

	SUPPLIERID	CITY	COMPANYNAME	STREET
1	1	Poznań	Firma1	krakowska
2	2	Kraków	Firma2	warszawaska

Diagram:



zad 4 - Dodanie Category

IV. Dodaj klase Category z property int CategoryID, String Name oraz listą produktow List<Product> Products

a. Zmodyfikuj produkty dodając wskazanie na kategorie do której należy.

b. Stworz kilka produktow i kilka kategorii

c. Dodaj kilka produktów do wybranej kategorii

d. Wydobądź produkty z wybranej kategorii oraz kategorię do której należy wybrany produkt

e. Udokumentuj wykonane kroki oraz uzyskane rezultaty (logi wywołań sqlowych, describe table/schemat bazy danych, select * from....)

Dodaje nową klasę `Category`:

```
@Entity
@Table(name = "Categories")
public class Category {
    @Id
    @GeneratedValue(strategy = GenerationType.AUTO)
    private int categoryID;
    private String name;

    @OneToMany(mappedBy = "category")
    private List<Product> products = new ArrayList<>();

    public Category() {
    }

    public Category(String name) {
        this.name = name;
    }

    @Override
    public String toString() {
        return name;
    }

    public List<Product> getProducts() {
        return products;
    }

    public void addProduct(Product product) {
        products.add(product);
    }
}
```

Dodaje nowe pole do klasy `Product`:

```
public class Product {

    @Id
    @GeneratedValue(strategy = GenerationType.AUTO)
    private int productID;
    private String productName;
```

```
    private int unitsOnStock;
    @ManyToOne
    @JoinColumn(name = "supplierID")
    private Supplier supplier;

    @ManyToOne
    @JoinColumn(name = "categoryID")
    private Category category;

    public Product() {

    }

    public Product(String productName, int unitsOnStock) {
        this.productName = productName;
        this.unitsOnStock = unitsOnStock;
    }

    public Product(String productName, int unitsOnStock, Supplier supplier) {
        this.productName = productName;
        this.unitsOnStock = unitsOnStock;
        this.supplier = supplier;
    }

    @Override
    public String toString() {
        return "Product{" +
                "productID=" + productID +
                ", productName='" + productName + '\'' +
                ", unitsOnStock=" + unitsOnStock +
                ", supplier=" + supplier +
                '}';
    }

    public void setSupplier(Supplier supplier) {
        this.supplier = supplier;
    }

    public Supplier getSupplier() {
        return supplier;
    }

    public void setCategory(Category category) {
        this.category = category;
    }
    public Category getCategory() {
        return category;
    }
}
```

Klasa `Supplier` pozostaje bez zmian (jest takie sama jak w poprzednim podpunkcie)

Dodałem do bazy kilka produktów i kategorii:

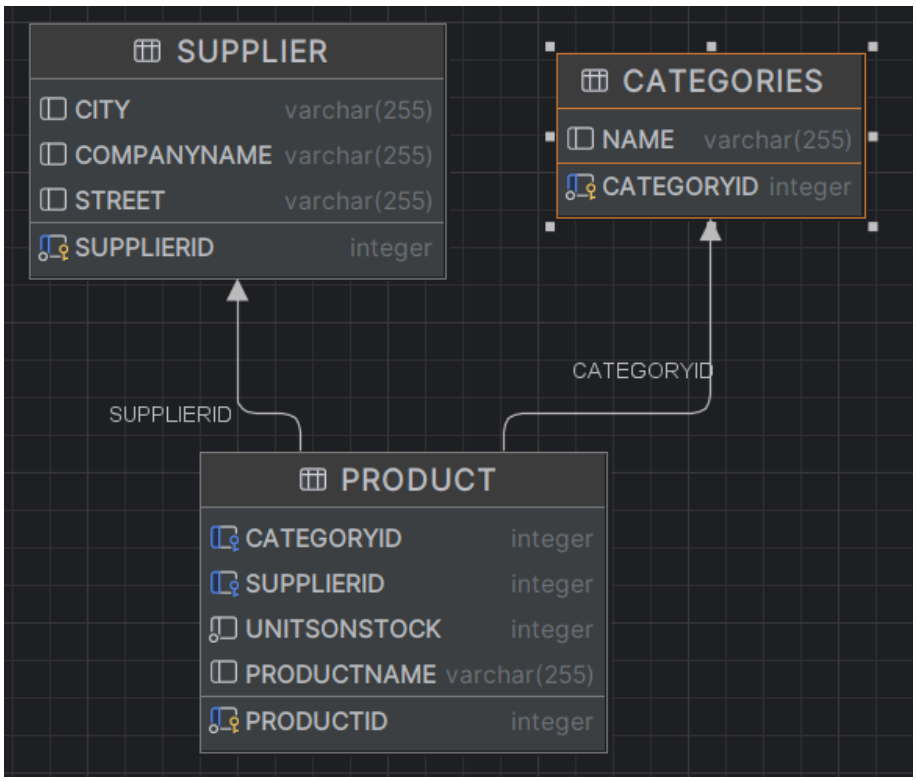
```
public static void main(String[] args) {
    sessionFactory = getSessionFactory();
    Session session = sessionFactory.openSession();

    Transaction tx = session.beginTransaction();

    Product product1 = new Product("laptop", 1);
    Product product2 = new Product("myszka", 11);
    Product product3 = new Product("trzewiki", 30);

    Category category1 = new Category("Elektornika");
    Category category2 = new Category("Obuwie");
```

```
        category1.addProduct(product1);
        category1.addProduct(product2);
        category2.addProduct(product3);

        product1.setCategory(category1);
        product2.setCategory(category1);
        product3.setCategory(category2);

        session.save(product1);
        session.save(product2);
        session.save(product3);
        session.save(category1);
        session.save(category2);

        tx.commit();

        session.close();
    }
```

