**Лабораторна робота №3**

**СПАДКУВАННЯ ТА ПОЛІМОРФІЗМ JAVA**

**Мета роботи:**

* Ознайомитися з реалізацією спадкування в Java.
* Ознайомитися зі шляхами реалізації поліморфізму в Java.
* Створити додаток з використанням спадкування і реалізацією поліморфізму.

**Хід роботи**

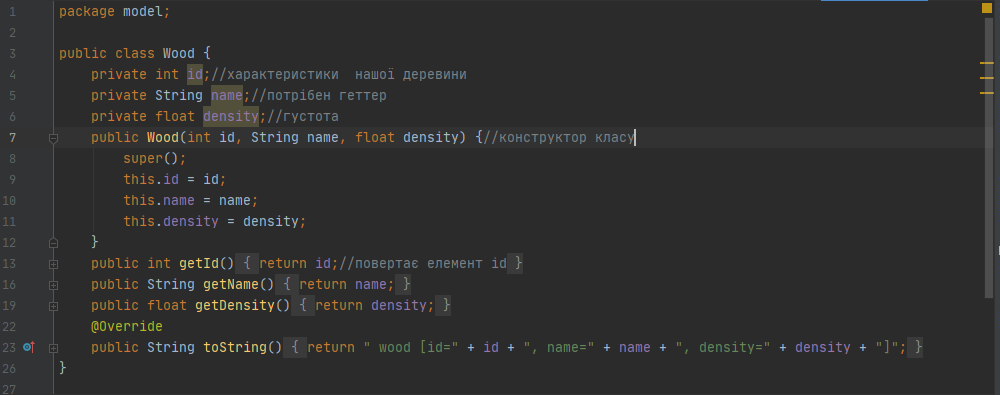
Припустимо, що деревообробне підприємство, для якого створювалося застосування на попередній лабораторній роботі, почало виготовляти також циліндричні бруси, і в подальшому, можливо, ще й інших форм.

Окрім того, з’ясувалося, що є великий попит на залишки деревини, що подрібнюються без сортування на види деревини та завантажуються у мішки.

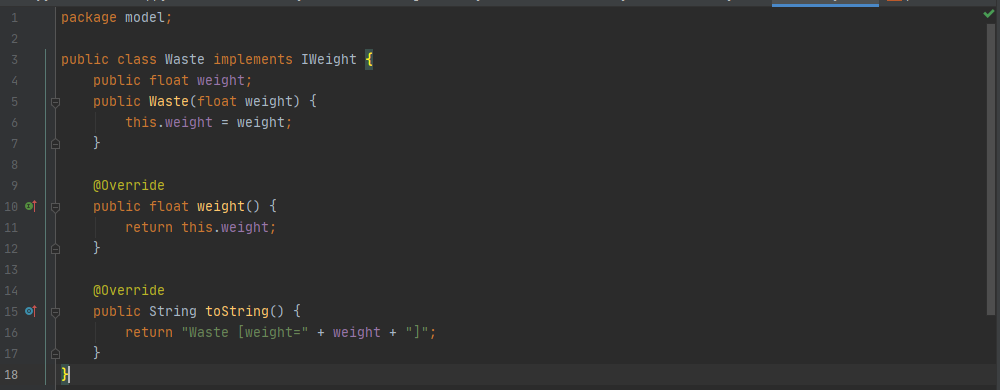
Необхідно терміново доробити створений додаток. Інформація про продукцію, що відправляєтеся, має накопичуватися у одному сховищі.

Шляхом копіювання пакетів із попередньої лабораторної роботи ми створюємо новий проект. Після цього за допомогою рефакторингу змінюємо назви пакетів у відповідності з номером лабораторної роботи.

