

Balanced Allocate

Complete User Guide

The smart way to sort anything into groups

balancedapp.io

support@balancedapp.io

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What Is Balanced Allocate?

Balanced Allocate is a web-based allocation tool powered by Google OR-Tools, a world-class optimisation engine used by companies like Google, Amazon, and UPS to solve complex logistics problems. It takes a list of items — people, packages, resources, applicants, livestock, anything — a set of groups, and your rules, then finds the optimal assignment in seconds using a constraint programming solver.

Think of every time you have manually sorted people or objects into groups and spent hours trying to make it "fair," "balanced," or "compliant." You move one person and three other constraints break. You get close enough, give up, and hope nobody notices the imbalance. Balanced Allocate solves the entire problem simultaneously. It considers every rule at once and finds a globally optimal solution — or tells you exactly which constraints conflict if no solution exists.

It handles two fundamental problems. The first is distribution: split 700 students into 28 classes, balanced by gender, reading level, and special needs, with siblings together and conflicts apart. The second is selection: choose the best 12 scholarship recipients from 30 applicants, maximising merit while meeting Indigenous, regional, and gender quotas within a fixed budget. Most allocation tools only handle the first. Balanced Allocate handles both.

Who Is This For?

If you have ever stared at a spreadsheet and thought "I need to split these into groups fairly," or "I need to pick the best subset that meets all these requirements," this tool is for you. It serves anyone who allocates, grades, assigns, distributes, selects, or sorts — across any industry:

- **Education:** forming balanced classrooms from hundreds of students, grading composite classes across year levels, assigning students to camp cabins or excursion groups, allocating elective blocks, distributing equipment across departments, placing student teachers across schools.
- **Sport:** grading junior teams by ability with strong, development, and balanced middle divisions, drafting fair recreational league teams, selecting representative squads from a player pool, assigning relay or carnival teams, balancing training groups by position and skill.
- **Events & hospitality:** building wedding seating charts that respect families, dietary needs, and social dynamics, assigning conference delegates to breakout sessions, allocating vendors to festival zones, distributing staff across event shifts, planning corporate gala tables with VIP placement.
- **Healthcare:** assigning nurses to shifts with the right mix of certifications and specialties, distributing patient caseloads, balancing surgical theatre rosters, allocating on-call schedules, ensuring each shift has senior coverage.
- **Logistics & supply chain:** loading trucks with weight, volume, and zone constraints, distributing inventory across warehouses or storage zones, assigning deliveries to drivers by route and priority, splitting shipments across freight carriers.
- **Government & non-profit:** selecting scholarship or grant recipients from a competitive applicant pool with equity requirements, allocating funded program placements, distributing funding across regions, shortlisting award nominees, assigning community housing applicants to available properties.
- **Corporate & HR:** assigning employees to project teams balancing skills and departments, forming cross-functional task forces, allocating workshop or training breakout groups, distributing office hot-desks, balancing onboarding cohorts, planning secondments.

- **Real estate & property management:** distributing commercial tenants across buildings by lease tier and revenue, allocating parking bays, assigning co-working or shared office spaces, balancing floor occupancy with shared resource constraints.
- **Manufacturing & operations:** balancing production lines by operator certification and experience, distributing workers across shifts, allocating machinery to work cells, spreading safety-critical skills across teams, rostering maintenance crews.
- **Agriculture & primary industry:** assigning seasonal workers to paddocks or stations, distributing livestock across holdings, allocating harvesting crews to fields, planning crop rotation, sorting show teams by breed and class.
- **Finance & professional services:** allocating audit team members across engagements, distributing client portfolios across advisors, assigning trainees to practice areas, balancing caseloads in legal or consulting firms.

In short: if you need to distribute a list of things into groups — or select an optimal subset from a larger pool — while respecting budgets, quotas, relationships, and preferences simultaneously, Balanced Allocate handles it.

Core Concepts

Everything in the tool maps to three ideas:

- **Items** — the things being allocated. Students, wedding guests, packages, nurses, netball players, job applicants, tenants, machine operators — any list of things that need to go somewhere.
- **Groups** — what items go into. Classes, tables, trucks, shifts, teams, buildings, production lines — or "Awarded" and "Not Selected" for competitive selection problems.
- **Rules** — the constraints the solver must respect. Budgets cap numeric totals per group. Quotas require percentages or counts of specific values. Balance spreads attributes evenly — or concentrates them using Maximise and Minimise. Relationships keep items together or apart. Preferences steer items toward specific groups. Pins force or block individual assignments.

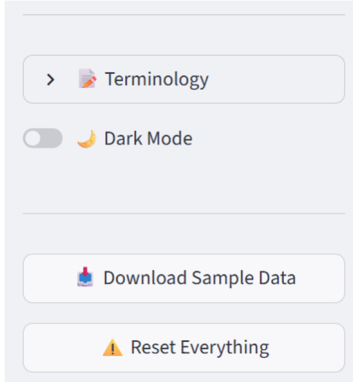
The solver considers every rule simultaneously and finds the best possible assignment. This is fundamentally different from manual sorting, where moving one item breaks other constraints. It is also different from simple randomisation or round-robin approaches, which cannot honour complex overlapping requirements.

Quick Start — Your First Allocation in 5 Minutes

This walkthrough uses the built-in sample data to get you from zero to results quickly.

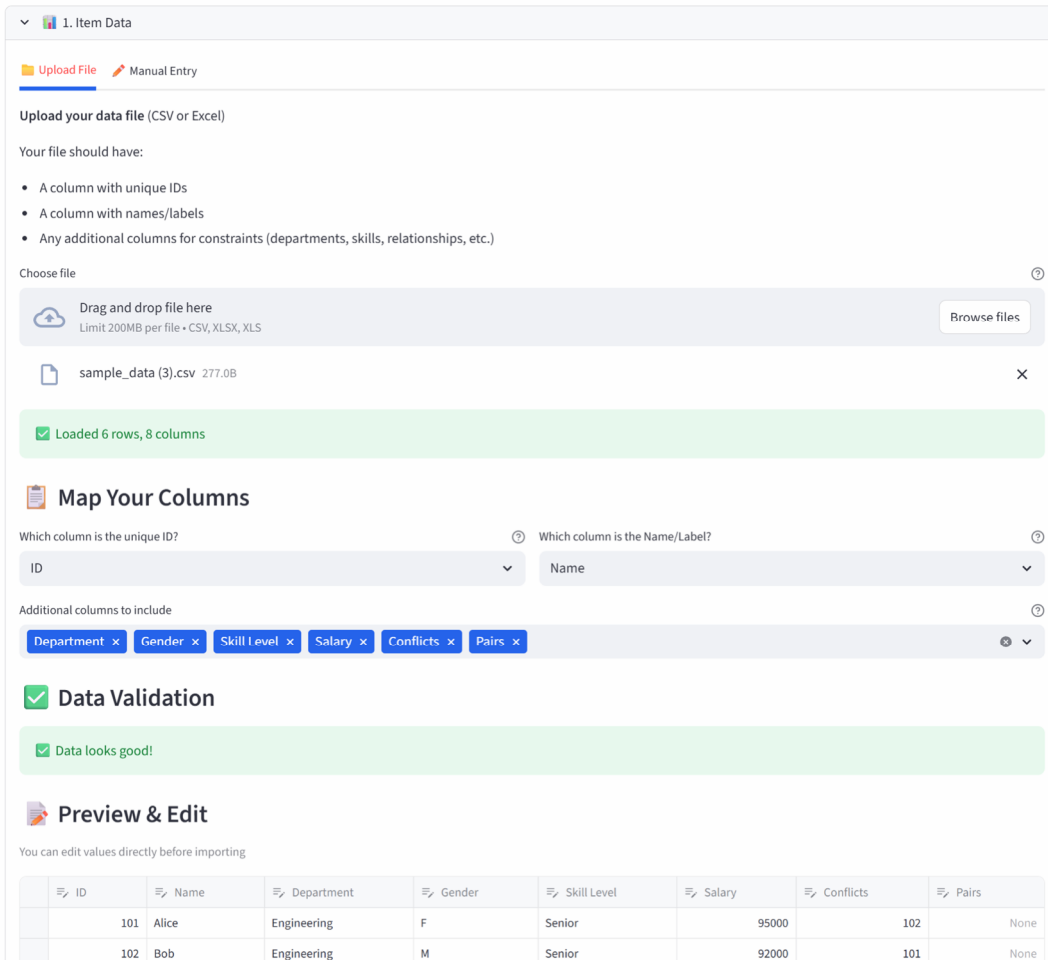
Step 1: Download Sample Data

In the sidebar, click **Download Sample Data**. This gives you a small CSV file with 6 employees.



Step 2: Upload Your Data

In the main area, use the file uploader under **1. Your Data** to upload the CSV. The tool previews your data. Select the **ID** column and **Name** column using the dropdowns, then choose which columns to keep and click **Import Data**.



Step 3: Configure Groups

In the **Configuration** section, the **Groups** tab is selected by default. Set the number of groups (try 2). The tool auto-calculates min/max capacity. Rename the groups if you like.

2. Configuration

Unique ID ⓘ
Display Name ⓘ

ID

Name

🔥 Groups
🔥 Budgets
📊 Quotas
⚖️ Balance
🔗 Relationships
⚙️ Preferences
📌 Pins
⚙️ Options

Number of Groups ⓘ

2
- +

✔️ 6 items - Capacity: 2-10

| Name | Min | Max | Tags | Flex |
|---------|-----|-----|------|--------------------------|
| Group 1 | 1 | 5 | | <input type="checkbox"/> |
| Group 2 | 1 | 5 | | <input type="checkbox"/> |

2 groups - 6 items

🔥 Run Optimizer

Step 4: Run the Optimiser

Scroll down and click the blue **Run Optimizer** button. Within seconds you will see a result summary and can explore the Overview, Rosters, Validation, Analytics, and Export tabs.

3. Results

✔️ Optimal - 6 items → 2 groups - 0.1s - 2026-03-05 02:24

📊 Overview
📅 Rosters
✔️ Validation
📊 Analytics
📄 Export

Total Items
Groups
Smallest Group
Largest Group

6
2
1
5

Distribution

| | |
|---------|---------|
| Group 1 | Group 2 |
|---------|---------|

Group Summary

| Group | Count | Min | Max | Status |
|---------|-------|-----|-----|--------|
| Group 1 | 1 | 1 | 5 | ✔️ |
| Group 2 | 5 | 1 | 5 | ✔️ |

Step 5: Export Results

Go to the **Export** tab within Results. You have four download options:

- **Excel Report (.xlsx)** — a fully formatted workbook containing a branded Summary sheet, a Group Summary with sizes and budget totals, a Constraints sheet listing every rule as an audit trail, an All Assignments sheet, one sheet per group, and distribution cross-tabulations for every categorical column. This is the most comprehensive export.
- **PDF Rosters** — a print-ready branded report with one page per group showing the roster and summary statistics. Hand these directly to teachers, team managers, or shift supervisors.
- **CSV (All Assignments)** — a single flat file with every item and its assigned group. Opens in any spreadsheet application. Use for importing into other systems.
- **CSV per Group (Zip)** — a zip archive with one CSV per group, named after the group. Use when you need to email individual rosters to different people.

3. Results

Optimal - 6 items -> 2 groups - 0.0s - 2026-03-05 02:29

Overview Rosters Validation Analytics **Export**

Download Results

Download your results:

Excel Report

Summary, groups, rosters, distributions, constraint audit

PDF Rosters

Print-ready report with branded roster pages

CSV (All Assignments)

Single file with every assignment — opens anywhere

CSV per Group (Zip)

One CSV per group — ready to distribute or import

Tip: every table in the results tabs can also be exported individually — hover over it and click the download icon.

Every table elsewhere in the results tabs can also be exported individually — hover over any table and click the download icon in the top-right corner.

Overview Rosters Validation **Analytics** Export

Analytics

Size Distribution

| Group | Size | Min | Max | Total Items |
|---------|------|-----|-----|-------------|
| Group 1 | 1 | 1 | 5 | 6 |
| Group 2 | 5 | 1 | 5 | |

Avg per Group: 3.0

Size Range: 1 - 5

Distribution Analysis

Analyze distribution of:

Department Download as CSV

Department by Group

| Assigned_Group | Engineering | Finance | Sales | All |
|----------------|-------------|---------|-------|-----|
| Group 1 | 1 | 0 | 0 | 1 |
| Group 2 | 1 | 2 | 2 | 5 |
| All | 2 | 2 | 2 | 6 |

Getting Your Data In

Uploading a File

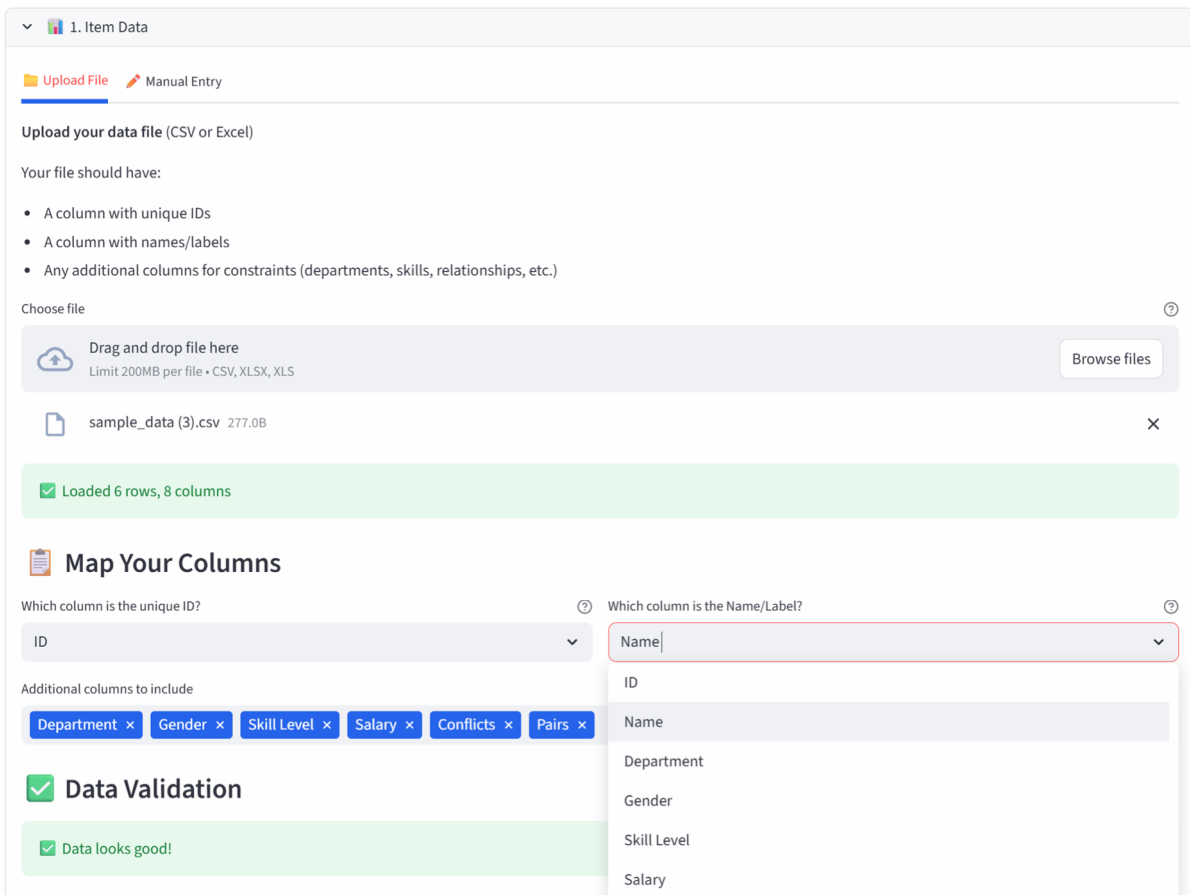
The tool accepts **CSV** and **Excel (.xlsx)** files. Your file needs at minimum a unique ID column. Additional columns are used by the constraint features.

File Requirements

- One row per item
- A unique identifier column (numbers or text)
- Headers in the first row
- No merged cells (for Excel files)

Column Mapping

After upload, you select which column is the **Unique ID** and which is the **Display Name**. These appear in the compact dropdowns at the top of the Configuration section. You can change them later in the **Options** tab.



Manual Entry

If you don't have a file, you can build your dataset directly in the tool. Switch to the Manual Entry tab under "1. Your Data." Type your column names as a comma-separated list — for example, Student ID, Name, Gender, Reading Level, IEP Hours — and click Create Table. You need at least two columns (an ID and a Name).

BA **Balanced Allocate**

Automatic, constraint-aware allocation

1. Item Data

Upload File **Manual Entry**

Enter data manually

Enter column names below and press Enter or click "Create Table".

Column names (comma-separated) Ⓜ

Student ID, Name, Gender, Reading Level, IEP Hours Press Enter to submit form

Create Table

This creates an empty data editor where you can type values directly into cells. Click the + button at the bottom of the table to add new rows. Each row represents one item to be allocated. You can add as many rows as you need — the editor scrolls and supports hundreds of rows.

The default column suggestions (ID, Name, Department, Gender) are just placeholders. Replace them with whatever columns your scenario needs. The column names you enter here become available throughout the Configuration tabs for budgets, quotas, balance, relationships, and preferences.

1. Item Data

✔ Data loaded: 0 items

Replace Data

Manage Data

e.g. Skill Level

+ Add Column

Select columns to delete... ▼

✖ Delete Selected

| ☞ Student ID | ☞ Name | ☞ Gender | ☞ Reading Level | ☞ IEP Hours |
|--------------|----------|----------|-----------------|-------------|
| 1 | Person 1 | Male | Good | 1 |
| 2 | None | None | None | None |
| 3 | None | None | None | None |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

Managing Data After Import

Once data is loaded — whether uploaded or manually entered — the interface switches to a management view with several tools:

The data editor is a live, editable spreadsheet showing all your data. Click any cell to edit its value. Click the + button to add rows. Select a row and press Delete to remove it. The editor supports sorting by clicking column headers and resizing columns by dragging the header borders. Changes are held in the editor's state and committed to the solver when you click Run Optimizer — you don't need to save manually.

Add Column lets you add new columns to your dataset after import. Type a column name (e.g. "Skill Level") and click the button. The new column appears in the editor with empty values for you to fill in. This is useful when you realise mid-setup that you need an extra attribute for a budget or quota rule.

Delete Columns lets you remove columns you don't need. Select one or more columns from the dropdown and click Delete Selected. The ID and Name columns cannot be deleted. Removing a column also removes it from any constraint that referenced it, so check your rules afterwards.

Replace Data clears the current dataset entirely and returns you to the upload/manual entry screen. This also resets all constraints, since the old rules may reference columns that no longer exist. If you want to keep your rules and just swap the data, use the Rules only save in the sidebar: save your rules first, replace the data, then load the rules back.

Every table in the data editor — and throughout the results — supports CSV export: hover over any table and click the download icon in the top-right corner.

The screenshot shows the 'Manage Data' interface. At the top, there's a green banner indicating 'Data loaded: 32 items'. Below it is a 'Replace Data' button. The main section is titled 'Manage Data' and contains an input field with the placeholder 'e.g. Skill Level' and an '+ Add Column' button. To the right, a dropdown menu is open, titled 'Select columns to delete...', listing several columns: Gender, ReadingLevel, SpecialNeeds, IEP_Hours, Behaviour, and Siblings. Below the dropdown is a table with 10 columns and 10 rows of data. The first five columns are ID, Name, Gender, ReadingLevel, and SpecialNeeds. The remaining five columns are partially visible and contain numerical values and text.

| ID | Name | Gender | ReadingLevel | SpecialNeeds | | | | | |
|------|---------------|--------|--------------|--------------|----|---------|------|------|------------|
| S001 | Liam Chen | M | Advanced | No | | | | | |
| S002 | Emma Patel | F | Proficient | No | | | | | |
| S003 | Olivia Patel | F | Proficient | No | | | | | |
| S004 | Noah Williams | M | Basic | Yes | | | | | |
| S005 | Ava Thompson | F | Advanced | No | | | | | |
| S006 | Jackson Lee | M | Below Basic | Yes | 10 | Monitor | None | S012 | None |
| S007 | Sophia Garcia | F | Proficient | No | 0 | Good | None | None | Mr Hoffman |
| S008 | Lucas Brown | M | Basic | No | 0 | At Risk | S009 | S004 | None |
| S009 | Mia Brown | F | Proficient | No | 0 | Good | S008 | None | None |
| S010 | Ethan Davis | M | Advanced | No | 0 | Good | None | None | None |

Configuration — Every Tab Explained

All allocation rules live in the tabbed interface under **2. Configuration**. The ID and Name column selectors sit at the top, followed by eight tabs.

Groups

Set the number of groups and configure each one.

| Column | Purpose |
|--------|---|
| Name | Display name for each group (rename freely) |
| Min | Minimum items this group must receive |
| Max | Maximum items this group can hold |
| Tags | Comma-separated labels for targeting in quotas/preferences (e.g. 'Premium, Ground Floor') |
| Flex | When ticked, capacity is soft — the solver can slightly exceed limits if it improves the result |

A capacity summary line below the number input shows whether your total min/max range covers all items. Warnings appear if items exceed capacity.