I tak się prezentują dane: (produkty w kolumnie SuplierID mają wartości `NULL` bo tworzyłem nowe obiekty i nie ustawiałem im dostawcy)

	CATEGORYID	NAME
1	1	Elektornika
2	2	Obuwie

	CATEGORYID	PRODUCTID	SUPPLIERID	UNITSONSTOCK	PRODUCTNAME
1	1	1	<null>	1	laptop
2	1	2	<null>	11	myszka
3	2	3	<null>	30	trzewiki



Spróbuję teraz wydobyć dane:

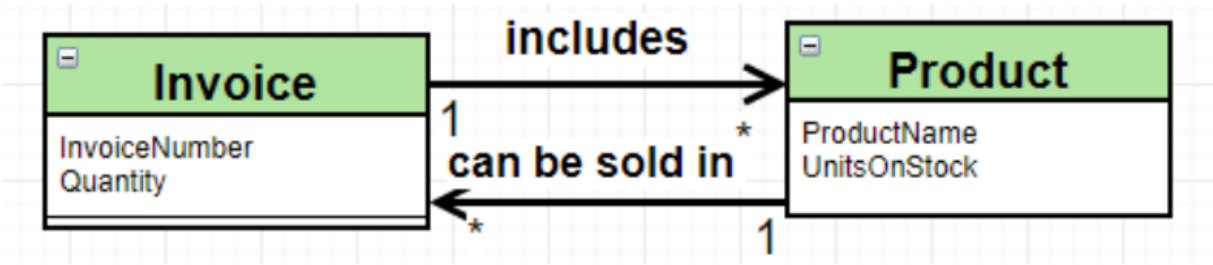
```
public static void main(String[] args) {
    sessionFactory = getSessionFactory();
    Session session = sessionFactory.openSession();
```

```
    Transaction tx = session.beginTransaction();

    Category category = session.get(Category.class, 1);
    List<Product> products = category.getProducts();
    System.out.println("Produkty nalezace do kategorii: " + category);
    for (Product product: products) {
        System.out.println(product);
    }

    System.out.println();
    Product prod = session.get(Product.class, 1);
    System.out.println(prod + " nalezy do kategorii: " + prod.getCategory());

    tx.commit();

    session.close();
}
```

```
Product{productID=1, productName='laptop', unitsOnStock=1, supplier=null}
Product{productID=2, productName='myszka', unitsOnStock=11, supplier=null}

Product{productID=1, productName='laptop', unitsOnStock=1, supplier=null} nalezy do kategorii: Elektornika
```

zad 5 - Relacja wiele do wielu

V. Zamodeluj relacje wiele-do-wielu, jak poniżej:



a. Stórz kilka produktów I “sprzedaj” je na kilku transakcjach.

b. Pokaż produkty sprzedane w ramach wybranej faktury/transakcji

c. Pokaż faktury w ramach których był sprzedany wybrany produkt

d. **Udokumentuj wykonane kroki oraz uzyskane rezultaty (logi wywołań sqlowych, describe table/schemat bazy dnaych, select * from….)**

Dodałem klasę `Invoice`

```
@Entity
public class Invoice {
    @Id
    @GeneratedValue(strategy = GenerationType.AUTO)
    private int invoiceNumber;
```

```
    private int quantity = 0;

    @ManyToMany
    @JoinTable(
        name = "invoice_product",
        joinColumns = @JoinColumn(name = "invoice_id"),
        inverseJoinColumns = @JoinColumn(name = "product_id")
    )
    private Set<Product> products = new HashSet<>();

    public Invoice() {}

    @Override
    public String toString() {
        return String.valueOf(invoiceNumber);
    }

    public void addProduct(Product product, int quantity) {
        this.products.add(product);
        this.quantity += quantity;
    }

    public int getInvoiceNumber() {
        return invoiceNumber;
    }

    public int getQuantity() {
        return quantity;
    }

    public Set<Product> getProducts() {
        return products;
    }

}
```

