WEEK 5 PRACTICE:

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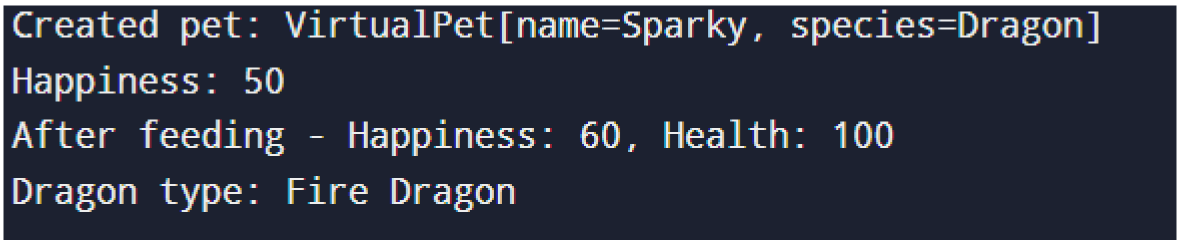
Ans1.
```
import java.util.*;

public class VirtualPetSystem {

  static final class PetSpecies {
    private final String speciesName;
    private final String[] evolutionStages;
    private final int maxLifespan;
    private final String habitat;

    public PetSpecies(String speciesName, String[] evolutionStages, int maxLifespan, String habitat) {
      this.speciesName = Objects.requireNonNull(speciesName);
      this.evolutionStages = evolutionStages != null ? evolutionStages.clone() : new String[0];
      this.maxLifespan = maxLifespan;
      this.habitat = Objects.requireNonNull(habitat);
      validateData();
    }

    private void validateData() {
      if (speciesName.isEmpty() || maxLifespan <= 0) {
        throw new IllegalArgumentException("Invalid species data");
      }
    }

    public String getSpeciesName() { return speciesName; }
    public String[] getEvolutionStages() { return evolutionStages.clone(); }
    public int getMaxLifespan() { return maxLifespan; }
    public String getHabitat() { return habitat; }
}

static class VirtualPet {
    private final String petId;
    private final PetSpecies species;
    private final long birthTimestamp;
    private String petName;
    private int age;
    private int happiness;
    private int health;
    protected static final String[] DEFAULT_EVOLUTION_STAGES = {"Egg", "Baby", "Adult"};
    static final int MAX_HAPPINESS = 100;
    static final int MAX_HEALTH = 100;
    public static final String PET_SYSTEM_VERSION = "2.0";

    public VirtualPet() {
        this("Pet" + UUID.randomUUID().toString().substring(0, 5));
    }

    public VirtualPet(String petName) {
        this(petName, new PetSpecies("Default", DEFAULT_EVOLUTION_STAGES, 100, "Forest"));
    }

    public VirtualPet(String petName, PetSpecies species) {
        this.petId = generatePetId();
        this.species = Objects.requireNonNull(species);
        this.birthTimestamp = System.currentTimeMillis();
        this.petName = Objects.requireNonNull(petName);
        this.age = 0;
    this.happiness = 50;
    this.health = 100;
}

private String generatePetId() {
    return "PET-" + UUID.randomUUID().toString().substring(0, 8);
}

public String getPetId() { return petId; }
public PetSpecies getSpecies() { return species; }
public long getBirthTimestamp() { return birthTimestamp; }
public String getPetName() { return petName; }
public int getAge() { return age; }
public int getHappiness() { return happiness; }
public int getHealth() { return health; }

public void setPetName(String petName) { this.petName = Objects.requireNonNull(petName); }

public void setHappiness(int happiness) {
    this.happiness = Math.max(0, Math.min(MAX_HAPPINESS, happiness));
}

public void setHealth(int health) {
    this.health = Math.max(0, Math.min(MAX_HEALTH, health));
}

public void feedPet(String foodType) {
    modifyHappiness(10);
    modifyHealth(5);
}
```

```
    public void playWithPet(String gameType) {
        modifyHappiness(15);
        modifyHealth(-2);
    }

    private void modifyHappiness(int amount) {
        setHappiness(happiness + amount);
    }

    private void modifyHealth(int amount) {
        setHealth(health + amount);
    }

    @Override
    public String toString() {
        return "VirtualPet[name=" + petName + ", species=" + species.getSpeciesName() + "]";
    }
}

static class DragonPet {
    private final String dragonType;
    private final String breathWeapon;
    private VirtualPet basePet;

    public DragonPet(String dragonType, String breathWeapon, VirtualPet basePet) {
        this.dragonType = Objects.requireNonNull(dragonType);
        this.breathWeapon = Objects.requireNonNull(breathWeapon);
        this.basePet = Objects.requireNonNull(basePet);
    }

    public String getDragonType() { return dragonType; }
```

```
        public String getBreathWeapon() { return breathWeapon; }
        public VirtualPet getBasePet() { return basePet; }
    }

    static class RobotPet {
        private boolean needsCharging;