Groups Budgets Quotas Balance Relationships Preferences Pins Options

Number of Groups ?

2 - +

6 items · Capacity: 2-10

| Name | Min | Max | Tags | Flex |
|---------|-----|-----|-----------------------|-------------------------------------|
| Group 1 | 1 | 5 | Premium, Ground Floor | <input type="checkbox"/> |
| Group 2 | 1 | 5 | | <input checked="" type="checkbox"/> |

Tip: Use Tags to create group categories. Then in Quotas or Preferences you can target 'Tag: Premium' to apply a rule to all tagged groups at once.

Budgets

Set min/max totals for any numeric column, per group. For example: max salary of \$500K per team, or max weight of 1,200kg per truck.

How It Works

1. Select one or more numeric columns from the multiselect.
2. A table appears for each column with rows for every group.
3. Set Min Total and Max Total per group.

This is how you enforce resource limits. If you're loading trucks, set max Weight per truck. If you're forming teams, set a salary cap per team. If you're placing tenants, set a revenue floor per building. The solver treats these as hard constraints — it will not produce a result that violates a budget limit.

If your budget limits are too tight for the data, the solver will report infeasibility and tell you which limits conflict. For example, if your total salary across all employees is \$1.8M but you

set max \$400K per team across 4 teams (\$1.6M total capacity), the solver will explain that the salary budget is impossible to satisfy.

You do not need to set both Min and Max. Leave Min at 0 if you only care about a ceiling. Leave Max at a very large number (e.g. 999999) if you only care about a floor. The solver only constrains what you explicitly set.

Combined Budgets

Sometimes you need a single limit across multiple groups. For example, two buildings sharing a total capacity. Use the **Combined Budget** section below the individual budgets to select a column, pick the groups to combine, and set one shared min/max.

Groups Budgets Quotas Balance Relationships Preferences Pins Options

Set min/max totals for numeric columns per group

Select columns to limit

Salary

Salary

Total Salary in your data: 447,000

| Group | Min Total | Max Total |
|---------|-----------|-----------|
| Group 1 | 0 | 250000 |
| Group 2 | 0 | 350000 |
| Group 3 | 0 | 100000 |

Combined budget across groups

Set a single total limit across multiple groups (e.g., total salary cap across your selected squads)

Column: Salary

Groups to include: Group 1, Group 3

Combined Min: 0

Combined Max: 300000

+ Add Combined Rule

Salary Group 1, Group 3 Min 0 Max 300,000

Tip: Combined budgets are ideal for shared resource pools where individual group limits are flexible, but the total is fixed. The solver can simultaneously consider both Individual Budget and Combined Budget limits to be adhered to. Set maximum Individual Budgets to a large value for any groups which should not be constrained.

Quotas

Require a percentage or count of specific values per group. For example: each team must be 40–60% female, or each shift must have at least 2 Charge Nurses.

How It Works

1. Toggle between **Percentage** and **Count** mode.
2. Select a column, a value to match, and the min/max range.
3. Choose which groups the quota applies to (All Groups, a specific group, or a Tag).
4. Click Add to create the rule.

Existing rules appear in a table below. Use the dropdown and delete button to remove rules.

A **Quick Rule** shortcut is available below the main quota form. Select a column and click “Add All Values” to create a count quota of Min 1 for every unique value in that column, applied to the group scope you select. This is useful when you want to guarantee at least one of every department, position, certification, or category in each group without adding rules one by one.

For example, selecting Position with Apply to All Groups creates a rule for each position (GS, GA, WA, C, WD, GD, GK) requiring at least 1 in every group. This is faster than adding 7 individual quota rules.

Groups Budgets **Quotas** Balance Relationships Preferences Pins Options

Require a percentage or count of specific values per group

Percentage
 Count

Column: Department | Value: Engineering | Min: 1 | Max: 2 | Apply to: Group 2 | + Add

Quick rule: require at least one of every value

Column: ID | Apply to: All Groups | + Add All Values

| Column | Value | Range | Group |
|------------|-------------|--------|------------|
| Gender | F | 40–60% | All Groups |
| Department | Engineering | 1–2 | Group 2 |

Note: Percentage quotas are calculated as a fraction of each group's actual size, not of total items.

Balance

Control how attributes are distributed across groups. Three modes are available:

| Mode | What It Does | Example |
|----------|--|--|
| Equal | Spreads each unique value evenly across groups | Every team gets roughly the same number of Engineers |
| Maximise | Concentrates high values in target group(s) | Push top scorers into the A-team |
| Minimise | Concentrates low values in target group(s) | Put the lightest packages in the small van |

Equal mode works with categorical columns (text values). **Maximise** and **Minimise** work with numeric columns and require you to select one or more target groups.

The screenshot shows the 'Balance' tab in the software interface. At the top, there are navigation tabs: Groups, Budgets, Quotas, Balance (selected), Relationships, Preferences, Pins, and Options. Below this, a subtitle reads 'Spread values evenly, or maximise/minimise across target groups'. Under 'Columns to optimise', two columns are listed: 'Department' and 'Salary'. The 'Department' section shows 'Mode' set to 'Equal' and 'Apply to' set to 'All Groups'. A note below states: '3 unique values will be distributed evenly across all groups'. The 'Salary' section shows 'Mode' set to 'Minimise' and 'Target groups' set to 'Group 1'. A note below states: 'Solver will push items with the lowest Salary into Group 1 (total pool: 447,000)'.

Tip: Maximise and Minimise now support multi-group targeting. Select multiple groups to concentrate values across all of them.

Balance is one of the most powerful features because it controls distribution without requiring you to know the exact numbers. **Equal** mode on a Department column means “spread departments evenly” — you don’t need to calculate how many Engineers should be in each team. The solver does that for you based on the data and group sizes. If you have 20 Engineers across 5 teams, it will aim for 4 per team. If you have 22, it will put 4 in some and 5 in others, as evenly as possible.

For the select/reject pattern (e.g. scholarship selection), Maximise is how you tell the solver “pick the best.” Set Maximise on MeritScore targeting the Awarded group, and the solver will select the highest-scoring applicants that satisfy all other constraints. The reject group gets whatever is left.

For asymmetric grading (e.g. netball teams), you can combine Maximise on the strong team with Preferences steering weak players to the development team, and Budget bands locking the middle teams together. This three-layer approach creates non-uniform distributions that would be nearly impossible to calculate manually.

Maximise and Minimise only work on numeric columns. They sum the column values in the target group and try to make that sum as high (or low) as possible. If your column has text values (like hazard class labels), you need to add a numeric equivalent column. For example, add a HazScore column where “None” = 0, “Class 3” = 3, etc.

Relationships

Define which items should be together or apart based on ID references in your data.

| Type | Meaning |
|---------------|--|
| KEEP_APART | These items must NOT be in the same group (e.g. conflicts, rivals, exes) |
| KEEP_TOGETHER | These items SHOULD be in the same group (e.g. siblings, couples, partners) |

How It Works

Your data must have a column containing IDs of related items, separated by a delimiter (default: semicolon). For example, if student S001 has a Conflicts column value of 'S015', the solver will keep S001 and S015 in different groups.

5. Select the column containing related IDs.
6. Choose KEEP_APART or KEEP_TOGETHER.
7. Set the separator character.
8. Toggle Required (hard) or Preferred (soft).

Unique ID Display Name

Groups Budgets Quotas Balance Relationships Preferences Pins Options

Keep Apart = must not share a group · Keep Together = should share a group

Column Type Separator Must Enforce?

| Column | Type | Sep | Enforce |
|-----------|---------------|-----|-----------|
| Conflicts | KEEP_APART | ; | Required |
| Pairs | KEEP_TOGETHER | ; | Preferred |

Note: Hard relationships ('Must Enforce' ticked) are enforced strictly. Soft relationships ('Must Enforce' not ticked) are preferred but can be broken if other hard constraints make it impossible.

Common issues with relationships:

The most frequent error is putting shared labels (like family surnames) in the relationship column instead of IDs. The column must contain the **IDs** of the related items, not a group label. For example, if Robert Taylor (G003) and Linda Taylor (G004) should sit together, G003's Family column should contain "G004" and G004's should contain "G003" — not "Taylor" in both. The solver matches on IDs, not labels.

If you have multiple related items, separate them with the delimiter character (default semicolon). For example, if a student conflicts with three others: "S015;S020;S028".

Relationships are bidirectional in effect but only need to be declared in one direction. If G003 lists G004 as a family member, the solver keeps them together regardless of whether G004 also lists G003. However, listing in both directions is good practice for clarity and won't cause issues.

If the tool warns that relationship IDs are not found in your data, check for whitespace, case sensitivity, or float formatting (e.g. "101.0" vs "101"). The tool normalises IDs on import, but if you added relationship values manually after import, they may not match.

Preferences

Express soft or hard preferences for where items should go, based on column values.

How It Works

Preferences let you say 'items matching this condition should go to this group.' You can match on exact values (Department = Engineering) or numeric thresholds (Salary > 100000).

- **Operator:** = for exact match, >, <, >=, <= for numeric comparisons
- **Target:** which group to prefer
- **Strength:** 1–100, where higher means stronger preference. Or toggle Must for a hard constraint.

| Column | Match | Target | Strength |
|------------|---------------|---------|----------|
| Department | = Engineering | Group 1 | 50 |

Tip: A preference with Must ticked becomes a hard constraint — the item MUST go to that group. Use this sparingly as it reduces solver flexibility.

Preferences vs Pins: Preferences are different from Pins in an important way. A Pin is absolute — the item must or must not go to a specific group, and the solver fails if it can't honour it. A Preference is weighted — the solver tries to honour it but can override it if other constraints are more important. Use Preferences when you have a desired outcome but want the solver to have flexibility. Use Pins only when the assignment is non-negotiable.

How Strength interacts with Priority Sliders: The Strength value (1–100) on each preference controls its importance relative to other preferences. The Priority Slider for Preferences in the Options tab scales all preferences globally. So a preference at Strength 80 with the Preferences priority at 60% behaves differently than the same preference with the priority at 100%. If preferences aren't being honoured, try increasing the Preferences priority slider before increasing individual strengths.

Numeric operator preferences are particularly useful for steering items by threshold. For example, "SkillRating < 55 → Rubies (Strength 85)" pushes low-rated players toward the development team without hard-pinning them. Combined with Maximise on the strong team, this creates the asymmetric grading pattern used in the Netball example.

Pins & Exclusions

Force specific items into or out of specific groups. This is the most direct form of control.

Bulk Assign

Use the bulk assign row at the top to pin or exclude all items matching a column value at once. For example: pin all items where BridalParty is not empty to Table 1.

Manual Pins

The two side-by-side editors let you add individual pins and exclusions. Select an item and a group from the dropdowns. Use the + button to add rows.

Groups Budgets Quotas Balance Relationships Preferences **Pins** Options

Pin items to specific groups, or exclude them

Column Value Rule Group

Name Alice Exclu... Group 3 + Add All

★ Must Go To

| Item | Must Go To |
|-------------|------------|
| 105 (Emma) | Group 2 |
| 106 (Frank) | Group 2 |
| | |

⊘ Cannot Go To

| Item | Cannot Go To |
|-------------|--------------|
| 101 (Alice) | Group 3 |
| | |

Options

Fine-tune the solver and configure output.

Priority Sliders

When soft constraints compete, priority sliders control which ones the solver tries hardest to satisfy:

| Slider | Default | What It Controls |
|---------------|---------|---|
| Keep Apart | 100 | How important is it to separate conflicting items |
| Keep Together | 80 | How important is it to keep paired items together |
| Preferences | 60 | How strongly to honour preferred assignments |
| Balance | 20 | How important is even distribution of attributes |

Output Options

- **Columns to show:** select which columns appear in results.
- **Solver timeout:** how many seconds before the solver stops (default 30). Increase for large or complex problems.
- **Hide names in output:** will report the unique identifier (ID), but show the display name as 'Redacted' per below.
- **Lock solution** prevents accidental re-runs. Once you're happy with a result, tick this to disable the Run button until you untick it. This is useful when presenting results to stakeholders or when you've finished an allocation and want to ensure nobody accidentally overwrites it during an export or review session.

Group Rosters

| Group 1 (2 items) | | | | | | | |
|-------------------|----------|-------------|--------|-------------|--------|-----------|-------|
| ID | Name | Department | Gender | Skill Level | Salary | Conflicts | Pairs |
| 102 | Redacted | Engineering | M | Senior | 92000 | 101 | None |
| 103 | Redacted | Sales | F | Mid | 75000 | None | 104 |

Running the Optimiser

Constraint Summary

Below the Configuration section, a compact summary line shows your active constraints. For example: **6** groups · **700** items · **2** limits · **9** quotas · **1** balance. Only non-zero counts appear. This can be used as a sense-check to confirm the intended rules have been included and registering correctly (e.g. 'Add' button has been used where applicable).

Pre-Run Validation

The tool checks for common issues before running: capacity mismatches, empty data, invalid IDs in relationships. Any errors appear in red and prevent the solver from running.

Solution Status

| Status | Meaning |
|-----------------|---|
| Optimal | The mathematically best solution was found |
| Good (Feasible) | A valid solution was found within the time limit, though a better one may exist |
| Infeasible | No solution satisfies all hard constraints — see conflict report |

2 groups · 6 items · 1 limits · 2 quotas · 2 balance · 1 prefs · 1 relations · 2 pins · 1 exclusions

 Run Optimizer

 Optimal solution found in 0.0s

Troubleshooting Infeasibility

If the solver reports no solution possible, a **conflict report** appears listing which constraints conflict. Common causes:

- Total capacity (sum of group Max values) is less than the number of items
- Hard quotas that are mathematically impossible (e.g. 50% of 5 items = 2.5)
- Contradictory pins (item pinned to Group A but also excluded from Group A)
- Too many hard constraints leaving no valid configuration

Tip: Start with fewer hard constraints. Use the conflict report to identify which constraint to relax. Switch hard rules to soft where possible.

Understanding Your Results

After a successful run, a compact summary line appears: status, items allocated, groups, solve time, and timestamp. Results are organised in five tabs.

Overview

The Overview tab gives you an at-a-glance health check of the allocation. Four metrics appear at the top: Total Items, Groups, Smallest Group, and Largest Group. Below that, a bar chart shows the distribution of items across groups — any obvious imbalance is immediately visible.

The Group Summary table is the most useful element. Each row shows one group with its item count, min/max capacity, and a pass/fail status. If you set budgets, the table automatically appends columns showing the actual total of each budget column per group — so you can see at a glance that Team Alpha has \$487,000 in salary, Team Beta has \$462,000, and so on.

3. Results

Optimal · 6 items → 2 groups · 0.0s · 2026-03-05 05:35

Overview
Rosters
Validation
Analytics
Export

Total Items
6

Groups
2

Smallest Group
2

Largest Group
4

Distribution

| Group | Count |
|---------|-------|
| Group 1 | 2 |
| Group 2 | 4 |

Group Summary

| Group | Count | Min | Max | Status | Salary Total |
|---------|-------|-----|-----|--------|--------------|
| Group 1 | 2 | 1 | 5 | ✓ | 167,000 |
| Group 2 | 4 | 1 | 5 | ✓ | 280,000 |

Rosters

The Rosters tab shows one expandable panel per group, each containing a full data table of every item assigned to that group. The columns displayed are controlled by the "Columns to show" setting in the Options tab — you choose which columns matter for the final output. Each panel shows the group name and item count in its header.

These tables are what you would print, email, or hand out. A teacher gets their class list with student names, reading levels, and special needs flags. A logistics dispatcher gets their truck manifest with package weights and zones. A grading coordinator gets each team roster with player names, positions, and skill ratings.

Every table in the results — including these roster tables — supports individual export: hover over any table and click the download icon in the top-right corner to save it as a CSV. This means you can export individual group rosters without downloading the full report.

Overview **Rosters** Validation Analytics Export

Group Rosters

| Group 1 (2 items) | | | | | | | |
|-------------------|-------|-------------|--------|-------------|--------|-----------|-------|
| ID | Name | Department | Gender | Skill Level | Salary | Conflicts | Pairs |
| 102 | Bob | Engineering | M | Senior | 92000 | 101 | None |
| 103 | Carol | Sales | F | Mid | 75000 | None | 104 |

| Group 2 (4 items) | | | | | | | |
|-------------------|-------|-------------|--------|-------------|--------|-----------|-------|
| ID | Name | Department | Gender | Skill Level | Salary | Conflicts | Pairs |
| 101 | Alice | Engineering | F | Senior | 95000 | 102 | None |
| 104 | David | Sales | M | Mid | 78000 | None | 103 |
| 105 | Emma | Finance | F | Junior | 55000 | None | None |
| 106 | Frank | Finance | M | Junior | 52000 | None | None |

Validation

The Validation tab audits every constraint you set against the actual result. It is organised into sections by constraint type, and each section shows a detailed verification table with pass/fail indicators.

- **Budgets** — for each budget column, a table shows every group's actual total alongside the min/max you set, with a green tick or red cross. A summary line above confirms whether all groups are within limits or flags those that aren't.
- **Combined Budgets** — shows each combined constraint with the individual group contributions and the combined total, checked against your shared limit.
- **Quotas** — for each quota rule, a table shows every targeted group with its actual count (and percentage, if in percentage mode) versus the required range. Quotas applied to specific groups or tags only show those groups.
- **Relationships** — lists every relationship pair (keep-apart or keep-together) with the groups each item landed in and whether the rule was satisfied. Duplicate pairs are deduplicated. A summary line reports the total count and how many were violated.
- **Preferences** — shows each preference rule with how many matching items landed in the target group versus how many matched overall, expressed as a count and percentage. Preferences are soft constraints, so partial satisfaction is expected and the tab notes this.

- **Balance** — for Equal mode, shows a distribution table with each value's count per group and an evenness percentage (100% = perfectly even). For Maximise or Minimise, shows the sum, count, and average per group with the target group marked, plus the percentage of total value concentrated in the target.
- **Pins & Exclusions** — lists every pin and exclusion with the required group, the actual group, and pass/fail. Any violations are flagged in red.
- At the bottom, a single summary line confirms whether all constraints passed or flags that some have issues.

Overview Rosters **Validation** Analytics Export

Constraint Check

Budgets

✓ Salary: All groups within limits

| Group | Total Salary | Min | Max | Status |
|---------|--------------|-----|---------|--------|
| Group 1 | 167,000 | 0 | 200,000 | ✓ |
| Group 2 | 280,000 | 0 | 300,000 | ✓ |

Quotas

Gender = F (%)

| Group | Count | % F | Required | Status |
|---------|-------|-------|----------|--------|
| Group 1 | 1 | 50.0% | 40-60% | ✓ |
| Group 2 | 2 | 50.0% | 40-60% | ✓ |

Department = Engineering (Group 2) (count)

| Group | Count | Required | Status |
|---------|-------|----------|--------|
| Group 2 | 1 | 1-2 | ✓ |

Relationships

✓ All 1 relationships satisfied

| Item 1 | Item 2 | Rule | Result | Status |
|--------|--------|------------|-------------------|--------|
| 101 | 102 | Keep Apart | Group 2 / Group 1 | ✓ |

Analytics

The Analytics tab lets you explore the distribution of your data across groups interactively — not just for the columns you set constraints on, but for any column in your data via dropdowns.

- **Size Distribution** shows a table of group sizes alongside capacity limits, plus summary metrics (total items, average per group, size range).
- **Distribution Analysis** provides a dropdown to select any categorical column. Selecting a column generates two tables: a cross-tabulation showing the raw count of each value in each group (with row and column totals), and a percentage breakdown showing the proportion of each value within each group. For example, selecting "Department" shows that Team Alpha is 25% Engineering, 25% Sales, 25% Finance, 25% Operations — or reveals if one department is over-represented.
- **Numeric Statistics** provides a similar dropdown for numeric columns. Selecting a column shows a table with each group's count, sum, mean, min, and max for that column. This is useful for spotting numeric imbalances that aren't covered by a formal budget constraint — for example, checking average age or experience years across groups even if you didn't set an explicit rule for it.

These tables are useful for presentations and stakeholder reports. Like all tables in the results, each can be individually exported by hovering and clicking the download icon.

