Scheduling-123

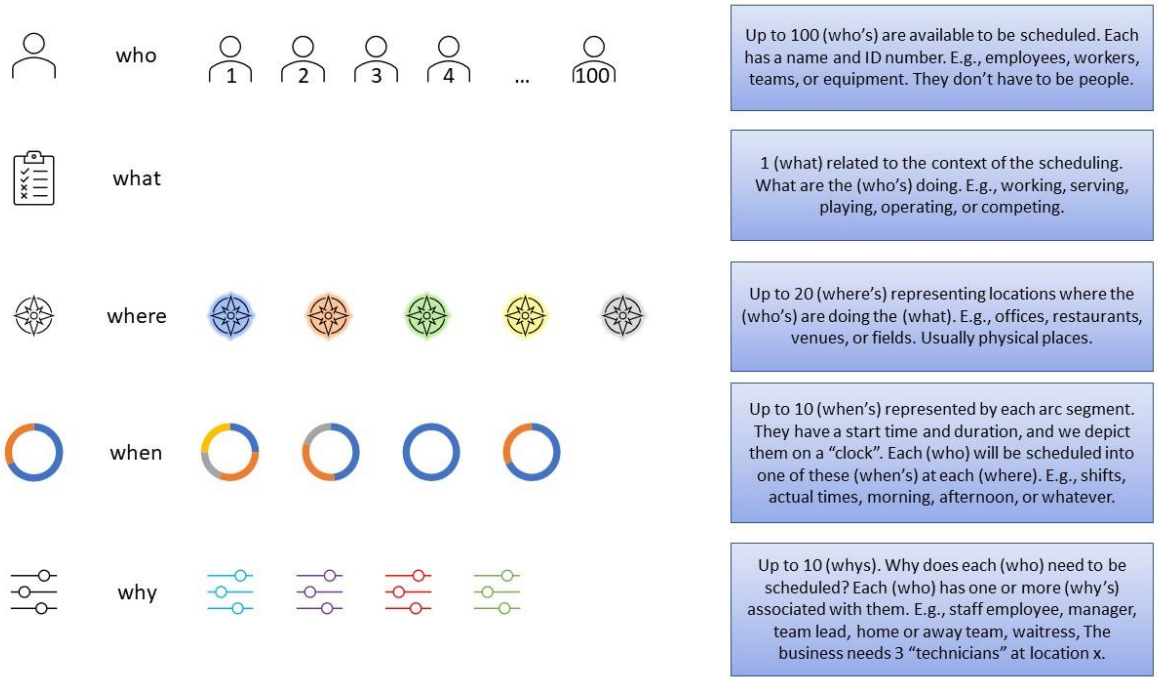
“I have a staff of 100 employees, and I run 4 restaurants that operate daily. I need to figure who is going to work at each location, on each shift, and in what role since many of my staff can perform multiple duties at my restaurants. I need a schedule for each day for the next 6 months so I can let everyone know when and where they will be working. I’d like to honor everyone’s preferences with respect to scheduling restrictions as much as possible because I know many of my staff have vacations scheduled or they have personal situations preventing them from working at some of my locations or work shifts.”

"I run a baseball league with 15 teams, and I need to create a schedule detailing which teams play each other in a Home and Away Double Round Robin format. Several teams have scheduling restrictions related to the availability of their Home fields on certain dates and others cannot compete on certain dates due to travel restrictions. I also schedule the umpires for each game. I need to assign them, by base, to be present at each game (again working around their scheduling restrictions as well)."

Table of Contents

What is this tool and what features does it have?

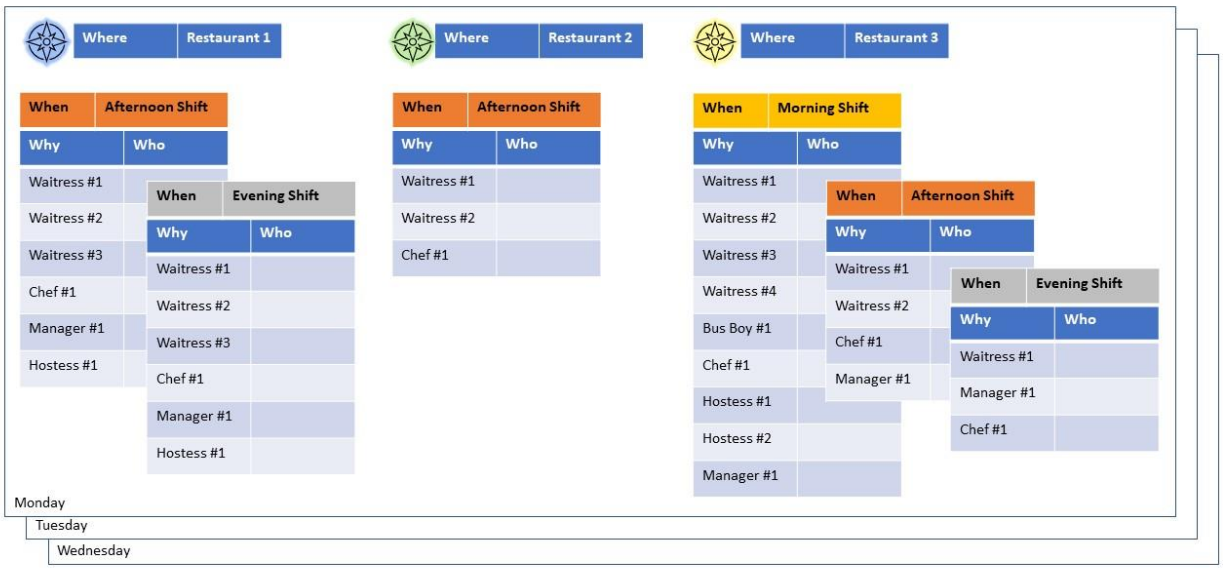
This is a tool that does generalized scheduling. It can schedule any set of people or things, in any context, to be at a certain location, at a certain time, fulfilling a certain purpose. It uses a who, what, where, when, and why paradigm to define this. For purposes of easy readability, this document will assume the context is a Small Business, scheduling Employees to be working at various Office/Locs, during various Shifts, fulfilling various Roles. These are indeed the default values in the tool for context, who, what, where, when, and why. Keep your mind open as you read about this tool for uses in other contexts.



With that background, this tool creates an assignment schedule for all your employees over any date span. What is an assignment schedule? Essentially who should show up where, when, and why.

In more technical terms, we are filling multiple schedule slots (sometimes called work slots) with the right people. Schedule slots are the association of a (date), (where), (when), and (why). In our default context, which person is scheduled to be at a specific Office/Loc, on a certain Shift, filling a particular Role, on a required date. This is repeated for every date, office, shift, and role across the span of dates comprising the schedule. A schedule could be filling hundreds of schedule slots.

What's the Goal? To fill out potentially hundreds of scheduling slots over many days, weeks, months. Think of finding the right person (a who) to fill out tables like these.



Help me visualize the scheduling

Step 1 and Step 2 – Define the (where's) and (when's)

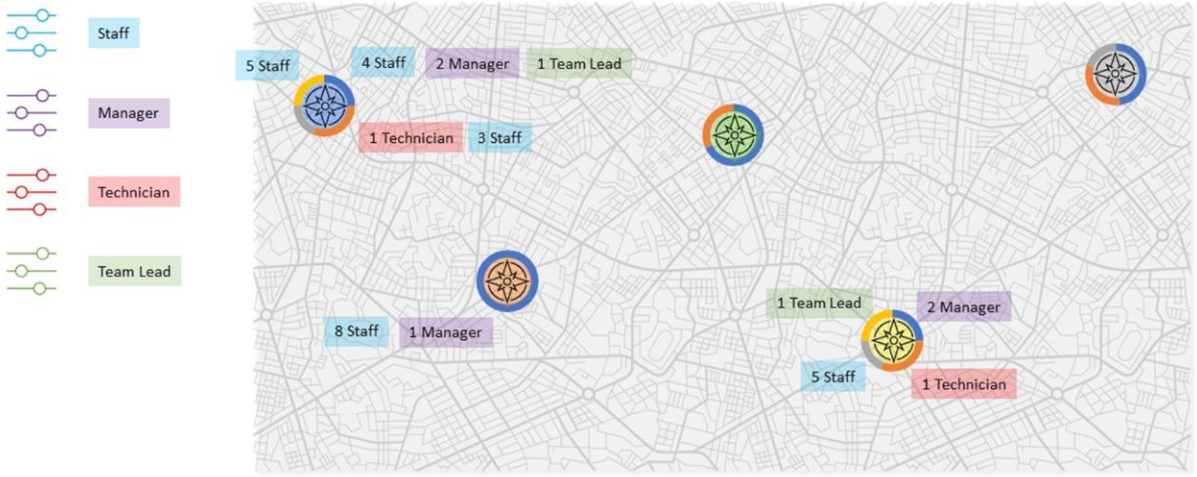
Step 1 is to define your (where's) or locations. Places where the (what) takes place and where the (who's) will be scheduled.

Step 2 is to match the (when's) to each (where). How many start times and durations exist at each (where).

In the small business context, you will have employees scheduled to be at various offices during various shifts.

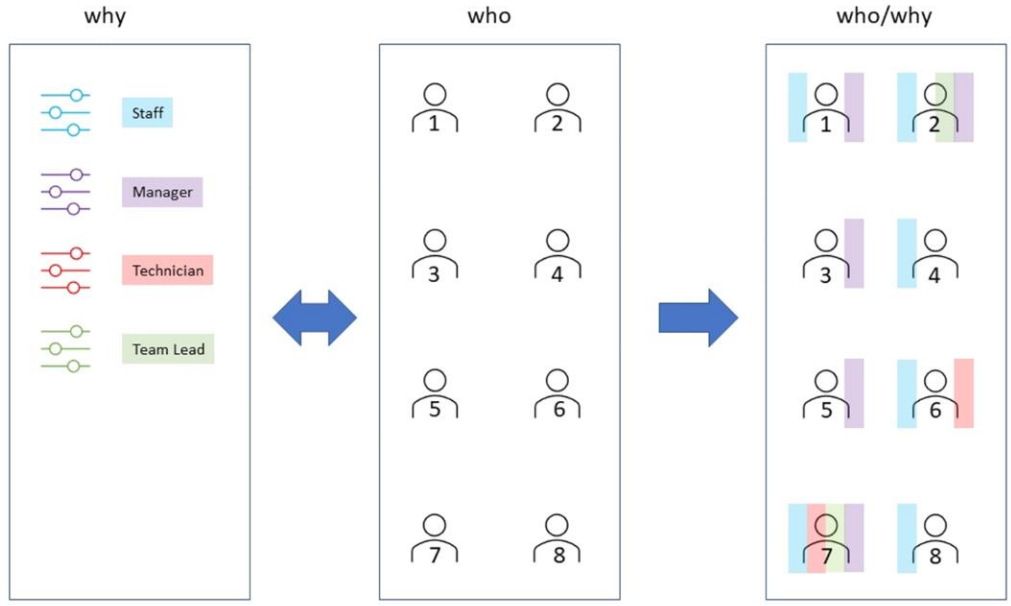
Step 3 – Define the (why's) and the association of (where/when/why) for your operation

Step 3 is to define what mix of (whys) and how many of each are required at each (where) during each (when). e.g., How many staff, managers, and technicians are needed on 1st shift vs 2nd shift at the Main office versus the Spring St. office. Repeat for each (where/when) pair you defined. In this example we filled in a few locations, but each (where/when) pairing would have its own set of (why's). We call the combination of each (where/when/why) a work slot, and it will be the job of this tool to fill each work slot with an appropriate person.



Step 4 – Associate (who's & why's) to document all roles each person has

Step 4 is to record which (whys) each (who) has. In the small business context, the (who's) are employees and the (why's) are job roles. So, we need to know which employees by name have the job role Manager, Technician, Team Lead, or general Staff. Some employees can fulfill multiple job roles.



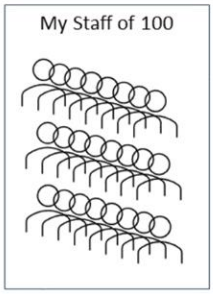
Step 5 – Record any scheduling restrictions for each (who)

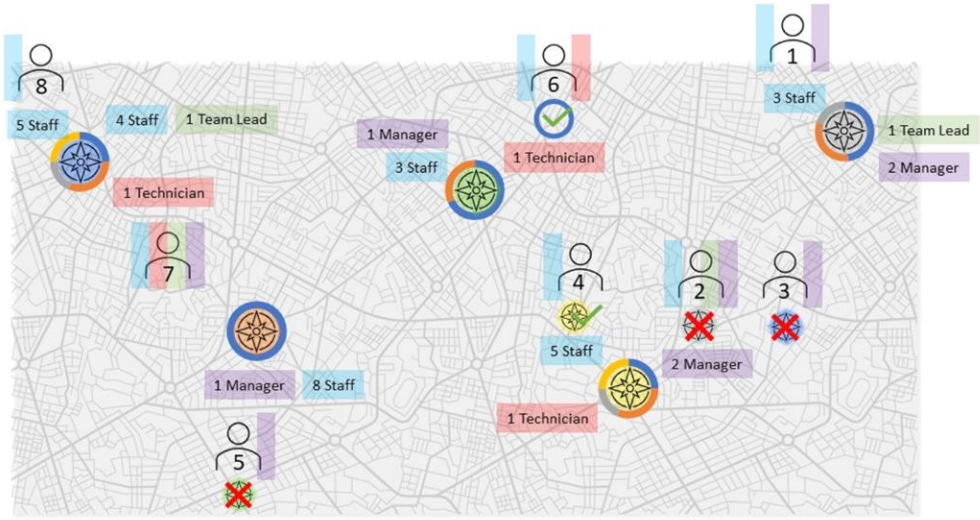
Step 5 is to define which people have scheduling restrictions like only being able to work in certain locations or times or never working in certain locations or times. Ditto for dates or days of the week to avoid vacations and personal hardships.

Step 6 – The magic! How this tool creates a schedule

Step 6 is where the Scheduling-123 tool steps in. It matches an appropriate person with each work slot you defined. Example, who by name should we schedule to be at the green office during the blue shift to work in the technician role. We chose #6 in this example because they have the technician role and can only work on a blue shift. Several of the 8 people are depicted with scheduling restrictions and therefore cannot be used to fill certain work slots.

In this example there are many people required to be able to schedule all the depicted work slots. We are only showing 8 people scheduled so far, but the more work slots that are required the more people you will need on staff from which to draw.





Remember, the real schedule is this picture repeated every day (or every week).

How do I get the tool and its latest version?

This is version 1.5 dated 6/14/2021

This tool was written by Bill Hladik and it uses Excel version "Microsoft 365" with recently added formulas and dynamic arrays. This version is sometimes called Office 365 or O365. You do not need to understand Excel to any depth to use the tool.

- If you do not have Excel version Microsoft 365 installed, you will have to use this tool from the online version of Excel (which is free to use) from here:
  - https://wjhladik.github.io/scheduling-123.html

  Take note that the online version is not fully functional. You can change inputs and options and it will regenerate the schedule, but you cannot save anything nor export any data. It is meant as a way for you to take a quick look at the tool.

- If you do have Excel version Microsoft 365 installed, you can download it from here:
  - https://wjhladik.github.io/scheduling-123.zip

    which will include the scheduling-123.xlsx tool and the scheduling-123.pdf documentation.

- The documentation is also available separately for direct online viewing from here:
  - https://wjhladik.github.io/scheduling-123.pdf
- Please view the dynamic online Sway I created that introduces you to Schedule-123:
  - https://sway.office.com/78P4vbWu7YMMwG7d?ref=Link

Scheduling-123 Overview

Schedule Features

- The schedule can extend out in time for 1 year (a soft limit for performance reasons).
- Employees can be scheduled by the day or by the week (365 daily work schedules or 52 weekly work schedules).
- Any day or days of the week can be skipped (not scheduled) – perfect for excluding weekends when your business is not open.
- A list of holidays can be recorded when your business is not open and when no employees will be scheduled to work.
- A special type of scheduling called “Round Robin” sports scheduling can be enabled if you are working with sports teams or players that must compete against all others in a league or tournament.

Schedule Slot Features

- Employees can be scheduled to work in up to 20 different office/locations and shifts/start times. For example, the Main office can be scheduled for 1st and 2nd shift, while the Spring St. office should only be scheduled for 3rd shift.
- You can define up to 10 shifts (or start times and durations). E.g., the normal 1st, 2nd, and 3rd shifts lasting 8 hrs each or perhaps half shifts of 4 hr durations. Whatever your business operates on.