        private int batteryLevel;
        private VirtualPet basePet;

        public RobotPet(VirtualPet basePet) {
            this.basePet = Objects.requireNonNull(basePet);
            this.batteryLevel = 100;
            this.needsCharging = false;
        }

        public boolean getNeedsCharging() { return needsCharging; }
        public int getBatteryLevel() { return batteryLevel; }
        public VirtualPet getBasePet() { return basePet; }

        public void setBatteryLevel(int batteryLevel) {
            this.batteryLevel = Math.max(0, Math.min(100, batteryLevel));
            this.needsCharging = batteryLevel < 20;
        }
    }

    public static void main(String[] args) {
        PetSpecies dragonSpecies = new PetSpecies("Dragon", new String[]{"Egg", "Wyrmling", "Adult"},
  500, "Mountain");

        VirtualPet myPet = new VirtualPet("Sparky", dragonSpecies);
        System.out.println("Created pet: " + myPet);
        System.out.println("Happiness: " + myPet.getHappiness());


        myPet.feedPet("Dragon Fruit");
        System.out.println("After feeding - Happiness: " + myPet.getHappiness() + ", Health: " +
myPet.getHealth());


        DragonPet dragon = new DragonPet("Fire Dragon", "Fire Breath", myPet);
        System.out.println("Dragon type: " + dragon.getDragonType());
    }
}
```



```
Created pet: VirtualPet[name=Sparky, species=Dragon]
Happiness: 50
After feeding - Happiness: 60, Health: 100
Dragon type: Fire Dragon
```

Ans 2. import java.util.*;

```
public class MedievalKingdom {


    static final class KingdomConfig {
        private final String kingdomName;
        private final int foundingYear;
        private final String[] allowedStructureTypes;
        private final Map<String, Integer> resourceLimits;


        public KingdomConfig(String kingdomName, int foundingYear, String[] allowedStructureTypes,
Map<String, Integer> resourceLimits) {
            this.kingdomName = Objects.requireNonNull(kingdomName);
            this.foundingYear = foundingYear;
            this.allowedStructureTypes = allowedStructureTypes != null ? allowedStructureTypes.clone() :
new String[0];
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            this.resourceLimits = resourceLimits != null ? new HashMap<>(resourceLimits) : new
HashMap<>();
            validateConfig();
        }

        private void validateConfig() {
            if (kingdomName.isEmpty() || foundingYear <= 0) {
                throw new IllegalArgumentException("Invalid kingdom configuration");
            }
        }

        public String getKingdomName() { return kingdomName; }
        public int getFoundingYear() { return foundingYear; }
        public String[] getAllowedStructureTypes() { return allowedStructureTypes.clone(); }
        public Map<String, Integer> getResourceLimits() { return new HashMap<>(resourceLimits); }

        public static KingdomConfig createDefaultKingdom() {
            return new KingdomConfig("Default Kingdom", 1000, new String[]{"Castle", "Tower"},
Map.of("Gold", 1000, "Wood", 5000));
        }
    }

    static class MagicalStructure {
        private final String structureId;
        private final long constructionTimestamp;
        private final String structureName;
        private final String location;
        private int magicPower;
        private boolean isActive;
        private String currentMaintainer;
        static final int MIN_MAGIC_POWER = 0;
        static final int MAX_MAGIC_POWER = 1000;
        public static final String MAGIC_SYSTEM_VERSION = "3.0";


        public MagicalStructure(String name, String location) {
            this(name, location, 100);
        }


        public MagicalStructure(String name, String location, int power) {
            this(name, location, power, true);
        }


        public MagicalStructure(String name, String location, int power, boolean active) {
            this.structureId = "STRUCT-" + UUID.randomUUID().toString().substring(0, 8);
            this.constructionTimestamp = System.currentTimeMillis();
            this.structureName = Objects.requireNonNull(name);