[Overview](#)
[Rosters](#)
[Validation](#)
[Analytics](#)
[Export](#)

Analytics

Size Distribution

| Group | Size | Min | Max | Total Items |
|---------|------|-----|-----|-------------|
| Group 1 | 2 | | 1 | 6 |
| Group 2 | 4 | | 1 | 5 |

Avg per Group
3.0

Size Range
2 - 4

Distribution Analysis

Analyze distribution of:

Department

Department by Group

| Assigned_Group | Engineering | Finance | Sales | All |
|----------------|-------------|---------|-------|-----|
| Group 1 | 1 | 0 | 1 | 2 |
| Group 2 | 1 | 2 | 1 | 4 |
| All | 2 | 2 | 2 | 6 |

Percentage breakdown:

| Assigned_Group | Engineering | Finance | Sales |
|----------------|-------------|---------|-------|
| Group 1 | 50.0% | 0.0% | 50.0% |
| Group 2 | 25.0% | 50.0% | 25.0% |

Numeric Statistics

Analyze totals of:

| | | | | | | |
|---------------|--|---|----|-----|---|---|
| LeaseYears | | | | | | |
| AnnualRevenue | | | | | | |
| SqMetres | | | | | | |
| LeaseYears | | | | | | |
| Pier One | | 5 | 15 | 3.0 | 2 | 5 |
| Dock View | | 5 | 18 | 3.6 | 2 | 5 |
| Waitlist | | 7 | 19 | 2.7 | 2 | 5 |

Distribution Analysis

Analyze distribution of:

| | | | | | | | | | | | | | | | |
|--------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----|
| Sector | | | | | | | | | | | | | | | |
| Sector | | | | | | | | | | | | | | | |
| LeaseTier | | | | | | | | | | | | | | | |
| LeaseYears | | | | | | | | | | | | | | | |
| FloorPref | | | | | | | | | | | | | | | |
| Conflicts | | | | | | | | | | | | | | | |
| NeedsParking | | | | | | | | | | | | | | | |
| Waitlist | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 2 | 1 | 7 |
| All | 2 | 1 | 4 | 2 | 3 | 2 | 1 | 1 | 1 | 1 | 2 | 1 | 6 | 1 | 28 |

Percentage breakdown:

| Assigned_Building | Design | Environment | Finance | Health | Healthcare | Hospitality | Import/Export | Logistics | Manufacturing | Media | Professional | Retail | Tech | Trade |
|-------------------|--------|-------------|---------|--------|------------|-------------|---------------|-----------|---------------|-------|--------------|--------|-------|-------|
| Dock View | 20.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 20.0% | 0.0% | 20.0% | 0.0% | 20.0% | 0.0% | 20.0% | 0.0% |
| Harbour Tower | 0.0% | 16.7% | 33.3% | 0.0% | 16.7% | 16.7% | 0.0% | 0.0% | 0.0% | 0.0% | 16.7% | 0.0% | 0.0% | 0.0% |
| Marina West | 0.0% | 0.0% | 20.0% | 0.0% | 40.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 40.0% | 0.0% |
| Pier One | 20.0% | 0.0% | 20.0% | 0.0% | 0.0% | 20.0% | 0.0% | 0.0% | 0.0% | 20.0% | 0.0% | 0.0% | 20.0% | 0.0% |
| Waitlist | 0.0% | 0.0% | 0.0% | 28.6% | 0.0% | 0.0% | 0.0% | 14.3% | 0.0% | 0.0% | 0.0% | 14.3% | 28.6% | 14.3% |

Export

The Export tab provides four download formats, all pre-generated and ready to download instantly.

- **Excel Report (.xlsx)** — a fully formatted workbook containing: a branded Summary sheet with key metrics, a Group Summary sheet showing sizes and budget totals, a Constraints sheet listing every rule you set (budget limits, quotas, preferences, pins, balance rules, relationships) as a complete audit trail, an All Assignments sheet with every item and its assigned group, one sheet per group with just that group's roster, and distribution cross-tabulation sheets for every categorical column in your data. Headers are styled with branded colours and alternating row shading. This is the most comprehensive export and the one to use for formal reporting or archival.
- **PDF Rosters** — a print-ready branded report with one page per group showing the roster table and summary statistics. Designed to be printed and handed out directly — to teachers, team managers, shift supervisors, or event coordinators.
- **CSV (All Assignments)** — a single flat file with every item and its assigned group column. Opens in any spreadsheet application. Use this for importing into other systems or further processing.
- **CSV per Group (Zip)** — a zip archive containing one CSV file per group, named after the group. Use this when you need to distribute individual rosters to different people — email each team leader their own file.

Tip: Every individual table across all results tabs can also be exported by hovering over it and clicking the download icon — so you can grab a single validation table or a specific analytics cross-tab without downloading the full report.

Overview Rosters Validation Analytics **Export**

Download Results

Download your results:

| | |
|---|---|
|  Excel Report |  PDF Rosters |
| Summary, groups, rosters, distributions, constraint audit | Print-ready report with branded roster pages |
|  CSV (All Assignments) |  CSV per Group (Zip) |
| Single file with every assignment — opens anywhere | One CSV per group — ready to distribute or import |

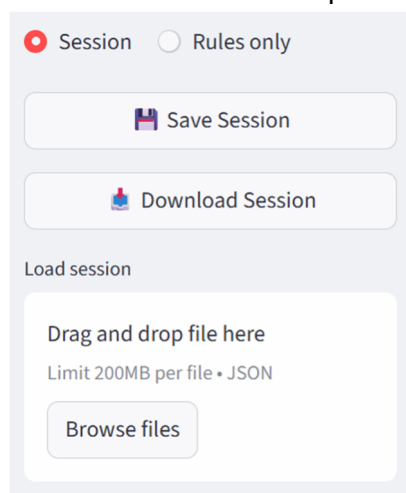
 Tip: every table in the results tabs can also be exported individually — hover over it and click the download icon.

Sidebar Features

Save & Load

The sidebar has a toggle between **Session** and **Rules only**:

- **Session** saves everything: your data and all rules. Use this to pause and resume work.
- **Rules only** saves just the configuration (groups, budgets, quotas, etc.) without data. Use this to apply the same rules to different datasets — for example, running the same classroom placement rules each year with new students.



The **Rules Only** save is particularly powerful for recurring allocations. A school that runs classroom placement every year can save the rules once (gender balance quotas, IEP budget limits, sibling relationship rules, reading level balance) and reload them the following year with a completely new student list. The rules reference column names, not specific data values, so they apply to any dataset with the same column structure.

The **Session** save captures a complete snapshot: data, rules, and results. Use this for version control — save before each solver run so you can compare iterations. Name your files descriptively (e.g. “Year6_v1_beforeBalance.json”, “Year6_v2_withPins.json”) for a complete audit trail.

Workflow for applying saved rules to new data: Upload your new data file and import it. Switch the sidebar toggle to “Rules only.” Upload a previously saved rules file. The tool loads the group configuration, budgets, quotas, balance settings, relationships, preferences, and pins — but keeps your new data. Review the rules in each tab to confirm they still make sense with the new data (e.g. column names match), then run the solver.

Terminology

Expand the Terminology section to rename the core labels. Change 'Item' to 'Student', 'Group' to 'Class', and 'ID' to 'Student ID'. This updates labels throughout the interface.

Dark Mode

Toggle for a dark colour scheme. Purely cosmetic.

Sample Data & Reset

Download Sample Data provides a small CSV to test with. **Reset Everything** clears all data and settings — use with caution.

Tips & Best Practices

- **Start simple, add complexity.** Begin with just groups and capacity. Run the solver. Then add one constraint type at a time. This lets you identify which rule causes issues if the solver reports infeasibility.
- **Use soft constraints when possible.** Hard constraints (must enforce, pins) reduce the solver's options. Soft constraints (preferences, flexible capacity) give better results because the solver has more room to optimise.
- **Check the Validation tab.** After every run, review which constraints passed and which were partially met. This tells you exactly where compromises were made.
- **Save before you run.** Use the session save so you can revert if the results are not what you expected.
- **Increase the timeout for large problems.** 700+ items with many constraints may need 60–90 seconds. Check the Options tab.
- **Name your groups meaningfully.** 'Mrs Robertson' is more useful than 'Group 1' when reviewing results.
- **Use the priority sliders wisely.** If relationships are more important than balance, increase Keep Apart/Together and decrease Balance.
- **Understand the difference between hard and soft.** Budgets, required relationships, and pins are hard — the solver fails if it can't satisfy them. Balance, preferences, and soft relationships are soft — the solver does its best but can compromise. If you're getting infeasible results, check whether you've made too many things hard.
- **Use Tags for group categories.** Instead of applying a quota to each group individually, tag groups (e.g. "Division 1", "Active", "Ground Floor") and apply rules to the tag. This scales better and is easier to maintain when you add or rename groups.
- **The select/reject pattern works for any competitive selection.** Create two groups: one for selected items (fixed size) and one for the remainder. Use Maximise on a merit column targeting the selected group. Add quotas for diversity requirements. This works for scholarships, grants, team selection, shortlisting, and any scenario where you're picking the best N from a pool.
- **Combined budgets are for shared resources.** If two buildings share a parking structure, or two shifts share an equipment pool, use a combined budget rather than trying to calculate individual limits. The solver handles the allocation within the shared cap.
- **Don't over-constrain.** Every hard constraint reduces the solver's options. If you set hard quotas, hard budgets, hard relationships, and pins all at once on a small dataset, the solver may report infeasibility simply because there aren't enough items to satisfy every rule simultaneously. Start with the most important constraints as hard, and make everything else soft.
- **Check the constraint summary line.** Before clicking Run, scan the summary below the Configuration section. If it shows 0 quotas when you expected 3, you probably forgot to click the Add button after filling in the quota form.

Troubleshooting

| Problem | Cause | Fix |
|--|--|---|
| No Solution Possible | Hard constraints conflict | Review conflict report. Relax hard quotas, reduce pins, or increase capacity. |
| 'Good' instead of 'Optimal' | Solver ran out of time | Increase timeout in Options tab. Or accept the 'Good' solution — it is valid. |
| Relationships not working | IDs in the relationship column don't match the ID column | Ensure IDs match exactly (case-sensitive). Check the separator character. |
| Balance seems uneven | Balance weight is too low | Increase the Balance priority slider in Options. Or the data itself may be skewed. |
| Data upload errors | Wrong file format or encoding | Save as CSV UTF-8 from Excel. Remove merged cells or empty header rows. |
| Solver takes too long | Too many items or constraints | Increase timeout in Options. Reduce hard constraints. For 500+ items, start with 60–90 seconds. |
| Pins conflict with relationships | A pinned item's partner can't fit in the same group | Reduce pins. Use preferences instead where possible. Check that pinning doesn't force more items into a group than its capacity allows. |
| Quotas don't seem to apply | Quota targets the wrong groups or mode | Check the Apply to dropdown. Check Percentage vs Count mode. Verify you clicked Add after filling in the form. |
| Budget values reset after changing group count | Editor state not committed before resize | This is fixed in the latest version. If you experience it, save your session before changing group count. |
| Relationship warning about unknown IDs | Column has labels instead of IDs | The relationship column must contain item IDs (e.g. G004), not shared labels (e.g. Taylor). See the Relationships section. |

Getting Help

If you encounter a bug, unexpected behaviour, or need assistance with your allocation, visit the website balancedapp.io for additional information or contact us at support@balancedapp.io.

When reporting an issue, include the following so we can help quickly:

- A description of what you were trying to do and what happened instead
- The error message, if one appeared (a screenshot is ideal)
- Your saved session file (.json) — use the Session save in the sidebar to capture your data and rules at the point the issue occurred
- The number of items and groups you were working with
- Your browser (Chrome, Safari, Edge, etc.)

We also welcome feature requests and feedback on the tool. If you have a use case that doesn't quite fit the current feature set, let us know — many of the features in this version were built in response to user feedback.

Glossary

| Term | Definition |
|-----------------|---|
| Item | A single thing being allocated (a student, a package, a nurse) |
| Group | A container items are assigned to (a class, a truck, a shift) |
| Budget | A numeric column limit per group (e.g. max weight, salary cap) |
| Combined Budget | A shared budget across multiple groups |
| Quota | A percentage or count requirement per group (e.g. 40–60% female) |
| Balance | Evening out the distribution of a column across groups |
| Relationship | A keep-apart or keep-together rule based on item ID references |
| Preference | A soft or hard rule that items matching a condition should go to a specific group |
| Pin | A hard assignment of a specific item to a specific group |
| Exclusion | A hard rule preventing an item from being in a specific group |
| Tag | A label on a group used to target rules at multiple groups |
| Flex | Soft capacity on a group — the solver can slightly exceed the limit |
| Hard constraint | Must be satisfied — solver fails if it cannot |
| Soft constraint | Preferred but can be violated if necessary |
| Feasible | A valid solution that satisfies all hard constraints |
| Optimal | The mathematically best feasible solution |

Worked Examples

The following eight appendices provide complete, realistic scenarios with sample data and step-by-step instructions. Additional examples and a copy of each CSV file is available for download from balancedapp.io.

Appendix A: Education — Classroom Placement

Scenario

Greenfield Primary School needs to form 4 classes of 8 students from 32 incoming Year 3 students. Classes must be balanced by gender and reading level. Students with special needs require IEP (Individual Education Plan) hours, and no class should bear a disproportionate load. Certain students have documented behavioural conflicts. Siblings must be kept together. Some parents have requested specific teachers.

The data includes 32 students with gender, reading level (Advanced/Proficient/Basic/Below Basic), special needs status, IEP hours, behaviour flags, sibling links, conflict links, and parent teacher requests.

The Data

Save the following as `classroom_placement.csv`:

32 rows, 10 columns. First 5 rows shown:

| StudentID | Name | Gender | Reading Level | SpecialNeeds | IEP_Hours | Behaviour | Siblings | Conflicts | ParentRequest |
|-----------|---------------|--------|---------------|--------------|-----------|-----------|----------|-----------|---------------|
| S001 | Liam Chen | M | Advanced | No | 0 | Good | | S015 | |
| S002 | Emma Patel | F | Proficient | No | 0 | Good | S003 | | Mrs Robertson |
| S003 | Olivia Patel | F | Proficient | No | 0 | Good | S002 | | Mrs Robertson |
| S004 | Noah Williams | M | Basic | Yes | 6 | Monitor | | S008 | |
| S005 | Ava Thompson | F | Advanced | No | 0 | Good | | | |

Full CSV file: `classroom_placement.csv`



classroom_placement.csv

Step-by-Step Instructions

Step 1: Upload & Map

1. Upload `classroom_placement.csv`.
2. Set Unique ID to StudentID and Display Name to Name.
3. Keep all columns. Click Import Data.

Map Your Columns

Which column is the unique ID? ? Which column is the Name/Label? ?

StudentID ▼ Name ▼

Additional columns to include ?

Gender × ReadingLevel × SpecialNeeds × IEP_Hours × Behaviour × Siblings × Conflicts × ParentRequest × ⌵

✓ Data Validation

✓ Data looks good!

Preview & Edit

You can edit values directly before importing

| ID | Name | Gender | ReadingLevel | SpecialNeeds | IEP_Hours | Behaviour | Siblings | Conflicts | ParentRequest |
|------|---------------|--------|--------------|--------------|-----------|-----------|----------|-----------|---------------|
| S001 | Liam Chen | M | Advanced | No | 0 | Good | None | S015 | None |
| S002 | Emma Patel | F | Proficient | No | 0 | Good | S003 | None | Mrs Robertson |
| S003 | Olivia Patel | F | Proficient | No | 0 | Good | S002 | None | Mrs Robertson |
| S004 | Noah Williams | M | Basic | Yes | 6 | Monitor | None | S008 | None |
| S005 | Ava Thompson | F | Advanced | No | 0 | Good | None | None | None |
| S006 | Jackson Lee | M | Below Basic | Yes | 10 | Monitor | None | S012 | None |
| S007 | Sophia Garcia | F | Proficient | No | 0 | Good | None | None | Mr Hoffman |
| S008 | Liam Brown | M | Basic | No | 0 | At Risk | None | S004 | None |

✓ Import Data

Step 2: Configure Groups

1. Set Number of Groups to 4.
2. Rename to: Mrs Robertson, Mr Hoffman, Ms Tanaka, Mr Chen.
3. Set each to Min 7 / Max 9.

2. Configuration

Unique ID ? Display Name ?

ID ▼ Name ▼

Groups Budgets Quotas Balance Relationships Preferences Pins Options

Number of Groups ?

4 − +

✓ 32 items · Capacity: 28-36

| Name | Min | Max | Tags | Flex |
|---------------|-----|-----|------|--------------------------|
| Mrs Robertson | 7 | 9 | | <input type="checkbox"/> |
| Mr Hoffman | 7 | 9 | | <input type="checkbox"/> |
| Ms Tanaka | 7 | 9 | | <input type="checkbox"/> |
| Mr Chen | 7 | 9 | | <input type="checkbox"/> |

Step 3: Set Budget — IEP Hours

1. Go to the Budgets tab.
2. Select IEP_Hours from the multiselect.
3. Set Max Total to 25 for each class (prevents overloading any one teacher).
4. Leave Min Total at 0.

Groups Budgets Quotas Balance Relationships Preferences Pins Options

Set min/max totals for numeric columns per group

Select columns to limit

IEP_Hours x

IEP_Hours

Total IEP_Hours in your data: 72

| Group | Min Total | Max Total |
|---------------|-----------|-----------|
| Mrs Robertson | 0 | 25 |
| Mr Hoffman | 0 | 25 |
| Ms Tanaka | 0 | 25 |
| Mr Chen | 0 | 25 |

Tip: Total IEP hours across all students is 72. With a max of 25 per class, the solver must spread them across at least 3 classes.

Step 4: Set Quotas — Gender Balance

1. Go to the Quotas tab. Ensure Percentage mode is selected.
2. Column: Gender, Value: F, Min: 40, Max: 60. Group: All Groups. Click Add.
3. This ensures every class is 40–60% female. The balance male, which will inherently be 40–60% given there are two options which will total to 100%. This means we do not technically need to set a second 40-60% male rule, though it can be inserted if desired.

Groups Budgets Quotas Balance Relationships Preferences Pins Options

Require a percentage or count of specific values per group

Percentage
 Count

Column: Gender, Value: F, Range %: 40–60, Apply to: All Groups, + Add

Quick rule: require at least one of every value

Column: ID, Apply to: All Groups, + Add All Values

| Column | Value | Range | Group |
|--------|-------|--------|------------|
| Gender | F | 40–60% | All Groups |

Step 5: Enable Balance — Reading Level

1. Go to the Balance tab.
2. Select ReadingLevel from the multiselect.
3. Leave mode as Equal and apply to All Groups. This spreads Advanced, Proficient, Basic, and Below Basic students evenly across all 4 classes.

Groups Budgets Quotas **Balance** Relationships Preferences Pins Options

Spread values evenly, or maximise/minimise across target groups

Columns to optimise

ReadingLevel x

ReadingLevel

Mode Apply to

Equal All Groups

4 unique values will be distributed evenly across all groups

Step 6: Add Relationships — Conflicts and Siblings

1. Go to the Relationships tab.
2. Add rule: Column = Conflicts, Type = KEEP_APART, Enforce = Required. Click Add.
3. Add rule: Column = Siblings, Type = KEEP_TOGETHER, Enforce = Required. Click Add.

Groups Budgets Quotas Balance **Relationships** Preferences Pins Options

Keep Apart = must not share a group · Keep Together = should share a group

Column Type Separator Must Enforce? + Add

Siblings KEEP_TOGETHER ;

| Column | Type | Sep | Enforce |
|-----------|---------------|-----|----------|
| Conflicts | KEEP_APART | ; | Required |
| Siblings | KEEP_TOGETHER | ; | Required |

Tip: S002 and S003 (the Patel sisters) will be kept together. S001 and S015 (a documented conflict) will be separated.

Step 7: Add Pins — Parent Requests

1. Go to the Pins tab.
2. Use Bulk Assign: Column = ParentRequest, Value = Mrs Robertson, Rule = Pin to, Group = Mrs Robertson. Click Add All.
3. Repeat for Mr Hoffman.
4. This pins S002, S003, S032 to Mrs Robertson and S007, S017 to Mr Hoffman.