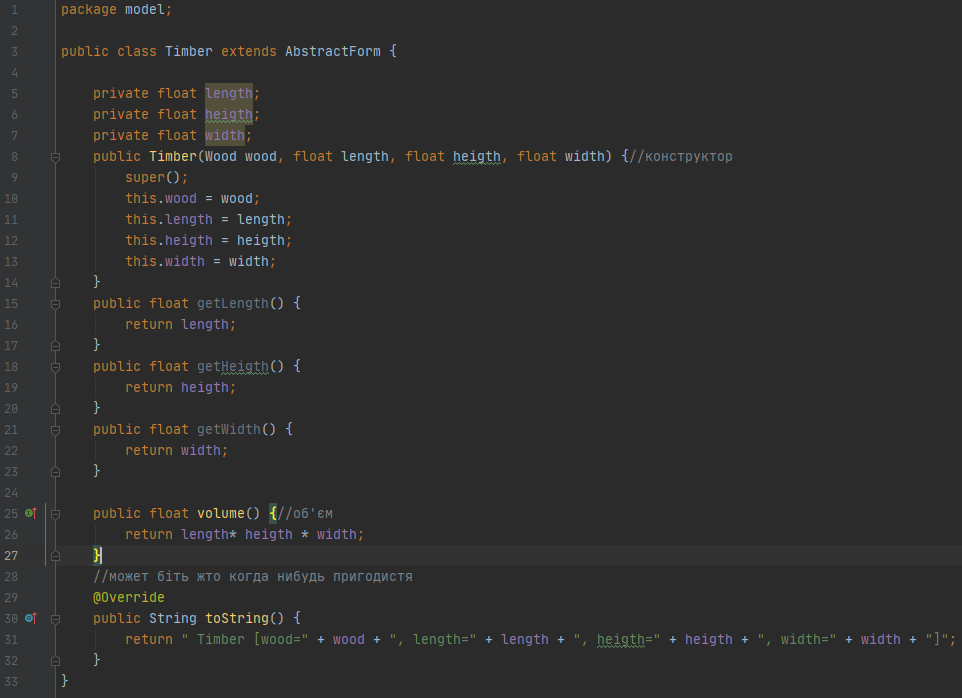
**1. Код класу model.Wood**



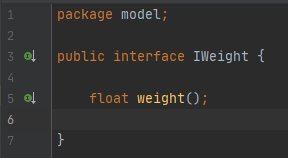
**2.** **Код класу model.Waste**



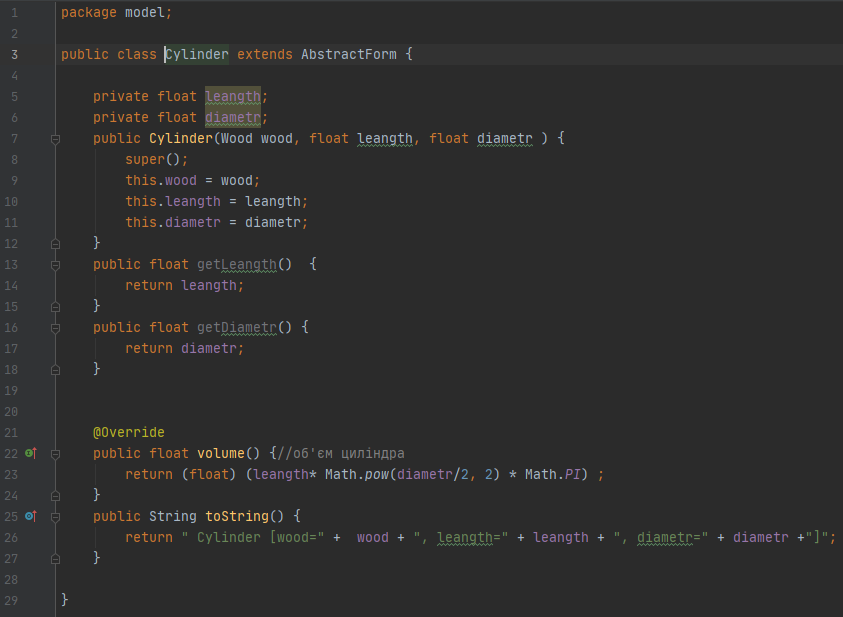
**3.** **Код класу model.Timber**



**4.** **Код інтерфесу model.IWeight**



**5.** **Код інтерфесу model.Cylinder**



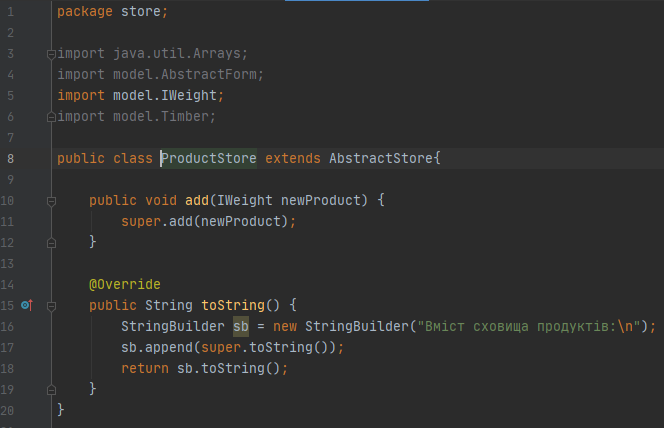
**6.** **Код класу model.AbstractForm**



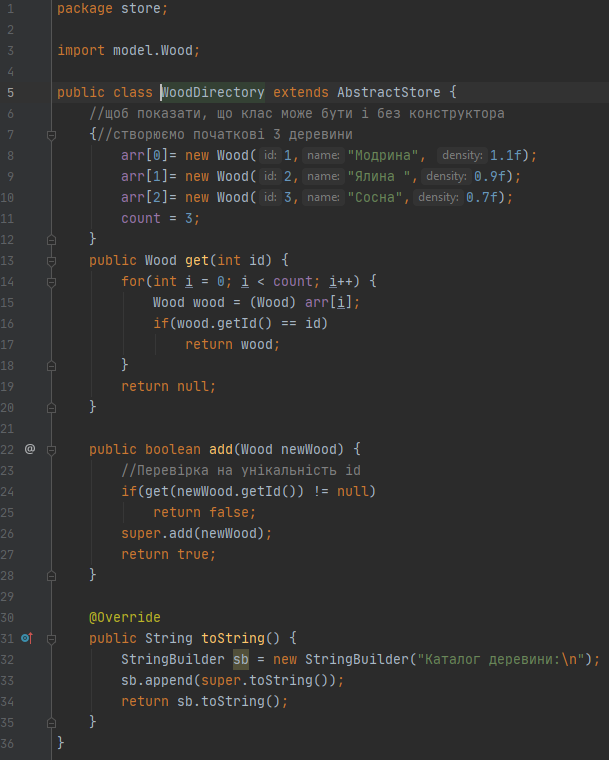
**7.** **Код класу store.AbstractStore**