            this.location = Objects.requireNonNull(location);
            setMagicPower(power);
            this.isActive = active;
            this.currentMaintainer = "Unknown";
        }


        public String getStructureId() { return structureId; }
        public long getConstructionTimestamp() { return constructionTimestamp; }
        public String getStructureName() { return structureName; }
        public String getLocation() { return location; }
        public int getMagicPower() { return magicPower; }
        public boolean getIsActive() { return isActive; }
        public String getCurrentMaintainer() { return currentMaintainer; }


        public void setMagicPower(int magicPower) {
            this.magicPower = Math.max(MIN_MAGIC_POWER, Math.min(MAX_MAGIC_POWER,
magicPower));
```

```
        }

        public void setIsActive(boolean isActive) { this.isActive = isActive; }
        public void setCurrentMaintainer(String currentMaintainer) { this.currentMaintainer =
currentMaintainer; }
    }

    static class WizardTower {
        private final int maxSpellCapacity;
        private final List<String> knownSpells;
        private String currentWizard;
        private MagicalStructure baseStructure;

        public WizardTower(String name, String location, int maxSpellCapacity) {
            this.baseStructure = new MagicalStructure(name, location);
            this.maxSpellCapacity = maxSpellCapacity;
            this.knownSpells = new ArrayList<>();
            this.currentWizard = "None";
        }

        public int getMaxSpellCapacity() { return maxSpellCapacity; }
        public List<String> getKnownSpells() { return new ArrayList<>(knownSpells); }
        public String getCurrentWizard() { return currentWizard; }
        public MagicalStructure getBaseStructure() { return baseStructure; }

        public void setCurrentWizard(String currentWizard) { this.currentWizard = currentWizard; }
        public void addSpell(String spell) { if (knownSpells.size() < maxSpellCapacity)
knownSpells.add(spell); }
    }

    static class KingdomManager {
        private final List<Object> structures;
        private final KingdomConfig config;

        public KingdomManager(KingdomConfig config) {
            this.config = Objects.requireNonNull(config);
            this.structures = new ArrayList<>();
        }

        public static boolean canStructuresInteract(Object s1, Object s2) {
            return (s1 instanceof WizardTower && s2 instanceof WizardTower) ||
                   (s1 instanceof MagicalStructure && s2 instanceof MagicalStructure);
        }

        public void addStructure(Object structure) {
            structures.add(structure);
        }

        public List<Object> getStructures() { return new ArrayList<>(structures); }
        public KingdomConfig getConfig() { return config; }
    }

    // Main method to run the program
    public static void main(String[] args) {
        // Create kingdom configuration
        KingdomConfig config = KingdomConfig.createDefaultKingdom();
        System.out.println("Kingdom: " + config.getKingdomName());

        // Create kingdom manager
        KingdomManager manager = new KingdomManager(config);

        // Create structures
        WizardTower tower = new WizardTower("Arcane Tower", "Northern Hills", 10);
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        MagicalStructure castle = new MagicalStructure("Royal Castle", "Central Plains", 500);

        // Add structures to kingdom
        manager.addStructure(tower);
        manager.addStructure(castle);

        // Test structure interaction
        boolean canInteract = KingdomManager.canStructuresInteract(tower, castle);
        System.out.println("Can structures interact: " + canInteract);

        // Add spells to wizard tower
        tower.addSpell("Fireball");
        tower.addSpell("Lightning Bolt");
        System.out.println("Tower spells: " + tower.getKnownSpells());
    }
}
```

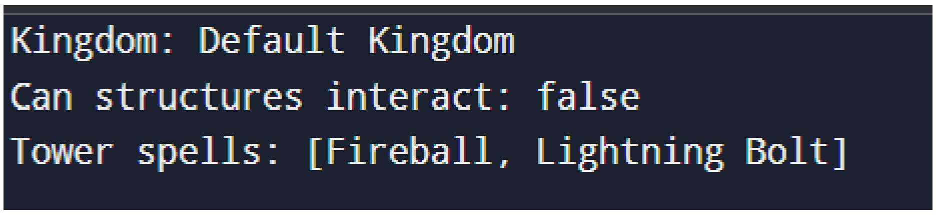

```
Kingdom: Default Kingdom
Can structures interact: false
Tower spells: [Fireball, Lightning Bolt]
```