Groups Budgets Quotas Balance Relationships Preferences **Pins** Options

Pin items to specific groups, or exclude them

Column Value Rule Group + Add All

ParentRequest Mr Hoffman Pin to Mr Hoffman

Must Go To

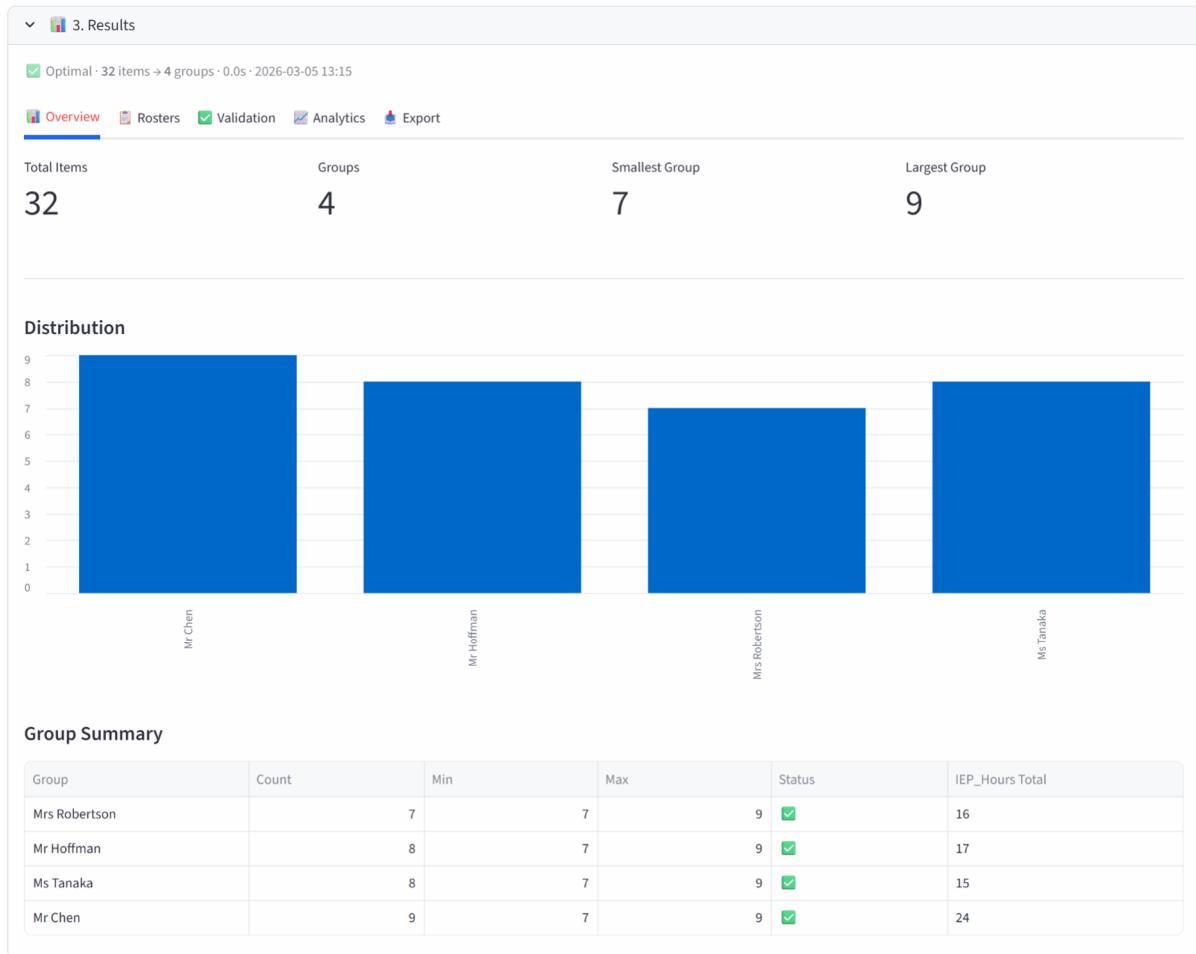
| Item | Must Go To |
|-----------------------|---------------|
| S002 (Emma Patel) | Mrs Robertson |
| S003 (Olivia Patel) | Mrs Robertson |
| S032 (Logan Campbell) | Mrs Robertson |
| S007 (Sophia Garcia) | Mr Hoffman |
| S017 (Harper Martin) | Mr Hoffman |

Cannot Go To

| Item | Cannot Go To |
|------|--------------|
| | |

Step 8: Run the Optimiser

1. Scroll to the Run Optimizer button and click it.
2. The solver should find an Optimal or Good solution within a few seconds.



Step 9: Validate & Export

1. Check the Validation tab: all quotas, budgets, and relationships should pass.
2. Review the Analytics tab to see gender and reading level distribution charts.
3. Export as Excel and share with the teaching team.

Expected Outcome

Each class has 7–9 students. Gender is 40–60% female in every class. Reading levels are spread evenly. No class exceeds 25 IEP hours. Siblings (Patels, Browns, Scotts, Harrises) are together. Conflict pairs are separated. Parent-requested students are in the right class.

If the solver reports Good rather than Optimal, the result is still valid — it means the time limit was reached before proving mathematical optimality, but all hard constraints are satisfied.

This example uses 32 students for clarity, but schools routinely run this with 100–700+ students across 4–28 classes using the same rule setup. Increase the solver timeout in Options for larger cohorts. Use the Rules Only save to preserve this year's configuration and reload it next year with a fresh student list.

Group Rosters

| Mrs Robertson (7 items) | | | | | | | | | |
|-------------------------|-----------------|--------|--------------|--------------|-----------|-----------|----------|-----------|---------------|
| ID | Name | Gender | ReadingLevel | SpecialNeeds | IEP_Hours | Behaviour | Siblings | Conflicts | ParentRequest |
| S002 | Emma Patel | F | Proficient | No | 0 | Good | S003 | None | Mrs Robertson |
| S003 | Olivia Patel | F | Proficient | No | 0 | Good | S002 | None | Mrs Robertson |
| S010 | Ethan Davis | M | Advanced | No | 0 | Good | None | None | None |
| S016 | James Taylor | M | Below Basic | Yes | 12 | At Risk | None | S020 | None |
| S025 | Scarlett Harris | F | Advanced | No | 0 | Good | S026 | None | None |
| S026 | William Harris | M | Proficient | No | 0 | Good | S025 | None | None |
| S032 | Logan Campbell | M | Basic | Yes | 4 | Good | None | None | Mrs Robertson |

| Mr Hoffman (8 items) | | | | | | | | | |
|----------------------|---------------|--------|--------------|--------------|-----------|-----------|----------|-----------|---------------|
| ID | Name | Gender | ReadingLevel | SpecialNeeds | IEP_Hours | Behaviour | Siblings | Conflicts | ParentRequest |
| S001 | Liam Chen | M | Advanced | No | 0 | Good | None | S015 | None |
| S004 | Noah Williams | M | Basic | Yes | 6 | Monitor | None | S008 | None |
| S007 | Sophia Garcia | F | Proficient | No | 0 | Good | None | None | Mr Hoffman |
| S012 | Aiden Clark | M | Proficient | No | 0 | At Risk | None | S006 | None |
| S017 | Harper Martin | F | Advanced | No | 0 | Good | None | None | Mr Hoffman |
| S020 | Daniel White | M | Proficient | No | 0 | At Risk | None | S016 | None |
| S027 | Grace Lewis | F | Basic | No | 0 | Good | None | None | None |
| S029 | Chloe Hall | F | Below Basic | Yes | 11 | Good | None | None | None |

| Ms Tanaka (8 items) | | | | | | | | | |
|---------------------|----------------|--------|--------------|--------------|-----------|-----------|----------|-----------|---------------|
| ID | Name | Gender | ReadingLevel | SpecialNeeds | IEP_Hours | Behaviour | Siblings | Conflicts | ParentRequest |
| S005 | Ava Thompson | F | Advanced | No | 0 | Good | None | None | None |
| S011 | Isabella Moore | F | Below Basic | Yes | 8 | Good | None | None | None |
| S015 | Amelia Wilson | F | Proficient | No | 0 | Monitor | None | S001 | None |
| S018 | Benjamin Scott | M | Proficient | No | 0 | Good | S019 | None | None |
| S019 | Evelyn Scott | F | Basic | No | 0 | Good | S018 | None | None |
| S022 | Henry Wright | M | Basic | Yes | 7 | Good | None | None | None |
| S028 | Michael Walker | M | Proficient | No | 0 | At Risk | None | S024 | None |
| S030 | Jacob Robinson | M | Advanced | No | 0 | Good | None | None | None |

✓ IEP_Hours: All groups within limits

| Group | Total IEP_Hours | Min | Max | Status |
|---------------|-----------------|-----|-----|--------|
| Mrs Robertson | 16 | 0 | 25 | ✓ |
| Mr Hoffman | 17 | 0 | 25 | ✓ |
| Ms Tanaka | 15 | 0 | 25 | ✓ |
| Mr Chen | 24 | 0 | 25 | ✓ |

Quotas

Gender = F (%)

| Group | Count | % F | Required | Status |
|---------------|-------|-------|----------|--------|
| Mrs Robertson | 3 | 42.9% | 40-60% | ✓ |
| Mr Hoffman | 4 | 50.0% | 40-60% | ✓ |
| Ms Tanaka | 4 | 50.0% | 40-60% | ✓ |
| Mr Chen | 5 | 55.6% | 40-60% | ✓ |

Relationships

✓ All 9 relationships satisfied

| Item 1 | Item 2 | Rule | Result | Status |
|--------|--------|---------------|-------------------------------|--------|
| S001 | S015 | Keep Apart | Mr Hoffman / Ms Tanaka | ✓ |
| S004 | S008 | Keep Apart | Mr Hoffman / Mr Chen | ✓ |
| S006 | S012 | Keep Apart | Mr Chen / Mr Hoffman | ✓ |
| S016 | S020 | Keep Apart | Mrs Robertson / Mr Hoffman | ✓ |
| S024 | S028 | Keep Apart | Mr Chen / Ms Tanaka | ✓ |
| S002 | S003 | Keep Together | Mrs Robertson / Mrs Robertson | ✓ |
| S008 | S009 | Keep Together | Mr Chen / Mr Chen | ✓ |
| S018 | S019 | Keep Together | Ms Tanaka / Ms Tanaka | ✓ |
| S025 | S026 | Keep Together | Mrs Robertson / Mrs Robertson | ✓ |

Balance

⚠ ReadingLevel: Moderately balanced (74% even)

| Value | Total | Distribution | Evenness |
|-------------|-------|---------------|----------|
| Advanced | 8 | 2 / 2 / 2 / 2 | 100% |
| Basic | 7 | 2 / 2 / 1 / 2 | 57% |
| Below Basic | 5 | 2 / 1 / 1 / 1 | 40% |
| Proficient | 12 | 3 / 3 / 3 / 3 | 100% |

Note: Balance is a soft constraint - perfect distribution may not be possible with other constraints

Pins

✓ All 5 fixed assignments satisfied

| Type | Item | Required | Actual | Status |
|--------------|------|---------------|---------------|--------|
| 📌 Must Go To | S002 | Mrs Robertson | Mrs Robertson | ✓ |
| 📌 Must Go To | S003 | Mrs Robertson | Mrs Robertson | ✓ |
| 📌 Must Go To | S032 | Mrs Robertson | Mrs Robertson | ✓ |
| 📌 Must Go To | S007 | Mr Hoffman | Mr Hoffman | ✓ |
| 📌 Must Go To | S017 | Mr Hoffman | Mr Hoffman | ✓ |

Appendix B: Events — Wedding Seating

Scenario

James and Sophie are getting married with 30 guests seated at 3 tables of 10.

Requirements: bridal party at Table 1 (the top table), families together, exes apart, a mix of both sides at each table, and dietary needs spread so the kitchen can manage service. VIPs should be close to the couple.

The data includes 30 guests with side (Bride/Groom), table group (Friends/Family/Work), dietary requirements, age, family groupings, ex-partner conflicts, bridal party role, and VIP status.

The Data

Save the following as `wedding_seating.csv`:

30 rows, 10 columns. First 5 rows shown:

| GuestID | Name | Side | TableGroup | Dietary | Age | Family | Exes | BridalParty | VIP |
|---------|----------------|-------|------------|-------------|-----|--------|------|-----------------|-----|
| G001 | James Mitchell | Groom | Friends | None | 32 | | | Best Man | Yes |
| G002 | Sarah Mitchell | Groom | Friends | Vegetarian | 30 | | | | |
| G003 | Robert Taylor | Bride | Family | None | 58 | Taylor | | Father of Bride | Yes |
| G004 | Linda Taylor | Bride | Family | Gluten Free | 56 | Taylor | | Mother of Bride | Yes |
| G005 | Michael Chen | Groom | Family | None | 61 | Chen | | | Yes |

Full CSV file: `wedding_seating.csv`



wedding_seating.csv

Step-by-Step Instructions

Step 1: Upload & Map

1. Upload `wedding_seating.csv`.
2. Set Unique ID to GuestID and Display Name to Name.
3. Keep all columns. Click Import Data.

Map Your Columns

Which column is the unique ID? ? Which column is the Name/Label? ?

GuestID ▼ Name ▼

Additional columns to include ?

Side x TableGroup x Dietary x Age x Family x Exes x BridalParty x VIP x ⌵

✓ Data Validation

✓ Data looks good!

Preview & Edit

You can edit values directly before importing

| ID | Name | Side | TableGroup | Dietary | Age | Family | Exes | BridalParty | VIP |
|------|----------------|-------|------------|-------------|-----|--------|------|-----------------|------|
| G001 | James Mitchell | Groom | Friends | None | 32 | None | None | Best Man | Yes |
| G002 | Sarah Mitchell | Groom | Friends | Vegetarian | 30 | None | None | None | None |
| G003 | Robert Taylor | Bride | Family | None | 58 | Taylor | None | Father of Bride | Yes |
| G004 | Linda Taylor | Bride | Family | Gluten Free | 56 | Taylor | None | Mother of Bride | Yes |
| G005 | Michael Chen | Groom | Family | None | 61 | Chen | None | None | Yes |
| G006 | Wei Chen | Groom | Family | Vegetarian | 59 | Chen | None | None | Yes |
| G007 | Emma Roberts | Bride | Friends | Vegan | 28 | None | None | Maid of Honour | Yes |
| G008 | Daniel Roberts | Bride | Friends | None | 20 | None | None | None | None |

✓ Import Data

Step 2: Set Terminology

1. In the sidebar, expand Terminology.
2. Change Item to 'Guest', Group to 'Table', ID to 'Guest ID'. Click Apply.

Terminology

What are you allocating? ?

Guest

Where are you allocating to? ?

Table

ID column label ?

Guest ID

Apply

Tip: The entire interface now reads 'Guest' and 'Table' instead of 'Item' and 'Group'.

Step 3: Configure Tables

1. Set Number of Tables to 3.
2. Rename to: Top Table, Table 2, Table 3.
3. Set the Top Table to Min 9 / Max 14 and each to Min 9 / Max 11.

Tables Budgets Quotas Balance Relationships Preferences Pins Options

Number of Tables ⓘ

3 - +

✓ 30 items · Capacity: 27–36

| Name | Min | Max | Tags | Flex |
|-----------|-----|-----|------|--------------------------|
| Top Table | | 9 | 14 | <input type="checkbox"/> |
| Table 2 | | 9 | 11 | <input type="checkbox"/> |
| Table 3 | | 9 | 11 | <input type="checkbox"/> |

Step 4: Pin Bridal Party

- Go to the Pins tab.
- Bulk Assign: Column = BridalParty, Value = Best Man, Rule = Pin to, Group = Top Table. Click Add All.
- Repeat for Maid of Honour, Father of Bride, Mother of Bride.

Tables Budgets Quotas Balance Relationships Preferences Pins Options

Pin items to specific groups, or exclude them

Column: BridalParty Value: Mother of Bride Rule: Pin to Group: Top Table + Add All

| Must Go To | | Cannot Go To | |
|-----------------------|------------|--------------|--|
| Item | Must Go To | | |
| G001 (James Mitchell) | Top Table | empty | |
| G007 (Emma Roberts) | Top Table | | |
| G003 (Robert Taylor) | Top Table | | |
| G004 (Linda Taylor) | Top Table | | |

Tip: This gives the Top Table its bridal party core. We have excluded the groomsman and bridesmaids to allow them to be paired with their partners across any of the three tables. The solver fills remaining seats optimally.

Step 5: Add Relationships

- Go to the Relationships tab.
- Add: Column = Family, Type = KEEP_TOGETHER, Enforce = Required.
- Add: Column = Exes, Type = KEEP_APART, Enforce = Required.

Tables Budgets Quotas Balance Relationships Preferences Pins Options

Keep Apart = must not share a group · Keep Together = should share a group

Column: Exes Type: KEEP_APART Separator: ; Must Enforce? + Add

| Column | Type | Sep | Enforce |
|--------|---------------|-----|----------|
| Family | KEEP_TOGETHER | ; | Required |
| Exes | KEEP_APART | ; | Required |

Tip: The Family column contains the Guest IDs of family members (e.g. G003 has G004, meaning Robert and Linda Taylor must sit together). This is how relationships work — the column must contain IDs of other items, not shared labels. The Exes column works the same way: G013 lists G025, keeping Tom Davies and Ryan Hughes apart.

Step 6: Set Balance — Side Mix

1. Go to the Balance tab.
2. Select Side. Leave mode as Equal.
3. This ensures each table has a mix of Bride-side and Groom-side guests.

Tables Budgets Quotas **Balance** Relationships Preferences Pins Options

Spread values evenly, or maximise/minimise across target groups

Columns to optimise

Side x

Side

Mode Apply to

Equal All Tables

2 unique values will be distributed evenly across all tables

Step 7: Set Quota — Dietary Spread

1. Go to the Quotas tab. Select Count mode.
2. Column: Dietary, Value: Vegan, Min: 0, Max: 2. Group: All Tables. Click Add.
3. Column: Dietary, Value: Vegetarian, Min: 0, Max: 3. Group: All Tables. Click Add.

Tables Budgets **Quotas** Balance Relationships Preferences Pins Options

Require a percentage or count of specific values per group

Percentage
 Count

Column Value Min Max Apply to

Dietary Vegetarian 0 3 All Tables + Add

Quick rule: require at least one of every value

Column Apply to

Guest ID All Tables + Add All Values

| Column | Value | Range | Group |
|---------|------------|-------|------------|
| Dietary | Vegan | 0-2 | All Tables |
| Dietary | Vegetarian | 0-3 | All Tables |

Tip: This prevents all special diets from landing at one table, helping kitchen logistics.

Step 8: Add Preference — VIPs

1. Go to the Preferences tab.
2. Column: VIP, Operator: =, Value: Yes, Target: Top Table, Strength: 70. Click Add.
3. This gives a strong but not mandatory pull for VIPs to the top table.
4. Column: BridalParty, Operator: =, Value: Groomsman, Target: Top Table, Strength: 80. Click Add.
5. Column: BridalParty, Operator: =, Value: Bridesmaid, Target: Top Table, Strength: 80. Click Add.
6. This gives a very strong but not mandatory pull for the remaining bridal party to the top table.

Tables Budgets Quotas Balance Relationships Preferences Pins Options

Soft: prefer items in a group · Must: force items into a group

Column

BridalParty

Match

=

Value

Bridesmaid

Target Group

Top Table

Strength

80

Must ⓘ

+ Add

| Column | Match | Target | Strength |
|-------------|--------------|-----------|----------|
| VIP | = Yes | Top Table | 70 |
| BridalParty | = Groomsman | Top Table | 80 |
| BridalParty | = Bridesmaid | Top Table | 80 |

Step 9: Run & Validate

1. Click Run Optimizer.
2. Check Validation: families together, exes apart, dietary quotas met, sides balanced.
3. Export as PDF for the venue coordinator.

Expected Outcome

The Top Table seats the majority of bridal party, parents, and some VIPs. Each table has a mix of Bride and Groom guests. Where groomsman or bridesmaids are not on the Top Table, they are with their family. Family members are together. Tom Davies (G013) and Ryan Hughes (G025) are at separate tables. No table has more than 2 vegans or 3 vegetarians.

The solver balances these competing requirements simultaneously — something that would take hours by hand with 30 guests and is practically impossible with 150+. This example uses 30 guests at 3 tables, but the same rules work for 150 guests at 15 tables or 300 guests at 30 tables. Only the data file and number of groups change.