I dodaję pole @ManyToMany w o klasie `Product`

```
@Entity
public class Product {

    @Id
    @GeneratedValue(strategy = GenerationType.AUTO)
    private int productID;
    private String productName;
    private int unitsOnStock;
    @ManyToOne
    @JoinColumn(name = "supplierID")
    private Supplier supplier;

    @ManyToOne
    @JoinColumn(name = "categoryID")
    private Category category;
    @ManyToMany(mappedBy = "products")
    private Set<Invoice> invoices = new HashSet<>();

    public Product() {
    }

    public Product(String productName, int unitsOnStock) {
        this.productName = productName;
        this.unitsOnStock = unitsOnStock;
    }

    public Product(String productName, int unitsOnStock, Supplier supplier) {
        this.productName = productName;
        this.unitsOnStock = unitsOnStock;
```

```
        this.supplier = supplier;
    }

    @Override
    public String toString() {
        return "Product{" +
                "productID=" + productID +
                ", productName='" + productName + '\'' +
                ", unitsOnStock=" + unitsOnStock +
                ", supplier=" + supplier +
                '}';
    }

    public void setSupplier(Supplier supplier) {
        this.supplier = supplier;
    }

    public Supplier getSupplier() {
        return supplier;
    }

    public void setCategory(Category category) {
        this.category = category;
    }
    public Category getCategory() {
        return category;
    }

    public Set<Invoice> getInvoices() {
        return invoices;
    }


    public void sell(Invoice invoice, int quantity) throws InvalidAttributeValueException {
        if (unitsOnStock < quantity) {
            throw new InvalidAttributeValueException("Unable to sell " + quantity + " products");
        }
        unitsOnStock -= quantity;
        invoice.addProduct(this, quantity);
        invoices.add(invoice);
    }
}
```

W klasie `Main` dodałem nowe produkty i połączyłem je z nową fakturą

```
public static void main(String[] args) throws InvalidAttributeValueException {
    sessionFactory = getSessionFactory();
    Session session = sessionFactory.openSession();

    Transaction tx = session.beginTransaction();

    // Create new products and assign a category to them
    Category category = new Category("elektronika");
    Product p1 = new Product("Telewizor", 12);
    Product p2 = new Product("Tablet", 10);
    category.addProduct(p1);
    category.addProduct(p2);
    p1.setCategory(category);
    p2.setCategory(category);

    // Sell existing products
    Invoice invoice1 = new Invoice();
    invoice1.setInvoiceNumber(1);

    try {
        p1.sell(invoice1, 2);
        p2.sell(invoice1, 3);
```

```
        } catch (InvalidAttributeValueException e) {
            e.printStackTrace();
        }

        invoice1.addProduct(p1, 2);
        invoice1.addProduct(p2, 3);

        session.save(invoice1);
        session.save(category);
        session.save(p1);
        session.save(p2);

        tx.commit();


        session.close();
    }
```