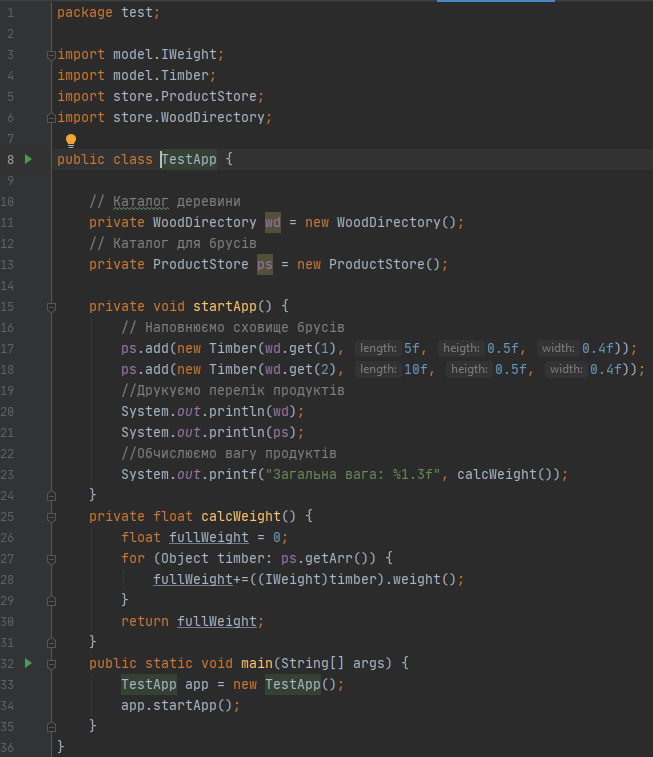
**8.** **Код класу store.ProductStore**



**9.** **Код класу store.WoodDirectory**



**10.** **Код класу test.** **TestApp**



**11.** **Код класу view.** **MainWindow**

|  |
| --- |
| package view; import java.awt.EventQueue;  import javax.swing.JFrame; import javax.swing.JPanel; import java.awt.BorderLayout; import javax.swing.JList; import javax.swing.JOptionPane; import javax.swing.DefaultListModel; import javax.swing.UIManager;  import store.ProductStore; import store.WoodDirectory; import model.\*;  import java.awt.GridBagLayout; import java.awt.GridBagConstraints; import java.awt.Insets; import java.awt.Color; import javax.swing.JTextField; import javax.swing.JTabbedPane; import java.awt.Label; import java.awt.Button; import javax.swing.JScrollPane; import java.awt.event.ActionListener; import java.awt.event.ActionEvent; import javax.swing.JComboBox; import javax.swing.JButton;  public class MainWindow {   private JFrame frame;  private JTextField new\_id\_wood;  private JTextField new\_density\_wood;  private JTextField new\_name\_wood;  private JTextField new\_lenght\_timber;  private JTextField new\_height\_timber;  private JTextField new\_width\_timber;  DefaultListModel<String> list\_woods = new DefaultListModel<>();  JList<String> list = new JList<>(list\_woods);   DefaultListModel<String> listTibers = new DefaultListModel<>();  JList<String> list\_1 = new JList<>(listTibers);   private WoodDirectory wd1 = new WoodDirectory();  private ProductStore ps1 = new ProductStore();  private JTextField new\_diameter\_cylinder;  private JTextField new\_length\_cylinder;  private JTextField new\_weight\_waste;   */\*\*  \* Launch the application.  \*/* public static void main(String[] args) {  EventQueue.*invokeLater*(new Runnable() {  public void run() {  try {  UIManager.*setLookAndFeel*(UIManager.*getSystemLookAndFeelClassName*());  MainWindow window = new MainWindow();  window.frame.setVisible(true);  } catch (Exception e) {  e.printStackTrace();  }  }  });  }   */\*\*  \* Create the application.  \*/* public MainWindow() {  initialize();  }  */\*\*  \* Initialize the contents of the frame.  \*/* private void initialize() {  frame = new JFrame();  frame.setBounds(100, 100, 653, 485);  frame.setDefaultCloseOperation(JFrame.*EXIT\_ON\_CLOSE*);  frame.setTitle("LAB 2");   JTabbedPane tabbedPane = new JTabbedPane(JTabbedPane.*TOP*);  frame.getContentPane().add(tabbedPane, BorderLayout.*CENTER*);   JPanel panel = new JPanel();  panel.setBackground(new Color(239, 255, 0));  tabbedPane.addTab("Woods", null, panel, null);  GridBagLayout gbl\_panel = new GridBagLayout();  gbl\_panel.columnWidths = new int[]{0, 0, 0, 0};  gbl\_panel.rowHeights = new int[]{0, 0, 0, 0, 0, 0};  gbl\_panel.columnWeights = new double[]{0.0, 0.0, 1.0, Double.*MIN\_VALUE*};  gbl\_panel.rowWeights = new double[]{0.0, 0.0, 0.0, 0.0, 1.0, Double.