3. Results

Optimal - 30 Items -> 3 groups - 0.0s - 2026-03-06 13:54

Overview Rosters Validation Analytics Export

Total Items: 30 Groups: 3 Smallest Group: 10 Largest Group: 10

Distribution

Group Summary

| Table | Count | Min | Max | Status |
|-----------|-------|-----|-----|--------|
| Top Table | 10 | 9 | 14 | ✓ |
| Table 2 | 10 | 9 | 11 | ✓ |
| Table 3 | 10 | 9 | 11 | ✓ |

Table Rosters

Top Table (10 guests)

| Guest ID | Name | Side | TableGroup | Dietary | Age | Family | Exes | BridalParty | VIP |
|----------|----------------|-------|------------|-------------|-----|--------|------|-----------------|------|
| G001 | James Mitchell | Groom | Friends | None | 32 | G002 | None | Best Man | Yes |
| G002 | Sarah Mitchell | Groom | Friends | Vegetarian | 30 | G001 | None | None | None |
| G003 | Robert Taylor | Bride | Family | None | 58 | G004 | None | Father of Bride | Yes |
| G004 | Linda Taylor | Bride | Family | Gluten Free | 56 | G003 | None | Mother of Bride | Yes |
| G005 | Michael Chen | Groom | Family | None | 61 | G006 | None | None | Yes |
| G006 | Wei Chen | Groom | Family | Vegetarian | 59 | G005 | None | None | Yes |
| G007 | Emma Roberts | Bride | Friends | Vegan | 28 | G008 | None | Maid of Honour | Yes |
| G008 | Daniel Roberts | Bride | Friends | None | 30 | G007 | None | None | None |
| G019 | Chris Palmer | Groom | Friends | None | 33 | G020 | None | Groomsman | None |
| G020 | Jessica Palmer | Groom | Friends | Vegan | 31 | G019 | None | Bridesmaid | None |

Table 2 (10 guests)

| Guest ID | Name | Side | TableGroup | Dietary | Age | Family | Exes | BridalParty | VIP |
|----------|---------------|-------|------------|-------------|-----|--------|------|-------------|------|
| G011 | Mark Anderson | Groom | Work | None | 35 | G012 | None | Groomsman | None |
| G012 | Lucy Anderson | Groom | Work | Gluten Free | 33 | G011 | None | None | None |
| G017 | Helen White | Bride | Family | None | 75 | G018 | None | None | Yes |
| G018 | George White | Bride | Family | None | 78 | G017 | None | None | Yes |
| G023 | Oliver Brown | Bride | Work | None | 38 | G024 | None | None | None |
| G024 | Natalie Brown | Bride | Work | Gluten Free | 36 | G023 | None | None | None |
| G025 | Ryan Hughes | Bride | Friends | None | 34 | G026 | G013 | None | None |
| G026 | Megan Hughes | Bride | Friends | Vegetarian | 32 | G025 | None | None | None |
| G027 | Patrick Quinn | Groom | Family | None | 68 | G028 | None | None | Yes |
| G028 | Fiona Quinn | Groom | Family | None | 65 | G027 | None | None | Yes |

Table 3 (10 guests)

Constraint Check

Quotas

Dietary = Vegetarian (count)

| Group | Count | Required | Status |
|-----------|-------|----------|--------|
| Top Table | 2 | 0-3 | ✓ |
| Table 2 | 1 | 0-3 | ✓ |
| Table 3 | 3 | 0-3 | ✓ |

Dietary = Vegan (count)

| Group | Count | Required | Status |
|-----------|-------|----------|--------|
| Top Table | 2 | 0-2 | ✓ |
| Table 2 | 0 | 0-2 | ✓ |
| Table 3 | 1 | 0-2 | ✓ |

Relationships

✓ All 16 relationships satisfied

| Item 1 | Item 2 | Rule | Result | Status |
|--------|--------|---------------|-----------------------|--------|
| G013 | G025 | Keep Apart | Table 3 / Table 2 | ✓ |
| G001 | G002 | Keep Together | Top Table / Top Table | ✓ |
| G003 | G004 | Keep Together | Top Table / Top Table | ✓ |
| G005 | G006 | Keep Together | Top Table / Top Table | ✓ |
| G007 | G008 | Keep Together | Top Table / Top Table | ✓ |
| G009 | G010 | Keep Together | Table 3 / Table 3 | ✓ |
| G011 | G012 | Keep Together | Table 2 / Table 2 | ✓ |
| G013 | G014 | Keep Together | Table 3 / Table 3 | ✓ |
| G015 | G016 | Keep Together | Table 3 / Table 3 | ✓ |
| G017 | G018 | Keep Together | Table 2 / Table 2 | ✓ |

Balance

⚠ Side: Moderately balanced (73% even)

| Value | Total | Distribution | Evenness |
|-------|-------|--------------|----------|
| Bride | 16 | 6 / 6 / 4 | 75% |
| Groom | 14 | 4 / 4 / 6 | 71% |

Note: Balance is a soft constraint - perfect distribution may not be possible with other constraints

Pins

✓ All 4 fixed assignments satisfied

| Type | Item | Required | Actual | Status |
|--------------|------|-----------|-----------|--------|
| ✳ Must Go To | G001 | Top Table | Top Table | ✓ |
| ✳ Must Go To | G007 | Top Table | Top Table | ✓ |
| ✳ Must Go To | G003 | Top Table | Top Table | ✓ |
| ✳ Must Go To | G004 | Top Table | Top Table | ✓ |

Appendix C: Logistics — Fleet Loading

Scenario

Metro Distribution has 24 packages to load onto 4 trucks. Each truck has a weight limit and volume limit. Packages have destination zones (CBD, North, South, East, West), priority levels, fragile flags, and hazardous material classifications. The goal is efficient loading that respects all limits while spreading fragile items to reduce risk.

The data includes 24 packages with weight (kg), volume (m³), destination zone, priority, fragile flag, hazard class, and special handling notes.

The Data

Save the following as `fleet_loading.csv`:

24 rows, 9 columns. First 5 rows shown:

| PackageID | Description | Weight_kg | Volume_m3 | Zone | Priority | Fragile | HazClass |
|-----------|----------------------|-----------|-----------|-------|----------|---------|----------|
| P001 | Industrial Pump | 85 | 1.2 | North | Standard | No | None |
| P002 | Glass Panels x20 | 120 | 2.1 | CBD | Express | Yes | None |
| P003 | Office Furniture Set | 200 | 3.5 | South | Standard | No | None |
| P004 | Chemical Drums x4 | 180 | 1.8 | West | Standard | No | Class 3 |
| P005 | Electronics Pallet | 45 | 0.8 | CBD | Express | Yes | None |

Full CSV file: `fleet_loading.csv`



fleet_loading.csv

Step-by-Step Instructions

Step 1: Upload & Map

1. Upload `fleet_loading.csv`.
2. Set Unique ID to PackageID, Display Name to Description.
3. Keep all columns. Click Import Data.

Map Your Columns

Which column is the unique ID? ⓘ Which column is the Name/Label? ⓘ

PackageID ▼ Description ▼

Additional columns to include ⓘ

Weight_kg × Volume_m3 × Zone × Priority × Fragile × HazClass × SpecialHandling × × ▼

✓ Data Validation

✓ Data looks good!

Preview & Edit

You can edit values directly before importing

| ID | Name | Weight_kg | Volume_m3 | Zone | Priority | Fragile | HazClass | SpecialHandling |
|------|----------------------|-----------|-----------|-------|----------|---------|----------|-----------------|
| P001 | Industrial Pump | 85 | 1.2 | North | Standard | No | None | None |
| P002 | Glass Panels x20 | 120 | 2.1 | CBD | Express | Yes | None | Upright Only |
| P003 | Office Furniture Set | 200 | 3.5 | South | Standard | No | None | None |
| P004 | Chemical Drums x4 | 180 | 1.8 | West | Standard | No | Class 3 | None |
| P005 | Electronics Pallet | 45 | 0.8 | CBD | Express | Yes | None | None |
| P006 | Steel Beams x6 | 350 | 2 | North | Standard | No | None | Crane Required |
| P007 | Medical Supplies | 30 | 0.5 | East | Urgent | Yes | None | Temperature |
| P008 | Print Case x50 | 150 | 1.5 | South | Standard | No | Class 2 | None |

✓ Import Data

Step 2: Set Terminology

1. Change Item to 'Package', Group to 'Truck', ID to 'Package ID'.

Terminology

What are you allocating? ⓘ

Package

Where are you allocating to? ⓘ

Truck

ID column label ⓘ

Package ID

Apply

Step 3: Configure Trucks

1. Set Number of Trucks to 4.
2. Rename to: Truck A, Truck B, Truck C, Truck D.
3. Set each to Min 5 / Max 7.

Trucks Budgets Quotas Balance Relationships Preferences Pins Options

Number of Trucks ⓘ

4 - +

✓ 24 items · Capacity: 20–28

| Name | Min | Max | Tags | Flex |
|---------|-----|-----|------|--------------------------|
| Truck A | | 5 | 7 | <input type="checkbox"/> |
| Truck B | | 5 | 7 | <input type="checkbox"/> |
| Truck C | | 5 | 7 | <input type="checkbox"/> |
| Truck D | | 5 | 7 | <input type="checkbox"/> |

Step 4: Set Budgets — Weight and Volume

1. Go to the Budgets tab.
2. Select `Weight_kg`. Set Max Total to 1500 for each truck.
3. Select `Volume_m3`. Set Max Total to 12.0 for each truck.

Trucks Budgets Quotas Balance Relationships Preferences Pins Options

Set min/max totals for numeric columns per group

Select columns to limit ⓘ

Weight_kg × Volume_m3 × ✕ ↓

Weight_kg

Total Weight_kg in your data: 4,200

| Group | Min Total | Max Total |
|---------|-----------|-----------|
| Truck A | | 1500 |
| Truck B | | 1500 |
| Truck C | | 1500 |
| Truck D | | 1500 |

Volume_m3

Total Volume_m3 in your data: 44

| Group | Min Total | Max Total |
|---------|-----------|-----------|
| Truck A | | 12 |
| Truck B | | 12 |
| Truck C | | 12 |
| Truck D | | 12 |

Tip: Total weight is ~4,200kg across 24 packages. With 4 trucks at max 1,500kg each, there is enough capacity but the solver must balance carefully.

Step 5: Set Quota — Fragile Spread

1. Go to the Quotas tab. Use Count mode.
2. Column: Fragile, Value: Yes, Min: 0, Max: 3. Group: All Trucks. Click Add.

Trucks Budgets Quotas Balance Relationships Preferences Pins Options

Require a percentage or count of specific values per group

- Percentage
 Count

| | | | | | |
|---------|-------|-----|-----|------------|-------|
| Column | Value | Min | Max | Apply to | |
| Fragile | Yes | 0 | 3 | All Groups | + Add |

Quick rule: require at least one of every value

| | | |
|--------|------------|------------------|
| Column | Apply to | |
| ID | All Groups | + Add All Values |

| Column | Value | Range | Group |
|---------|-------|-------|------------|
| Fragile | Yes | 0-3 | All Groups |

Step 6: Set Balance — Zones

1. Go to the Balance tab.
2. Select Zone. Leave mode as Equal.
3. This spreads destination zones across trucks, which helps with delivery routing.

Trucks Budgets Quotas Balance Relationships Preferences Pins Options

Spread values evenly, or maximise/minimise across target groups

Columns to optimise

Zone x

Zone

| | |
|-------|------------|
| Mode | Apply to |
| Equal | All Groups |

5 unique values will be distributed evenly across all groups

Step 7: Add Preference — CBD Express on Truck A

1. Go to the Preferences tab.
2. Column: Zone, Operator: =, Value: CBD, Target: Truck A, Strength: 80. Click Add.
3. Column: Priority, Operator: =, Value: Urgent, Target: Truck A, Strength: 90. Click Add.

Trucks Budgets Quotas Balance Relationships Preferences Pins Options

Soft: prefer items in a group · Must: force items into a group

Column
Priority

Match Value Target Group Strength Must

= Urgent Truck A 90 + Add

| Column | Match | Target | Strength |
|----------|----------|---------|----------|
| Zone | = CBD | Truck A | 80 |
| Priority | = Urgent | Truck A | 90 |

Tip: Truck A departs first and covers CBD. Urgent items get priority loading.

Step 8: Minimise Hazmat on Truck D

1. Go to the Balance tab.
2. Select HazScore from the multiselect.
3. Set Mode to Minimise. Set Target group to Truck D.

Trucks Budgets Quotas Balance Relationships Preferences Pins Options

Spread values evenly, or maximise/minimise across target groups

Columns to optimise

Zone x HazScore x

Zone

Mode Apply to

Equal All Groups

5 unique values will be distributed evenly across all groups

HazScore

Mode Target groups

Minimise Truck D x

Solver will push items with the lowest HazScore into Truck D (total pool: 28)

Tip: Truck D is the oldest vehicle with the least hazmat containment. HazScore is a numeric column (0 for non-hazardous, 3/5/8/9 matching the UN hazard class). Minimise works on numeric columns by reducing the total sum in the target group — so it pushes high-scoring hazmat packages away from Truck D toward the other trucks. If your data only has text labels (like HazClass), you need to add a numeric equivalent for Maximise/Minimise to work.

Step 9: Run & Validate

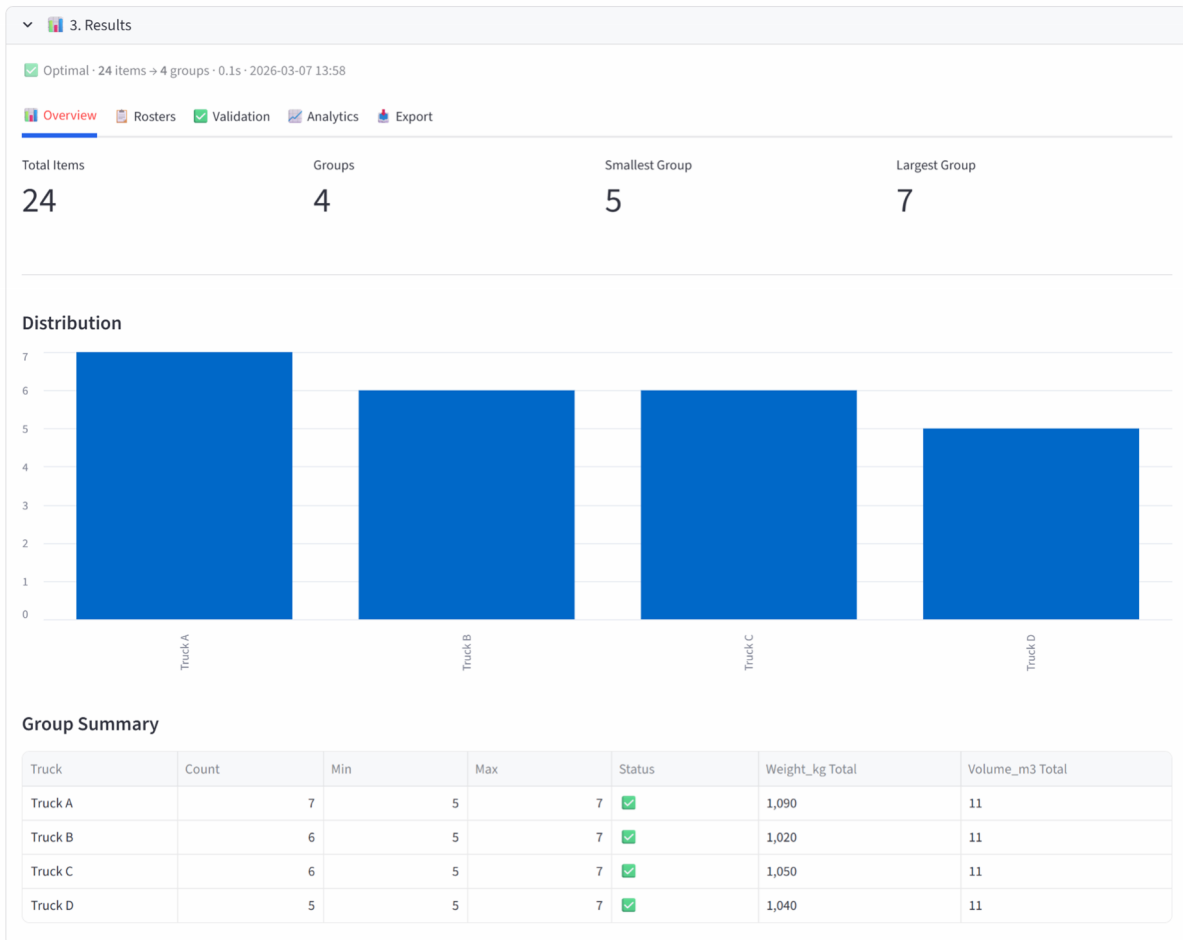
1. Click Run Optimizer.
2. Check Validation: no truck exceeds weight/volume limits, fragile items are spread, zone balance is reasonable, Truck D has few or no hazmat packages.
3. Export for the dispatch team.

Expected Outcome

No truck exceeds 1,500kg or 12.0m³. Fragile items are spread across trucks (max 3 per truck). CBD and Urgent packages cluster toward Truck A. Truck D has minimal or no hazardous materials. Zone distribution is roughly even. Each truck has 5–7 packages.

The solver handles the multi-dimensional packing problem (weight + volume + zone + priority + fragility + hazmat) in seconds. Manual loading would require constant recalculation as each package is assigned.

This example uses 24 packages for clarity, but the same configuration scales to hundreds of packages across dozens of vehicles with no changes to the rule setup — only the data file grows.



Truck Rosters

> Truck A (7 packages)

> Truck B (6 packages)

∨ Truck C (6 packages)

| ID | Name | Weight_kg | Volume_m3 | Zone | Priority | Fragile | HazClass | HazScore | SpecialHandling |
|------|--------------------|-----------|-----------|-------|----------|---------|----------|----------|-----------------|
| P001 | Industrial Pump | 85 | 1.2 | North | Standard | No | None | 0 | None |
| P002 | Glass Panels x20 | 120 | 2.1 | CBD | Express | Yes | None | 0 | Upright Only |
| P010 | Timber Bundle | 280 | 3 | North | Standard | No | None | 0 | None |
| P014 | Cleaning Chemicals | 95 | 1 | South | Standard | No | Class 8 | 8 | None |
| P017 | Wine Cases x40 | 320 | 2.8 | CBD | Standard | Yes | None | 0 | Temperature |
| P023 | Battery Crates x8 | 150 | 1 | West | Standard | No | Class 9 | 9 | None |

∨ Truck D (5 packages)

| ID | Name | Weight_kg | Volume_m3 | Zone | Priority | Fragile | HazClass | HazScore | SpecialHandling |
|------|----------------------|-----------|-----------|-------|----------|---------|----------|----------|-----------------|
| P003 | Office Furniture Set | 200 | 3.5 | South | Standard | No | None | 0 | None |
| P009 | Server Rack | 90 | 1.1 | CBD | Express | Yes | None | 0 | None |
| P012 | Concrete Mix x20 | 400 | 2.5 | West | Standard | No | None | 0 | None |
| P020 | Automotive Parts | 130 | 1.6 | South | Standard | No | None | 0 | None |
| P022 | Roofing Iron Sheets | 220 | 2.2 | North | Standard | No | None | 0 | None |

Budgets

Weight_kg: All groups within limits

| Group | Total Weight_kg | Min | Max | Status |
|---------|-----------------|-----|-------|-------------------------------------|
| Truck A | 1,090 | 0 | 1,500 | <input checked="" type="checkbox"/> |
| Truck B | 1,020 | 0 | 1,500 | <input checked="" type="checkbox"/> |
| Truck C | 1,050 | 0 | 1,500 | <input checked="" type="checkbox"/> |
| Truck D | 1,040 | 0 | 1,500 | <input checked="" type="checkbox"/> |

Volume_m3: All groups within limits

| Group | Total Volume_m3 | Min | Max | Status |
|---------|-----------------|-----|-----|-------------------------------------|
| Truck A | 11 | 0 | 12 | <input checked="" type="checkbox"/> |
| Truck B | 11 | 0 | 12 | <input checked="" type="checkbox"/> |
| Truck C | 11 | 0 | 12 | <input checked="" type="checkbox"/> |
| Truck D | 11 | 0 | 12 | <input checked="" type="checkbox"/> |

Quotas

Fragile = Yes (count)

| Group | Count | Required | Status |
|---------|-------|----------|-------------------------------------|
| Truck A | 3 | 0-3 | <input checked="" type="checkbox"/> |
| Truck B | 2 | 0-3 | <input checked="" type="checkbox"/> |
| Truck C | 2 | 0-3 | <input checked="" type="checkbox"/> |
| Truck D | 1 | 0-3 | <input checked="" type="checkbox"/> |

Appendix D: Healthcare — Shift Scheduling

Scenario

City General Hospital needs to assign 30 nurses across 3 shifts (Day, Evening, Night). Each shift needs a mix of certifications (RN, LPN), specialties, and seniority levels. Each shift has a patient load hour budget. At least one Charge Nurse per shift is required. Certain nurse pairs have requested not to work together.

The data includes 30 nurses with certification, specialty, seniority, years of experience, patient load hours, incompatible pairs, and charge nurse flags.

The Data

Save the following as `shift_scheduling.csv`:

30 rows, 9 columns. First 5 rows shown:

| Nurse ID | Name | Certification | Specialty | Seniority | Years | PatientLoad Hrs | Incompatible | ChargeNurse |
|----------|---------------|---------------|-------------|-----------|-------|-----------------|--------------|-------------|
| N001 | Anna Morrison | RN | Emergency | Senior | 18 | 22 | | Yes |
| N002 | Ben Cooper | RN | ICU | Senior | 15 | 20 | N005 | Yes |
| N003 | Clara Dunn | LPN | General | Mid | 8 | 16 | | |
| N004 | Derek Fong | RN | Paediatrics | Senior | 20 | 18 | | Yes |
| N005 | Elena Ruiz | RN | ICU | Mid | 6 | 18 | N002 | |

Full CSV file: `shift_scheduling.csv`



`shift_scheduling.csv`

Step-by-Step Instructions

Step 1: Upload & Map

1. Upload `shift_scheduling.csv`.
2. Set Unique ID to `NurseID`, Display Name to `Name`.
3. Import all columns.

Map Your Columns

Which column is the unique ID? ⓘ NurseID ⌵

Which column is the Name/Label? ⓘ Name ⌵

Additional columns to include ⓘ

Certification × Specialty × Seniority × Years × PatientLoadHrs × Incompatible × ChargeNurse × ⌵

✓ Data Validation

✓ Data looks good!