- Each of the up to 20 office/location & shifts can have up to 10 self-defined roles working in them. For example, the Main office on 1st shift might require 8 general Staff employees and 2 Managers or supervisors, while the 3rd shift Spring St. office only needs 3 Staff employees, 1 Team Lead, and 1 Maintenance Tech role.

Employee Related Features

- Each employee can have their own personal scheduling restrictions recorded and the tool will consider those when finding employees to fill each work slot in the schedule. Examples are:
    - Not working on specific days of the week or only working on specific days of the week.
    - Not working on specific dates or date ranges because of vacation or holiday.
    - Not working in specific Office/Locations or only working in specific Office/Locations.
    - Not working on specific shifts or only working on specific shifts.
- Each employee can be tagged with a single or with multiple roles making them available to fill various work slots in the schedule (if their personal scheduling restrictions allow it). Employees with no tagged role are available to fill general "Staff" schedule slots. Examples of roles your business may wish to schedule:
    - A restaurant: Staff (Wait staff), Manager, Hostess, Cook, Bus Boy
    - A medical office: Staff (receptionist), PA, Nurse, Doctor
    - A basketball team: Point Guard, Guard, Power Forward, Forward, Center

Tool Features

- Very few inputs are required to get started.
- Up to 100 employees can be scheduled (a soft limit for performance reasons).
- By default, no employee will be scheduled twice on the same day. However, you can change an option to allow this if certain types of employees wish to work multiple shifts in a single day, or if it is appropriate that sports teams or players compete multiple times in a single day.
- Repeat scheduling of the same employee is limited by their role and how many other employees with the same role you have. This is to spread out the scheduling amongst all employees if possible. For example, if you have a lot of employees tagged as general Staff, they will most likely only be scheduled up to 2 times until we get through scheduling all the employees with the Staff role. However, if there are only a few employees with a role of Manager or Team Lead, they might be scheduled each day and would therefore have lots of repeat schedule assignments.
- The tool contains various reports showing you the assignment schedule it calculated. You can use these to both communicate the schedule to your employees and to manage your business by understanding who is supposed to be where each day.
- It also contains exports of the schedule for import into a shared Google Calendar or a shared Microsoft Outlook Calendar. This is an easy way for all employees to know when and where they have been scheduled to work.
- You can "Lock in" or override the schedule if you wish. There is a mechanism to lock in all or part of the calculated schedule to perhaps preserve already communicated work dates or to force key employees to be scheduled into specific work slots.
- The tool takes the form of a Microsoft 365 Excel spreadsheet and can either be downloaded and used locally or used online for free if you do not have Excel installed locally.

Here is an example of one report the tool produces:

Total Assignments --->		11	8	18	15	48	24	10	6	25	48	34	27	24	48	20	22	0	29	2	29	0	4	30	0	17	27	28
		Audrey Hepburn	Ava Gardner	Barbara Stanwyck	Bette Davis	Burt Lancaster	Buster Keaton	Carole Lombard	Cary Grant	Charlie Chaplin	Clark Gable	Claudette Colbert	Edward G. Robinson	Elizabeth Taylor	Fred Astaire	Gary Cooper	Gene Kelly	Ginger Rogers	Grace Kelly	Gregory Peck	Greta Garbo	Henry Fonda	Humphrey Bogart	Ingrid Bergman	James Cagney	James Dean	James Stewart	Jean Harlow
Weekday	Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Tuesday	6/1/2021		IW			S					S	S	S	S	S						XD		IW	S				
Wednesday	6/2/2021		IW		S	S	XW				S	S			S	S												
Thursday	6/3/2021	S	IW	S		S					S	S	S	S	S	XW	S		S		S		IW	S		S	S	S
Friday	6/4/2021															XW					S		IW	S		S	S	S
Monday	6/7/2021	XW			S	S	XD			S	S				S	S			S				IW					
Tuesday	6/8/2021	S	IW			S	S			S	S	S			S						S		IW	S			S	
Wednesday	6/9/2021		IW		S	S	XW				S				S	S	S		S									
Thursday	6/10/2021		IW	S			S			S		S		S		XW			S				IW					S
Friday	6/11/2021	S				S					S	S	S	S	S	XW							IW					
Monday	6/14/2021	XD	S		S	S				S	S	S			S	S	S						IW					
Tuesday	6/15/2021		IW			S					S	S	S	S	S	S	S				S		IW					
Wednesday	6/16/2021		IW				XW		S							S			S				S	S				
Thursday	6/17/2021		IW			S	S			S	S	S	S		S	XW	S		S				IW			S	S	S
Friday	6/18/2021	S				S	S	S		S	S	S	S	S	S	XW					S		IW					
Monday	6/21/2021	XW	S			S			S	S	S				S				S		S		IW	S			S	
Tuesday	6/22/2021		IW				S			S		S				S				S			IW					
Wednesday	6/23/2021	S	IW	S		S	XW				S				S													
Thursday	6/24/2021		IW			S	S	S		S	S	S			S	XW	S				S		IW	S		S	S	
Friday	6/25/2021					S					S	S	S	S	S	XW	S						IW					
Monday	6/28/2021	XW	S													S	S						IW			S	S	S
Tuesday	6/29/2021		IW			S	S	S			S	S	S		S	S					XD		IW	S		S	S	S
Wednesday	6/30/2021		IW	S	XD	S	XW		S	S	S				S	S					XD			S		S		S
Thursday	7/1/2021		IW			S					S	S	S	S	S	XD	S		S		XD		IW					
Friday	7/2/2021	S					S									XW	S				XD		IW	S			S	
Tuesday	7/6/2021		IW	S		S					S	S		S	S						XD		IW					S

Figure 1: A sample portion of a work schedule (some employees have scheduling restrictions in orange). Some days (in red) do not have enough of the right people available to fill all scheduling slots defined for that day.

			Jun 2021			
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1 Main (s1): Edward G. Robinson,	2 Main (s1): Annette Brüls, Robert	3 Main (s1): Greta Garbo, Claudette	4 Main (s1): Shirley Temple, Jean	5
6	7 Main (s1): Robert Frist, Sidney	8 Main (s1): Buster Keaton, Greta	9 Main (s1): Robert Mitchum, Mae	10 Main (s1): Jean Harlow, Claudette	11 Main (s1): Claudette Colbert, Sundar	12
13	14 Main (s1): Ava Gardner, Bette Davis, Marlon Brando, Mae West, Ryan Smith, Eric Yuan, Charlie Chaplin, Robert Frist, Claudette Colbert, Lynn	15 Main (s1): Sundar Pichai, Spencer Tracy, Mitch Snyder, Marx Brothers, Bert Bean, John Wayne, Marlene Dietrich, Edward G. Robinson, Greta	16 Main (s1): Marilyn Monroe, Cary Grant, Gary Cooper, Ian Siegel, Shantanu Narayen, Orson Welles, Brian Halligan, Judy Garland, Rita	17 Main (s1): Laurence Olivier, Claudette Colbert, James Dean, Buster Keaton, Jean Harlow, Grace Kelly, Marx Brothers, Lillian Gish,	18 Main (s1): Shirley Temple, Marx Brothers, Buster Keaton, Claudette Colbert, Daniel Dines, Vlad Shmunis, Eric Yuan, Edward G. Robinson,	19
20	21 Main (s1): Cary Grant, Kirk Douglas, Lauren Bacall, Charlie Chaplin, Judy Garland, John Wayne, Ava Gardner, Ingrid Bergman, Grace Kelly, Lynn Jurich, Mgr:Burt Lancaster, Mgr:Clark Gable	22 Main (s1): Manny Medina, Buster Keaton, Timothy Cook, Marx Brothers, John Foley, Eric Yuan, Katharine Hepburn, Dan Rosensweig, Daniel Dines, Laurence Olivier, Mgr:Conflict, Mgr:Conflict	23 Main (s1): Judy Garland, William Holden, Annette Brüls, Katharine Hepburn, Lynn Jurich, Vlad Shmunis, Manny Medina, Kirk Douglas, Bert Bean, Brian Halligan, Mgr:Fred Astaire, Mgr:Burt Lancaster	24 Main (s1): Mary Pickford, Claudette Colbert, Katharine Hepburn, Laurence Olivier, Greta Garbo, Eric Yuan, Buster Keaton, Carole Lombard, John Foley, James Dean, Mgr:Burt Lancaster, Mgr:Clark Gable	25 Main (s1): Claudette Colbert, Edward G. Robinson, Sundar Pichai, Marlene Dietrich, Mitch Snyder, Vlad Shmunis, Patrick Pacious, Marlon Brando, Timothy Cook, Elizabeth Taylor, Mgr:Burt Lancaster, Mgr:Clark Gable	26
27	28 Main (s1): Gary Cooper, Lynn Jurich, James Dean, William Holden, Ryan Smith, Vlad Shmunis, Satya Nadella, Annette Brüls, Jean Harlow, Manny Medina, Mgr:Conflict, Mgr:Conflict	29 Main (s1): Dan Rosensweig, Laurence Olivier, Buster Keaton, Marx Brothers, Satya Nadella, Gary Cooper, James Dean, Jean Harlow, Ingrid Bergman, Carole Lombard, Mgr:Fred Astaire, Mgr:Burt Lancaster	30 Main (s1): Ingrid Bergman, James Dean, Gary Cooper, Barbara Stanwyck, Brian Halligan, John Wayne, Shantanu Narayen, Judy Garland, Henry Schuck, Cary Grant, Mgr:Burt Lancaster, Mgr:Clark Gable			

Figure 2: An example report in calendar format

Preferred Uses

- It is perfect for a small business (e.g., a restaurant) that must staff several locations across several shifts while it is seemingly impossible to accommodate every employee's desires of when and where they wish to work (or not work).
- A mid-sized firm where most employees are working from home each day, but a small percentage must be scheduled to come into the office periodically.
- A team where only x out of y team members can play each game.
- A sports league scheduling teams to play at various venues each week using Round Robin or Double Round Robin formats to make sure they play the other teams the right number of times. This would apply to a tournament as well. You can even include the scheduling of referees or umpires to be present at each match.

Here are just a few examples of how you might define the context, who, what, where, when, and why to change the scheduling. Again, just for readability, we are writing this document in terms of the values in the green cells that are the defaults in the tool.

Key Scheduling Elements		Example 1	Example 2	Example 3	Example 4	Example 5	Example 6	Example 7
Small Business	(context)	Business	Restaurant	Baseball Team	Baseball Umpire	Basketball Team	Rental	Sports Team
Employees	(who)	People	Associates	Players	Umpires	Kids	Equipment	Teams
Working	(what)	Working	Working	Playing	Umping	Competing	Operating	Competing
Office/Loc	(where)	Office	Restaurant	Field	Venue	Court	Job site	Field
Shift	(when)	Workshift	Start time	Game time	Game	Time	Session	Game Slot
Role	(why)	Jobrole	Job	Position	Base Ump	Home/Away	Loan	Home/Away

Goals

- Give each employee/team member about the same number of scheduled assignments while being mindful of their personal scheduling restrictions.
- With Round Robin scheduling enabled, ensure each team/player competes against the others once for RR and twice for Double RR in a Home and Away format.
- Vary the employee assignment mix enough so that each employee gets some in-office face time with all other employees at least once. (Sufficient scheduling duration is required depending on total employee count).

- Make sure each role is staffed at each Office/Location & Shift.
- Revise the schedule instantly when business parameters change or employees and their scheduling restrictions change.
- Share the calculated schedule in a variety of ways.
- No macros. This tool is distributed without any VBS (macros) on purpose to appeal to the widest audience.
- No random functions. No part of the scheduling calculations uses the built in Excel "random" functions to pick employees to fill work slots. While this might have made things easier on my part, the user would see every report change each time they made small changes and that would make for a bad user experience.

How does it schedule people to work?

You pick how far out you want to generate a schedule for, and the tool will, for each date, schedule employees to work at each office/shift/role work slot you profile. It allows you to customize its scheduling method to vary how the next employee is chosen to fill an available slot. Each of the up to 20 Office/Location & Shift's can have up to 10 roles scheduled to work, such as Staff or Manager or Waitress. You make up the roles and configure the tool to schedule xx employees per role. These can vary by Office/Location & Shift.

Scheduling conflicts

There may be times when this tool is unable to schedule an employee in a work slot. When that happens, it will display a "C" or "Conflict" and leave it up to you to resolve in some way. Here is a list of potential reasons why this may occur:

- Too few employees to staff all the profiled offices/shifts work slots.
- Too few employees listed as a specific role to fill the minimum qty for that role that you have profiled.
- Too many employee scheduling restrictions are in place preventing potentially available employees from being scheduled in each work slot. Restrictions related to Office, Shift, Days of the Week, or Dates all come into play.
- When using Round Robin scheduling, you may not have enough fields to play on or the same team may not be able to compete again on the same day.

Artificial limits and suggested limits

This tool does some serious dynamic array-based calculations and will really tax Excel's calculation engine if you make it do too much. I have limited the number of employees to 100. The duration of the schedule is also suggested to be no more than 365 days. As you approach these limits you may see excel pause for many seconds after hitting enter while it recalculates - this is normal, just wait.

How do I use the tool?

1. On the Options sheet, profile your context by entering/changing data, including how many employees you have in total, duration of the schedule you want to create, list of roles, list of shift names, list of offices/shifts with how many total employees must be staffed at each office by role, what your normal days of operation are for your business (e.g. Mon-Fri), and

also decide if you want to schedule employees by the day or by the week (this means the same set of scheduled employees will work together the entire week).

2. On the Holidays sheet, enter any Holidays that your business will be closed and that the tool will avoid when scheduling.
3. On the Names sheet, enter the name of each employee and what role(s) they fulfill. Gather from each employee any work restrictions they might have and enter this information. You might want to start with no restrictions, create a schedule, share it with employees, and then let them tell you which dates are bad for them and why. Then record their restrictions and regenerate the schedule.
4. View the various reports sheets and see how things look. Do you have enough coverage by role? Do you have enough people marked in each role given recorded vacation time? Do you have any scheduling conflicts noted in the reports? Did each employee get about the same number of assignments? Do you care about face time with other employees and if so, is the Never Worked Together sheet sparse?
5. Decide if you want to schedule 1 or 2 months out and then repeat every month, or if you want to create a schedule for the next 6, 9 or 12 months and stick to it.
6. Communicate the results to your employees by sharing or printing the various reports sheets or by using the export sheet to create a file to import to a shared Google Calendar.
7. Accommodating changes... when employees inevitably come back to you with additional or changed work restrictions you can take these approaches.
    A) Keep the schedule - let each employee worry about finding a substitute employee to take their work slot
    B) Generate a new schedule - Record the employee's new restrictions and regenerate a schedule. Keep in mind, this may change the work assignments of many other employees from the last published schedule.
    C) Generate a new schedule for just that employee - Use the Override sheet to lock in all employee schedules except the employee in question. The tool will just reassign that employee's work slots.

Getting to know this tool

The tool comes loaded with sample employee data with scheduling restrictions coded to show you all the capabilities. They sometimes get in the way until you understand them. So, I suggest when first starting out, configure the tool as follows to see and understand how it works. You may wish to read ahead to the sections that describe the Options and Names sheets in more detail – that is where these inputs are changed.

- Set the **Restrictions** flag on the Options sheet to Off
- Set the **Method** to 1 on the Options sheet, so it sequentially assigns employees.
- Change the **Role Name** table on the Options sheet to just list the “Staff” role.
- Change the **Shift Name** table to just list 1 shift called s1.
- Change the **Office/Loc** table on the Options sheet so that it lists only one Office on shift s1.
- Change the **Employees** table on the Names sheet and delete all the entries in the Roles column. That will make all employees the default role of "Staff".

Then view the various reports sheets. Go back and start playing with Options sheet changes one by one to see how things change. Slowly add different roles for each employee.