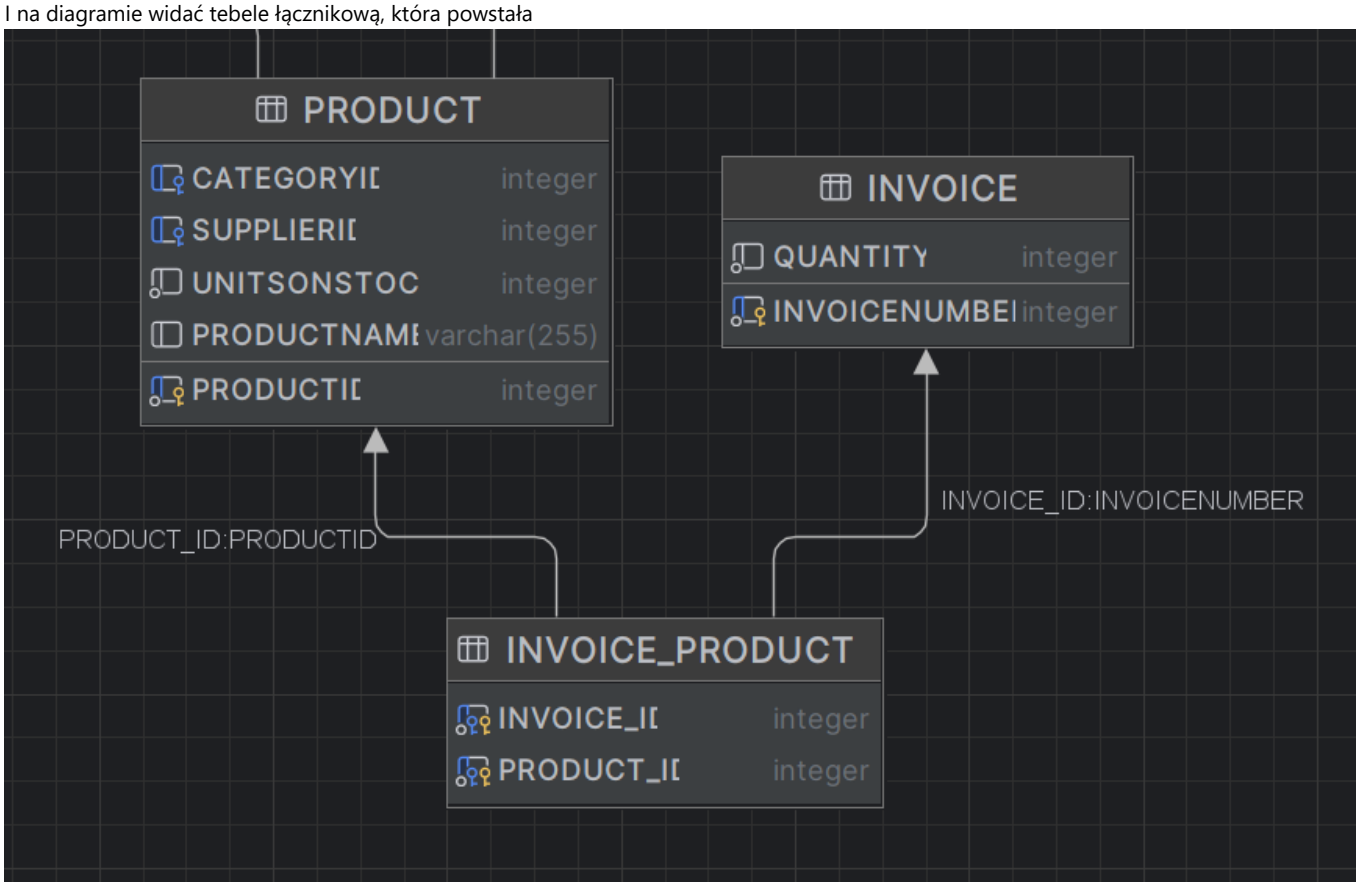
I oto efekty

	INVOICENUMBER	QUANTITY
1	1	10

	CATEGORYID	PRODUCTID	SUPPLIERID	UNITSONSTOCK	PRODUCTNAME
1	1	1	<null>	10	Telewizor
2	1	2	<null>	7	Tablet

	INVOICE_ID	PRODUCT_ID
1	1	1
2	1	2

I na diagramie widać tebele łącznikową, która powstała



Próba wydobycia danych z bazy:

```java
public static void main(String[] args) throws InvalidAttributeValueException {
    sessionFactory = getSessionFactory();
    Session session = sessionFactory.openSession();

    Transaction tx = session.beginTransaction();

    Invoice inv = session.get(Invoice.class, 1);
    Set<Product> products = inv.getProducts();
    System.out.println("Produkty na fakturze: " + inv);
    for (Product product: products) {
        System.out.println(product);
    }

    System.out.println();
    Product prod = session.get(Product.class, 1);
    System.out.println(prod + " znajduje sie na fakturze: " + prod.getInvoices());

    tx.commit();


    session.close();
}
```

Dane zostały pobrane z tabel bez problemu:

```
Produkty na fakturze: 1
Hibernate:
    select
        p1_0.invoice_id,
        p1_1.productID,
        c1_0.categoryID,
        c1_0.name,
        p1_1.productName,
        s1_0.supplierID,
        s1_0.city,
        s1_0.companyName,
        s1_0.street,
        p1_1.unitsOnStock
    from
        invoice_product p1_0
    join
        Product p1_1
            on p1_1.productID=p1_0.product_id
    left join
        Categories c1_0
            on c1_0.categoryID=p1_1.categoryID
    left join
        Supplier s1_0
            on s1_0.supplierID=p1_1.supplierID
    where
        p1_0.invoice_id=?
Product{productID=2, productName='Tablet', unitsOnStock=7, supplier=null}
Product{productID=1, productName='Telewizor', unitsOnStock=10, supplier=null}
```

```
Product{productID=1, productName='Telewizor', unitsOnStock=10, supplier=null} znajduje sie na fakturze: [1]
```

JPA

zad 6 - Nowy Main

VI. JPA

a. Stwórz nowego maina w którym zrobisz to samo co w poprzednim ale z wykorzystaniem JPA

b. **Udokumentuj wykonane kroki oraz uzyskane rezultaty (logi wywołań sqlowych, describe table/schemat bazy danych, select * from….)**