Preview & Edit

You can edit values directly before importing

| ID | Name | Certification | Specialty | Seniority | Years | PatientLoadHrs | Incompatible | ChargeNurse |
|------|---------------|---------------|-------------|-----------|-------|----------------|--------------|-------------|
| N001 | Anna Morrison | RN | Emergency | Senior | 18 | 22 | None | Yes |
| N002 | Ben Cooper | RN | ICU | Senior | 15 | 20 | N005 | Yes |
| N003 | Clara Dunn | LPN | General | Mid | 8 | 16 | None | None |
| N004 | Derek Fong | RN | Paediatrics | Senior | 20 | 18 | None | Yes |
| N005 | Elena Ruiz | RN | ICU | Mid | 6 | 18 | N002 | None |
| N006 | Fran Okafor | LPN | General | Junior | 2 | 14 | None | None |
| N007 | George Tan | RN | Emergency | Mid | 9 | 20 | None | None |
| N008 | Hannah Li | RN | Surgical | Senior | 16 | 22 | N012 | Yes |

✓ Import Data

Step 2: Configure Shifts

1. Set Number of Groups to 3.
2. Rename to: Day Shift, Evening Shift, Night Shift.
3. Set each to Min 9 / Max 11.

Groups Budgets Quotas Balance Relationships Preferences Pins Options

Number of Groups ⓘ

3 − +

✓ 30 items · Capacity: 27–33

| Name | Min | Max | Tags | Flex |
|---------------|-----|-----|------|--------------------------|
| Day Shift | 9 | 11 | | <input type="checkbox"/> |
| Evening Shift | 9 | 11 | | <input type="checkbox"/> |
| Night Shift | 9 | 11 | | <input type="checkbox"/> |

Step 3: Set Budget — Patient Load Hours

1. Go to Budgets tab. Select PatientLoadHrs.
2. Set Min Total to 140, Max Total to 180 for each shift.

Set min/max totals for numeric columns per group

Select columns to limit

PatientLoadHrs x

▼ PatientLoadHrs

Total PatientLoadHrs in your data: 528

| Group | Min Total | Max Total |
|---------------|-----------|-----------|
| Day Shift | 140 | 180 |
| Evening Shift | 140 | 180 |
| Night Shift | 140 | 180 |

Tip: Total patient load hours across all nurses is ~520. With 3 shifts at 140–180 each, coverage is 420–540.

Step 4: Set Quotas

1. Go to Quotas tab. Use Count mode.
2. Column: ChargeNurse, Value: Yes, Min: 2, Max: 4. Group: All Groups. Click Add.
3. Switch to Percentage mode.
4. Column: Certification, Value: RN, Min: 60, Max: 80. Group: All Groups. Click Add.

Require a percentage or count of specific values per group

- Percentage
- Count

Column: Certification Value: RN Range %: 60-80 Apply to: All Groups + Add

Quick rule: require at least one of every value

Column: ID Apply to: All Groups + Add All Values

| Column | Value | Range | Group |
|---------------|-------|--------|------------|
| ChargeNurse | Yes | 2-4 | All Groups |
| Certification | RN | 60-80% | All Groups |

Tip: This ensures each shift has 2–4 Charge Nurses and 60–80% of staff are RNs.

Step 5: Set Balance

1. Go to the Balance tab.
2. Select Specialty. Mode: Equal.
3. Select Seniority. Mode: Equal.

Spread values evenly, or maximise/minimise across target groups

Columns to optimise

Specialty x Seniority x

Specialty

Mode Apply to
 Equal All Groups

5 unique values will be distributed evenly across all groups

Seniority

Mode Apply to
 Equal All Groups

3 unique values will be distributed evenly across all groups

Step 6: Add Relationships — Incompatible Pairs

1. Go to Relationships tab.
2. Column: Incompatible, Type: KEEP_APART, Enforce: Required. Click Add.

Keep Apart = must not share a group · Keep Together = should share a group

Column Type Separator Must Enforce?
 Incompatible KEEP_APART ; + Add

| Column | Type | Sep | Enforce |
|--------------|------------|-----|----------|
| Incompatible | KEEP_APART | ; | Required |

Step 7: Pin Head Nurse to Day Shift

1. Go to Pins tab.
2. Add Anna Morrison (N001) to Day Shift in the Must Go To editor.

Pin items to specific groups, or exclude them

Column Value Rule Group
 Name Anna Morrison Pin to Day Shift + Add All

| Must Go To | | Cannot Go To | |
|----------------------|------------|--------------|--|
| Item | Must Go To | | |
| N001 (Anna Morrison) | Day Shift | empty | |

Step 8: Run & Validate

1. Click Run Optimizer.
2. Check Validation: each shift has 2+ Charge Nurses, patient load hours are within budget, specialties are spread, incompatible pairs are separated.
3. Export for the scheduling coordinator.

Expected Outcome

Each shift has 9–11 nurses, 2–4 Charge Nurses, 60–80% RNs, and patient load hours between 140–180. Specialties and seniority levels are spread evenly. Incompatible pairs (Cooper/Ruiz, Li/Singh, Gomez/Lam) are on different shifts. Anna Morrison is on Day Shift.

This approach replaces what is typically a multi-hour manual scheduling process that frequently results in complaints about unfair distribution.

This example uses 30 nurses across 3 shifts. The same setup scales to 200+ staff across 6–12 shifts. Save the rules and reload them each roster cycle with updated staff availability data.

3. Results

Optimal · 30 items → 3 groups · 0.1s · 2026-03-09 13:30

Overview Rosters Validation Analytics Export

| | | | |
|-------------|--------|----------------|---------------|
| Total Items | Groups | Smallest Group | Largest Group |
| 30 | 3 | 10 | 10 |

Distribution

Group Summary

| Group | Count | Min | Max | Status | PatientLoadHrs Total |
|---------------|-------|-----|-----|--------|----------------------|
| Day Shift | 10 | 9 | 11 | ✓ | 176 |
| Evening Shift | 10 | 9 | 11 | ✓ | 178 |
| Night Shift | 10 | 9 | 11 | ✓ | 174 |

Overview Rosters Validation Analytics Export

Group Rosters

Day Shift (10 items)

| ID | Name | Certification | Specialty | Seniority | Years | PatientLoadHrs | Incompatible | ChargeNurse |
|------|---------------|---------------|-------------|-----------|-------|----------------|--------------|-------------|
| N001 | Anna Morrison | RN | Emergency | Senior | 18 | 22 | None | Yes |
| N002 | Ben Cooper | RN | ICU | Senior | 15 | 20 | N005 | Yes |
| N009 | Ivan Petrov | LPN | General | Mid | 5 | 16 | None | None |
| N010 | Julia West | RN | Paediatrics | Mid | 7 | 18 | None | None |
| N014 | Nina Park | RN | ICU | Mid | 6 | 18 | None | None |
| N015 | Oscar Diaz | RN | General | Senior | 12 | 20 | None | Yes |
| N018 | Rosa Chen | RN | Surgical | Junior | 2 | 16 | None | None |
| N022 | Vic Turner | LPN | Paediatrics | Junior | 2 | 14 | None | None |
| N023 | Wendy Lam | RN | General | Mid | 4 | 16 | N020 | None |
| N024 | Xavier Noye | RN | Emergency | Junior | 3 | 16 | None | None |

Budgets

PatientLoadHrs: All groups within limits

| Group | Total PatientLoadHrs | Min | Max | Status |
|---------------|----------------------|-----|-----|-------------------------------------|
| Day Shift | 176 | 140 | 180 | <input checked="" type="checkbox"/> |
| Evening Shift | 178 | 140 | 180 | <input checked="" type="checkbox"/> |
| Night Shift | 174 | 140 | 180 | <input checked="" type="checkbox"/> |

Quotas

ChargeNurse = Yes (count)

| Group | Count | Required | Status |
|---------------|-------|----------|-------------------------------------|
| Day Shift | 3 | 2-4 | <input checked="" type="checkbox"/> |
| Evening Shift | 3 | 2-4 | <input checked="" type="checkbox"/> |
| Night Shift | 3 | 2-4 | <input checked="" type="checkbox"/> |

Certification = RN (%)

| Group | Count | % RN | Required | Status |
|---------------|-------|-------|----------|-------------------------------------|
| Day Shift | 8 | 80.0% | 60-80% | <input checked="" type="checkbox"/> |
| Evening Shift | 6 | 60.0% | 60-80% | <input checked="" type="checkbox"/> |
| Night Shift | 7 | 70.0% | 60-80% | <input checked="" type="checkbox"/> |

Relationships

All 3 relationships satisfied

| Item 1 | Item 2 | Rule | Result | Status |
|--------|--------|------------|-----------------------------|-------------------------------------|
| N002 | N005 | Keep Apart | Day Shift / Night Shift | <input checked="" type="checkbox"/> |
| N008 | N012 | Keep Apart | Night Shift / Evening Shift | <input checked="" type="checkbox"/> |
| N020 | N023 | Keep Apart | Evening Shift / Day Shift | <input checked="" type="checkbox"/> |

Appendix E: Sports — Under 8s Netball Grading

Scenario

Riverside Netball Club has 30 registered Under 8s players to grade into 4 teams. The club competes in a local league with a top division and a lower division. The grading coordinator needs: one strong team (Diamonds) for Division 1 matches, one development team (Rubies) for players who are newer or less experienced, and two middle teams (Opals and Sapphires) that are balanced evenly against each other for Division 2. Siblings must be kept together. Best friends should be kept together where possible. Parent coaches should be spread across teams.

The data includes 30 players with skill rating (0–100), preferred position (GS, GA, WA, C, WD, GD, GK), height, attendance rate, parent coach status, sibling links, best friend links, and years played. Skill ratings range from 40 (complete beginner) to 92 (experienced).

The Data

Save the following as netball_grading.csv:

30 rows, 10 columns. First 5 rows shown:

| Playe rID | Nam e | SkillRa ting | Posit ion | Height _cm | Attendanc eRate | Parent_C oach | Sibli ngs | BestFri end | YearsPI ayed |
|-----------|--------------|--------------|-----------|------------|-----------------|---------------|-----------|-------------|--------------|
| N01 | Ava Mitchell | 92 | GS | 132 | 95 | Yes | | N02 | 2 |
| N02 | Chloe Tran | 88 | GA | 128 | 90 | | | N01 | 2 |
| N03 | Sophie Adams | 85 | WA | 130 | 100 | | | N04 | 2 |
| N04 | Ella Adams | 83 | GD | 127 | 100 | | | N03 | 2 |
| N05 | Mia Patel | 90 | C | 135 | 95 | Yes | N06 | | 2 |

Full CSV file: netball_grading.csv



netball_grading.csv

Step-by-Step Instructions

Step 1: Upload & Map

1. Upload netball_grading.csv.
2. Set Unique ID to PlayerID, Display Name to Name.
3. Import all columns.

Step 2: Set Terminology

1. In the sidebar, expand Terminology.
2. Change Item to 'Player', Group to 'Team', ID to 'Player ID'. Click Apply.

Step 3: Configure Teams

1. Set Number of Teams to 4.
2. Rename to: Diamonds, Opals, Sapphires, Rubies.
3. Set Diamonds to Min 7 / Max 8.
4. Set Opals to Min 7 / Max 8.
5. Set Sapphires to Min 7 / Max 8.
6. Set Rubies to Min 7 / Max 8.
7. Add Tag 'Middle' to both Opals and Sapphires (type 'Middle' in each Tag cell).

2. Configuration

Unique ID: ID | Display Name: Name

Teams | Budgets | Quotas | Balance | Relationships | Preferences | Pins | Options

Number of Teams: 4

30 items · Capacity: 28-32

| Name | Min | Max | Tags | Flex |
|-----------|-----|-----|--------|--------------------------|
| Diamonds | 7 | 8 | | <input type="checkbox"/> |
| Opals | 7 | 8 | Middle | <input type="checkbox"/> |
| Sapphires | 7 | 8 | Middle | <input type="checkbox"/> |
| Rubies | 7 | 8 | | <input type="checkbox"/> |

Tip: The 'Middle' tag lets you target Opals and Sapphires together in later rules.

Step 4: Set Balance — Maximise Skill for Diamonds

1. Go to the Balance tab.
2. Select SkillRating from the multiselect.
3. Set Mode to Maximise. Set Target group(s) to Diamonds only.
4. This pushes the highest-rated players into Diamonds — the Division 1 team.

2. Configuration

Unique ID ? Display Name ?

ID ▼ Name ▼

Teams Budgets Quotas **Balance** Relationships Preferences Pins Options

Spread values evenly, or maximise/minimise across target groups

Columns to optimise ?

SkillRating × ⌵

SkillRating

Mode ? Target groups ?

Maximise ▼ Diamonds × ⌵

ℹ Solver will push items with the highest SkillRating into Diamonds (total pool: 2,007)

Step 5: Steer Beginners to Rubies via Preferences

1. Go to the Preferences tab.
2. Column: SkillRating, Operator: <, Value: 55, Target: Rubies, Strength: 85. Click Add.
3. Column: YearsPlayed, Operator: =, Value: 0, Target: Rubies, Strength: 70. Click Add.

2. Configuration

Unique ID ? Display Name ?

ID ▼ Name ▼

Teams Budgets Quotas Balance Relationships **Preferences** Pins Options

Soft: prefer items in a group · Must: force items into a group

Column

SkillRating ▼

Match Value Target Group Strength Must ?

< ▼ 55.00 - + Rubies ▼ 85 + Add

| Column | Match | Target | Strength |
|-------------|--------|--------|----------|
| YearsPlayed | = 0 | Rubies | 70 |
| SkillRating | < 55.0 | Rubies | 85 |

YearsPlayed = 0 → Rubies ▼

🗑 Delete selected preference

Tip: Players rated under 55 and those with zero years played are steered toward Rubies. Between the Maximise on Diamonds and these preferences, the middle-tier players naturally fill Opals and Sapphires.

Step 6: Set Budget — Even Skill for Middle Teams

1. Go to the Budgets tab. Select SkillRating.
2. For Opals: set Min Total to 470, Max Total to 540.
3. For Sapphires: set Min Total to 470, Max Total to 540.
4. For Diamonds: set Min Total to 500, Max Total to 99999 (unconstrained upward).
5. For Rubies: set Min Total to 0, Max Total to 400.

Tip: The narrow 470–540 band forces Opals and Sapphires to be competitively even. Diamonds is uncapped so the solver can stack it. Rubies is capped low.

Step 7: Set Combined Budget — Shared Middle Total

1. In the Combined Budgets section below the individual budgets, click to add a combined budget.
2. Column: SkillRating, Groups: Opals + Sapphires, Min: 960, Max: 1060.

Tip: This combined constraint ensures the two middle teams share a fixed total pool of skill points. If Opals gets a slightly stronger player, Sapphires gets a slightly weaker one to compensate. This is the key to making them mirror teams.

2. Configuration

Unique ID: ID | Display Name: Name

Teams | **Budgets** | Quotas | Balance | Relationships | Preferences | Pins | Options

Set min/max totals for numeric columns per group

Select columns to limit: SkillRating

SkillRating

Total SkillRating in your data: 2,007

| Group | Min Total | Max Total |
|-----------|-----------|-----------|
| Diamonds | 500 | 99999 |
| Opals | 470 | 540 |
| Sapphires | 470 | 540 |
| Rubies | 0 | 400 |

Combined budget across groups

Set a single total limit across multiple groups (e.g., total salary cap across your selected squads)

Column: SkillRating | Groups to include: Opals, Sapphires

Combined Min: 960 | Combined Max: 1060

SkillRating | Opals, Sapphires | Min 960 | Max 1,060

Step 8: Set Quotas — Position Coverage and Parent Coaches

1. Go to Quotas tab. Use Count mode.
2. Column: Position, Value: GK, Min: 1, Max: 2. Group: All Teams. Click Add.
3. Column: Position, Value: GS, Min: 1, Max: 2. Group: All Teams. Click Add.
4. Column: Parent_Coach, Value: Yes, Min: 0, Max: 1. Group: All Teams. Click Add.

2. Configuration

Unique ID ?

Display Name ?

ID ▼

Name ▼

Teams
Budgets
Quotas
Balance
Relationships
Preferences
Pins
Options

Require a percentage or count of specific values per group

Percentage

Count

Column

Value

Min

Max

Apply to

Parent_Coach ▼

Yes ▼

0

1

All Groups ▼

+ Add

Quick rule: require at least one of every value

Column

Apply to

ID ▼

All Groups ▼

+ Add All Values

| Column | Value | Range | Group |
|--------------|-------|-------|------------|
| Position | GK | 1-2 | All Groups |
| Position | GS | 1-2 | All Groups |
| Parent_Coach | Yes | 0-1 | All Groups |

Position = GK (All Groups) ▼

Delete selected quota

Tip: Every team needs at least one goalkeeper and one goal shooter. The parent coach quota (max 1 per team) spreads the 3 parent coaches across teams.

Step 9: Set Balance — Positions Across All Teams

1. Go back to Balance tab.
2. Select Position. Mode: Equal.
3. This spreads positions evenly so no team is all shooters or all defenders.

2. Configuration

Unique ID Display Name

Teams Budgets Quotas Balance Relationships Preferences Pins Options

Spread values evenly, or maximise/minimise across target groups

Columns to optimise

SkillRating x Position x

SkillRating

Mode Target groups

Solver will push items with the highest SkillRating into Diamonds (total pool: 2,007)

Position

Mode Apply to

7 unique values will be distributed evenly across all groups

Step 10: Add Relationships — Siblings and Friends

1. Go to Relationships tab.
2. Column: Siblings, Type: KEEP_TOGETHER, Must Enforce: Tick (Required). Click Add.
3. Column: BestFriend, Type: KEEP_TOGETHER, Must Enforce: Untick (Preferred). Click Add.

2. Configuration

Unique ID Display Name

Teams Budgets Quotas Balance Relationships Preferences Pins Options

Keep Apart = must not share a group · Keep Together = should share a group

Column Type Separator Must Enforce?

| Column | Type | Sep | Enforce |
|------------|---------------|-----|-----------|
| Siblings | KEEP_TOGETHER | ; | Required |
| BestFriend | KEEP_TOGETHER | ; | Preferred |

Siblings — KEEP_TOGETHER

Tip: Siblings (Adams sisters N03/N04, Patel sisters N05/N06, Osei sisters N18/N19) must be together. Best friends are a soft preference that can be broken if needed.

Step 11: Run & Validate

1. Click Run Optimizer.
2. Check Validation: Diamonds has the highest total skill, Rubies the lowest, Opals and Sapphires are within the 470–540 band and their combined total is 960–1060.
3. Review Rosters to confirm siblings are together.
4. Check Analytics to compare skill distributions across all four teams.
5. Export for the grading committee.

3. Results

Optimal · 30 items → 4 groups · 0.1s · 2026-03-01 14:48

Overview Rosters **Validation** Analytics Export

Constraint Check

Budgets

✓ SkillRating: All groups within limits

| Group | Total SkillRating | Min | Max | Status |
|-----------|-------------------|-----|--------|--------|
| Diamonds | 677 | 500 | 99,999 | ✓ |
| Opals | 474 | 470 | 540 | ✓ |
| Sapphires | 529 | 470 | 540 | ✓ |
| Rubies | 327 | 0 | 400 | ✓ |

Expected Outcome

Diamonds (Division 1) has the 7–8 highest-rated players including Ava (92), Mia (90), Chloe (88), Lily (87), Sophie (85), and Olivia (84), with a combined skill rating above 550. Rubies (development) has the lowest-rated players with a combined rating under 400. Opals and Sapphires each sit in the 470–540 band, and their combined total falls within the 960–1060 range — making them competitively matched for Division 2.

Sibling pairs are together: Adams sisters on one team, Patel sisters together (even though Priya at 45 is weaker, she stays with Mia at 90 — this may pull one strong player out of Diamonds), Osei sisters together. Best friend pairs are together where possible. No team has more than one parent coach.

This demonstrates the key pattern of asymmetric grading: not all teams are equal. Maximise targets the strong team, Preferences steer the weak team, Budget bands lock the middle teams, and the Combined Budget ensures fairness between the pair. This is common in junior sports where you need a competitive top team and a supportive environment for beginners.

This example uses 30 players across 4 teams. Clubs with 60–120 registrations across 8–16 teams use the same configuration with more groups. Save the rules at the start of the season and reload them if late registrations require re-grading.