*MIN\_VALUE*};  panel.setLayout(gbl\_panel);   Button add\_woood = new Button("Add wood");   GridBagConstraints gbc\_add\_woood = new GridBagConstraints();  gbc\_add\_woood.insets = new Insets(0, 0, 5, 5);  gbc\_add\_woood.gridx = 0;  gbc\_add\_woood.gridy = 0;  panel.add(add\_woood, gbc\_add\_woood);   Button delete\_wood = new Button("Delete wood");   GridBagConstraints gbc\_delete\_wood = new GridBagConstraints();  gbc\_delete\_wood.insets = new Insets(0, 0, 5, 5);  gbc\_delete\_wood.gridx = 0;  gbc\_delete\_wood.gridy = 1;  panel.add(delete\_wood, gbc\_delete\_wood);   Label label = new Label("Id");  GridBagConstraints gbc\_label = new GridBagConstraints();  gbc\_label.insets = new Insets(0, 0, 5, 5);  gbc\_label.gridx = 0;  gbc\_label.gridy = 2;  panel.add(label, gbc\_label);   new\_id\_wood = new JTextField();  GridBagConstraints gbc\_new\_id\_wood = new GridBagConstraints();  gbc\_new\_id\_wood.insets = new Insets(0, 0, 5, 5);  gbc\_new\_id\_wood.fill = GridBagConstraints.*HORIZONTAL*;  gbc\_new\_id\_wood.gridx = 1;  gbc\_new\_id\_wood.gridy = 2;  panel.add(new\_id\_wood, gbc\_new\_id\_wood);  new\_id\_wood.setColumns(10);   Label label\_1 = new Label("Name");  GridBagConstraints gbc\_label\_1 = new GridBagConstraints();  gbc\_label\_1.insets = new Insets(0, 0, 5, 5);  gbc\_label\_1.gridx = 0;  gbc\_label\_1.gridy = 3;  panel.add(label\_1, gbc\_label\_1);   new\_name\_wood = new JTextField();  GridBagConstraints gbc\_new\_name\_wood = new GridBagConstraints();  gbc\_new\_name\_wood.insets = new Insets(0, 0, 5, 5);  gbc\_new\_name\_wood.fill = GridBagConstraints.*HORIZONTAL*;  gbc\_new\_name\_wood.gridx = 1;  gbc\_new\_name\_wood.gridy = 3;  panel.add(new\_name\_wood, gbc\_new\_name\_wood);  new\_name\_wood.setColumns(10);   Label label\_2 = new Label("density");  GridBagConstraints gbc\_label\_2 = new GridBagConstraints();  gbc\_label\_2.anchor = GridBagConstraints.*NORTH*;  gbc\_label\_2.insets = new Insets(0, 0, 0, 5);  gbc\_label\_2.gridx = 0;  gbc\_label\_2.gridy = 4;  panel.add(label\_2, gbc\_label\_2);   new\_density\_wood = new JTextField();  GridBagConstraints gbc\_new\_density\_wood = new GridBagConstraints();  gbc\_new\_density\_wood.anchor = GridBagConstraints.*NORTH*;  gbc\_new\_density\_wood.insets = new Insets(0, 0, 0, 5);  gbc\_new\_density\_wood.fill = GridBagConstraints.*HORIZONTAL*;  gbc\_new\_density\_wood.gridx = 1;  gbc\_new\_density\_wood.gridy = 4;  panel.add(new\_density\_wood, gbc\_new\_density\_wood);  new\_density\_wood.setColumns(10);   JScrollPane scrollPane = new JScrollPane();  GridBagConstraints gbc\_scrollPane = new GridBagConstraints();  gbc\_scrollPane.gridheight = 5;  gbc\_scrollPane.fill = GridBagConstraints.*BOTH*;  gbc\_scrollPane.gridx = 2;  gbc\_scrollPane.gridy = 0;  panel.add(scrollPane, gbc\_scrollPane);   JComboBox<String> comboBoxWood = new JComboBox<>();  GridBagConstraints gbc\_comboBoxWood = new GridBagConstraints();  gbc\_comboBoxWood.gridwidth = 4;  gbc\_comboBoxWood.insets = new Insets(0, 0, 5, 5);  gbc\_comboBoxWood.fill = GridBagConstraints.*HORIZONTAL*;  gbc\_comboBoxWood.gridx = 1;  gbc\_comboBoxWood.gridy = 2;   scrollPane.setViewportView(list);   JPanel panel\_1 = new JPanel();  panel\_1.setBackground(new Color(209, 255, 0));  tabbedPane.addTab("Timbers", null, panel\_1, null);  GridBagLayout gbl\_panel\_1 = new GridBagLayout();  gbl\_panel\_1.columnWidths = new int[]{61, 116, 0, 64, 0, 0, 0, 0, 0, 0};  gbl\_panel\_1.rowHeights = new int[]{0, 0, 0, 0, 0, 3, 5, 225, 0};  gbl\_panel\_1.columnWeights = new double[]{1.0, 1.