Do resources dodałem nowy plik `persistence.xml`

```
<?xml version="1.0" encoding="UTF-8" ?>
<persistence xmlns="https://jakarta.ee/xml/ns/persistence"
             xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
             xsi:schemaLocation="https://jakarta.ee/xml/ns/persistence
                                 https://jakarta.ee/xml/ns/persistence/persistence_3_0.xsd"
             version="3.0">
    <persistence-unit name="derby" transaction-type="RESOURCE_LOCAL">
        <properties>
            <property name="hibernate.dialect" value="org.hibernate.dialect.DerbyDialect" />

            <property name="hibernate.connection.driver_class"
                      value="org.apache.derby.jdbc.ClientDriver"/>
            <property name="hibernate.connection.url"
                      value="jdbc:derby://127.0.0.1/TFDatabase-2;create=true"/>
            <property name="hibernate.show_sql" value="true"/>
            <property name="hibernate.format_sql" value="true"/>
            <property name="hibernate.hbm2ddl.auto" value="create-drop"/>
        </properties>
    </persistence-unit>
</persistence>
```

Stworzyłem nowego Maina:

```
package org.example;

import javax.management.InvalidAttributeValueException;
import jakarta.persistence.*;
import org.hibernate.cfg.Configuration;

public class Main2 {
    private static final EntityManagerFactory emf;

    static {
        try {
            emf = Persistence.createEntityManagerFactory("derby");
        } catch (Throwable ex) {
            throw new ExceptionInInitializerError(ex);
        }
    }
    public static EntityManager getEntityManager() {
        return emf.createEntityManager();
    }

    public static void main(String[] args) {
        EntityManager em = getEntityManager();
        EntityTransaction etx = em.getTransaction();

        etx.begin();

        etx.commit();

        em.close();
```

```
    }
}
```

Przy próbie uruchomienia pojawiał się problem co wymusiło na mnie założenie nowej bazy danych `TFDatabase-2`.

zad 7 - Kaskady

VII. Kaskady

a. Zmodyfikuj model w taki sposób aby było możliwe kaskadowe tworzenie faktur wraz z nowymi produktami, oraz produktów wraz z nową fakturą

b. **Udokumentuj wykonane kroki oraz uzyskane rezultaty (logi wywołań sqlowych, describe table/schemat bazy danych, select * from….)**

Małe zmiany w klasach `Product` i `Invoice`

```
package org.example;

import jakarta.persistence.*;

import javax.management.InvalidAttributeValueException;
import java.util.HashSet;
import java.util.Set;

@Entity
public class Product {

    @Id
    @GeneratedValue(strategy = GenerationType.AUTO)
    private int productID;
    private String productName;
    private int unitsOnStock;
    @ManyToOne(cascade = CascadeType.PERSIST)
    @JoinColumn(name = "supplierID")
    private Supplier supplier;

    @ManyToOne(cascade = CascadeType.PERSIST)
    @JoinColumn(name = "categoryID")
    private Category category;
    @ManyToMany(cascade = CascadeType.PERSIST)
    private Set<Invoice> invoices = new HashSet<>();

    public Product() {
    }

    public Product(String productName, int unitsOnStock) {
        this.productName = productName;
        this.unitsOnStock = unitsOnStock;
    }

    public Product(String productName, int unitsOnStock, Supplier supplier) {
        this.productName = productName;
        this.unitsOnStock = unitsOnStock;
        this.supplier = supplier;
    }

    @Override
    public String toString() {
        return "Product{" +
                "productID=" + productID +
                ", productName='" + productName + '\'' +
                ", unitsOnStock=" + unitsOnStock +
                ", supplier=" + supplier +
                '}';
```

```java
    }

    public void setSupplier(Supplier supplier) {
        this.supplier = supplier;
    }

    public Supplier getSupplier() {
        return supplier;
    }

    public void setCategory(Category category) {
        this.category = category;
    }
    public Category getCategory() {
        return category;
    }

    public Set<Invoice> getInvoices() {
        return invoices;
    }

    public void sell(Invoice invoice, int quantity) throws InvalidAttributeValueException {
        if (unitsOnStock < quantity) {
            throw new InvalidAttributeValueException("Unable to sell " + quantity + " products");
        }
        unitsOnStock -= quantity;
        invoice.addProduct(this, quantity);
        invoices.add(invoice);
    }
}
```

```java
package org.example;

import jakarta.persistence.*;

import java.util.HashSet;
import java.util.Set;

@Entity
public class Invoice {
    @Id
    @GeneratedValue(strategy = GenerationType.AUTO)
    private int invoiceNumber;
    private int quantity = 0;

    @ManyToMany(cascade = CascadeType.PERSIST)
    private Set<Product> products = new HashSet<>();

    public Invoice() {}

    @Override
    public String toString() {
        return String.valueOf(invoiceNumber);
    }

    public void addProduct(Product product, int quantity) {
        this.products.add(product);
        this.quantity += quantity;
    }

    public int getInvoiceNumber() {
        return invoiceNumber;
    }

    public int getQuantity() {
        return quantity;
    }
```

```
    public Set<Product> getProducts() {
        return products;
    }

    public void setInvoiceNumber(int i) {
        invoiceNumber = i;
    }
}
```