Initial/Default Value on the Options Sheet

Core Option Name	Core Value
# of Employees	70
Begin Sched	
End Sched	
Period	Days
Sched Days	0000011
Restrictions	On
Method	

This is the (why) table:

Role Name	Max Same Day	Max Assign	Role Description	Count
Staff		2	General Staff	64
Manager		3	Manager	3
Team Lead	2	4	Leader	3

Shift Name	Start Time	Hours
s1	6:00:00 AM	8
s2	2:00:00 PM	8
s3	10:00:00 PM	8
7-11	7:00:00 AM	4
11-3	11:00:00 AM	4
3-7	3:00:00 PM	4

Office/Loc Name	Shift Name	Staff	Manager	Team Lead
Main	s1	5	2	
Main	s2	3	1	1
Spring St.	s2	3		1
Uptown	s3	5		2
Uptown	11-3		1	

ID	Employees	Only Schedule Restrictions (Include)	Never Schedule Restrictions (Exclude)	Role(s)
1	Audrey Hepburn		Monday, 6/14/2021	
2	Ava Gardner	Friday, Monday		
3	Barbara Stanwyck			
4	Bette Davis		6/29/2021, 7/30/2021	
5	Burt Lancaster			Manager
6	Buster Keaton		Wednesday, 6/7/2021	
7	Carole Lombard	Main		
8	Cary Grant	s1		
9	Charlie Chaplin			
10	Clark Gable			Manager
11	Claudette Colbert		Uptown	
12	Edward G. Robinson		s2	
13	Elizabeth Taylor			
14	Fred Astaire			Manager
15	Gary Cooper		Friday, 7/1/2021, Thursday	
16	Gene Kelly	Uptown, Spring St.		
17	Ginger Rogers			Team Lead
18	Grace Kelly			
19	Gregory Peck	s2		
			6/25/2021-7/1/2021,	
20	Greta Garbo		7/29/2021-8/10/2021	
21	Henry Fonda			Team Lead
22	Humphrey Bogart	s2, s3, Wednesday		
23	Ingrid Bergman			
24	James Cagney			Team Lead
25	James Dean	s1		
26	James Stewart		Main, s2	
27	Jean Harlow			
28	Joan Crawford	Main, s1, Thursday		

Changes to make learning the tool easier

Core Option Name	Core Value
# of Employees	70
Begin Sched	
End Sched	
Period	Days
Sched Days	0000011
Restrictions	Off
Method	1

This is the (why) table:

Role Name	Max Same Day	Max Assign	Role Description	Count
Staff		2	General Staff	64

Shift Name	Start Time	Hours
s1	6:00:00 AM	8

Office/Loc Name	Shift Name	Staff
Main	s1	5

ID	Employees	Only Schedule Restrictions (Include)	Never Schedule Restrictions (Exclude)	Role(s)
1	Audrey Hepburn		Monday, 6/14/2021	
2	Ava Gardner	Friday, Monday		
3	Barbara Stanwyck			
4	Bette Davis		6/29/2021, 7/30/2021	
5	Burt Lancaster			
6	Buster Keaton		Wednesday, 6/7/2021	
7	Carole Lombard	Main		
8	Cary Grant	s1		
9	Charlie Chaplin			
10	Clark Gable			
11	Claudette Colbert		Uptown	
12	Edward G. Robinson		s2	
13	Elizabeth Taylor			
14	Fred Astaire			
15	Gary Cooper		Friday, 7/1/2021, Thursday	
16	Gene Kelly	Uptown, Spring St.		
17	Ginger Rogers			
18	Grace Kelly			
19	Gregory Peck	s2		
			6/25/2021-7/1/2021,	
20	Greta Garbo		7/29/2021-8/10/2021	
21	Henry Fonda			
22	Humphrey Bogart	s2, s3, Wednesday		
23	Ingrid Bergman			
24	James Cagney			
25	James Dean	s1		
26	James Stewart		Main, s2	
27	Jean Harlow			
28	Joan Crawford	Main, s1, Thursday		

Structure of the Excel File

Sheets in the Excel file

Sheet Name	Type	Description

Read Me	Info	An intro to what this tool does.
Options	Input	Where you enter and change options that govern the operation of this tool.
Holidays	Input	A place to record Holidays. No employee will be scheduled to work on these holidays.
Names	Input	A place to record a list of employee names, the roles they work in, and any scheduling restrictions that employee might have (e.g., vacations).
Override	Input	A place to override the scheduling algorithm and force specific employees into specific work slots. Also, a place to "lock in the schedule".
Flat Assign	Calculation	The main workhorse of this tool. A list of all possible dates, offices, shifts, roles, and staffing slots paired with the employee scheduled to work that slot.
Grid Assign ID	Report	A report showing the data from Flat Assign in a grid of date by office/shift/slot. Easy to see the set of Employee IDs scheduled to work on a given day across all offices/shifts.
Grid Assign Name	Report	A duplicate of Grid Assign ID using Employee Names instead of IDs.
Full Grid	Report	A report showing the assignments from Flat Assign in a grid of date by employee. The grid contains an indicator if that employee is scheduled to work that day or a scheduling restriction marker (if any).
Bad Where (When)	Report	A report showing a grid of where (when) Office/Loc (Shift) by employee indicating if that employee has a scheduling restriction preventing them from being scheduled for a given office/shift.
Bad Dates	Report	A report showing a grid of date by employee indicating if that employee has a scheduling restriction preventing them from being scheduled for a given date.
Calendar	Report	A series of monthly calendars over the span of 1 year from the start of the schedule showing content determined by the Cal Content sheet.
Cal Content	Calculation	Where we calculate the list of employee names scheduled to work in each Office (shift). You control which one via the (caldisplay) option. These will appear on the Calendar sheet.
Export Google	Export	The employee schedule for all Office/Locs & Shifts that you can export to a csv file for import to a shared Google Calendar.
Export Outlook	Export	The employee schedule for all Office/Locs & Shifts that you can export to a csv file for import to a shared Microsoft Outlook Calendar.
Never Worked Together	Report	A report showing a grid of employee by employee with an indicator if the employee pair have never been scheduled to work together on the same date.
Worked Together	Calculation	A grid of employee by employee counting how many times each employee pairing has been scheduled to work together on a given shift.
Compete	Calculation	A reference sheet used when Round Robin scheduling is in effect.

The Options Sheet

This is where you set options/defaults that govern the operation of this scheduling tool. Enter only in the green cells.

Key Scheduling Elements

- **Context** describes the context in which this scheduling application will be doing its scheduling.
- **Who** represents the group of people that is being scheduled? Sometimes this can be a group of things.
- **What** is an action that describes what the people will be doing when they are scheduled?
- **Where** depicts a location where the people should be when they are scheduled to do what.
- **When** describes when the people should be at the where to do the what when they are scheduled.
- **Why** describes the purpose why the people are scheduled. A more refined description of the (what).

Below you will see 7 different examples to get you thinking about how to configure the scheduling tool. You can stick with the defaults entered in the green cells or overtype them.

Key Scheduling Elements		Example 1	Example 2	Example 3	Example 4	Example 5	Example 6	Example 7
Small Business	(context)	Business	Restaurant	Baseball Team	Baseball Umpire	Basketball Team	Rental	Sports Team
Employees	(who)	People	Associates	Players	Umpires	Kids	Equipment	Teams
Working	(what)	Working	Working	Playing	Umping	Competing	Operating	Competing
Office/Loc	(where)	Office	Restaurant	Field	Venue	Court	Job site	Field
Shift	(when)	Workshift	Start time	Game time	Game	Time	Session	Game Slot
Role	(why)	Jobrole	Job	Position	Base Ump	Home/Away	Loan	Home/Away

Given these defaults, within the context of a (Small Business), (Employees) will be scheduled to be (Working) at one of the (Office/Loc's) during one of the (Shift's) satisfying a required (Role).

Core Options

Core Option Name	Core Value	
# of Employees	70	(whocnt) Total number of who's
Begin Sched		(beginsched) When should the schedule begin. If blank, then next Monday from today. (Enter a date)
End Sched		(endsched) End of schedule. If blank, then 90 days after (beginsched). (Enter a date)
Period	Days	(period) Schedule based on days or weeks?
Sched Days	0000011	(sched_days) A text string of 0's and 1's starting with Monday. 0 means a schedule day and 1 means a non-schedule day (e.g. a week
Restrictions	On	(restrictions) Off or On. If On, then consider any people (who) scheduling restrictions entered on the Names sheet. If Off, ignore then
Method		(method) Assignment method. Leave blank to choose a semi random (who) pick for each schedule slot. Or 1 through 9 to skip "n" (w

- **# Of Employees** is how many total employees you have on staff that we can draw from to do assignments. This will change based on the (who) value. (e.g., it could read “# of Players”). This option is referred to as (whocnt).
- **Begin Sched** is a date representing the start of the schedule. If blank it will be next Monday. This is (begingsched).
- **End Sched** is a date representing the end of the schedule. If blank it will be (beginsched) + 90 days. This is called (endsched).
- **Period** is either "Days" or "Weeks" and it determines the level at which work assignments are made. Named (period).
- **Sched Days** is a string of 0's or 1's for each day of the week to say if it is a scheduled day or not. 0 means yes, 1 means no. "0000011" is a standard work week in the US with Saturday and Sunday off. Called (sched_days).
- **Restrictions** is either On or Off. If Off, it ignores any scheduling restrictions entered on the Names sheet. Referred to as (restrictions).
- **Method** is the scheduling method used to select the next employee as it searches to find the next employee to fill a scheduling slot. Termed (method).

- Blank is the default. It picks the next Employee in the rotation of assignments based on a semi-random number.
- Or you can choose 1 through 9 to use a skipping method of n employees.
- Or you can pick “Round Robin” or “Double Round Robin” to schedule team vs team or player vs player in a Home and Away paradigm.

I suggest you set restrictions to off and try various settings of (method), each time viewing the Full Grid sheet to see the pattern of assignments.

A note about Period vs. Sched Days

If your intended schedule is once a week you can go two routes. Set Period to “Weeks” and the schedule date of each week will be the Monday of that week (regardless of Sched Days). It is meant to imply “these people or teams are scheduled this week, not necessarily on Monday”. Or, you can set Period to “Days” and change the Sched Days to only have one “0” in it (like “1101111” – which means only schedule on Wednesday of each week.

A note about (whocnt) and Round Robin Scheduling

The first option in this section is the number of (who’s) you have available to schedule. When you change (method) to Round Robin or to Double Round Robin, the assumption is “most” of the (who’s) in the Names table are teams or players in whatever competition you are trying to schedule. So, if you have a league or tournament of 15 teams, this number will be 15 and each of those 15 teams will have both a “Home” and “Away” (why) designation.

However, if you want to include scheduling referees or umpires in addition to teams/players, this (whocnt) number will be higher. It will be the number of teams/players plus the total number of available umpires/referees. The scheduling of teams/players competing will be dealt with differently than the scheduling of umpires/referees.

The (why) table (e.g., Roles Names)

This is the (why) table:				
Role Name	**Max Same Day**	**Max Assign**	**Role Description**	**Count**
Staff		2	General Staff	64
Manager		3	Manager	3
Team Lead	2	4	Leader	3

You can designate up to 10 entries. The first entry is required, and it becomes the default (why). In this example our (why) value is “Role” and the default Role is called “Staff”. You do not have to define any additional roles if all your Employees are equal. We will treat them all as “Staff”. That is, if you just care about a count of people being scheduled each period versus what kind of person is being scheduled. Remember to mark which Employees have which Roles in the Names sheet.

- **Role Name** is a name by which you refer to the role. The first role listed becomes the default – in this example "Staff". You can define up to 10 total roles. The table is pre-loaded with sample role names. Delete them if you do not want them. You should populate the Roles column in the Names sheet with these Role Names.
    - These are made up names except for when you use Round Robin scheduling and then they must be “Home” and “Away” (or “H” and “A”).
- **Max Same Day** is a maximum number of times people with that role can be scheduled on the same day (if needed). The default is 1 if left blank. If you coded a 2, for example, it means employee X could fill two different scheduling slots on the same day if they have this role and if the shift is different on each.
    - You should consider making this higher than 1 for Round Robin scheduling of teams/payers if the tournament is happing on the same day and you expect each team/player to compete multiple times that day.
- **Max Assign** is calculated and controls how many repeat assignments a given employee can have within a scheduling period (see the note in the header for more explanation). It ranges from 2 to (rowcnt), with a slight bump up if you set Max Same Day to something greater than 1. Max Same Day is under your control and Max Assign is under the program’s control. They sound similar but are different internally.
- **Description** is optional - just for you to use to describe the role.
- **Count** shows how many employees on the Names sheet have that role. This reminds you if you defined a role but have not tagged any employee on the Names sheet with that role name.

A note about Round Robin scheduling

If you set the (method) to Round Robin or Double Round Robin, you must make the first 2 entries in this table “Home” followed by “Away”. You can use “H” and “A” if you want to shorten it. Again, two entries must exist to cover the teams/players being scheduled. If umpires/referees are also being scheduled, then you can use up to 8 additional entries to define the type of umpire/referee or other game official you are trying to schedule.

The (when) table (e.g., Shift Names)

Shift Name	Start Time	Hours
s1	6:00:00 AM	8
s2	2:00:00 PM	8
s3	10:00:00 PM	8
7-11	7:00:00 AM	4
11-3	11:00:00 AM	4
3-7	3:00:00 PM	4

You can designate up to 10 Shifts. Give each shift a name such as “1” or “s2” or “Third”.

- **Shift Name** is a name you will use to refer to the shift. It will print out on all reports using this name.

- **Start Time** is a time when employees working on this shift are expected to start work.
- **Hours** is a number representing how long the shift lasts. On the Google and Outlook calendars the end time will appear as Start Time plus this hour value.

You might wish to define different shift names that will be used for weekend work versus weekday work.

The (where) table (e.g., Office/Loc Names)

You can designate up to 20 Office/Location & Shifts to schedule employees into.

This is the (where) table:												
		Role Names from the Role table above										
Office/Loc Name	Shift Name	Staff	Manager	Team Lead								Total
Main	s1	5	2									
Main	s2	3	1	1								
Spring St.	s2	3		1								
Uptown	s3	5		2								
Uptown	11-3		1									

- **Office/Loc** Each Office/Location has its own name - enter whatever your business uses to refer to a particular Office/Location. There is always a default of one Office/Location if you do not enter one and it will be called "Main".
- **Shift Name** is one of the shift names you defined above. This defaults to “s1” if you do not enter a shift for a given Office/Location. If a given office is open for 2 or 3 shifts, you must use separate rows in this table (change the shift name on each row).
- **Roles...** The default role (e.g., Staff) followed by any other roles you defined in the Roles table. Enter a count of employees with that role you wish to schedule each period into this Office/Loc & Shift. Allowable values are 1 to (employees). Notes:
  - Any employee may be given a single role or multiple roles in the Names sheet.
  - If you define a role such as "Chef" and no employee is labeled with that role, then no one will ever be assigned those work slots.
- **Total** is calculated as the sum of required employees across all roles (including the general "Staff" role) for that Office/Loc & Shift.

An entry in this table for Office/Loc, Shift Name, and Role=Staff of "Main, s1, 3" means the Office/Loc called Main is staffed, on shift “s1”, with 3 general Staff employees. You could have another row for the same Office/Loc such as "Main, s2, 1" meaning only 1 employee of the general Staff role works at the Main office on shift “s2”.

Labels

In this tool, when referring to an Office/Loc & Shift, reports will display **"Office/Loc (Shift Name)"**. So, in my example, "Main (s1) and Main (s2)" would display to refer to the 2 shifts of staffing at the Main office.

Labels by Office/Loc							
Main (s1) [Staff] #1	Main (s1) [Staff] #2	Main (s1) [Staff] #3	Main (s1) [Staff] #4	Main (s1) [Staff] #5	Main (s1) [Manager] #1	Main (s1) [Manager] #2	
Main (s2) [Staff] #1	Main (s2) [Staff] #2	Main (s2) [Staff] #3	Main (s2) [Manager] #1	Main (s2) [Team Lead] #1			
Spring St. (s2) [Staff] #1	Spring St. (s2) [Staff] #2	Spring St. (s2) [Staff] #3	Spring St. (s2) [Team Lead] #1				
Uptown (s3) [Staff] #1	Uptown (s3) [Staff] #2	Uptown (s3) [Staff] #3	Uptown (s3) [Staff] #4	Uptown (s3) [Staff] #5	Uptown (s3) [Team Lea	Uptown (s3) [Team Lead] #2	
Uptown (11-3) [Staff] #	Uptown (11-3) [Manager] #1						

When referring to employees scheduled to work at a particular Office/Location & Shift, you will see the employee role and a sequential number to indicate the scheduling slot. The general format is **"Office/Loc (Shift Name) [Role Name] #x"**. So, the 4 general staff employees assigned to work at the Main office across 2 shifts would be displayed as:

- Main (s1) [Staff] #1
- Main (s1) [Staff] #2
- Main (s1) [Staff] #3
- Main (s2) [Staff] #1

Further, if you had also specified 2 employees with a role of Team Lead to work at the Main office on shift “third”, you would see:

- Main (third) [Team Lead] #1
- Main (third) [Team Lead] #2

Role table, Shift table, and Office/Loc table Defaults:

If you blank out the entire Roles table, Shift table, and Office/Loc table, the tool will assume one Office/Loc called "Main", staffing shift “s1”, with 2 employees, each having the general "Staff" role, and repeating no more than 3 times in a scheduling period.