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, Double.*MIN\_VALUE*};  gbl\_panel\_1.rowWeights = new double[]{0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, Double.*MIN\_VALUE*};  panel\_1.setLayout(gbl\_panel\_1);  for(int i = 0; i < 3; i++) {  comboBoxWood.addItem(wd1.getArr()[i].toString());  }   Button delete\_timber = new Button("Delete timber");  GridBagConstraints gbc\_delete\_timber = new GridBagConstraints();  gbc\_delete\_timber.insets = new Insets(0, 0, 5, 0);  gbc\_delete\_timber.gridx = 8;  gbc\_delete\_timber.gridy = 0;  panel\_1.add(delete\_timber, gbc\_delete\_timber);   delete\_timber.addActionListener(new ActionListener() {  public void actionPerformed(ActionEvent e) {  int n = list\_1.getSelectedIndex();  if (n != -1) {  ps1.remove(n);  listTibers.remove(n);  }  }  });   JButton btnTotalWeight = new JButton("Total weight");  GridBagConstraints gbc\_btnTotalWeight = new GridBagConstraints();  gbc\_btnTotalWeight.insets = new Insets(0, 0, 5, 0);  gbc\_btnTotalWeight.gridx = 8;  gbc\_btnTotalWeight.gridy = 1;  panel\_1.add(btnTotalWeight, gbc\_btnTotalWeight);   btnTotalWeight.addActionListener(new ActionListener() {   public void actionPerformed(ActionEvent e) {  float totalWeight = 0f;  for (Object ps1: ps1.getArr()) {  totalWeight+=((IWeight) ps1).weight();  }  JOptionPane.*showMessageDialog*(btnTotalWeight, totalWeight, "Total weight: " , JOptionPane.*INFORMATION\_MESSAGE*);  }  });   Label label\_3 = new Label("Wood");  GridBagConstraints gbc\_label\_3 = new GridBagConstraints();  gbc\_label\_3.insets = new Insets(0, 0, 5, 5);  gbc\_label\_3.gridx = 0;  gbc\_label\_3.gridy = 2;  panel\_1.add(label\_3, gbc\_label\_3);   panel\_1.add(comboBoxWood, gbc\_comboBoxWood);   Label label\_4 = new Label("Lenght");  GridBagConstraints gbc\_label\_4 = new GridBagConstraints();  gbc\_label\_4.insets = new Insets(0, 0, 5, 5);  gbc\_label\_4.gridx = 0;  gbc\_label\_4.gridy = 3;  panel\_1.add(label\_4, gbc\_label\_4);   new\_lenght\_timber = new JTextField();  GridBagConstraints gbc\_new\_lenght\_timber = new GridBagConstraints();  gbc\_new\_lenght\_timber.insets = new Insets(0, 0, 5, 5);  gbc\_new\_lenght\_timber.fill = GridBagConstraints.*HORIZONTAL*;  gbc\_new\_lenght\_timber.gridx = 1;  gbc\_new\_lenght\_timber.gridy = 3;  panel\_1.add(new\_lenght\_timber, gbc\_new\_lenght\_timber);  new\_lenght\_timber.setColumns(10);   Label label\_5 = new Label("Height");  GridBagConstraints gbc\_label\_5 = new GridBagConstraints();  gbc\_label\_5.insets = new Insets(0, 0, 5, 5);  gbc\_label\_5.gridx = 0;  gbc\_label\_5.gridy = 4;  panel\_1.add(label\_5, gbc\_label\_5);   new\_height\_timber = new JTextField();  GridBagConstraints gbc\_new\_height\_timber = new GridBagConstraints();  gbc\_new\_height\_timber.insets = new Insets(0, 0, 5, 5);  gbc\_new\_height\_timber.fill = GridBagConstraints.*HORIZONTAL*;  gbc\_new\_height\_timber.gridx = 1;  gbc\_new\_height\_timber.gridy = 4;  panel\_1.add(new\_height\_timber, gbc\_new\_height\_timber);  new\_height\_timber.setColumns(10);   Label label\_7 = new Label("Length");  GridBagConstraints gbc\_label\_7 = new GridBagConstraints();  gbc\_label\_7.insets = new Insets(0, 0, 5, 5);  gbc\_label\_7.gridx = 3;  gbc\_label\_7.gridy = 4;  panel\_1.add(label\_7, gbc\_label\_7);   new\_length\_cylinder = new JTextField();  GridBagConstraints gbc\_new\_length\_cylinder = new GridBagConstraints();  gbc\_new\_length\_cylinder.insets = new Insets(0, 0, 5, 5);  gbc\_new\_length\_cylinder.fill = GridBagConstraints.