

RPG Clothing System – Design Notes

Core Model

Gear interface defines common API: getAttack/Defense, getType, strongerThan, combineWith.
AbstractGear holds shared fields and enforces invariants; concrete types specify slot behavior by ItemType.

Invariants

- HeadGear: attack == 0 (defense-only)
- HandGear: defense == 0 (attack-only)
- Footwear: attack, defense >= 0
- All stats >= 0; Name requires non-blank adjective & noun.

Strength Ordering & Tie-Breaking

Stronger = higher attack; if tied, higher defense; if still tied, Random decides (seeded in tests).

Combining Items

Types must match; returns new instance (originals unchanged).
New stats: attack = a1 + a2; defense = d1 + d2.
New name: Name.combine(weaker, stronger) → "{weaker.adj}, {stronger.adj} {stronger.noun}".

Outfit Slot Policy

Slots: HEAD x1, HAND x2, FOOT x2.
If slot full, replace weaker existing item by combination with new item.

Character Totals

totalAttack = baseAttack + outfit.totals.attack
totalDefense = baseDefense + outfit.totals.defense

Testability

Random injected (deterministic), Name.combine pure, Outfit.itemsOf/isFull for white-box checks.

Testing Plan

| ID | Area | Condition / What to Prove | Setup / Inputs | Expected Result |
|----|------------|-------------------------------|--|---------------------------------|
| T1 | Invariants | HeadGear must be defense-only | new HeadGear(Name('Sturdy','Helm'),5) | getAttack()==0, getDefense()==5 |
| T2 | Invariants | HandGear must be attack-only | new HandGear(Name('Sharp','Dagger'),7) | getDefense()==0, getAttack()==7 |
| T3 | Invariants | Negative stats rejected | Footwear attack=-1 or defense=-2 | IllegalArgumentException |
| T4 | Name | Name requires non-blank parts | new Name(null,'Boots') | IllegalArgumentException |
| T5 | Strength | Stronger by higher attack | A: atk5, B: atk3 def10 | A stronger |

| ID | Area | Condition / What to Prove | Setup / Inputs | Expected Result |
|-----|-----------|---------------------------------|--|---|
| T6 | Strength | If attack ties, compare defense | A: atk2 def4, B: atk2 def3 | A stronger |
| T7 | Strength | Tie resolved by RNG | A: atk2 def3, B: atk2 def3, seed=42 | Deterministic result |
| T8 | Combine | Example naming/stats | Scurrying Sandals + Happy HoverBoard | Scurrying, Happy HoverBoard atk=1 def=4 |
| T9 | Combine | HandGear naming rule | Rusty Sword + Glorious Saber | Rusty, Glorious Saber atk=6 |
| T10 | Combine | Mismatched types rejected | HeadGear.combineWith(Footwear) | IllegalArgumentException |
| T11 | Combine | Immutability | Combine two items then inspect originals | Originals unchanged |
| T12 | Outfit | Add when slot not full | Empty HAND, add H1 | HAND size=1, contains H1 |
| T13 | Outfit | Full HAND then combine | Hands H1,H2 full; add H3 | Size=2; weaker replaced with combined |
| T14 | Outfit | HEAD combine on second add | HEAD HG; add HG2 | HEAD size=1; combined item |
| T15 | Outfit | FOOT allows 2 then combine | Feet F1,F2; add F3 | Size=2; weaker replaced |
| T16 | Outfit | Totals sum correctly | Known items atk=7 def=9 | totals()==(7,9) |
| T17 | Character | Base + outfit totals | Base(10,5) outfit(7,9) | totalAttack=17 totalDefense=14 |
| T18 | Errors | Null item rejected | outfit.add(null) | IllegalArgumentException |
| T19 | RNG | Deterministic outcomes | Repeat with seed=123 | Identical names/stats |
| T20 | Bounds | Large value behavior | Large int values | Correct sums / doc overflow |