Calendar Related Options

Cal Display	Main (s1)

- **(caldisplay)** allows you to choose one Office/Loc (Shift) to be displayed on the built-in Calendar sheet. All employees scheduled to work at that Office/Loc on that Shift will appear in the Calendar sheet. This only affects the built-in Calendar sheet, not the exports to Google Calendar and Microsoft Outlook Calendar. Those two always have entries for all Office/Locs and shifts, whereas the built-in Calendar sheet displays content for only one Office/Loc (Shift) due to space considerations.

The Holidays Sheet

Holiday Table

Fill out this (optional) table with any dates your business considers a holiday. The tool will avoid scheduling an employee to work on these dates. If there is a real holiday like Christmas and your business is open that day, then do not include it in this table. You can avoid scheduling employees on that date by using the scheduling restrictions table on the Names sheet.

Date	Holiday
1/1/2021	New Year's Day
1/18/2021	Martin Luther King Jr. Day
1/20/2021	Inauguration Day
2/15/2021	Presidents' Day
5/31/2021	Memorial Day
7/4/2021	Independence Day
7/5/2021	Independence Day observed
9/6/2021	Labor Day
10/11/2021	Columbus Day
11/11/2021	Veterans Day
11/25/2021	Thanksgiving Day
12/24/2021	Day off for Christmas Day
12/25/2021	Christmas Day
12/31/2021	Day off for New Year's Day
1/1/2022	New Year's Day
1/17/2022	Martin Luther King Jr. Day
2/15/2021	Presidents' Day
5/30/2022	Memorial Day
7/4/2022	Independence Day
9/5/2022	Labor Day
10/10/2022	Columbus Day
11/11/2022	Veterans Day
11/24/2022	Thanksgiving Day
12/24/2022	Christmas Eve
12/25/2022	Christmas Day
12/31/2022	New Year's Eve

The Names Sheet

The (who) table (e.g., Employee Names)

This is where you designate names for each employee and where you denote scheduling restrictions if any. Enter only in the green cells.

ID	Employees	Only Schedule Restrictions (Include)	Never Schedule Restrictions (Exclude)	Role(s)
1	Audrey Hepburn		Monday, 6/14/2021	
2	Ava Gardner	Friday, Monday		
3	Barbara Stanwyck			
4	Bette Davis		6/29/2021, 7/30/2021	
5	Burt Lancaster			Manager
6	Buster Keaton		Wednesday, 6/7/2021	
7	Carole Lombard	Main		
8	Cary Grant	s1		
9	Charlie Chaplin			
10	Clark Gable			Manager
11	Claudette Colbert		Uptown	
12	Edward G. Robinson		s2	
13	Elizabeth Taylor			
14	Fred Astaire			Manager
15	Gary Cooper		Friday, 7/1/2021, Thursday	
16	Gene Kelly	Uptown, Spring St.		
17	Ginger Rogers			Team Lead
18	Grace Kelly			
19	Gregory Peck	s2		
20	Greta Garbo		6/25/2021-7/1/2021, 7/29/2021-8/10/2021	
21	Henry Fonda			Team Lead
22	Humphrey Bogart	s2, s3, Wednesday		
23	Ingrid Bergman			
24	James Cagney			Team Lead
25	James Dean	s1		
26	James Stewart		Main, s2	
27	Jean Harlow			
28	Joan Crawford	Main, s1, Thursday		
29	John Wayne			
30	Judy Garland			

Note, there is a setting on the Options tab called (restrictions) that controls whether we honor these scheduling restrictions or not.

ID: First, on the Options sheet you said how many employees you have. That sequence is in column A and it becomes the employee ID within this tool. You cannot change this even if your business happens to have its own employee IDs.

Employee Name: In the Employee Name column, type whatever name you use to refer to this employee. There are sample names loaded, just type over them. If an employee quits or is fired, or a new employee hires on, please see **Employee Changes**.

Only Schedule Restrictions (Include): In the next 2 columns you "code" whatever restrictions there might be for each employee. In col C "Only Schedule Restrictions" you may code any of these items:

Weekday name e.g., Wednesday, Monday

Office/Loc name	e.g., any of entries in the (where) table (e.g., Office/Loc) like Main
Shift name	e.g., any (when) entry (e.g., Shifts) like s1, s2, s3, second, 7-11, etc.

You can record multiple of these by separating them with a comma. An entry in this column means the employee assignment is restricted to only these days, offices, and/or shifts.

Never Schedule Restrictions (Exclude): By contrast, col D "Never Schedule Restrictions" is coded to denote when this employee should never be scheduled. You can code the same 3 items as listed above for the "Only Schedule Restrictions" (Days, Office/Locs, and/or Shifts). But you can also code two additional items if needed:

A single date	e.g., 10/29/2021
A span of dates	e.g., 10/29/2021-11/7/2021

These will likely be used to record when each employee has scheduled personal vacation days.

Together, these 2 columns tell the tool if it is ok to schedule an employee on a certain date, in a certain office, for a certain shift. Be careful not to code contradictory information such as "only on s2" and "never on s2" because that will have the net effect of never scheduling that employee.

Roles: The Roles column can be blank which means the employee has the default Role from the Roles table and in this context, it is the general “Staff” role. People designated as “Staff” can be assigned to any Office/Loc and Shift to fill the qty of workers needed for the "Staff" role in the Office/Loc table on the Options sheet. You could also code the role "Staff" for these employees, but it is unnecessary since most employees will be of this role type.

You can also enter the name of any other Role you defined in the Roles table on the Options sheet. For example, if you defined a role of "Team Lead" you can enter that for each employee you consider a Team Lead.

Examples of Multiple Roles:

If you want a given employee to be chosen to fill work slots labeled "Team Lead" or "Staff", you must list both roles like this: Team Lead, Staff

If you just list "Team Lead" as the role, they will only be chosen to fill "Team Lead" work slots.

If you have a superstar employee capable of performing any role and you want them scheduled into any work slot, you must list all roles for that employee: e.g., Staff, Mgr, Team Lead, Chef

Round Robin Scheduling

If you are using Round Robin scheduling, then you must code “Home, Away” for each player or team in this table. Or, “H, A” if you chose those names in your (why) table. Referees, umpires, or other game officials can be designated with any other (why) values you coded in the (why) table on the Options sheet.

The Override Sheet

The Override Table

This is where you can force overrides into the scheduling. The structure of this sheet is the same as the Flat Assign sheet. You can either manually enter data to force a specific employee to fill a specific work slot, or (the preferred approach) you can copy and paste the data from the Flat Assign sheet into this sheet to "lock in a schedule".

Date	Office (Shift) [Role] #n	ID	Employee Name
Monday, May 17, 2021	Main (s1) [Staff] #1	23	Ingrid Bergman
Monday, May 17, 2021	Main (s1) [Staff] #2	67	Shantanu Narayen
Monday, May 17, 2021	Main (s1) [Staff] #3	18	Grace Kelly
Monday, May 17, 2021	Main (s1) [Staff] #4	15	Gary Cooper
Monday, May 17, 2021	Main (s1) [Staff] #5	58	Ian Siegel
Monday, May 17, 2021	Main (s1) [Staff] #6	7	Carole Lombard
Monday, May 17, 2021	Main (s1) [Staff] #7	2	Ava Gardner
Monday, May 17, 2021	Main (s1) [Staff] #8	43	Rita Hayworth
Monday, May 17, 2021	Main (s1) [Staff] #9	60	Lynn Jurich
Monday, May 17, 2021	Main (s1) [Staff] #10	53	Brian Halligan
Tuesday, May 18, 2021	Main (s1) [Staff] #1	27	Jean Harlow
Tuesday, May 18, 2021	Main (s1) [Staff] #2	66	Satya Nadella
Tuesday, May 18, 2021	Main (s1) [Staff] #3	14	Fred Astaire
Tuesday, May 18, 2021	Main (s1) [Staff] #4	11	Claudette Colbert
Tuesday, May 18, 2021	Main (s1) [Staff] #5	54	Dan Rosensweig
Tuesday, May 18, 2021	Main (s1) [Staff] #6	6	Buster Keaton
Tuesday, May 18, 2021	Main (s1) [Staff] #7	7	Carole Lombard
Tuesday, May 18, 2021	Main (s1) [Staff] #8	55	Daniel Dines
Tuesday, May 18, 2021	Main (s1) [Staff] #9	12	Edward G. Robinson
Tuesday, May 18, 2021	Main (s1) [Staff] #10	15	Gary Cooper
Wednesday, May 19, 2021	Main (s1) [Staff] #1	60	Lynn Jurich
Wednesday, May 19, 2021	Main (s1) [Staff] #2	65	Ryan Smith
Wednesday, May 19, 2021	Main (s1) [Staff] #3	50	William Holden
Wednesday, May 19, 2021	Main (s1) [Staff] #4	16	Gene Kelly
Wednesday, May 19, 2021	Main (s1) [Staff] #5	30	Judy Garland
Wednesday, May 19, 2021	Main (s1) [Staff] #6	25	James Dean
Wednesday, May 19, 2021	Main (s1) [Staff] #7	70	Vlad Shmunis
Wednesday, May 19, 2021	Main (s1) [Staff] #8	27	Jean Harlow
Wednesday, May 19, 2021	Main (s1) [Staff] #9	31	Katharine Hepburn
Wednesday, May 19, 2021	Main (s1) [Staff] #10	18	Grace Kelly

If you paste data into this sheet, do so by pasting values only. On the Paste icon, look for Paste Special and then choose Values. You can copy and paste the entire schedule from Flat Assign or just a portion of it. The Employee Name column is optional (only the first 3 columns are referenced).

A typical use case might be to create a schedule based on experimenting with various Options. Once you are satisfied, copy the whole schedule to this sheet. Publish it to your employees. When/if employees come back to you requesting changes, filter this sheet for that employee's schedule and either manually change it or delete the data for that employee. Do not delete the entire row, just delete the data in the cells for that employee. This will cause the tool to assign a new employee into that work slot. Repeat, as necessary.

The Flat Assign Sheet

This is the main calculation sheet that determines the schedule of where and when each employee is assigned to work.

Date	Office (Shift) [Role] #n	ID	Employee Name	Override	Validation		1
Monday, May 17, 2021	Main (s1) [Staff] #1	23	Ingrid Bergman		1=XW		
Monday, May 17, 2021	Main (s1) [Staff] #2	67	Shantanu Narayen		1=XW		
Monday, May 17, 2021	Main (s1) [Staff] #3	18	Grace Kelly		1=XW		
Monday, May 17, 2021	Main (s1) [Staff] #4	15	Gary Cooper		1=XW		
Monday, May 17, 2021	Main (s1) [Staff] #5	58	Ian Siegel		1=XW		
Monday, May 17, 2021	Main (s1) [Staff] #6	7	Carole Lombard		1=XW		
Monday, May 17, 2021	Main (s1) [Staff] #7	2	Ava Gardner		1=XW		
Monday, May 17, 2021	Main (s1) [Staff] #8	43	Rita Hayworth		1=XW		
Monday, May 17, 2021	Main (s1) [Staff] #9	60	Lynn Jurich		1=XW		
Monday, May 17, 2021	Main (s1) [Staff] #10	53	Brian Halligan		1=XW		
Monday, May 17, 2021	Main (s1) [Mgr] #1	5	Burt Lancaster		1=XW		
Monday, May 17, 2021	Main (s1) [Mgr] #2	10	Clark Gable		1=XW		
Monday, May 17, 2021	Spring St. (s2) [Staff] #1	29	John Wayne		1=XW		
Monday, May 17, 2021	Spring St. (s2) [Staff] #2	65	Ryan Smith		1=XW		
Monday, May 17, 2021	Spring St. (s2) [Staff] #3	9	Charlie Chaplin		1=XW		
Monday, May 17, 2021	Uptown (s3) [Staff] #1	68	Sundar Pichai		1=XW		
Monday, May 17, 2021	Uptown (s3) [Staff] #2	32	Kirk Douglas		1=XW		
Monday, May 17, 2021	Uptown (s3) [Staff] #3	44	Robert Mitchum		1=XW		
Monday, May 17, 2021	Uptown (s3) [Staff] #4	30	Judy Garland		1=XW		
Monday, May 17, 2021	Uptown (s3) [Staff] #5	63	Patrick Pacious		1=XW		
Monday, May 17, 2021	Uptown (s3) [Mgr] #1	14	Fred Astaire		1=XW		
Tuesday, May 18, 2021	Main (s1) [Staff] #1	27	Jean Harlow				
Tuesday, May 18, 2021	Main (s1) [Staff] #2	34	Laurence Olivier				
Tuesday, May 18, 2021	Main (s1) [Staff] #3	20	Greta Garbo				
Tuesday, May 18, 2021	Main (s1) [Staff] #4	54	Dan Rosensweig				
Tuesday, May 18, 2021	Main (s1) [Staff] #5	66	Satya Nadella				
Tuesday, May 18, 2021	Main (s1) [Staff] #6	56	Eric Yuan				
Tuesday, May 18, 2021	Main (s1) [Staff] #7	25	James Dean				
Tuesday, May 18, 2021	Main (s1) [Staff] #8	40	Marx Brothers				
Tuesday, May 18, 2021	Main (s1) [Staff] #9	35	Lillian Gish				
Tuesday, May 18, 2021	Main (s1) [Staff] #10	6	Buster Keaton				
Tuesday, May 18, 2021	Main (s1) [Mgr] #1	5	Burt Lancaster		1=RM		
Tuesday, May 18, 2021	Main (s1) [Mgr] #2	10	Clark Gable		1=RM		
Tuesday, May 18, 2021	Spring St. (s2) [Staff] #1	70	Vlad Shmunis				
Tuesday, May 18, 2021	Spring St. (s2) [Staff] #2	29	John Wayne				
Tuesday, May 18, 2021	Spring St. (s2) [Staff] #3	30	Judy Garland				
Tuesday, May 18, 2021	Uptown (s3) [Staff] #1	9	Charlie Chaplin				
Tuesday, May 18, 2021	Uptown (s3) [Staff] #2	36	Mae West				
Tuesday, May 18, 2021	Uptown (s3) [Staff] #3	41	Mary Pickford				
Tuesday, May 18, 2021	Uptown (s3) [Staff] #4	26	James Stewart				
Tuesday, May 18, 2021	Uptown (s3) [Staff] #5	57	Henry Schuck				
Tuesday, May 18, 2021	Uptown (s3) [Mgr] #1	14	Fred Astaire		1=RM		

Date: Every date to be scheduled in the scheduling period between Start Date and End Date. Any holidays are excluded. Any days of the week not scheduled based on the (sched_days) option are also excluded.

Office (Shift) [Role] #n: Each Office/Loc, Shift, and Role required to be scheduled on each date according to the Office/Loc table on the Options sheet.

ID: Col C (ID) does the employee assignment using the (method) chosen on the Options sheet. The default assignment method attempts to randomize who works when, such that each employee gets about the same number of work assignments and is mixed up enough to have been paired to work with each other employee at least once. There is no guarantee here, so check the sheet "Never Worked Together" if this is critical.

Each employee, by default, is only scheduled once per day. An Option on the Options sheet called "Max Same Day" can be used to allow the same employee to be picked multiple times on the same date if the shift is different. This happens by employee role, so you could enable it for "Technician" or "Manager", but not Staff.

"C" for "Conflict" - when this appears in the ID column it means the automatic scheduling logic found no employee without scheduling restrictions that could have been chosen to fill this work slot.

Employee Name: Col E is just the Name lookup that goes with the employee ID matching the calculated ID to the Names table on the Names sheet.

Override: You can make entries on the Override sheet to force a given employee to fill a specific work slot. They will be transferred to col E (Override) and that employee ID will be scheduled in place of the automatic logic.

Validation: If you want to check and see why each employee was not eligible to fill a given schedule slot you can copy the formula in the yellow cell at H2 and paste that into column H of any number of rows. This is an array formula that will spill results from column H out to the right for however many employees there are. The Validate columns will be filled with various codes you can examine that all take the form:

ID=Code (where ID is the ID number of the employee and code is described below)

blank - No restrictions are in place. The employee ID was eligible to fill this schedule slot (whether they were chosen or not).