*HORIZONTAL*;  gbc\_new\_length\_cylinder.gridx = 4;  gbc\_new\_length\_cylinder.gridy = 4;  panel\_1.add(new\_length\_cylinder, gbc\_new\_length\_cylinder);  new\_length\_cylinder.setColumns(10);   Label label\_6 = new Label("Width");  GridBagConstraints gbc\_label\_6 = new GridBagConstraints();  gbc\_label\_6.anchor = GridBagConstraints.*NORTH*;  gbc\_label\_6.insets = new Insets(0, 0, 5, 5);  gbc\_label\_6.gridx = 0;  gbc\_label\_6.gridy = 5;  panel\_1.add(label\_6, gbc\_label\_6);   new\_width\_timber = new JTextField();  GridBagConstraints gbc\_new\_width\_timber = new GridBagConstraints();  gbc\_new\_width\_timber.anchor = GridBagConstraints.*NORTH*;  gbc\_new\_width\_timber.insets = new Insets(0, 0, 5, 5);  gbc\_new\_width\_timber.fill = GridBagConstraints.*HORIZONTAL*;  gbc\_new\_width\_timber.gridx = 1;  gbc\_new\_width\_timber.gridy = 5;  panel\_1.add(new\_width\_timber, gbc\_new\_width\_timber);  new\_width\_timber.setColumns(10);   Label label\_8 = new Label("Diameter");  GridBagConstraints gbc\_label\_8 = new GridBagConstraints();  gbc\_label\_8.insets = new Insets(0, 0, 5, 5);  gbc\_label\_8.gridx = 3;  gbc\_label\_8.gridy = 5;  panel\_1.add(label\_8, gbc\_label\_8);   new\_diameter\_cylinder = new JTextField();  GridBagConstraints gbc\_new\_diameter\_cylinder = new GridBagConstraints();  gbc\_new\_diameter\_cylinder.insets = new Insets(0, 0, 5, 5);  gbc\_new\_diameter\_cylinder.fill = GridBagConstraints.*HORIZONTAL*;  gbc\_new\_diameter\_cylinder.gridx = 4;  gbc\_new\_diameter\_cylinder.gridy = 5;  panel\_1.add(new\_diameter\_cylinder, gbc\_new\_diameter\_cylinder);  new\_diameter\_cylinder.setColumns(10);   Label label\_9 = new Label("Weight");  GridBagConstraints gbc\_label\_9 = new GridBagConstraints();  gbc\_label\_9.insets = new Insets(0, 0, 5, 5);  gbc\_label\_9.gridx = 6;  gbc\_label\_9.gridy = 5;  panel\_1.add(label\_9, gbc\_label\_9);   new\_weight\_waste = new JTextField();  GridBagConstraints gbc\_new\_weight\_waste = new GridBagConstraints();  gbc\_new\_weight\_waste.insets = new Insets(0, 0, 5, 5);  gbc\_new\_weight\_waste.fill = GridBagConstraints.*HORIZONTAL*;  gbc\_new\_weight\_waste.gridx = 7;  gbc\_new\_weight\_waste.gridy = 5;  panel\_1.add(new\_weight\_waste, gbc\_new\_weight\_waste);  new\_weight\_waste.setColumns(10);   Button add\_timber = new Button("Add timber");   GridBagConstraints gbc\_add\_timber = new GridBagConstraints();  gbc\_add\_timber.insets = new Insets(0, 0, 5, 5);  gbc\_add\_timber.gridx = 1;  gbc\_add\_timber.gridy = 6;  panel\_1.add(add\_timber, gbc\_add\_timber);    Button add\_cylinderBtn = new Button("Add cylinder");   GridBagConstraints gbc\_add\_cylinderBtn = new GridBagConstraints();  gbc\_add\_cylinderBtn.insets = new Insets(0, 0, 5, 5);  gbc\_add\_cylinderBtn.gridx = 4;  gbc\_add\_cylinderBtn.gridy = 6;  panel\_1.add(add\_cylinderBtn, gbc\_add\_cylinderBtn);   Button add\_waste = new Button("Add waste");   GridBagConstraints gbc\_add\_waste = new GridBagConstraints();  gbc\_add\_waste.fill = GridBagConstraints.