Dodałem nową klasę `Main`, która prezentuje się następująco

```
package org.example;

import javax.management.InvalidAttributeValueException;
import jakarta.persistence.*;
import org.hibernate.cfg.Configuration;

public class Main2 {
    private static final EntityManagerFactory emf;

    static {
        try {
            emf = Persistence.createEntityManagerFactory("derby");
        } catch (Throwable ex) {
            throw new ExceptionInInitializerError(ex);
        }
    }
    public static EntityManager getEntityManager() {
        return emf.createEntityManager();
    }

    public static void main(String[] args) {
        EntityManager em = getEntityManager();
        EntityTransaction etx = em.getTransaction();

        etx.begin();

        Product product1 = new Product("Telewizor", 12);
        Product product2 = new Product("Tablet", 10);
        Product product3 = new Product("Buty", 2);

        Invoice invoice1 = new Invoice();
        Invoice invoice2 = new Invoice();

        try {
            product1.sell(invoice1, 2);
            product2.sell(invoice1, 3);

            invoice1.addProduct(product1, 2);
            invoice1.addProduct(product2, 3);

            product2.sell(invoice2, 5);
            product3.sell(invoice2, 1);

            invoice1.addProduct(product2, 5);
            invoice1.addProduct(product3, 1);
        } catch (InvalidAttributeValueException e) {
            e.printStackTrace();
        }
        em.persist(invoice1);
        em.persist(invoice2);

        em.persist(product1);
        em.persist(product2);
        em.persist(product3);
```

```
        etx.commit();

        em.close();
    }
}
```

I po uruchomieniu: Produkty

	CATEGORYID	PRODUCTID	SUPPLIERID	UNITSONSTOCK	PRODUCTNAME
1	<null>	1	<null>	10	Telewizor
2	<null>	2	<null>	2	Tablet
3	<null>	3	<null>	1	Buty