Codes related to (where) (e.g., Office/Loc) or (when) (e.g., Shift)

- IT - Include Time. A (when) shift restriction based on "Only Schedule Restriction" on the Names sheet. Example, employee 5 only works on s2 and this row is a shift of s1.
- XT - Exclude Time. A (when) shift restriction based on "Never Schedule Restriction" on the Names sheet. Example, employee 23 never works on s2 and this row is for s2.
- IL - Include Loc. A (where) office restriction based on "Only Schedule Restriction" on the Names sheet. Example, employee 17 only works in the Main office and this row is for the Spring St. office.
- XL - Exclude Loc. A (where) office restriction based on "Never Schedule Restriction" on the Name sheet. Example, employee 7 never works in the Main office and this row is for the Main office.

Codes related to weekday or actual date

- IW - Include Weekday. A weekday restriction based on "Only Schedule Restriction" on the Names sheet. Example, employee 12 only works on Wednesday and this row is for Monday.
- XW - Exclude Weekday. A weekday restriction based on "Never Schedule Restriction" on the Names sheet. Example, employee 3 never works on Monday and this row is a Monday.
- XD - Exclude date. A date restriction based on "Never Schedule Restriction" on the Names sheet. Example, employee 18 never works on 5/1/2021 and this row is for date 5/1/2021.

Codes related to repeat or duplicate assignments

- RA - Repeat Assignment. The max repeat assignment threshold for their role would be exceeded. Example, employee 3 was already scheduled 2 times in the current scheduling period and the max is calculated to be 2, so if we were to assign them on this row it would make 3 assignments.
    - *Note on the RA (Repeat Assignment) code:* The amount of times a given employee can be repeat scheduled within a scheduling period is controlled by the Roles table on the Options sheet. The tool determines a count from 2 to (rowcnt) where (rowcnt) is essentially how many consecutive days it takes to schedule all employees. For example, if you have 30 employees and 12 must be (at_where_cnt) each day, then (rowcnt) becomes 3 (it takes 3 days at 12 people/day to exceed 30 employees).
- AS - Already Scheduled. The employee ID was already scheduled for this date. Example, the row is for date 5/1/2021 and employee 8 was already assigned on another row for this same date.

Codes related to role

- RM - Role Mismatch. The (why's) (e.g., Roles) of the employee do not match the required role for the schedule slot. Example, employee 19 has a role of Technician, and this row is calling for a Manager to be assigned.

Codes related to Round Robin Scheduling

- RRC – Round Robin Count. The ID could not be chosen because it would exceed the count for how many times that player/team can compete in a Round Robin or Double Round Robin competition. For a 5 team competition, no team can compete more than 4 times in Round Robin and no more that 8 times in Double Round Robin (4 Home and 4 Away).
- RRR – Round Robin Repeat. The ID could not be chosen because it would repeat a match that has already been scheduled earlier. If team 1 vs. team 2 had been scheduled already, then in Round Robin you cannot schedule 1 vs. 2 nor can you schedule 2 vs. 1. In Double Round Robin you can schedule both 1H vs. 2A and 2H vs. 1A.

Example:

Suppose we see a row on the Flat Assign sheet where it has chosen ID number 10 “Clark Gable” to fill a schedule slot for Tues, June 22, 2021 fulfilling the 2nd “Manager” role on Shift “s1” at the “Main” office.

Tuesday, June 22, 2021	Main (s1) [Manager] #2	10	Clark Gable

We want to know why all the other ID’s were not chosen. We copy the formula from H2 and paste it into H32 (row 32 is where we are concerned):

1=RM	2=IW	3=RM	4=RM	5=AS	6=RM	7=RM	8=RM	9=RM	10=	11=RM	12=RM	13=RM	14=	15=RM	16=IL	17=RM

Here is a sample of the codes we might see.

- Most are “RM” for “Role Mismatch” indicating these people are not “Managers” and this row 32 is trying to fill a Manager schedule slot.
- We see ID number 2 has a code of “IW” for “Include Weekday”. If we look at ID 2 on the Names sheet, we see they can only work on Friday and Monday and this row 32 is a Tuesday. Hence, ID 2 could not be chosen due to code “IW”.
- ID 5 has an “Already Scheduled” code of “AS” meaning they were already assigned on this date on an earlier row and the Max Same Day setting is 1 for the Manager role.
- ID 10 is blank which means they could have been assigned, and in this instance they were actually chosen.
- Ditto for ID 14, but they were not chosen this time.
- ID 16 has a code of “IL” meaning “Include Location”. On the Names sheet ID 16 can only work at the “Uptown” or “Spring St.” locations and this row 32 is for the “Main” location.

So, as you can see, this technique can help you understand why certain people are not being chosen to fill certain slots. It should be used sparingly, and once used, you can delete the copied formulas.

The Grid Assign ID Sheet

This simply takes the employee ID's in the Flat Assign sheet and maps them into this grid that shows the Office/Locs and Shifts for each date. A "C" means Conflict and basically says there was no employee without scheduling restrictions that could have been chosen to work in this slot. A sample portion of such a sheet appears below as an example. This is not really intended for the scheduler or for any employee unless you are intimately familiar with employee ID’s. It is, however, key to other parts of the tool to know the complete set of employees scheduled on one date. On this sheet there is one row per date scheduled and one column per “Office/Loc (Shift) [Role] #x”.

	Main (s1) [Staff] #1	Main (s1) [Staff] #2	Main (s1) [Staff] #3	Main (s1) [Staff] #4	Main (s1) [Staff] #5	Main (s1) [Staff] #6	Main (s1) [Staff] #7	Main (s1) [Staff] #8	Main (s1) [Staff] #9	Main (s1) [Staff] #10	Main (s1) [Mgr] #1	Main (s1) [Mgr] #2	Spring St. (s2) [Staff] #1	Spring St. (s2) [Staff] #2	Spring St. (s2) [Staff] #3	Uptown (s3) [Staff] #1	Uptown (s3) [Staff] #2	Uptown (s3) [Staff] #3	Uptown (s3) [Staff] #4	Uptown (s3) [Staff] #5	Uptown (s3) [Mgr] #1
Monday, May 17, 2021	23	67	18	15	58	7	2	43	60	53	5	10	29	65	9	68	32	44	30	63	14
Tuesday, May 18, 2021	27	34	20	54	66	56	25	40	35	6	5	10	70	29	30	9	36	41	26	57	14
Wednesday, May 19, 2021	31	15	50	65	60	35	61	66	51	18	5	10	70	27	32	16	52	67	62	36	14
Thursday, May 20, 2021	20	68	25	34	28	1	31	37	33	69	5	10	16	54	6	12	3	38	55	56	14
Friday, May 21, 2021	52	33	69	18	23	7	48	3	12	8	5	10	29	37	11	47	68	4	62	38	14
Monday, May 24, 2021	50	60	61	51	30	2	32	53	63	64	5	10	70	34	54	65	66	55	35	4	14
Tuesday, May 25, 2021	56	41	23	63	25	49	67	6	7	1	5	10	70	31	57	9	13	15	66	50	14
Wednesday, May 26, 2021	8	51	25	58	18	42	60	9	11	13	5	10	43	19	59	22	52	3	26	29	14
Thursday, May 27, 2021	27	6	52	28	68	35	69	30	53	3	5	10	42	47	48	45	38	29	12	64	14
Friday, May 28, 2021	27	31	32	33	23	18	7	67	54	40	5	10	56	34	11	55	26	66	35	70	14
Tuesday, June 1, 2021	12	62	48	40	38	43	53	68	23	49	5	10	30	15	69	63	64	70	13	31	14
Wednesday, June 2, 2021	51	65	15	44	18	56	39	32	33	36	5	10	37	4	54	41	34	42	43	57	14
Thursday, June 3, 2021	20	11	13	25	41	1	44	27	28	29	5	10	3	42	30	16	26	35	45	4	14

The Grid Assign Name Sheet

This translates the Grid Assign ID sheet from Employee ID's to Employee Names.

	Main (s1) [Staff] #1	Main (s1) [Staff] #2	Main (s1) [Staff] #3	Main (s1) [Staff] #4	Main (s1) [Staff] #5	Main (s1) [Staff] #6	Main (s1) [Staff] #7	Main (s1) [Staff] #8	Main (s1) [Staff] #9	Main (s1) [Staff] #10	Main (s1) [Mgr] #1	Main (s1) [Mgr] #2	Spring St. (s2) [Staff] #1	Spring St. (s2) [Staff] #2	Spring St. (s2) [Staff] #3	Uptown (s3) [Staff] #1	Uptown (s3) [Staff] #2	Uptown (s3) [Staff] #3	Uptown (s3) [Staff] #4	Uptown (s3) [Staff] #5	Uptown (s3) [Mgr] #1
Monday, May 17, 2021	Ingrid Bergman	Shantanu Narayen	Grace Kelly	Gary Cooper	Ian Siegel	Carole Lombard	Ava Gardner	Rita Hayworth	Lynn Jurich	Brian Halligan	Burt Lancaster	Clark Gable	John Wayne	Ryan Smith	Charlie Chaplin	Sundar Pichai	Kirk Douglas	Robert Mitchum	Judy Garland	Patrick Pacious	Fred Astaire
Tuesday, May 18, 2021	Jean Harlow	Laurence Olivier	Greta Garbo	Dan Rosensweig	Satya Nadella	Eric Yuan	James Dean	Marx Brothers	Lillian Gish	Buster Keaton	Burt Lancaster	Clark Gable	Vlad Shmunis	John Wayne	Judy Garland	Charlie Chaplin	Mae West	Mary Pickford	James Stewart	Henry Schuck	Fred Astaire
Wednesday, May 19, 2021	Katharine Hepburn	Gary Cooper	William Holden	Ryan Smith	Lynn Jurich	Lillian Gish	Manny Medina	Satya Nadella	Annette Brüls	Grace Kelly	Burt Lancaster	Clark Gable	Vlad Shmunis	Jean Harlow	Kirk Douglas	Gene Kelly	Bert Bean	Shantanu Narayen	Mitch Snyder	Mae West	Fred Astaire
Thursday, May 20, 2021	Greta Garbo	Sundar Pichai	James Dean	Laurence Olivier	Joan Crawford	Audrey Hepburn	Katharine Hepburn	Marilyn Monroe	Lauren Bacall	Timothy Cook	Burt Lancaster	Clark Gable	Gene Kelly	Dan Rosensweig	Buster Keaton	Edward G. Robinson	Barbara Stanwyck	Marlene Dietrich	Daniel Dines	Eric Yuan	Fred Astaire
Friday, May 21, 2021	Bert Bean	Lauren Bacall	Timothy Cook	Grace Kelly	Ingrid Bergman	Carole Lombard	Spencer Tracy	Barbara Stanwyck	Edward G. Robinson	Cary Grant	Burt Lancaster	Clark Gable	John Wayne	Marilyn Monroe	Claudette Colbert	Sophia Loren	Sundar Pichai	Bette Davis	Mitch Snyder	Marlene Dietrich	Fred Astaire
Monday, May 24, 2021	William Holden	Lynn Jurich	Manny Medina	Annette Brüls	Judy Garland	Ava Gardner	Kirk Douglas	Brian Halligan	Patrick Pacious	Robert Frist	Burt Lancaster	Clark Gable	Vlad Shmunis	Laurence Olivier	Dan Rosensweig	Ryan Smith	Satya Nadella	Daniel Dines	Lillian Gish	Bette Davis	Fred Astaire
Tuesday, May 25, 2021	Eric Yuan	Mary Pickford	Ingrid Bergman	Patrick Pacious	James Dean	Vivien Leigh	Shantanu Narayen	Buster Keaton	Carole Lombard	Audrey Hepburn	Burt Lancaster	Clark Gable	Vlad Shmunis	Katharine Hepburn	Henry Schuck	Charlie Chaplin	Elizabeth Taylor	Gary Cooper	Satya Nadella	William Holden	Fred Astaire
Wednesday, May 26, 2021	Cary Grant	Annette Brüls	James Dean	Ian Siegel	Grace Kelly	Orson Welles	Lynn Jurich	Charlie Chaplin	Claudette Colbert	Elizabeth Taylor	Burt Lancaster	Clark Gable	Rita Hayworth	Gregory Peck	John Foley	Humphrey Bogart	Bert Bean	Barbara Stanwyck	James Stewart	John Wayne	Fred Astaire
Thursday, May 27, 2021	Jean Harlow	Buster Keaton	Bert Bean	Joan Crawford	Sundar Pichai	Lillian Gish	Timothy Cook	Judy Garland	Brian Halligan	Barbara Stanwyck	Burt Lancaster	Clark Gable	Orson Welles	Sophia Loren	Spencer Tracy	Shirley Temple	Marlene Dietrich	John Wayne	Edward G. Robinson	Robert Frist	Fred Astaire
Friday, May 28, 2021	Jean Harlow	Katharine Hepburn	Kirk Douglas	Lauren Bacall	Ingrid Bergman	Grace Kelly	Carole Lombard	Shantanu Narayen	Dan Rosensweig	Marx Brothers	Burt Lancaster	Clark Gable	Eric Yuan	Laurence Olivier	Claudette Colbert	Daniel Dines	James Stewart	Satya Nadella	Lillian Gish	Vlad Shmunis	Fred Astaire
Tuesday, June 1, 2021	Edward G. Robinson	Mitch Snyder	Spencer Tracy	Marx Brothers	Marlene Dietrich	Rita Hayworth	Brian Halligan	Sundar Pichai	Ingrid Bergman	Vivien Leigh	Burt Lancaster	Clark Gable	Judy Garland	Gary Cooper	Timothy Cook	Patrick Pacious	Robert Frist	Vlad Shmunis	Elizabeth Taylor	Katharine Hepburn	Fred Astaire
Wednesday, June 2, 2021	Annette Brüls	Ryan Smith	Gary Cooper	Robert Mitchum	Grace Kelly	Eric Yuan	Marlon Brando	Kirk Douglas	Lauren Bacall	Mae West	Burt Lancaster	Clark Gable	Marilyn Monroe	Bette Davis	Dan Rosensweig	Mary Pickford	Laurence Olivier	Orson Welles	Rita Hayworth	Henry Schuck	Fred Astaire
Thursday, June 3, 2021	Greta Garbo	Claudette Colbert	Elizabeth Taylor	James Dean	Mary Pickford	Audrey Hepburn	Robert Mitchum	Jean Harlow	Joan Crawford	John Wayne	Burt Lancaster	Clark Gable	Barbara Stanwyck	Orson Welles	Judy Garland	Gene Kelly	James Stewart	Lillian Gish	Shirley Temple	Bette Davis	Fred Astaire

The Full Grid Sheet

This is one sample report showing all the dates on the left and all the employees across the top. We are purposely not showing the Office/Loc and Shift on this report (but there will be enough S's on each row to cover all named Offices and their respective Shifts).

The very top row is a count of how many times this employee has been scheduled to work.

Here are the possible values in this grid and their meaning.

- blank - A blank means the employee was not scheduled to work this date. It could be because they were not up in the rotation of assignments or because they had an Office and/or Shift restriction which we cannot show here.
- IW - Include Weekday. A restriction based on "Only Schedule Restriction" on the Names sheet.
- XW - Exclude Weekday. A restriction based on "Never Schedule Restriction" on the Names sheet.
- XD - Exclude Date. A date restriction based on "Never Schedule Restriction" on the Names sheet.
- S - This employee is scheduled to work on this date.

The date column will change to red if fewer than (at_where_cnt) employees were able to be scheduled on that date. This would be due to scheduling restrictions.

The following example shows a scheduling pattern produced by the default setting of blank in the (method) option.