*HORIZONTAL*;  gbc\_add\_waste.insets = new Insets(0, 0, 5, 5);  gbc\_add\_waste.gridx = 7;  gbc\_add\_waste.gridy = 6;  panel\_1.add(add\_waste, gbc\_add\_waste);   list\_1.setBackground(new Color(240, 255, 240));  GridBagConstraints gbc\_list\_1 = new GridBagConstraints();  gbc\_list\_1.gridwidth = 9;  gbc\_list\_1.fill = GridBagConstraints.*BOTH*;  gbc\_list\_1.gridx = 0;  gbc\_list\_1.gridy = 7;  panel\_1.add(list\_1, gbc\_list\_1);  for(int i = 0; i < 3; i++) {  list\_woods.addElement(wd1.getArr()[i].toString());  }   delete\_wood.addActionListener(new ActionListener() {  public void actionPerformed(ActionEvent e) {  int n = list.getSelectedIndex();  if (n != -1) {  wd1.remove(n);  list\_woods.remove(n);  }  //оновлюємо інформацію в combobox після видалення деревини  int itemCount = comboBoxWood.getItemCount();   for(int i=0;i<itemCount;i++){  comboBoxWood.removeItemAt(0);  }  for (int i = 0; i < wd1.getCount(); i++) {  comboBoxWood.addItem(wd1.getArr()[i].toString());  }  }  });   add\_woood.addActionListener(new ActionListener() {  public void actionPerformed(ActionEvent e) {  if(new\_id\_wood.getText().length() != 0 && new\_name\_wood.getText().length() !=0 && new\_density\_wood.getText().length() != 0) {  if(wd1.add(new Wood(Integer.*parseInt*(new\_id\_wood.getText()), new\_name\_wood.getText(), Float.*parseFloat*(new\_density\_wood.getText())))) {  list\_woods.addElement(wd1.getArr()[wd1.getCount() - 1].toString());  comboBoxWood.addItem(((Wood)wd1.getArr()[wd1.getCount() - 1]).getName());  //оновлюємо інформацію в combobox після додавання деревини  int itemCount = comboBoxWood.getItemCount();   for(int i=0;i<itemCount;i++){  comboBoxWood.removeItemAt(0);  }  for (int i = 0; i < wd1.getCount(); i++) {  comboBoxWood.addItem(wd1.getArr()[i].toString());  }  }  }  }  });  add\_timber.addActionListener(new ActionListener() {  public void actionPerformed(ActionEvent e) {  if(comboBoxWood.getItemAt(comboBoxWood.getSelectedIndex()) != null && new\_lenght\_timber.getText().length() != 0 && new\_height\_timber.getText().length() != 0 && new\_width\_timber.getText().length() != 0) {  ps1.add(new Timber((Wood) wd1.getArr()[comboBoxWood.getSelectedIndex()], Float.*parseFloat*(new\_lenght\_timber.getText()), Float.*parseFloat*(new\_height\_timber.getText()), Float.*parseFloat*(new\_width\_timber.getText())));  listTibers.addElement(ps1.getArr()[ps1.getCount() - 1].toString());  }  }  });   add\_cylinderBtn.addActionListener(new ActionListener() {  public void actionPerformed(ActionEvent e) {  if (new\_length\_cylinder.getText().length() != 0 && new\_diameter\_cylinder.getText().length() != 0) {  ps1.add(new Cylinder((Wood) wd1.getArr()[comboBoxWood.getSelectedIndex()], Float.*parseFloat*(new\_length\_cylinder.getText()), Float.*parseFloat*(new\_diameter\_cylinder.getText())));  listTibers.addElement(ps1.getArr()[ps1.getCount() - 1].toString());  }  }  });   add\_waste.addActionListener(new ActionListener() {  public void actionPerformed(ActionEvent e) {  if (new\_weight\_waste.getText().length() != 0) {  ps1.add(new Waste(Float.*parseFloat*(new\_weight\_waste.getText())));  listTibers.addElement(ps1.getArr()[ps1.getCount() - 1].toString());  }  }  });  } |