3. Results

Optimal - 30 items → 4 groups - 0.1s - 2026-03-01 14:48

Overview Rosters Validation Analytics Export

Team Rosters

▼ Diamonds (8 players)

| ID | Name | SkillRating | Position | Height_cm | AttendanceRate | Parent_Coach | Siblings | BestFriend | YearsPlayed |
|-----|---------------|-------------|----------|-----------|----------------|--------------|----------|------------|-------------|
| N01 | Ava Mitchell | 92 | GS | 132 | 95 | Yes | None | N02 | 2 |
| N02 | Chloe Tran | 88 | GA | 128 | 90 | None | None | N01 | 2 |
| N03 | Sophie Adams | 85 | WA | 130 | 100 | None | None | N04 | 2 |
| N04 | Ella Adams | 83 | GD | 127 | 100 | None | None | N03 | 2 |
| N07 | Lily O'Brien | 87 | GK | 133 | 90 | None | None | None | 2 |
| N08 | Ruby Chen | 80 | GA | 129 | 85 | None | None | None | 1 |
| N09 | Zara Williams | 78 | WA | 126 | 90 | None | None | None | 1 |
| N25 | Olivia Marsh | 84 | C | 130 | 100 | None | None | None | 2 |

> Opals (7 players)

> Sapphires (8 players)

▼ Rubies (7 players)

| ID | Name | SkillRating | Position | Height_cm | AttendanceRate | Parent_Coach | Siblings | BestFriend | YearsPlayed |
|-----|--------------|-------------|----------|-----------|----------------|--------------|----------|------------|-------------|
| N17 | Matilda West | 55 | GS | 118 | 70 | None | None | None | 0 |
| N18 | Frankie Osei | 52 | C | 117 | 90 | None | N19 | None | 0 |
| N19 | Billie Osei | 48 | GD | 115 | 85 | None | N18 | None | 0 |
| N27 | Aria Young | 46 | WD | 114 | 70 | None | None | None | 0 |
| N28 | Luna Webb | 44 | GA | 113 | 60 | None | None | None | 0 |
| N29 | Hazel Foxx | 42 | GK | 112 | 65 | None | None | None | 0 |
| N30 | Ivy Noble | 40 | WA | 111 | 60 | None | None | None | 0 |

▼ Opals (7 players)

| ID | Name | SkillRating | Position | Height_cm | AttendanceRate | Parent_Coach | Siblings | BestFriend | YearsPlayed |
|-----|---------------|-------------|----------|-----------|----------------|--------------|----------|------------|-------------|
| N10 | Isla Brown | 75 | GS | 125 | 85 | None | None | N11 | 1 |
| N11 | Grace Kim | 72 | C | 124 | 80 | None | None | N10 | 1 |
| N15 | Sienna Fox | 62 | GA | 120 | 80 | None | None | None | 0 |
| N20 | Evie Hart | 82 | WD | 131 | 95 | Yes | None | None | 2 |
| N22 | Scarlett Fry | 73 | GK | 126 | 85 | None | None | None | 1 |
| N23 | Charlotte Lim | 60 | WA | 121 | 75 | None | None | None | 0 |
| N26 | Emily Ross | 50 | GD | 116 | 65 | None | None | None | 0 |

▼ Sapphires (8 players)

| ID | Name | SkillRating | Position | Height_cm | AttendanceRate | Parent_Coach | Siblings | BestFriend | YearsPlayed |
|-----|--------------|-------------|----------|-----------|----------------|--------------|----------|------------|-------------|
| N05 | Mia Patel | 90 | C | 135 | 95 | Yes | N06 | None | 2 |
| N06 | Priya Patel | 45 | WD | 120 | 70 | None | N05 | None | 0 |
| N12 | Hannah Lee | 70 | GD | 122 | 95 | None | None | None | 1 |
| N13 | Poppy Scott | 68 | WD | 121 | 90 | None | None | None | 1 |
| N14 | Willow Dunn | 65 | GK | 123 | 85 | None | None | None | 1 |
| N16 | Harper Moore | 58 | WA | 119 | 75 | None | None | None | 0 |
| N21 | Layla Singh | 76 | GA | 127 | 80 | None | None | None | 1 |
| N24 | Amelia Cruz | 57 | GS | 119 | 70 | None | None | None | 0 |

Appendix F: Government — Work Placement Scholarships

Scenario

The WA Department of Training administers 12 funded industry work placements for university students each year. There are 30 applicants competing for these spots. The program must balance merit (selecting the strongest applicants) with equity commitments: at least 3 placements for Indigenous students, at least 3 for regional students, representation across universities and fields of study, and a total stipend budget of \$110,000.

This demonstrates the select/reject pattern: 12 applicants are selected into the 'Awarded' group, and the remaining 18 go into an 'Applicant Pool' (not selected). The solver maximises merit scores in the Awarded group while enforcing diversity quotas and a budget cap. This is fundamentally different from the other examples where all items are distributed — here, most items are rejected.

The data includes 30 applicants with university, field of study, GPA, merit score (composite of GPA, interview, portfolio), gender, Indigenous status, regional status, disability flag, stipend requirement, and optional employer preferences.

The Data

Save the following as `work_placements.csv`:

30 rows, 13 columns. First 5 rows shown:

| App ID | Name | University | Field | GPA | MeritScore | Gender | Indigenous | Regional | Disability Flag | Stipend Req |
|--------|---------------|------------|-----------------|-----|------------|--------|------------|----------|-----------------|-------------|
| WP01 | Aisha Kemp | UWA | Engineering | 6.8 | 91 | F | No | No | No | 8000 |
| WP02 | Ben Tran | Curtin | Health Sciences | 6.5 | 87 | M | No | No | No | 8000 |
| WP03 | Chelsea Maris | UWA | Engineering | 6.2 | 83 | F | Yes | Yes | No | 10000 |
| WP04 | Daniel York | Murdoch | Business | 5.9 | 78 | M | Yes | No | No | 10000 |
| WP05 | Emma Stokes | ECU | Education | 6.7 | 89 | F | No | Yes | No | 8000 |

Full CSV file: `work_placements.csv`



`work_placements.csv`

Step-by-Step Instructions

Step 1: Upload & Map

1. Upload work_placements.csv.
2. Set Unique ID to AppID, Display Name to Name.
3. Import all columns.

Step 2: Set Terminology

1. In the sidebar, expand Terminology.
2. Change Item to 'Applicant', Group to 'Outcome', ID to 'Application ID'. Click Apply.

Step 3: Configure Groups — Awarded vs Pool

1. Set Number of Outcomes to 2.
2. Rename to: Awarded, Not Selected.
3. Set Awarded to Min 12 / Max 12 (exactly 12 placements).
4. Set Not Selected to Min 18 / Max 18.

2. Configuration

Unique ID: ID Display Name: Name

Outcomes Budgets Quotas Balance Relationships Preferences Pins Options

Number of Outcomes: 2

30 items · Capacity: 30-30

| Name | Min | Max | Tags | Flex |
|--------------|-----|-----|------|--------------------------|
| Awarded | 12 | 12 | | <input type="checkbox"/> |
| Not Selected | 18 | 18 | | <input type="checkbox"/> |

Tip: This is the key setup for select/reject: a fixed-size target group and a remainder group. The solver picks the best 12 while satisfying all constraints.

Step 4: Set Balance — Maximise Merit

1. Go to the Balance tab.
2. Select MeritScore from the multiselect.
3. Set Mode to Maximise. Set Target group to Awarded.

2. Configuration

Unique ID ? Display Name ?

ID ▼ Name ▼

Outcomes Budgets Quotas **Balance** Relationships Preferences Pins Options

Spread values evenly, or maximise/minimise across target groups

Columns to optimise ?

MeritScore × × ▼

MeritScore

Mode ? Target groups ?

Maximise ▼ Awarded × × ▼

i Solver will push items with the highest MeritScore into Awarded (total pool: 2,391)

Tip: This is the core of the selection: the solver will try to place the highest-scoring applicants into Awarded. But the diversity quotas and budget below will override pure merit where needed.

Step 5: Set Budget — Stipend Cap

1. Go to the Budgets tab. Select StipendReq.
2. Set Awarded: Min Total to 0, Max Total to 110000.
3. Set Not Selected: leave unconstrained (Min 0, Max 9999999).

2. Configuration

Unique ID ?
Display Name ?

ID

Name

🔗 Outcomes
🔥 Budgets
📊 Quotas
⚖️ Balance
🔗 Relationships
⚙️ Preferences
📌 Pins
⚙️ Options

Set min/max totals for numeric columns per group

Select columns to limit ?

StipendReq
✕

🔻 🔥 StipendReq

Total StipendReq in your data: 264,000

| Group | Min Total | Max Total |
|--------------|-----------|-----------|
| Awarded | 0 | 110000 |
| Not Selected | 0 | 9999999 |

Combined budget across groups

Set a single total limit across multiple groups (e.g., total salary cap across your selected squads)

Column

Groups to include ?

StipendReq

Choose options

Combined Min

Combined Max

0

-

+

99999

-

+

+ Add Combined Rule

Tip: Indigenous and regional students have \$10,000 stipends (higher support), others \$8,000. With 12 spots and a \$110,000 cap, the solver must balance the number of higher-stipend recipients. Pure merit might select 12 applicants costing \$96,000–\$120,000 — the budget forces trade-offs.

Step 6: Set Quotas — Indigenous Minimum

1. Go to Quotas tab. Use Count mode.
2. Column: Indigenous, Value: Yes, Min: 3, Max: 12. Group: Awarded. Click Add.

Tip: At least 3 of the 12 placements must go to Indigenous applicants. There are 8 Indigenous applicants in the pool, so this is achievable. The max of 12 means there is no upper cap — if merit supports more, the solver can select more.

Step 7: Set Quotas — Regional Minimum

1. Column: Regional, Value: Yes, Min: 3, Max: 12. Group: Awarded. Click Add.

Tip: At least 3 placements for regional students. There are 10 regional applicants.

Step 8: Set Quotas — Gender Balance

1. Switch to Percentage mode.
2. Column: Gender, Value: F, Min: 40, Max: 60. Group: Awarded. Click Add.

Step 9: Set Quotas — Field Diversity

1. Switch to Count mode.
2. Column: Field, Value: Engineering, Min: 1, Max: 3. Group: Awarded. Click Add.
3. Repeat for Health Sciences, IT, Law, Business, and Education (Min 1, Max 3 each).

Tip: This ensures the 12 placements span all 6 fields of study. No single field dominates.

Step 10: Set Quotas — University Spread

1. Column: University, Value: UWA, Min: 2, Max: 5. Group: Awarded. Click Add.
2. Repeat for Curtin, Murdoch, and ECU (Min 1, Max: 4 each).

Tip: Prevents all 12 placements going to one university.

2. Configuration

Unique ID ? Display Name ?

ID ▼ Name ▼

📊 Outcomes
🔥 Budgets
📊 **Quotas**
⚖️ Balance
🔗 Relationships
⚙️ Preferences
📌 Pins
⚙️ Options

Require a percentage or count of specific values per group

Percentage
 Count

Column: University ▼
 Value: Murdoch ▼
 Min: 1
 Max: 4
 Apply to: Awarded ▼
+ Add

Quick rule: require at least one of every value

Column: ID ▼
 Apply to: All Groups ▼
+ Add All Values

| Column | Value | Range | Group |
|------------|-----------------|--------|---------|
| Indigenous | Yes | 3-12 | Awarded |
| Regional | Yes | 3-12 | Awarded |
| Gender | F | 40-60% | Awarded |
| Field | Business | 1-3 | Awarded |
| Field | Education | 1-3 | Awarded |
| Field | Engineering | 1-3 | Awarded |
| Field | Health Sciences | 1-3 | Awarded |
| Field | IT | 1-3 | Awarded |
| Field | Law | 1-3 | Awarded |
| University | UWA | 2-5 | Awarded |

Indigenous = Yes (Awarded) ▼

🗑️ Delete selected quota

Step 11: Run & Validate

1. Click Run Optimizer.
2. Check Validation: Awarded has exactly 12 applicants, at least 3 Indigenous, at least 3 Regional, 40–60% female, all 6 fields represented, stipend total ≤ \$110,000.
3. Review the Rosters tab: the Awarded group should contain the highest-scoring applicants that satisfy all equity constraints.
4. Compare the average MeritScore in Awarded vs Not Selected — there should be a clear gap.
5. Export the Awarded list for the selection panel.

Expected Outcome

Awarded contains 12 applicants with an average merit score of approximately 83–88 (the top end of the pool). Not Selected contains 18 applicants with lower average scores. The total stipend is at or just under \$110,000.

At least 3 Indigenous students and 3 regional students are included. Gender is 40–60% female. All 6 fields of study are represented. Multiple universities contribute. Some high-scoring applicants may miss out if they would break a diversity quota or push the stipend over budget.

This is the select/reject pattern: not every applicant gets placed. The solver maximises merit in the Awarded group while enforcing equity and budget constraints. The Not Selected group is the reject pool. This pattern applies to any competitive selection: grants, scholarships, internships, awards shortlisting, or program admissions.

This example uses 30 applicants for 12 spots. The same approach scales to hundreds of applicants — for example, 500 grant applications for 40 funded positions. The solver handles the combinatorial complexity instantly. Save the rules and reuse them each funding round with a fresh applicant list.

3. Results

Optimal · 30 items → 2 groups · 0.0s · 2026-03-02 08:45

Overview **Rosters** Validation Analytics Export

Outcome Rosters

Awarded (12 applicants)

| ID | Name | University | Field | GPA | MeritScore | Gender | Indigenous | Regional | DisabilityFlag | StipendReq | Employer1Pref | Employer2Pref |
|------|----------------|------------|-----------------|-----|------------|--------|------------|----------|----------------|------------|---------------|---------------|
| WP01 | Aisha Kemp | UWA | Engineering | 6.8 | 91 | F | No | No | No | 8000 | None | None |
| WP02 | Ben Tran | Curtin | Health Sciences | 6.5 | 87 | M | No | No | No | 8000 | None | None |
| WP03 | Chelsea Maris | UWA | Engineering | 6.2 | 83 | F | Yes | Yes | No | 10000 | None | None |
| WP04 | Daniel Yorke | Murdoch | Business | 5.9 | 78 | M | Yes | No | No | 10000 | None | None |
| WP05 | Emma Stokes | ECU | Education | 6.7 | 89 | F | No | Yes | No | 8000 | None | None |
| WP06 | Finn Gallagher | Curtin | IT | 6.4 | 85 | M | No | No | No | 8000 | None | None |
| WP07 | Grace Noongar | UWA | Law | 6.1 | 80 | F | Yes | Yes | No | 10000 | None | None |
| WP08 | Harry Chen | UWA | Engineering | 7 | 94 | M | No | No | No | 8000 | None | None |
| WP15 | Olivia Trent | UWA | Health Sciences | 6.9 | 92 | F | No | No | No | 8000 | None | None |
| WP17 | Quinn Sawyer | Curtin | Business | 6.4 | 86 | F | No | No | No | 8000 | None | None |

Not Selected (18 applicants)

Distribution Analysis

Analyze distribution of:

University ▼

University by Outcome

| Assigned_Outcome | Curtin | ECU | Murdoch | UWA | All |
|------------------|--------|-----|---------|-----|-----|
| Awarded | 4 | 1 | 2 | 5 | 12 |
| Not Selected | 4 | 5 | 4 | 5 | 18 |
| All | 8 | 6 | 6 | 10 | 30 |

Percentage breakdown:

| Assigned_Outcome | Curtin | ECU | Murdoch | UWA |
|------------------|--------|-------|---------|-------|
| Awarded | 33.3% | 8.3% | 16.7% | 41.7% |
| Not Selected | 22.2% | 27.8% | 22.2% | 27.8% |

Numeric Statistics

Analyze totals of:

GPA ▼

| Group | Count | Sum | Mean | Min | Max |
|--------------|-------|-----|------|-----|-----|
| Awarded | 12 | 78 | 6.5 | 6 | 7 |
| Not Selected | 18 | 104 | 5.8 | 5 | 7 |

Appendix G: Real Estate — Tenant Allocation

Scenario

Harbour Point has 28 commercial tenants applying for space in 4 buildings plus a waitlist. Buildings have different capacities. Harbour Tower and Marina West share a site with only 800m² of parking between them, demonstrated using a **combined budget**. There are more tenants than spaces, so 3 buildings hold 6 each, 1 holds 5, and the remainder go on a **Waitlist** group.

This demonstrates three patterns not shown in other examples: (1) a reject/overflow group for items that don't fit, (2) a combined budget across two groups sharing a resource, and (3) targeting budgets and preferences at specific groups while letting the waitlist absorb the rest.

The data includes 28 tenants with sector, lease tier, annual revenue, square metre needs, lease years, floor preference, conflicts, and parking needs.

The Data

Save the following as tenant_allocation.csv:

28 rows, 10 columns. First 5 rows shown:

| TenantID | Company | Sector | Lease Tier | AnnualRevenue | SqMeters | LeaseYears | Floor Pref | Conflicts | NeedsParking |
|----------|--------------------|--------------|------------|---------------|----------|------------|------------|-----------|--------------|
| T001 | Apex Legal | Professional | Premium | 320000 | 280 | 5 | High | | Yes |
| T002 | ByteForce | Tech | Premium | 450000 | 350 | 3 | High | T008 | Yes |
| T003 | ClearView Finance | Finance | Premium | 380000 | 300 | 5 | High | | Yes |
| T004 | DataStream | Tech | Standard | 180000 | 200 | 3 | Mid | | Yes |
| T005 | EcoGreen Solutions | Environment | Standard | 95000 | 120 | 3 | Low | | No |

Full CSV file: [tenant_allocation.csv](#)



tenant_allocation.csv

Step-by-Step Instructions

Step 1: Upload & Map

1. Upload tenant_allocation.csv.

2. Set Unique ID to TenantID, Display Name to Company.
3. Import all columns.

Map Your Columns

Which column is the unique ID? ? Which column is the Name/Label? ?

TenantID ▼ Company ▼

Additional columns to include ?

Sector × LeaseTier × AnnualRevenue × SqMetres × LeaseYears × FloorPref × Conflicts × NeedsParking × ✕ ▼

✓ Data Validation

✓ Data looks good!

Preview & Edit

You can edit values directly before importing

| ID | Name | Sector | LeaseTier | AnnualRevenue | SqMetres | LeaseYears | FloorPref | Conflicts | NeedsParking |
|------|--------------------|---------------|-----------|---------------|----------|------------|-----------|-----------|--------------|
| T001 | Apex Legal | Professional | Premium | 320000 | 280 | 5 | High | None | Yes |
| T002 | ByteForce | Tech | Premium | 450000 | 350 | 3 | High | T008 | Yes |
| T003 | ClearView Finance | Finance | Premium | 380000 | 300 | 5 | High | None | Yes |
| T004 | DataStream | Tech | Standard | 180000 | 200 | 3 | Mid | None | Yes |
| T005 | EcoGreen Solutions | Environment | Standard | 95000 | 120 | 3 | Low | None | No |
| T006 | FreshMart | Retail | Budget | 65000 | 150 | 2 | Low | None | Yes |
| T007 | GlobalTrade Co | Import/Export | Standard | 210000 | 220 | 5 | Mid | None | Yes |
| T008 | HashTree Media | Media | Standard | 145000 | 180 | 2 | Mid | T002 | No |

✓ Import Data

Step 2: Set Terminology

1. Change Item to 'Tenant', Group to 'Building', ID to 'Tenant ID'.

Terminology

What are you allocating? ?

Tenant

Where are you allocating to? ?

Building

ID column label ?

Tenant ID

Apply

Step 3: Configure Buildings + Waitlist

1. Set Number of Buildings to 5.
2. Rename to: Harbour Tower, Marina West, Pier One, Dock View, Waitlist.
3. Set Harbour Tower to Min 6 / Max 7.
4. Set Marina West, Pier One, Dock View to Min 5 / Max 6.
5. Set Waitlist to Min 0 / Max 10. Tick the Flex checkbox for Waitlist.
6. Add Tag 'SharedSite' to Harbour Tower and Marina West.

7. Add Tag 'Active' to Harbour Tower, Marina West, Pier One, and Dock View.

Buildings Budgets Quotas Balance Relationships Preferences Pins Options

Number of Buildings ?

5 - +

28 items · Capacity: 21-35

| Name | Min | Max | Tags | Flex |
|---------------|-----|-----|-------------------|-------------------------------------|
| Harbour Tower | 6 | 7 | SharedSite,Active | <input type="checkbox"/> |
| Marina West | 5 | 6 | SharedSite,Active | <input type="checkbox"/> |
| Pier One | 5 | 6 | Active | <input type="checkbox"/> |
| Dock View | 5 | 6 | Active | <input type="checkbox"/> |
| Waitlist | 0 | 10 | | <input checked="" type="checkbox"/> |

Tip: The Waitlist group absorbs tenants that don't fit. Flex means the solver can put more in if needed. Tags let you target rules at the 4 real buildings or the 2 shared-site buildings.

Step 4: Set Budget — Revenue Floor for Active Buildings

1. Go to Budgets tab. Select AnnualRevenue.
2. Set Min Total to 500000 for Harbour Tower, Marina West, Pier One, Dock View.
3. Set Max Total to 1500000 for Harbour Tower, 900000 for others.
4. Set Waitlist: Min Total to 0, Max Total to 9999999 (no limit).

Tip: The revenue floor ensures each real building is commercially viable. The Waitlist has no revenue constraint.

Step 5: Set Combined Budget — Shared Parking

1. Still in the Budgets tab, scroll to the Combined Budgets section below the per-group table.
2. Click to add a combined budget.
3. Column: SqMetres. Groups: select Harbour Tower and Marina West.
4. Set Combined Max to 2000.
5. Leave Combined Min at 0.