Total Assignments --->		11	8	18	15	48	24	10	6	25	48	34	27	24	48	20	22	0	29	2	29	0	4	30	0	17	27	28
		Audrey Hepburn	Ava Gardner	Barbara Stanwyck	Bette Davis	Burt Lancaster	Buster Keaton	Carole Lombard	Cary Grant	Charlie Chaplin	Clark Gable	Claudette Colbert	Edward G. Robinson	Elizabeth Taylor	Fred Astaire	Gary Cooper	Gene Kelly	Ginger Rogers	Grace Kelly	Gregory Peck	Greta Garbo	Henry Fonda	Humphrey Bogart	Ingrid Bergman	James Cagney	James Dean	James Stewart	Jean Harlow
Weekday	Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Tuesday	6/1/2021		IW			S					S	S	S	S	S						XD		IW	S				
Wednesday	6/2/2021		IW		S	S	XW				S	S			S	S												
Thursday	6/3/2021	S	IW	S		S					S	S	S	S	S	XW	S		S		S		IW	S		S	S	S
Friday	6/4/2021															XW					S		IW	S		S	S	S
Monday	6/7/2021	XW			S	S	XD			S	S				S	S			S				IW					
Tuesday	6/8/2021	S	IW			S	S			S	S	S			S						S		IW	S			S	
Wednesday	6/9/2021		IW		S	S	XW				S				S	S	S		S									
Thursday	6/10/2021		IW	S			S			S		S		S		XW			S				IW					S
Friday	6/11/2021	S				S					S	S	S	S	S	XW							IW					
Monday	6/14/2021	XD	S		S	S				S	S	S			S	S	S						IW					
Tuesday	6/15/2021		IW			S					S	S	S	S	S	S	S				S		IW					
Wednesday	6/16/2021		IW				XW		S							S			S				S	S				
Thursday	6/17/2021		IW			S	S			S	S	S	S		S	XW	S		S				IW			S	S	S
Friday	6/18/2021	S				S	S	S		S	S	S	S	S	S	XW					S		IW					
Monday	6/21/2021	XW	S			S			S	S	S				S				S		S		IW	S			S	
Tuesday	6/22/2021		IW				S			S		S				S				S			IW					
Wednesday	6/23/2021	S	IW	S		S	XW				S				S													
Thursday	6/24/2021		IW			S	S	S		S	S	S			S	XW	S				S		IW	S		S	S	
Friday	6/25/2021					S					S	S	S	S	S	XW	S						IW					
Monday	6/28/2021	XW	S													S	S						IW			S	S	S
Tuesday	6/29/2021		IW			S	S	S			S	S	S		S	S					XD		IW	S		S	S	S
Wednesday	6/30/2021		IW	S	XD	S	XW		S	S	S				S	S					XD			S		S		S
Thursday	7/1/2021		IW			S					S	S	S	S	S	XD	S		S		XD		IW					
Friday	7/2/2021	S					S									XW	S				XD		IW	S			S	
Tuesday	7/6/2021		IW	S		S					S	S		S	S						XD		IW					S

By contrast, here is an example using the option where (method) is set to 1. We also changed the number of employees to 30 and the option (restrictions) to Off. There are a few interesting things to note in this example:

- The date 5/18/2021 is shaded red because there were no employees without scheduling restrictions that could have been chosen to fill one of the remaining scheduling slots for that date, or the only employees left to choose from were of the wrong role.
- 3 employees have blank columns because I left their role set to “Team Lead” in the Names sheet, but I did not define the “Team Lead” role in the Options sheet.

Total Assignments --->		45	48	46	43	63	49	46	48	48	63	50	49	47	63	48	47	0	50	49	46	0	46	46	0	47	48	47	47	47	46
	Work Restrictions Off	Audrey Hepburn	Ava Gardner	Barbara Stanwyck	Bette Davis	Burt Lancaster	Buster Keaton	Carole Lombard	Cary Grant	Charlie Chaplin	Clark Gable	Claudette Colbert	Edward G. Robinson	Elizabeth Taylor	Fred Astaire	Gary Cooper	Gene Kelly	Ginger Rogers	Grace Kelly	Gregory Peck	Greta Garbo	Henry Fonda	Humphrey Bogart	Ingrid Bergman	James Cagney	James Dean	James Stewart	Jean Harlow	Joan Crawford	John Wayne	Judy Garland
Weekday	Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Monday	5/17/2021		S	S	S	S	S	S	S	S	S	S	S	S	S	S	S		S	S	S		S	S		S					
Tuesday	5/18/2021	S	S	S		S	S	S	S	S	S	S	S	S	S									S		S	S	S	S	S	S
Wednesday	5/19/2021	S	S	S	S	S	S	S	S		S				S	S	S		S	S	S		S				S	S	S	S	S
Thursday	5/20/2021	S				S				S	S	S	S	S	S	S	S		S	S	S		S	S		S	S	S	S	S	S
Friday	5/21/2021		S	S	S	S	S	S	S	S	S	S	S	S	S	S	S		S	S	S		S	S		S					
Monday	5/24/2021	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S										S	S	S	S	S
Tuesday	5/25/2021	S	S	S	S	S	S	S	S		S				S				S	S	S		S	S		S	S	S	S	S	S
Wednesday	5/26/2021	S				S				S	S	S	S	S	S	S	S		S	S	S		S	S		S	S	S	S	S	S
Thursday	5/27/2021		S	S	S	S	S	S	S	S	S	S	S	S	S	S	S		S							S	S	S	S	S	
Friday	5/28/2021	S	S	S	S	S	S				S				S	S	S		S	S	S		S	S		S	S	S	S	S	S
Tuesday	6/1/2021		S	S	S	S	S	S	S	S	S	S	S	S	S					S	S		S	S		S	S	S	S		
Wednesday	6/2/2021	S	S			S		S	S	S	S	S	S	S	S	S	S		S	S	S		S	S		S				S	S
Thursday	6/3/2021	S	S	S	S	S	S	S	S	S	S	S	S		S	S	S		S								S	S	S	S	S
Friday	6/4/2021	S	S	S	S	S	S				S	S	S	S	S					S	S		S	S		S	S	S	S	S	S
Monday	6/7/2021	S				S		S	S	S	S			S	S	S	S		S	S	S		S	S		S	S	S	S	S	S
Tuesday	6/8/2021		S	S	S	S	S	S	S	S	S	S	S	S	S	S			S	S	S		S	S		S	S				
Wednesday	6/9/2021	S	S			S					S	S	S	S	S	S	S		S	S	S		S	S		S	S	S	S	S	S
Thursday	6/10/2021	S	S	S	S	S	S	S	S	S	S				S		S		S	S	S		S	S		S	S			S	S
Friday	6/11/2021			S	S	S	S	S	S	S	S	S	S	S	S	S	S		S	S	S		S	S				S	S		
Monday	6/14/2021	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S										S	S	S	S	S	S
Tuesday	6/15/2021		S			S	S	S	S	S	S	S	S		S	S	S		S	S	S		S	S		S	S	S	S		
Wednesday	6/16/2021	S		S	S	S					S	S	S	S	S	S	S		S	S	S		S	S		S	S	S		S	S
Thursday	6/17/2021	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S		S	S									S	S	S
Friday	6/18/2021					S	S	S	S	S	S	S	S	S	S	S			S	S	S		S	S		S	S	S	S	S	
Monday	6/21/2021	S	S	S	S	S	S				S				S	S	S		S	S	S		S	S		S	S	S	S	S	S

One last example where we go back to 70 employees and change (method) to 3. Here we pick every third employee if they are eligible. Three people have a solid column, being assigned every day. This is because they are marked as the role Manager, and the options page was set up calling for 3 people with the Manager role each day across 2 Office/Locs. This gives you an example of how changing the assignment (method) option produces different patterns of when people are chosen to work.

Total Assignments --->		13	19	12	13	63	26	25	19	19	63	26	19	19	63	25	19	0	26	19	20	0	25	19	0	25	24	19	19	17	19
	Work Restrictions Off	Audrey Hepburn	Ava Gardner	Barbara Stanwyck	Bette Davis	Burt Lancaster	Buster Keaton	Carole Lombard	Cary Grant	Charlie Chaplin	Clark Gable	Claudette Colbert	Edward G. Robinson	Elizabeth Taylor	Fred Astaire	Gary Cooper	Gene Kelly	Ginger Rogers	Grace Kelly	Gregory Peck	Greta Garbo	Henry Fonda	Humphrey Bogart	Ingrid Bergman	James Cagney	James Dean	James Stewart	Jean Harlow	Joan Crawford	John Wayne	Judy Garland
Weekday	Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Monday	5/17/2021					S	S			S	S		S		S	S			S				S			S		S			S
Tuesday	5/18/2021		S			S	S		S		S	S			S				S		S			S			S				
Wednesday	5/19/2021	S			S	S		S			S	S		S	S		S			S									S		
Thursday	5/20/2021			S		S		S		S	S		S		S								S			S		S			S
Friday	5/21/2021		S			S	S				S				S	S			S		S			S			S			S	
Monday	5/24/2021					S			S		S	S		S	S		S			S			S			S			S		
Tuesday	5/25/2021			S		S	S			S	S		S		S	S			S					S							
Wednesday	5/26/2021		S			S		S	S		S	S			S		S										S			S	
Thursday	5/27/2021	S			S	S		S			S				S						S					S	S		S		
Friday	5/28/2021					S					S			S	S				S	S			S				S		S		
Tuesday	6/1/2021					S	S			S	S		S		S	S				S			S			S		S			S
Wednesday	6/2/2021		S			S	S		S		S	S			S	S			S		S			S				S			
Thursday	6/3/2021	S			S	S		S			S	S		S	S		S				S								S		
Friday	6/4/2021			S		S		S		S	S		S		S								S			S			S		S
Monday	6/7/2021		S			S	S				S				S	S			S				S	S			S			S	
Tuesday	6/8/2021					S			S		S	S		S	S		S			S				S		S				S	
Wednesday	6/9/2021			S		S	S			S	S		S		S	S			S								S				
Thursday	6/10/2021		S			S		S	S		S	S			S		S											S			S
Friday	6/11/2021	S			S	S		S			S				S						S					S		S			S
Monday	6/14/2021					S					S			S	S				S	S			S				S		S			
Tuesday	6/15/2021					S	S			S	S		S		S	S				S			S			S			S			
Wednesday	6/16/2021		S			S	S		S		S	S			S	S			S		S			S			S				
Thursday	6/17/2021	S			S	S		S			S	S		S	S		S				S								S		
Friday	6/18/2021			S		S		S		S	S		S		S								S			S		S			S
Monday	6/21/2021		S			S	S				S				S	S			S				S	S			S			S	

The Where (When) Sheet

This sheet denotes if the employee has a scheduling restriction based on (where) (e.g., Office/Loc) or (when) (e.g., Shift). This is based on the scheduling restrictions coding you did on the Names sheet.

Here are the possible values in this grid.

- blank - A blank means no scheduling restriction is in place.
- IT - Include Time. A Shift restriction based on "Only Schedule Restriction" on the Names sheet.
- XT - Exclude Time. A Shift restriction based on "Never Schedule Restriction" on the Names sheet.
- IL - Include Loc. An Office/Loc restriction based on "Only Schedule Restriction" on the Names sheet.
- XL - Exclude Loc. An Office/Loc restriction based on "Never Schedule Restriction" on the Names sheet.

Examples:

- If you coded "Never work at Office called Main" there would be an XL for the rows with Office Main.
- If you coded "Only work at Office called Main" there would be an IL for each Office that is not Main.
- If you coded "Never work Shift 2" there would be an XT for the rows with Shift 2.
- If you coded "Only work Shift 2" there would be an IT for each row that is not Shift 2.

You can of course code in the "Only Schedule Restriction" column something like "Main, s2" meaning you only want the employee to work at the Office called Main on shift 2.

	Audrey Hepburn	Ava Gardner	Barbara Stanwyck	Bette Davis	Burt Lancaster	Buster Keaton	Carole Lombard	Cary Grant	Charlie Chaplin	Clark Gable	Claudette Colbert	Edward G. Robinson	Elizabeth Taylor	Fred Astaire	Gary Cooper	Gene Kelly	Ginger Rogers	Grace Kelly	Gregory Peck	Greta Garbo	Henry Fonda	Humphrey Bogart	Ingrid Bergman	James Cagney	James Dean	James Stewart	Jean Harlow	Joan Crawford	John Wayne	Judy Garland
Office/Loc(Shift)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Main (s1)																IL			IT			IT				XL				
Spring St. (s2)							IL	IT				XT													IT	XT		IL		
Uptown (s3)							IL	IT			XL								IT						IT			IL		

The Bad Dates Sheet

This sheet denotes if the employee has a scheduling restriction based on date. This is based on the scheduling restrictions coding you did on the Names sheet.

Here are the possible values in this grid.

- blank - A blank means no scheduling restriction is in place related to the weekday or actual date.
- IW - Include Weekday. A weekday restriction based on "Only Schedule Restriction" on the Names sheet.
- XW - Exclude Weekday. A weekday restriction based on "Never Schedule Restriction" on the Names sheet.
- XD - Exclude Date. A date restriction based on "Never Schedule Restriction" on the Names sheet.

Examples:

- If you coded "Never work Friday" there would be an XW every Friday.
- If you coded "Only work Friday" there would be an IW for each day except Friday.
- If you coded "Never work 4/29/2021" there would be an XD on 4/29/2021.
- If you coded "Vacation from 5/1/2021-5/10/2021" there would be an XD on all those dates.

There is no “ID” code for “Include Date”. On the Names sheet, in the "Only Schedule Restriction" column you cannot put a date or date range. That violates the premise of this tool. It is akin to

saying “I only want employee 5 to work on 6/13/2021” which does not make sense in this context.

		Audrey Hepburn	Ava Gardner	Barbara Stanwyck	Bette Davis	Burt Lancaster	Buster Keaton	Carole Lombard	Cary Grant	Charlie Chaplin	Clark Gable	Claudette Colbert	Edward G. Robinson	Elizabeth Taylor	Fred Astaire	Gary Cooper	Gene Kelly	Ginger Rogers	Grace Kelly	Gregory Peck	Greta Garbo	Henry Fonda	Humphrey Bogart	Ingrid Bergman	James Cagney	James Dean	James Stewart	Jean Harlow	Joan Crawford	John Wayne	Judy Garland
Weekday	Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Monday	5/17/2021	XW																					IW						IW		
Tuesday	5/18/2021		IW																				IW						IW		
Wednesday	5/19/2021		IW				XW																						IW		
Thursday	5/20/2021		IW													XW							IW								
Friday	5/21/2021															XW							IW						IW		
Monday	5/24/2021	XW																					IW						IW		
Tuesday	5/25/2021		IW																		XD		IW						IW		
Wednesday	5/26/2021		IW				XW														XD								IW		
Thursday	5/27/2021		IW													XW					XD		IW								
Friday	5/28/2021															XW					XD		IW						IW		
Tuesday	6/1/2021		IW																		XD		IW						IW		
Wednesday	6/2/2021		IW				XW																						IW		
Thursday	6/3/2021		IW													XW							IW								
Friday	6/4/2021															XW							IW						IW		
Monday	6/7/2021	XW					XD																IW						IW		
Tuesday	6/8/2021		IW																				IW						IW		
Wednesday	6/9/2021		IW				XW																						IW		
Thursday	6/10/2021		IW													XW							IW								
Friday	6/11/2021															XW							IW						IW		
Monday	6/14/2021	XD																					IW						IW		
Tuesday	6/15/2021		IW																				IW						IW		
Wednesday	6/16/2021		IW				XW																						IW		
Thursday	6/17/2021		IW													XW							IW								
Friday	6/18/2021															XW							IW						IW		
Monday	6/21/2021	XW																					IW						IW		
Tuesday	6/22/2021		IW																				IW						IW		
Wednesday	6/23/2021		IW				XW																						IW		

The Calendar Sheet

This sheet holds a series of monthly calendars spanning one year into the future from the start date. You choose the content that appears on these calendars via the (caldisplay) option on the Options sheet.