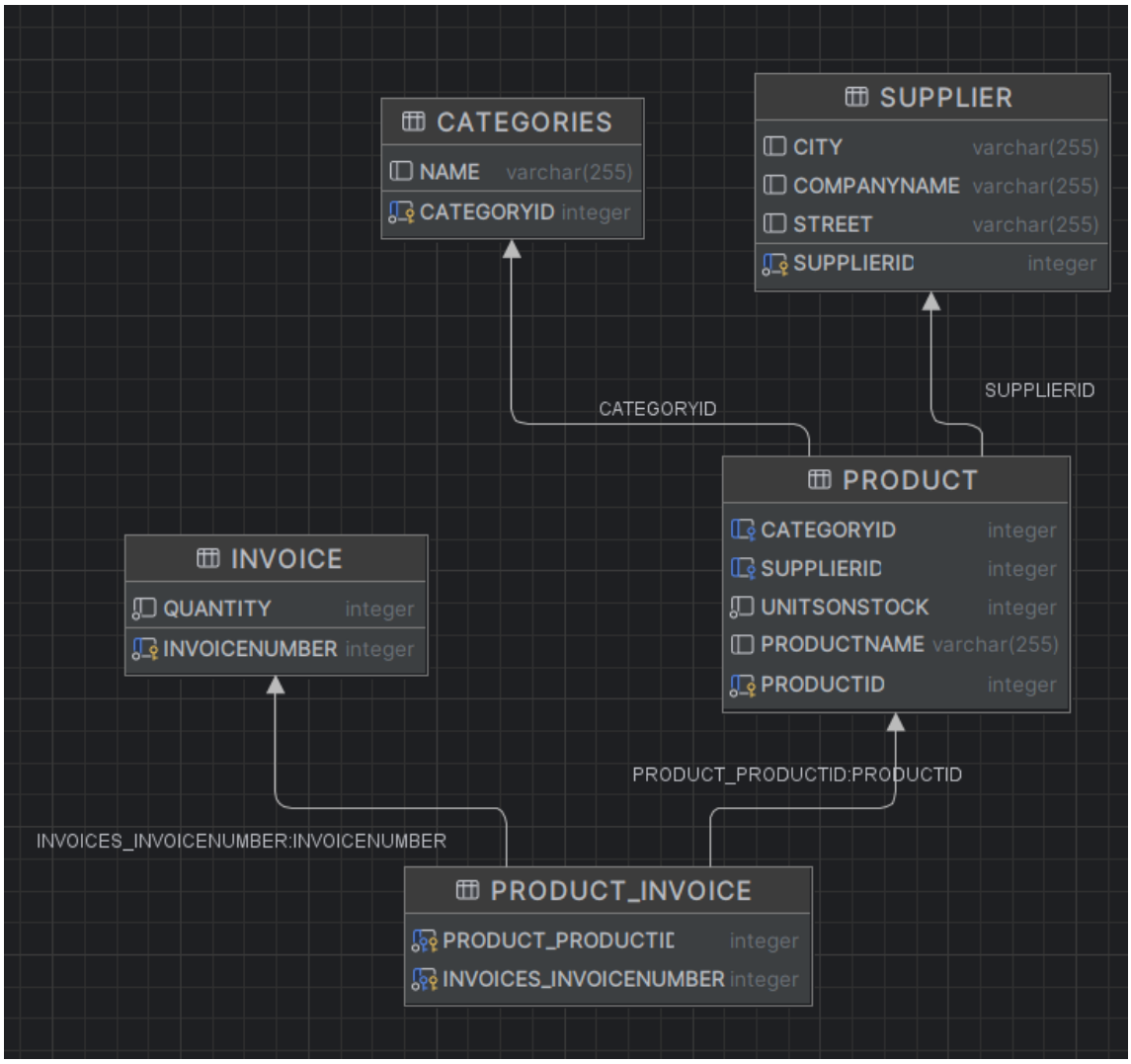
Invoice

	INVOICENUMBER	QUANTITY
1	1	16
2	2	6

Tabela łącząca

	PRODUCT_PRODUCTID	INVOICES_INVOICENUMBER
1	1	1
2	2	1
3	2	2
4	3	2

Diagram



Logi

```
Hibernate:
    alter table Categories_Product
       drop constraint FKj2os2i9k3csyvf46fkbwht0jr
Jun 18, 2024 5:23:07 PM
org.hibernate.resource.transaction.backend.jdbc.internal.DdlTransactionIsolatorNonJtaImpl
getIsolatedConnection
INFO: HHH10001501: Connection obtained from JdbcConnectionAccess
[org.hibernate.engine.jdbc.env.internal.JdbcEnvironmentInitiator$ConnectionProviderJdbcConnectionAccess@4cff
cc61] for (non-JTA) DDL execution was not in auto-commit mode; the Connection 'local transaction' will be
committed and the Connection will be set into auto-commit mode.
Hibernate:
    alter table Categories_Product
       drop constraint FKr4ej7oli41fs0pf2opwsbm895
Hibernate:
    alter table Invoice_Product
       drop constraint FK2mn08nt19nrqagr12grh5uho0
Hibernate:
    alter table Invoice_Product
       drop constraint FKdcqcg67bvypj7er793nxfs6c
Hibernate:
    alter table Product
       drop constraint FK2n895ibej5nhngow51i4v1hbk
Hibernate:
    alter table Product
       drop constraint FKj0x097f8xajoy9j9ryct9pf3o
Hibernate:
    alter table Product_Invoice
       drop constraint FK7ovenf6omukkxk1s5aw80e8dk
Hibernate:
```

```
    alter table Product_Invoice
       drop constraint FKjds8rnojb0u1k36chydx2ej7g
Hibernate:
    alter table Supplier_Product
       drop constraint FKar5fwoh7a3vqxo0f8fh1ey8ha
Hibernate:
    alter table Supplier_Product
       drop constraint FKjskj7cplt17tebkn930wt8ke6
Hibernate:
    drop table Categories
Hibernate:
    drop table Categories_Product
Hibernate:
    drop table Invoice
Hibernate:
    drop table Invoice_Product
Hibernate:
    drop table Product
Hibernate:
    drop table Product_Invoice
Hibernate:
    drop table Supplier
Hibernate:
    drop table Supplier_Product
Hibernate:
    drop sequence Categories_SEQ restrict
Hibernate:
    drop sequence Invoice_SEQ restrict
Hibernate:
    drop sequence Product_SEQ restrict
Hibernate:
    drop sequence Supplier_SEQ restrict
Hibernate:
    create sequence Categories_SEQ start with 1 increment by 50
Jun 18, 2024 5:23:08 PM
org.hibernate.resource.transaction.backend.jdbc.internal.DdlTransactionIsolatorNonJtaImpl
getIsolatedConnection
INFO: HHH10001501: Connection obtained from JdbcConnectionAccess
[org.hibernate.engine.jdbc.env.internal.JdbcEnvironmentInitiator$ConnectionProviderJdbcConnectionAccess@7483
4afd] for (non-JTA) DDL execution was not in auto-commit mode; the Connection 'local transaction' will be
committed and the Connection will be set into auto-commit mode.
Hibernate:
    create sequence Invoice_SEQ start with 1 increment by 50
Hibernate:
    create sequence Product_SEQ start with 1 increment by 50
Hibernate:
    create sequence Supplier_SEQ start with 1 increment by 50
Hibernate:
    create table Categories (
        categoryID integer not null,
        name varchar(255),
        primary key (categoryID)
    )
Hibernate:
    create table Categories_Product (
        Category_categoryID integer not null,
        products_productID integer not null unique
    )
Hibernate:
    create table Invoice (
        invoiceNumber integer not null,
        quantity integer not null,
        primary key (invoiceNumber)
    )
Hibernate:
    create table Invoice_Product (
        Invoice_invoiceNumber integer not null,
        products_productID integer not null,
        primary key (Invoice_invoiceNumber, products_productID)
```

```
    )
Hibernate:
    create table Product (
        categoryID integer,
        productID integer not null,
        supplierID integer,
        unitsOnStock integer not null,
        productName varchar(255),
        primary key (productID)
    )
Hibernate:
    create table Product_Invoice (
        Product_productID integer not null,
        invoices_invoiceNumber integer not null,
        primary key (Product_productID, invoices_invoiceNumber)
    )
Hibernate:
    create table Supplier (
        supplierID integer not null,
        city varchar(255),
        companyName varchar(255),
        street varchar(255),
        primary key (supplierID)
    )
Hibernate:
    create table Supplier_Product (
        Supplier_supplierID integer not null,
        products_productID integer not null unique
    )
Hibernate:
    alter table Categories_Product
       add constraint FKj2os2i9k3csyvf46fkbwht0jr
       foreign key (products_productID)
       references Product
Hibernate:
    alter table Categories_Product
       add constraint FKr4ej7oli41fs0pf2opwsbm895
       foreign key (Category_categoryID)
       references Categories
Hibernate:
    alter table Invoice_Product
       add constraint FK2mn08nt19nrqagr12grh5uho0
       foreign key (products_productID)
       references Product
Hibernate:
    alter table Invoice_Product
       add constraint FKdcqcg67bvypj7er793nxfs6c
       foreign key (Invoice_invoiceNumber)
       references Invoice
Hibernate:
    alter table Product
       add constraint FK2n895ibej5nhngow51i4v1hbk
       foreign key (categoryID)
       references Categories
Hibernate:
    alter table Product
       add constraint FKj0x097f8xajoy9j9ryct9pf3o
       foreign key (supplierID)
       references Supplier
Hibernate:
    alter table Product_Invoice
       add constraint FK7ovenf6omukkxk1s5aw80e8dk
       foreign key (invoices_invoiceNumber)
       references Invoice
Hibernate:
    alter table Product_Invoice
       add constraint FKjds8rnojb0u1k36chydx2ej7g
       foreign key (Product_productID)
       references Product
```

```
Hibernate:
    alter table Supplier_Product
       add constraint FKar5fwoh7a3vqxo0f8fh1ey8ha
       foreign key (products_productID)
       references Product
Hibernate:
    alter table Supplier_Product
       add constraint FKjskj7cplt17tebkn930wt8ke6
       foreign key (Supplier_supplierID)
       references Supplier
Hibernate:

values
    next value for Invoice_SEQ
Hibernate:

values
    next value for Product_SEQ
Hibernate:

values
    next value for Invoice_SEQ
Hibernate:

values
    next value for Product_SEQ
Hibernate:
    insert
    into
        Invoice
        (quantity, invoiceNumber)
    values
        (?, ?)
Hibernate:
    insert
    into
        Product
        (categoryID, productName, supplierID, unitsOnStock, productID)
    values
        (?, ?, ?, ?, ?)
Hibernate:
    insert
    into
        Invoice
        (quantity, invoiceNumber)
    values
        (?, ?)
Hibernate:
    insert
    into
        Product
        (categoryID, productName, supplierID, unitsOnStock, productID)
    values
        (?, ?, ?, ?, ?)
Hibernate:
    insert
    into
        Product
        (categoryID, productName, supplierID, unitsOnStock, productID)
    values
        (?, ?, ?, ?, ?)
Hibernate:
    insert
    into
        Invoice_Product
        (Invoice_invoiceNumber, products_productID)
    values
        (?, ?)
Hibernate:
```

```
    insert
    into
        Invoice_Product
        (Invoice_invoiceNumber, products_productID)
    values
        (?, ?)
Hibernate:
    insert
    into
        Invoice_Product
        (Invoice_invoiceNumber, products_productID)
    values
        (?, ?)
Hibernate:
    insert
    into
        Product_Invoice
        (Product_productID, invoices_invoiceNumber)
    values
        (?, ?)
Hibernate:
    insert
    into
        Invoice_Product
        (Invoice_invoiceNumber, products_productID)
    values
        (?, ?)
Hibernate:
    insert
    into
        Invoice_Product
        (Invoice_invoiceNumber, products_productID)
    values
        (?, ?)
Hibernate:
    insert
    into
        Product_Invoice
        (Product_productID, invoices_invoiceNumber)
    values
        (?, ?)
Hibernate:
    insert
    into
        Product_Invoice
        (Product_productID, invoices_invoiceNumber)
    values
        (?, ?)
Hibernate:
    insert
    into
        Product_Invoice
        (Product_productID, invoices_invoiceNumber)
    values
        (?, ?)
```

zad 8 i 9 - nie zdążyłem zrobić