**12.** **Діаграма**

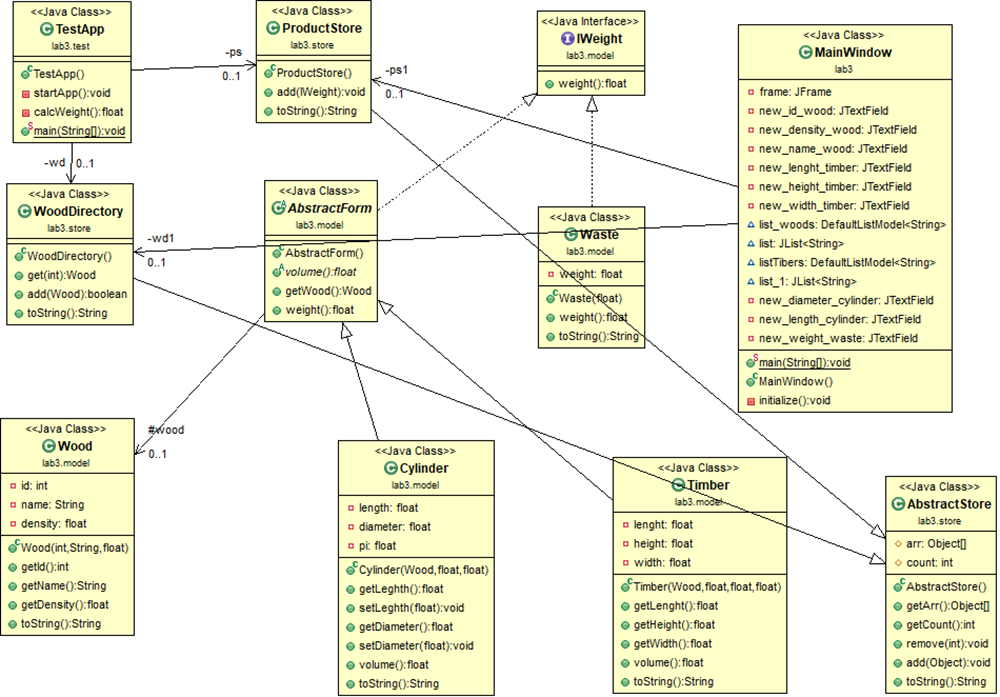


Рисунок 1.1 – Діаграма класів.

**13. Інтерфейс**

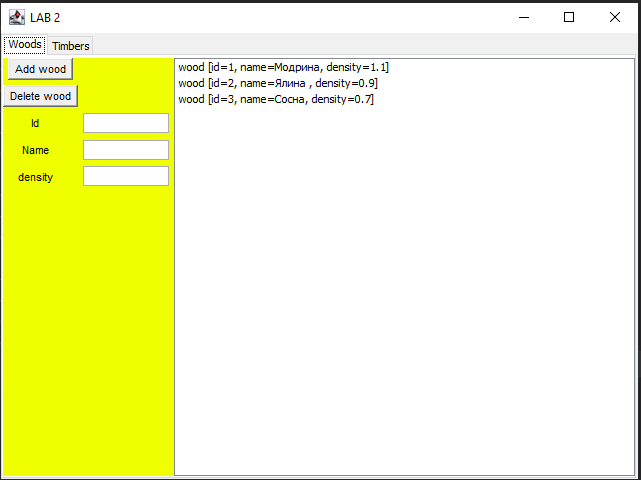


Рисунок 1.2 – Вікно введення даних різних типів.

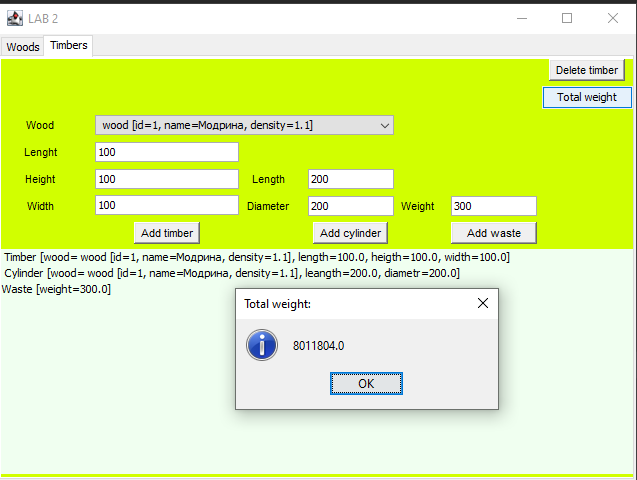


Рисунок 1.3 – Вікно введення даних різних типів.

**Висновки:** в процесі виконання лабораторної роботи ми ознайомились з реалізацією спадкування в Java та шляхами реалізації поліморфізму в Java. Також, перетворили додаток із попередньої лабораторної роботи з використанням спадкування і реалізацією поліморфізму.