			May 2021			
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17 Main (s1): Ingrid Bergman, Shantanu Narayen, Grace Kelly, Gary Cooper, Ian Siegel, Carole Lombard, Ava Gardner, Rita Hayworth, Lynn Jurich, Brian Halligan, Mgr:Burt Lancaster, Mgr:Clark Gable	18 Main (s1): Jean Harlow, Laurence Olivier, Greta Garbo, Dan Rosensweig, Satya Nadella, Eric Yuan, James Dean, Marx Brothers, Lillian Gish, Buster Keaton, Mgr:Burt Lancaster, Mgr:Clark Gable	19 Main (s1): Katharine Hepburn, Gary Cooper, William Holden, Ryan Smith, Lynn Jurich, Lillian Gish, Manny Medina, Satya Nadella, Annette Brüls, Grace Kelly, Mgr:Burt Lancaster, Mgr:Clark Gable	20 Main (s1): Greta Garbo, Sundar Pichai, James Dean, Laurence Olivier, Joan Crawford, Audrey Hepburn, Katharine Hepburn, Marilyn Monroe, Lauren Bacall, Timothy Cook, Mgr:Burt Lancaster, Mgr:Clark Gable	21 Main (s1): Bert Bean, Lauren Bacall, Timothy Cook, Grace Kelly, Ingrid Bergman, Carole Lombard, Spencer Tracy, Barbara Stanwyck, Edward G. Robinson, Cary Grant, Mgr:Burt Lancaster, Mgr:Clark Gable	22
23	24 Main (s1): William Holden, Lynn Jurich, Manny Medina, Annette Brüls, Judy Garland, Ava Gardner, Kirk Douglas, Brian Halligan, Patrick Pacious, Robert Frist, Mgr:Burt Lancaster, Mgr:Clark Gable	25 Main (s1): Eric Yuan, Mary Pickford, Ingrid Bergman, Patrick Pacious, James Dean, Vivien Leigh, Shantanu Narayen, Buster Keaton, Carole Lombard, Audrey Hepburn, Mgr:Burt Lancaster, Mgr:Clark Gable	26 Main (s1): Cary Grant, Annette Brüls, James Dean, Ian Siegel, Grace Kelly, Orson Welles, Lynn Jurich, Charlie Chaplin, Claudette Colbert, Elizabeth Taylor, Mgr:Burt Lancaster, Mgr:Clark Gable	27 Main (s1): Jean Harlow, Buster Keaton, Bert Bean, Joan Crawford, Sundar Pichai, Lillian Gish, Timothy Cook, Judy Garland, Brian Halligan, Barbara Stanwyck, Mgr:Burt Lancaster, Mgr:Clark Gable	28 Main (s1): Jean Harlow, Katharine Hepburn, Kirk Douglas, Lauren Bacall, Ingrid Bergman, Grace Kelly, Carole Lombard, Shantanu Narayen, Dan Rosensweig, Marx Brothers, Mgr:Burt Lancaster, Mgr:Clark Gable	29
30	31 Memorial Day					

The Cal Content Sheet

The (caldisplay) option on the Options sheet determines which set of employees will be displayed on the Calendar sheet. You can choose any of the possible Office (Shift) selections.

Note: when you change the selector, the number of employees working each day changes and therefore the space taken inside each calendar grid changes. If you are not able to see all the employee names on the Calendar, click in the upper left corner of the Calendar sheet to highlight all rows and columns and then click the "Wrap Text" button in the alignment section of the ribbon (twice). Once turns wrapping off and the 2nd time turns it back on. That should resize each calendar grid cell and all the names should now be visible. (Sorry, there is no way for me to do this for you without a macro).

6							
					1	13	16
Date	Holiday	Display on Calendar		row	Main (s1)	Spring St. (s2)	Uptown (s3)
Monday, May 17, 2021		Main (s1): Ingrid Bergman, Shantanu Naraye		1	Main (s1): Ingrid Bergm	Spring St. (s2): John Wayr	Uptown (s3): Sundar Pich
Tuesday, May 18, 2021		Main (s1): Jean Harlow, Laurence Olivier, Gre		2	Main (s1): Jean Harlow,	Spring St. (s2): Vlad Shmu	Uptown (s3): Charlie Cha
Wednesday, May 19, 2021		Main (s1): Katharine Hepburn, Gary Cooper,		3	Main (s1): Katharine He	Spring St. (s2): Vlad Shmu	Uptown (s3): Gene Kelly,
Thursday, May 20, 2021		Main (s1): Greta Garbo, Sundar Pichai, James		4	Main (s1): Greta Garbo,	Spring St. (s2): Gene Kelly	Uptown (s3): Edward G. F
Friday, May 21, 2021		Main (s1): Bert Bean, Lauren Bacall, Timothy		5	Main (s1): Bert Bean, La	Spring St. (s2): John Wayr	Uptown (s3): Sophia Lore
Saturday, May 22, 2021							
Sunday, May 23, 2021							
Monday, May 24, 2021		Main (s1): William Holden, Lynn Jurich, Mani		6	Main (s1): William Hold	Spring St. (s2): Vlad Shmu	Uptown (s3): Ryan Smith,
Tuesday, May 25, 2021		Main (s1): Eric Yuan, Mary Pickford, Ingrid Be		7	Main (s1): Eric Yuan, Ma	Spring St. (s2): Vlad Shmu	Uptown (s3): Charlie Cha
Wednesday, May 26, 2021		Main (s1): Cary Grant, Annette Brüls, James I		8	Main (s1): Cary Grant, A	Spring St. (s2): Rita Hayw	Uptown (s3): Humphrey B
Thursday, May 27, 2021		Main (s1): Jean Harlow, Buster Keaton, Bert I		9	Main (s1): Jean Harlow,	Spring St. (s2): Orson Wel	Uptown (s3): Shirley Tem
Friday, May 28, 2021		Main (s1): Jean Harlow, Katharine Hepburn,		10	Main (s1): Jean Harlow,	Spring St. (s2): Eric Yuan,	Uptown (s3): Daniel Dine
Saturday, May 29, 2021							
Sunday, May 30, 2021							
Monday, May 31, 2021	Memorial Day	Memorial Day					
Tuesday, June 1, 2021		Main (s1): Edward G. Robinson, Mitch Snyde		11	Main (s1): Edward G. Ro	Spring St. (s2): Judy Garla	Uptown (s3): Patrick Paci
Wednesday, June 2, 2021		Main (s1): Annette Brüls, Ryan Smith, Gary C		12	Main (s1): Annette Brüls	Spring St. (s2): Marilyn M	Uptown (s3): Mary Pickfo
Thursday, June 3, 2021		Main (s1): Greta Garbo, Claudette Colbert, E		13	Main (s1): Greta Garbo,	Spring St. (s2): Barbara St	Uptown (s3): Gene Kelly,
Friday, June 4, 2021		Main (s1): Shirley Temple, Jean Harlow, Gret		14	Main (s1): Shirley Temp	Spring St. (s2): Vivien Leig	Uptown (s3): Marx Broth
Saturday, June 5, 2021							
Sunday, June 6, 2021							
Monday, June 7, 2021		Main (s1): Robert Frist, Sidney Poitier, Sophia		15	Main (s1): Robert Frist, S	Spring St. (s2): Henry Sch	Uptown (s3): Charlie Cha
Tuesday, June 8, 2021		Main (s1): Buster Keaton, Ingrid Bergman, Da		16	Main (s1): Buster Keator	Spring St. (s2): Mae West	Uptown (s3): Katharine H
Wednesday, June 9, 2021		Main (s1): Robert Mitchum, Marilyn Monroe		17	Main (s1): Robert Mitch	Spring St. (s2): Audrey He	Uptown (s3): Ryan Smith,
Thursday, June 10, 2021		Main (s1): Jean Harlow, Claudette Colbert, G		18	Main (s1): Jean Harlow,	Spring St. (s2): Elizabeth T	Uptown (s3): Brian Halliga
Friday, June 11, 2021		Main (s1): Edward G. Robinson, Sundar Picha		19	Main (s1): Edward G. Ro	Spring St. (s2): Orson Wel	Uptown (s3): Marx Broth
Saturday, June 12, 2021							
Sunday, June 13, 2021							

The Export Google Sheet

This sheet is used to export data to a xxx.csv file that can then be used to import into a shared Google Calendar. You can ask all your employees to check this shared calendar for the work schedule.

Do a File - Save As and change the type to: **CSV (Comma delimited) (*.csv)**

You can make the filename whatever you want. Then go to your google calendar on the web and create a new calendar. Using the settings icon for that calendar, you can import this csv file. If you change the schedule and want to republish it, just delete the old calendar, and create a new one, then import the new csv file.

I suggest you not import these events to your main Google Calendar because it is impossible to bulk delete all events. It is best to import to alternate calendars that can easily be deleted and recreated.

Subject	Start Date	Start Time	End Date	End Time	All Day Event	Description	Location	Private
Scheduling-123: Main (s1)	6/1/2021	6:00:00 AM	6/1/2021	2:00:00 PM	FALSE	Main (s1): Edward G. Robinson, Mitch Snyder, Spenc	Main (s1)	FALSE
Scheduling-123: Spring St. (s2)	6/1/2021	2:00:00 PM	6/1/2021	10:00:00 PM	FALSE	Spring St. (s2): John Wayne, Claudette Colbert, Timo	Spring St. (s2)	FALSE
Scheduling-123: Uptown (s3)	6/1/2021	10:00:00 PM	6/2/2021	6:00:00 AM	FALSE	Uptown (s3): Patrick Pacious, Robert Frist, Vlad Shm	Uptown (s3)	FALSE
Scheduling-123: Main (s1)	6/2/2021	6:00:00 AM	6/2/2021	2:00:00 PM	FALSE	Main (s1): Annette Brüls, Robert Frist, Gary Cooper,	Main (s1)	FALSE
Scheduling-123: Spring St. (s2)	6/2/2021	2:00:00 PM	6/2/2021	10:00:00 PM	FALSE	Spring St. (s2): Lillian Gish, Bette Davis, Bert Bean	Spring St. (s2)	FALSE
Scheduling-123: Uptown (s3)	6/2/2021	10:00:00 PM	6/3/2021	6:00:00 AM	FALSE	Uptown (s3): Marilyn Monroe, Katharine Hepburn, K	Uptown (s3)	FALSE
Scheduling-123: Main (s1)	6/3/2021	6:00:00 AM	6/3/2021	2:00:00 PM	FALSE	Main (s1): Greta Garbo, Claudette Colbert, Edward G	Main (s1)	FALSE
Scheduling-123: Spring St. (s2)	6/3/2021	2:00:00 PM	6/3/2021	10:00:00 PM	FALSE	Spring St. (s2): Audrey Hepburn, Orson Welles, Jean	Spring St. (s2)	FALSE
Scheduling-123: Uptown (s3)	6/3/2021	10:00:00 PM	6/4/2021	6:00:00 AM	FALSE	Uptown (s3): Gene Kelly, James Stewart, John Wayne	Uptown (s3)	FALSE
Scheduling-123: Main (s1)	6/4/2021	6:00:00 AM	6/4/2021	2:00:00 PM	FALSE	Main (s1): Shirley Temple, Jean Harlow, Greta Garbo	Main (s1)	FALSE
Scheduling-123: Spring St. (s2)	6/4/2021	2:00:00 PM	6/4/2021	10:00:00 PM	FALSE	Spring St. (s2): Vivien Leigh, Laurence Olivier, Kathari	Spring St. (s2)	FALSE
Scheduling-123: Uptown (s3)	6/4/2021	10:00:00 PM	6/5/2021	6:00:00 AM	FALSE	Uptown (s3): Marx Brothers, Manny Medina, James	Uptown (s3)	FALSE
Scheduling-123: Main (s1)	6/7/2021	6:00:00 AM	6/7/2021	2:00:00 PM	FALSE	Main (s1): Robert Frist, Sidney Poitier, Sophia Loren,	Main (s1)	FALSE
Scheduling-123: Spring St. (s2)	6/7/2021	2:00:00 PM	6/7/2021	10:00:00 PM	FALSE	Spring St. (s2): Eric Yuan, Robert Mitchum, William H	Spring St. (s2)	FALSE
Scheduling-123: Uptown (s3)	6/7/2021	10:00:00 PM	6/8/2021	6:00:00 AM	FALSE	Uptown (s3): Charlie Chaplin, Spencer Tracy, Marilyn	Uptown (s3)	FALSE
Scheduling-123: Main (s1)	6/8/2021	6:00:00 AM	6/8/2021	2:00:00 PM	FALSE	Main (s1): Buster Keaton, Greta Garbo, Daniel Dines,	Main (s1)	FALSE
Scheduling-123: Spring St. (s2)	6/8/2021	2:00:00 PM	6/8/2021	10:00:00 PM	FALSE	Spring St. (s2): Lillian Gish, Claudette Colbert, Charlie	Spring St. (s2)	FALSE
Scheduling-123: Uptown (s3)	6/8/2021	10:00:00 PM	6/9/2021	6:00:00 AM	FALSE	Uptown (s3): James Stewart, Henry Schuck, Orson W	Uptown (s3)	FALSE
Scheduling-123: Main (s1)	6/9/2021	6:00:00 AM	6/9/2021	2:00:00 PM	FALSE	Main (s1): Robert Mitchum, Mae West, William Hold	Main (s1)	FALSE
Scheduling-123: Spring St. (s2)	6/9/2021	2:00:00 PM	6/9/2021	10:00:00 PM	FALSE	Spring St. (s2): Vlad Shmunis, Sophia Loren, Shirley T	Spring St. (s2)	FALSE
Scheduling-123: Uptown (s3)	6/9/2021	10:00:00 PM	6/10/2021	6:00:00 AM	FALSE	Uptown (s3): Ryan Smith, Marlene Dietrich, Katharin	Uptown (s3)	FALSE
Scheduling-123: Main (s1)	6/10/2021	6:00:00 AM	6/10/2021	2:00:00 PM	FALSE	Main (s1): Jean Harlow, Claudette Colbert, Grace Kel	Main (s1)	FALSE
Scheduling-123: Spring St. (s2)	6/10/2021	2:00:00 PM	6/10/2021	10:00:00 PM	FALSE	Spring St. (s2): Charlie Chaplin, Sundar Pichai, Elizabe	Spring St. (s2)	FALSE
Scheduling-123: Uptown (s3)	6/10/2021	10:00:00 PM	6/11/2021	6:00:00 AM	FALSE	Uptown (s3): Bert Bean, Shirley Temple, Patrick Paci	Uptown (s3)	FALSE
Scheduling-123: Main (s1)	6/11/2021	6:00:00 AM	6/11/2021	2:00:00 PM	FALSE	Main (s1): Claudette Colbert, Sundar Pichai, Edward	Main (s1)	FALSE
Scheduling-123: Spring St. (s2)	6/11/2021	2:00:00 PM	6/11/2021	10:00:00 PM	FALSE	Spring St. (s2): Orson Welles, Mitch Snyder, Marlene	Spring St. (s2)	FALSE
Scheduling-123: Uptown (s3)	6/11/2021	10:00:00 PM	6/12/2021	6:00:00 AM	FALSE	Uptown (s3): Marx Brothers, Audrey Hepburn, Dan F	Uptown (s3)	FALSE
Scheduling-123: Main (s1)	6/14/2021	6:00:00 AM	6/14/2021	2:00:00 PM	FALSE	Main (s1): Ava Gardner, Bette Davis, Marlon Brando	Main (s1)	FALSE
Scheduling-123: Spring St. (s2)	6/14/2021	2:00:00 PM	6/14/2021	10:00:00 PM	FALSE	Spring St. (s2): Vivien Leigh, Gene Kelly, Gary Cooper	Spring St. (s2)	FALSE

The Export Outlook Sheet

This sheet is used to export data to a xxx.csv file that can then be used to import into a shared Microsoft Outlook Calendar. You can ask all your employees to check this shared calendar for the work schedule.

Do a File - Save As and change the type to: **CSV (Comma delimited) (*.csv)**

You can make the filename whatever you want. Then go to the place in Outlook where you can Import events to the calendar and reference this saved file.