Set min/max totals for numeric columns per group

Select columns to limit

AnnualRevenue x

AnnualRevenue

Total AnnualRevenue in your data: 5,140,000

| Group | Min Total | Max Total |
|---------------|-----------|-----------|
| Harbour Tower | 500000 | 1500000 |
| Marina West | 500000 | 900000 |
| Pier One | 500000 | 900000 |
| Dock View | 500000 | 900000 |
| Waitlist | 0 | 9999999 |

Combined budget across groups

Set a single total limit across multiple groups — no per-group limits required

Column: SqMetres

Groups to include: Harbour Tower x Marina West x

Combined Min: 0

Combined Max: 2000

+ Add Combined Rule

SqMetres Harbour Tower, Marina West Min 0 Max 2,000

Tip: Harbour Tower and Marina West share a site with limited parking infrastructure. Their combined tenant square metre footprint (which drives parking demand) cannot exceed 2,000m². With 11–13 tenants across both buildings, this forces the solver to favour smaller tenants for these two buildings and push larger-footprint tenants to Pier One, Dock View, or the Waitlist.

Step 6: Set Balance — Lease Tier (Active Buildings Only)

1. Go to Balance tab. Select LeaseTier. Mode: Equal.
2. In the 'Apply to' dropdown, select Tag: Active.
3. This spreads Premium, Standard, and Budget tenants evenly across the four real buildings only. The Waitlist is excluded from balancing because we did not previously Tag it 'Active', so it can absorb whatever mix of tenants doesn't fit.

Spread values evenly, or maximise/minimise across target groups

Columns to optimise

LeaseTier x

LeaseTier

Mode: Equal

Apply to: Tag: Active

3 unique values will be distributed evenly across Tag: Active

Step 7: Add Preference — Premium to Harbour Tower, Budget to Waitlist

1. Go to Preferences tab.
2. Column: LeaseTier, Operator: =, Value: Premium, Target: Harbour Tower, Strength: 70. Click Add.
3. Column: LeaseTier, Operator: =, Value: Budget, Target: Waitlist, Strength: 50. Click Add.
4. Column: NeedsParking, Operator: =, Value: No, Target: Harbour Tower, Strength: 40. Click Add.

Buildings Budgets Quotas Balance Relationships **Preferences** Pins Options

Soft: prefer items in a group · Must: force items into a group

Column: NeedsParking

Match: = Value: No Target Group: Harbour Tower Strength: 40 Must:

+ Add

| Column | Match | Target | Strength |
|--------------|-----------|---------------|----------|
| LeaseTier | = Premium | Harbour Tower | 70 |
| LeaseTier | = Budget | Waitlist | 50 |
| NeedsParking | = No | Harbour Tower | 40 |

Tip: Premium tenants are pulled toward the flagship. Budget tenants are gently pushed to the waitlist (but only as a soft preference — if they meet the revenue requirements, they can still be placed). Tenants not needing parking are preferred for Harbour Tower to reduce pressure on the shared parking constraint.

Step 8: Add Relationships — Conflicts

1. Go to Relationships tab.
2. Column: Conflicts, Type: KEEP_APART, Enforce: Required. Click Add.

Buildings Budgets Quotas Balance Relationships **Preferences** Pins Options

Keep Apart = must not share a group · Keep Together = should share a group

Column: Conflicts Type: KEEP_APART Separator: ; Must Enforce?:

+ Add

| Column | Type | Sep | Enforce |
|-----------|------------|-----|----------|
| Conflicts | KEEP_APART | ; | Required |

Step 9: Run & Validate

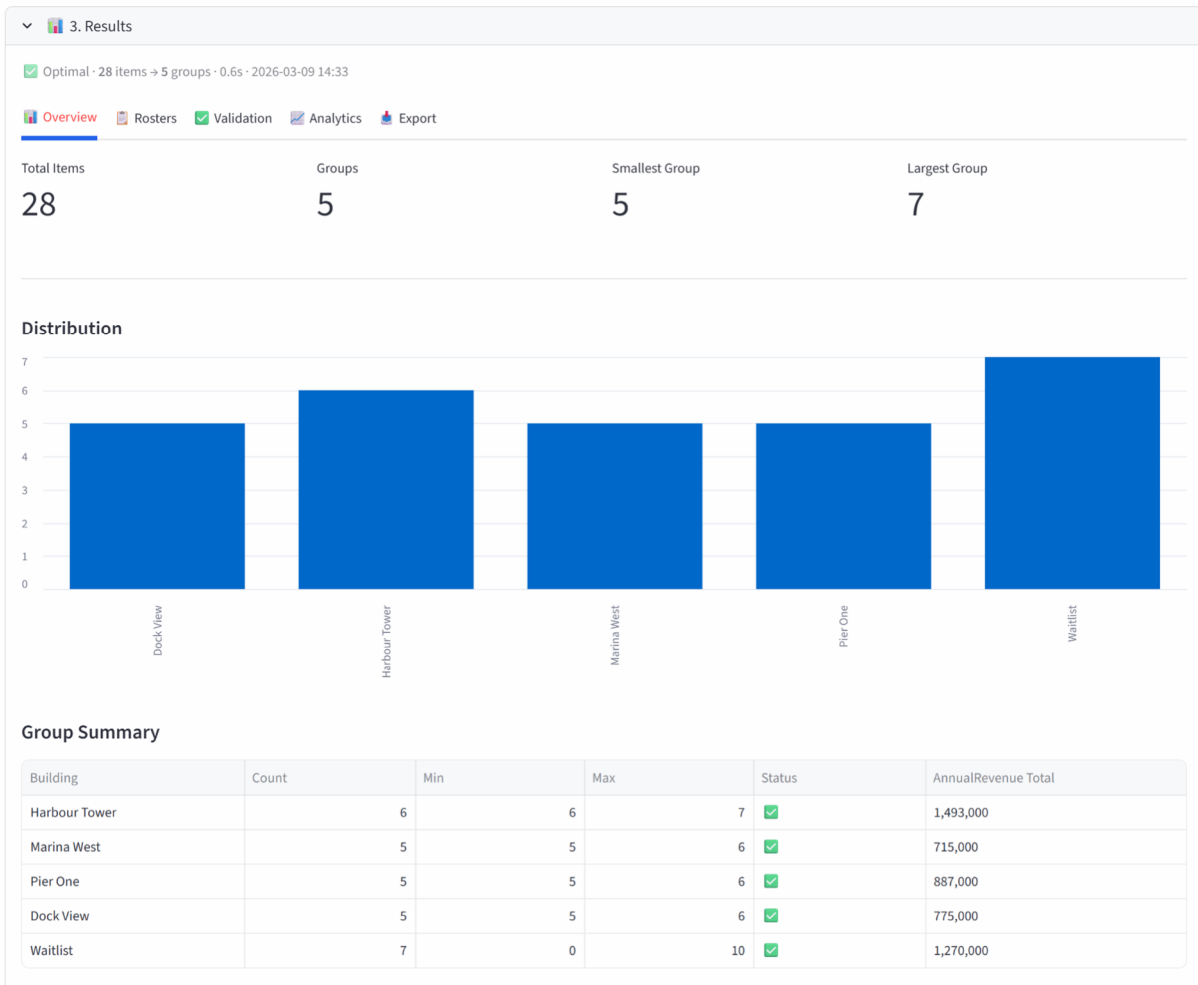
1. Click Run Optimizer.
2. Check: each active building meets \$500K revenue, Harbour Tower + Marina West combined SqMetres ≤ 2000, ByteForce and HashTag Media are in different buildings.
3. Review the Waitlist group — it should contain tenants that didn't fit the constraints.
4. Export the allocation report for the leasing team.

Expected Outcome

Harbour Tower, Marina West, Pier One, and Dock View each have 5–7 tenants and exceed \$500K in annual revenue. The Waitlist holds the tenants that couldn't fit the constraints. Harbour Tower and Marina West's combined square metre footprint stays under 2,000m².

Premium tenants cluster in Harbour Tower and the other active buildings. Some Budget tenants land on the Waitlist. ByteForce (T002) and HashTag Media (T008) are in different buildings.

This example demonstrates three important patterns: (1) the Waitlist as a reject/overflow group — not every item has to be placed in a 'real' group, (2) combined budgets for shared resources across building pairs, and (3) preferences that steer lower-priority items toward the overflow group while ensuring high-value items get placed. The same setup scales to 100+ tenants across 10–20 buildings with multiple shared-site pairs.



Budgets

AnnualRevenue: All groups within limits

| Group | Total AnnualRevenue | Min | Max | Status |
|---------------|---------------------|---------|-----------|-------------------------------------|
| Harbour Tower | 1,493,000 | 500,000 | 1,500,000 | <input checked="" type="checkbox"/> |
| Marina West | 715,000 | 500,000 | 900,000 | <input checked="" type="checkbox"/> |
| Pier One | 887,000 | 500,000 | 900,000 | <input checked="" type="checkbox"/> |
| Dock View | 775,000 | 500,000 | 900,000 | <input checked="" type="checkbox"/> |
| Waitlist | 1,270,000 | 0 | 9,999,999 | <input checked="" type="checkbox"/> |

Combined Budgets

SqMetres across [Harbour Tower, Marina West]: 1,990 (limit 0–2,000)

| Group | Total SqMetres |
|---------------|----------------|
| Harbour Tower | 1,290 |
| Marina West | 700 |
| COMBINED | 1,990 |

Relationships

All 1 relationships satisfied

| Item 1 | Item 2 | Rule | Result | Status |
|--------|--------|------------|---------------------|-------------------------------------|
| T002 | T008 | Keep Apart | Waitlist / Pier One | <input checked="" type="checkbox"/> |

Appendix H: Manufacturing — Production Line Balancing

Scenario

Precision Engineering runs 4 production lines with 24 operators. Each operator has primary and secondary certifications (CNC, Welding, Assembly, Quality), a certification level (1–3), years of experience, shift preference, and safety score. Lines need balanced certification coverage and total experience years within a range.

The data includes 24 operators with certifications, level, experience, shift preference, mentor flag, and safety score.

The Data

Save the following as `production_line.csv`:

24 rows, 9 columns. First 5 rows shown:

| OperatorID | Name | PrimaryCert | SecondCert | CertLevel | ExpYears | ShiftPref | Mentor | SafetyScore |
|------------|------------|-------------|------------|-----------|----------|-----------|--------|-------------|
| OP01 | Alan Ford | CNC | Welding | Level 3 | 18 | Day | | 98 |
| OP02 | Beth Moore | Assembly | Quality | Level 2 | 8 | Day | | 88 |
| OP03 | Carl Dunn | CNC | Assembly | Level 3 | 15 | Day | | 95 |
| OP04 | Diana Voss | Welding | CNC | Level 2 | 7 | Night | | 85 |
| OP05 | Ed Park | Assembly | Welding | Level 1 | 2 | Day | | 72 |

Full CSV file: `production_line.csv`



`production_line.csv`

Step-by-Step Instructions

Step 1: Upload & Map

1. Upload `production_line.csv`.
2. Set Unique ID to `OperatorID`, Display Name to `Name`.
3. Import all columns.

Map Your Columns

Which column is the unique ID? ⓘ Which column is the Name/Label? ⓘ

OperatorID ▼ Name ▼

Additional columns to include ⓘ

PrimaryCert × SecondCert × CertLevel × ExpYears × ShiftPref × Mentor × SafetyScore × ⊕ ▼

✓ Data Validation

✓ Data looks good!

Preview & Edit

You can edit values directly before importing

| ID | Name | PrimaryCert | SecondCert | CertLevel | ExpYears | ShiftPref | Mentor | SafetyScore |
|------|------------|-------------|------------|-----------|----------|-----------|--------|-------------|
| OP01 | Alan Ford | CNC | Welding | Level 3 | 18 | Day | None | 98 |
| OP02 | Beth Moore | Assembly | Quality | Level 2 | 8 | Day | None | 88 |
| OP03 | Carl Dunn | CNC | Assembly | Level 3 | 15 | Day | None | 95 |
| OP04 | Diana Voss | Welding | CNC | Level 2 | 7 | Night | None | 85 |
| OP05 | Ed Park | Assembly | Welding | Level 1 | 2 | Day | None | 72 |
| OP06 | Faye Lim | Quality | Assembly | Level 3 | 12 | Day | None | 92 |
| OP07 | Gus Hale | CNC | Quality | Level 2 | 6 | Night | None | 80 |
| OP08 | Holly Day | Welding | Assembly | Level 1 | 3 | Day | None | 76 |

✓ Import Data

Step 2: Configure Lines

1. Set Number of Groups to 4.
2. Rename: Line Alpha, Line Beta, Line Gamma, Line Delta.
3. Set each to Min 5 / Max 7.

Groups 👤 Budgets 💰 Quotas 📊 Balance ⚖️ Relationships 🔗 Preferences ⚙️ Pins 📌 Options ⚙️

Number of Groups ⓘ

4 − +

✓ 24 items - Capacity: 20-28

| Name | Min | Max | Tags | Flex |
|------------|-----|-----|------|--------------------------|
| Line Alpha | 5 | 7 | | <input type="checkbox"/> |
| Line Beta | 5 | 7 | | <input type="checkbox"/> |
| Line Gamma | 5 | 7 | | <input type="checkbox"/> |
| Line Delta | 5 | 7 | | <input type="checkbox"/> |

Step 3: Set Budget — Experience Years

1. Go to Budgets tab. Select ExpYears.
2. Set Min Total to 30, Max Total to 55 for each line.

Tip: Total experience across all operators is ~192 years. With 4 lines at 30–55 each (120–220 range), the solver has room to balance.

Step 4: Set Budget — Safety Score

1. Whilst still on Budgets tab. Select SafetyScore.
2. Set Min Total to 460, Max Total to 560 for each line.

Tip: This prevents any line from having all low-safety-score rookies.

Groups Budgets Quotas Balance Relationships Preferences Pins Options

Set min/max totals for numeric columns per group

Select columns to limit

ExpYears x SafetyScore x

ExpYears

Total ExpYears in your data: 196

| Group | Min Total | Max Total |
|------------|-----------|-----------|
| Line Alpha | 30 | 55 |
| Line Beta | 30 | 55 |
| Line Gamma | 30 | 55 |
| Line Delta | 30 | 55 |

SafetyScore

Total SafetyScore in your data: 2,011

| Group | Min Total | Max Total |
|------------|-----------|-----------|
| Line Alpha | 460 | 560 |
| Line Beta | 460 | 560 |
| Line Gamma | 460 | 560 |
| Line Delta | 460 | 560 |

Step 5: Set Quotas — Certification Levels

1. Go to Quotas tab. Use Count mode.
2. Column: CertLevel, Value: Level 3, Min: 2, Max: 3. Group: All Groups. Click Add.
3. Column: CertLevel, Value: Level 1, Min: 1, Max: 3. Group: All Groups. Click Add.

Groups Budgets Quotas Balance Relationships Preferences Pins Options

Require a percentage or count of specific values per group

Percentage

Count

Column: CertLevel Value: Level 1 Min: 1 Max: 3 Apply to: All Groups + Add

Quick rule: require at least one of every value

Column: ID Apply to: All Groups + Add All Values

| Column | Value | Range | Group |
|-----------|---------|-------|------------|
| CertLevel | Level 3 | 2-3 | All Groups |
| CertLevel | Level 1 | 1-3 | All Groups |

Tip: This ensures each line has experienced leaders (Level 3) and some junior operators (Level 1) for training.

Step 6: Set Balance — Primary Certification

1. Go to Balance tab.
2. Select PrimaryCert. Mode: Equal. Apply to: All Groups.
3. This distributes CNC, Welding, Assembly, and Quality operators across all lines.

Step 7: Add Balance — Shift Preference

1. Also select ShiftPref in the Balance tab. Mode: Equal. Apply to: All Groups.
2. This ensures Day and Night preference operators are spread evenly.

Groups Budgets Quotas **Balance** Relationships Preferences Pins Options

Spread values evenly, or maximise/minimise across target groups

Columns to optimise

PrimaryCert x ShiftPref x

PrimaryCert

Mode Apply to

Equal All Groups

4 unique values will be distributed evenly across all groups

ShiftPref

Mode Apply to

Equal All Groups

2 unique values will be distributed evenly across all groups

Step 8: Run & Validate

1. Click Run Optimizer.
2. Check: each line has 2–3 Level 3 operators, experience years are 30–55, primary certifications are spread, safety scores are in range.
3. Export for the floor supervisor.

Expected Outcome

Each line has 5–7 operators with 2–3 Level 3 certified. Experience years per line fall between 30–55. Primary certifications (CNC, Welding, Assembly, Quality) are spread evenly. Shift preferences are balanced. Safety scores are within the specified range.

This configuration ensures no line is understaffed on key certifications and no line is loaded with all inexperienced operators. Save the rules and reuse them quarterly when operators rotate.

This example uses 24 operators across 4 lines. Factories with 80–200 operators across 8–12 lines and multiple shift patterns use the same approach. Increase the solver timeout for larger workforces.

3. Results

Optimal - 24 items → 4 groups - 0.8s - 2026-03-10 05:01

Overview Rosters Validation Analytics Export

Total Items: 24 Groups: 4 Smallest Group: 6 Largest Group: 6

Distribution

Group Summary

| Group | Count | Min | Max | Status | ExpYears Total | SafetyScore Total |
|------------|-------|-----|-----|--------|----------------|-------------------|
| Line Alpha | 6 | 5 | 7 | ✓ | 46 | 493 |
| Line Beta | 6 | 5 | 7 | ✓ | 51 | 505 |
| Line Gamma | 6 | 5 | 7 | ✓ | 46 | 499 |
| Line Delta | 6 | 5 | 7 | ✓ | 53 | 514 |

Budgets

ExpYears: All groups within limits

| Group | Total ExpYears | Min | Max | Status |
|------------|----------------|-----|-----|--------|
| Line Alpha | 46 | 30 | 55 | ✓ |
| Line Beta | 51 | 30 | 55 | ✓ |
| Line Gamma | 46 | 30 | 55 | ✓ |
| Line Delta | 53 | 30 | 55 | ✓ |

SafetyScore: All groups within limits

| Group | Total SafetyScore | Min | Max | Status |
|------------|-------------------|-----|-----|--------|
| Line Alpha | 493 | 460 | 560 | ✓ |
| Line Beta | 505 | 460 | 560 | ✓ |
| Line Gamma | 499 | 460 | 560 | ✓ |
| Line Delta | 514 | 460 | 560 | ✓ |

Quotas


CertLevel = Level 3 (count)

| Group | Count | Required | Status |
|------------|-------|----------|--------|
| Line Alpha | 6 | 2 2-3 | ✓ |
| Line Beta | 6 | 2 2-3 | ✓ |
| Line Gamma | 6 | 2 2-3 | ✓ |
| Line Delta | 6 | 2 2-3 | ✓ |


CertLevel = Level 1 (count)

| Group | Count | Required | Status |
|------------|-------|----------|--------|
| Line Alpha | 6 | 2 1-3 | ✓ |
| Line Beta | 6 | 2 1-3 | ✓ |
| Line Gamma | 6 | 1 1-3 | ✓ |
| Line Delta | 6 | 2 1-3 | ✓ |

Balance


 PrimaryCert: Moderately balanced (70% even)

| Value | Total | Distribution | Evenness |
|----------|-------|--------------|----------|
| Assembly | 7 | 2/1/2/2 | 57% |
| CNC | 7 | 1/2/2/2 | 57% |
| Quality | 4 | 1/1/1/1 | 100% |
| Welding | 6 | 2/2/1/1 | 67% |

 ShiftPref: Well balanced (83% even)

| Value | Total | Distribution | Evenness |
|-------|-------|--------------|----------|
| Day | 14 | 4/3/4/3 | 86% |
| Night | 10 | 2/3/2/3 | 80% |

Note: Balance is a soft constraint - perfect distribution may not be possible with other constraints

 All constraints satisfied!

Distribution Analysis

Analyze distribution of:

PrimaryCert ▼

PrimaryCert by Group

| Assigned_Group | Assembly | CNC | Quality | Welding | All |
|----------------|----------|-----|---------|---------|-----|
| Line Alpha | 2 | 1 | 1 | 2 | 6 |
| Line Beta | 1 | 2 | 1 | 2 | 6 |
| Line Delta | 2 | 2 | 1 | 1 | 6 |
| Line Gamma | 2 | 2 | 1 | 1 | 6 |
| All | 7 | 7 | 4 | 6 | 24 |

Percentage breakdown:

| Assigned_Group | Assembly | CNC | Quality | Welding |
|----------------|----------|-------|---------|---------|
| Line Alpha | 33.3% | 16.7% | 16.7% | 33.3% |
| Line Beta | 16.7% | 33.3% | 16.7% | 33.3% |
| Line Delta | 33.3% | 33.3% | 16.7% | 16.7% |
| Line Gamma | 33.3% | 33.3% | 16.7% | 16.7% |

Numeric Statistics

Analyze totals of:

SafetyScore ▼

| Group | Count | Sum | Mean | Min | Max |
|------------|-------|-----|------|-----|-----|
| Line Alpha | 6 | 493 | 82.2 | 66 | 96 |
| Line Beta | 6 | 505 | 84.2 | 70 | 98 |
| Line Gamma | 6 | 499 | 83.2 | 68 | 95 |
| Line Delta | 6 | 514 | 85.7 | 74 | 97 |