Subject	Location	Start Time	Start Date	End Time	End Date	Description	Private
Scheduling-123: Main (s1)	Main (s1)	6:00:00 AM	6/1/2021	2:00:00 PM	6/1/2021	Main (s1): Edward G. Robinson, Mitch Snyder, Spen	No
Scheduling-123: Spring St. (s2)	Spring St. (s2)	2:00:00 PM	6/1/2021	10:00:00 PM	6/1/2021	Spring St. (s2): John Wayne, Claudette Colbert, Timo	No
Scheduling-123: Uptown (s3)	Uptown (s3)	10:00:00 PM	6/1/2021	6:00:00 AM	6/2/2021	Uptown (s3): Patrick Pacious, Robert Frist, Vlad Shm	No
Scheduling-123: Main (s1)	Main (s1)	6:00:00 AM	6/2/2021	2:00:00 PM	6/2/2021	Main (s1): Annette Brüls, Robert Frist, Gary Cooper,	No
Scheduling-123: Spring St. (s2)	Spring St. (s2)	2:00:00 PM	6/2/2021	10:00:00 PM	6/2/2021	Spring St. (s2): Lillian Gish, Bette Davis, Bert Bean	No
Scheduling-123: Uptown (s3)	Uptown (s3)	10:00:00 PM	6/2/2021	6:00:00 AM	6/3/2021	Uptown (s3): Marilyn Monroe, Katharine Hepburn,	No
Scheduling-123: Main (s1)	Main (s1)	6:00:00 AM	6/3/2021	2:00:00 PM	6/3/2021	Main (s1): Greta Garbo, Claudette Colbert, Edward (	No
Scheduling-123: Spring St. (s2)	Spring St. (s2)	2:00:00 PM	6/3/2021	10:00:00 PM	6/3/2021	Spring St. (s2): Audrey Hepburn, Orson Welles, Jean	No
Scheduling-123: Uptown (s3)	Uptown (s3)	10:00:00 PM	6/3/2021	6:00:00 AM	6/4/2021	Uptown (s3): Gene Kelly, James Stewart, John Wayn	No
Scheduling-123: Main (s1)	Main (s1)	6:00:00 AM	6/4/2021	2:00:00 PM	6/4/2021	Main (s1): Shirley Temple, Jean Harlow, Greta Garb	No
Scheduling-123: Spring St. (s2)	Spring St. (s2)	2:00:00 PM	6/4/2021	10:00:00 PM	6/4/2021	Spring St. (s2): Vivien Leigh, Laurence Olivier, Kathar	No
Scheduling-123: Uptown (s3)	Uptown (s3)	10:00:00 PM	6/4/2021	6:00:00 AM	6/5/2021	Uptown (s3): Marx Brothers, Manny Medina, James	No
Scheduling-123: Main (s1)	Main (s1)	6:00:00 AM	6/7/2021	2:00:00 PM	6/7/2021	Main (s1): Robert Frist, Sidney Poitier, Sophia Loren	No
Scheduling-123: Spring St. (s2)	Spring St. (s2)	2:00:00 PM	6/7/2021	10:00:00 PM	6/7/2021	Spring St. (s2): Eric Yuan, Robert Mitchum, William H	No
Scheduling-123: Uptown (s3)	Uptown (s3)	10:00:00 PM	6/7/2021	6:00:00 AM	6/8/2021	Uptown (s3): Charlie Chaplin, Spencer Tracy, Marily	No
Scheduling-123: Main (s1)	Main (s1)	6:00:00 AM	6/8/2021	2:00:00 PM	6/8/2021	Main (s1): Buster Keaton, Greta Garbo, Daniel Dines	No
Scheduling-123: Spring St. (s2)	Spring St. (s2)	2:00:00 PM	6/8/2021	10:00:00 PM	6/8/2021	Spring St. (s2): Lillian Gish, Claudette Colbert, Charli	No
Scheduling-123: Uptown (s3)	Uptown (s3)	10:00:00 PM	6/8/2021	6:00:00 AM	6/9/2021	Uptown (s3): James Stewart, Henry Schuck, Orson V	No
Scheduling-123: Main (s1)	Main (s1)	6:00:00 AM	6/9/2021	2:00:00 PM	6/9/2021	Main (s1): Robert Mitchum, Mae West, William Hol	No
Scheduling-123: Spring St. (s2)	Spring St. (s2)	2:00:00 PM	6/9/2021	10:00:00 PM	6/9/2021	Spring St. (s2): Vlad Shmunis, Sophia Loren, Shirley T	No
Scheduling-123: Uptown (s3)	Uptown (s3)	10:00:00 PM	6/9/2021	6:00:00 AM	6/10/2021	Uptown (s3): Ryan Smith, Marlene Dietrich, Katharii	No
Scheduling-123: Main (s1)	Main (s1)	6:00:00 AM	6/10/2021	2:00:00 PM	6/10/2021	Main (s1): Jean Harlow, Claudette Colbert, Grace Ke	No
Scheduling-123: Spring St. (s2)	Spring St. (s2)	2:00:00 PM	6/10/2021	10:00:00 PM	6/10/2021	Spring St. (s2): Charlie Chaplin, Sundar Pichai, Elizab	No
Scheduling-123: Uptown (s3)	Uptown (s3)	10:00:00 PM	6/10/2021	6:00:00 AM	6/11/2021	Uptown (s3): Bert Bean, Shirley Temple, Patrick Paci	No
Scheduling-123: Main (s1)	Main (s1)	6:00:00 AM	6/11/2021	2:00:00 PM	6/11/2021	Main (s1): Claudette Colbert, Sundar Pichai, Edward	No
Scheduling-123: Spring St. (s2)	Spring St. (s2)	2:00:00 PM	6/11/2021	10:00:00 PM	6/11/2021	Spring St. (s2): Orson Welles, Mitch Snyder, Marlen	No
Scheduling-123: Uptown (s3)	Uptown (s3)	10:00:00 PM	6/11/2021	6:00:00 AM	6/12/2021	Uptown (s3): Marx Brothers, Audrey Hepburn, Dan	No
Scheduling-123: Main (s1)	Main (s1)	6:00:00 AM	6/14/2021	2:00:00 PM	6/14/2021	Main (s1): Ava Gardner, Bette Davis, Marlon Brando	No
Scheduling-123: Spring St. (s2)	Spring St. (s2)	2:00:00 PM	6/14/2021	10:00:00 PM	6/14/2021	Spring St. (s2): Vivien Leigh, Gene Kelly, Gary Coope	No

The Never Worked Together Sheet

This sheet highlights each employee pair that have never been scheduled to work together on the same date. If you see a given employee with a lot of x's it is most likely due to the scheduling restrictions in place for that employee. Try turning (restrictions) to Off on the Options page to see how this reduces. Or you can set (endsched) on the Options page to a date further out in time to give more opportunities for employees to be paired together.

ID	Employee Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
		Audrey Hepburn	Ava Gardner	Barbara Stanwyck	Bette Davis	Burt Lancaster	Buster Keaton	Carole Lombard	Cary Grant	Charlie Chaplin	Clark Gable	Claudette Colbert	Edward G. Robinson	Elizabeth Taylor	Fred Astaire	Gary Cooper	Gene Kelly	Ginger Rogers	Grace Kelly	Gregory Peck	Greta Garbo	Henry Fonda	Humphrey Bogart	Ingrid Bergman	James Cagney	James Dean	James Stewart	Jean Harlow	Joan Crawford	John Wayne	Judy Garland
1	Audrey Hepburn																	x		x		x			x						
2	Ava Gardner											x						x				x	x		x				x		
3	Barbara Stanwyck																	x				x			x						
4	Bette Davis																	x				x			x						
5	Burt Lancaster																	x				x			x						
6	Buster Keaton																	x				x	x		x						
7	Carole Lombard																	x				x	x		x				x		
8	Cary Grant																	x				x			x						
9	Charlie Chaplin																	x				x			x						
10	Clark Gable																	x				x			x						
11	Claudette Colbert		x															x				x			x						
12	Edward G. Robinson																	x				x	x		x						
13	Elizabeth Taylor																	x				x			x						
14	Fred Astaire																	x				x			x						
15	Gary Cooper																	x				x			x				x		
16	Gene Kelly																	x				x	x		x						
17	Ginger Rogers	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x
18	Grace Kelly																	x				x			x						
19	Gregory Peck	x																x				x			x						
20	Greta Garbo																	x				x			x						
21	Henry Fonda	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x
22	Humphrey Bogart		x				x	x					x				x	x				x			x			x	x		
23	Ingrid Bergman																	x				x			x						
24	James Cagney	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x
25	James Dean																	x				x			x						
26	James Stewart																	x				x			x						
27	Jean Harlow																	x				x	x		x						
28	Joan Crawford		x					x								x		x				x	x		x						
29	John Wayne																	x				x			x						
30	Judy Garland																	x				x			x						

The Worked Together Sheet

This sheet counts how many times the employee pair represented by the intersection have been scheduled to work together on the same date across the whole schedule. This is mostly used to feed the Never Worked Together sheet.

ID	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1		2	6	5	17	5	3	1	5	17	4	8	7	17	5	5	0	7	0	6	0	1	5	0	6	4	4	2	7	7
2	2		3	4	11	1	1	1	3	11	0	3	3	11	4	2	0	5	1	3	0	0	3	0	3	2	3	0	4	6
3	6	3		7	18	6	2	5	6	18	6	6	6	18	4	4	0	4	1	5	0	2	5	0	6	4	5	3	8	9
4	5	4	7		15	3	1	2	4	15	3	4	3	15	6	4	0	7	1	2	0	2	4	0	3	3	3	1	3	8
5	17	11	18	15		22	14	10	18	63	23	21	20	63	21	17	0	26	6	21	0	5	25	0	22	19	24	7	26	25
6	5	1	6	3	22		6	2	9	22	12	7	5	22	5	8	0	3	1	9	0	0	10	0	13	10	14	4	8	7
7	3	1	2	1	14	6		2	6	14	7	6	5	14	6	2	0	7	2	4	0	0	7	0	4	3	5	0	5	4
8	1	1	5	2	10	2	2		5	10	4	3	4	10	1	1	0	6	3	4	0	3	8	0	4	4	1	1	5	2
9	5	3	6	4	18	9	6	5		18	6	6	4	18	6	2	0	7	2	4	0	2	8	0	7	6	5	1	7	5
10	17	11	18	15	63	22	14	10	18		23	21	20	63	21	17	0	26	6	21	0	5	25	0	22	19	24	7	26	25
11	4	0	6	3	23	12	7	4	6	23		10	9	23	6	8	0	9	4	9	0	1	13	0	10	11	11	5	13	8
12	8	3	6	4	21	7	6	3	6	21	10		12	21	6	4	0	11	2	7	0	0	10	0	3	1	6	5	12	5
13	7	3	6	3	20	5	5	4	4	20	9	12		20	5	6	0	11	2	10	0	1	9	0	7	4	7	3	11	7
14	17	11	18	15	63	22	14	10	18	63	23	21	20		21	17	0	26	6	21	0	5	25	0	22	19	24	7	26	25
15	5	4	4	6	21	5	6	1	6	21	6	6	5	21		4	0	9	2	3	0	1	6	0	7	4	5	0	8	11
16	5	2	4	4	17	8	2	1	2	17	8	4	6	17	4		0	6	1	8	0	0	5	0	8	9	9	4	6	6
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
18	7	5	4	7	26	3	7	6	7	26	9	11	11	26	9	6	0		1	8	0	4	12	0	4	6	5	2	12	9
19	0	1	1	1	6	1	2	3	2	6	4	2	2	6	2	1	0	1		1	0	2	2	0	2	2	2	1	2	1
20	6	3	5	2	21	9	4	4	4	21	9	7	10	21	3	8	0	8	1		0	1	11	0	12	8	9	3	9	9
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0
22	1	0	2	2	5	0	0	3	2	5	1	0	1	5	1	0	0	4	2	1	0		1	0	1	2	0	0	2	4
23	5	3	5	4	25	10	7	8	8	25	13	10	9	25	6	5	0	12	2	11	0	1		0	9	8	9	2	9	9
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0
25	6	3	6	3	22	13	4	4	7	22	10	3	7	22	7	8	0	4	2	12	0	1	9	0		14	14	4	12	9
26	4	2	4	3	19	10	3	4	6	19	11	1	4	19	4	9	0	6	2	8	0	2	8	0	14		13	3	9	9
27	4	3	5	3	24	14	5	1	5	24	11	6	7	24	5	9	0	5	2	9	0	0	9	0	14	13		4	12	9
28	2	0	3	1	7	4	0	1	1	7	5	5	3	7	0	4	0	2	1	3	0	0	2	0	4	3	4		5	2
29	7	4	8	3	26	8	5	5	7	26	13	12	11	26	8	6	0	12	2	9	0	2	9	0	12	9	12	5		9
30	7	6	9	8	25	7	4	2	5	25	8	5	7	25	11	6	0	9	1	9	0	4	9	0	9	9	9	2	9	

The Compete Sheet

This sheet only populates when you are using Round Robin scheduling. In this example, we set up Schedule-123 for Double Round Robin scheduling of 5 teams. You see two reference tables for Round Robin and Double Round Robin indicating all the possible matches. Then you see a Scheduled column indicating which matches have been scheduled by the tool so far.

Round Robin	Home	Away		Double Round Robin	Home	Away			Scheduled
1 - 2	1	2		1 - 2	1	2			
1 - 3	1	3		1 - 3	1	3			1H vs. 2A
1 - 4	1	4		1 - 4	1	4			1H vs. 3A
1 - 5	1	5		1 - 5	1	5			1H vs. 4A
2 - 3	2	3		2 - 1	2	1			1H vs. 5A
2 - 4	2	4		2 - 3	2	3			2H vs. 1A
2 - 5	2	5		2 - 4	2	4			2H vs. 3A
3 - 4	3	4		2 - 5	2	5			2H vs. 4A
3 - 5	3	5		3 - 1	3	1			2H vs. 5A
4 - 5	4	5		3 - 2	3	2			3H vs. 1A
				3 - 4	3	4			3H vs. 2A
				3 - 5	3	5			3H vs. 4A
				4 - 1	4	1			3H vs. 5A
				4 - 2	4	2			4H vs. 1A
				4 - 3	4	3			4H vs. 2A
				4 - 5	4	5			4H vs. 3A
				5 - 1	5	1			4H vs. 5A
				5 - 2	5	2			5H vs. 1A
				5 - 3	5	3			5H vs. 2A
				5 - 4	5	4			5H vs. 3A
									5H vs. 4A

This sheet just lists all the combinations of team vs team in a Round Robin and Double Round Robin competition.
The Scheduled column lists the unique matchups scheduled so far on the Flat Assign sheet.
None of this is valid if the (method) was not set to Round Robin or Double Round Robin on the Options sheet.
The Options sheet is set to use Double Round Robin Sports Scheduling

Required Matches	20
Scheduled Matches	20

Special Situations

How do you handle employee changes? (Termination, new hire, leave of absence, etc.)

This section is important if any employee changes occur due to perhaps an employee quitting, getting fired, taking a leave, or maybe a new employee joining the business.

- **New Hires:** The easiest is if a new employee hires on. Change the total employee count (employees) on the Options sheet. That will create the next employee ID on the Names sheet. e.g., if you changed the (employees) Option from 30 to 31, you would now see a new row at the bottom of the employee names table on the Names sheet for ID 31. Fill out their employee name and any scheduling restrictions they may have.
    - **Override No:** If you did not lock in the previous schedule using the Override sheet, you should now see employee 31 scheduled to work on certain days.
    - **Override Yes:** If you did lock in the previous schedule using the Override sheet then all work slots would have been previously assigned to employees 1-30 and this new employee will not get assigned. You have a few choices here. You can manually change the Override sheet and record employee ID 31 in place of previously scheduled employees. Or you can delete some or all the rows on the Override sheet causing those dates, office, shifts to be rescheduled. The hope here is that the auto-scheduling logic picks the new employee ID 31 for some of those assignments.
- **Removed Employees:** This is more complicated. Let us use the example where you have 30 employees, and the schedule has already been created and communicated. Assume the employee with ID 15 goes away. You should ***NOT*** change the (employees) Option from 30 to 29 because that will cause each named employee on the Names sheet to now get a new ID number. It is best if you just blank out the name for ID 15 on the Names sheet and set the role column to None. Setting the role to anything not defined as one of your valid roles in your business has the net effect of never scheduling that employee ID. Ok, that takes care of the auto-scheduling logic never trying to schedule ID 15 again.
    - **Override No:** If you did not lock in the previous schedule using the Override sheet, you should now see a brand-new assignment schedule minus employee ID 15 in the mix.
    - **Override Yes:** If you did lock in the previous schedule using the Override sheet, then ID 15 will have been assigned certain work slots. You have a few choices here. You can manually change the Override sheet and record any other employee ID in places where ID 15 was previously scheduled. Or you can delete all of ID 15's rows on the Override sheet causing those dates, office, shifts to be rescheduled. The auto-scheduling logic will pick new employees for those assignments.
- **Remove and Replace:** If you removed an employee and later replaced them with a new hire... Staying with the example of ID 15 previously removed as described above, you can just reuse the ID 15 row on the Names sheet. Assign the new employee name and restrictions on the ID 15 row and change the role from None to one or more valid roles (or blank it if the new person is general Staff).

- **Downsizing:** If you downsize your business permanently and go from say 30 total employees to 25. Follow the Removed Employees guidance above for each of the 5 people you are removing from the business. When the previously communicated schedule expires or when you are just ready to redo the whole schedule do this:
    1. Delete all rows on the Override sheet.
    2. Change the (employees) Option on the Options sheet from 30 to 25.
    3. Sort or move the employee names, restrictions, and roles on the Names sheet so they align with ID's 1-25. They do not need to align with the previous ID numbers; you just need to fill in the data for ID's 1-25. They will all be assigned on the new schedule.

Using multiple copies of the Scheduling-123 tool

You can copy this excel file and make 2 or 3 differently named copies. Each can be configured different from the others. Or they can all be configured the same way except for the date span of the schedule. Maybe file 1 covers May and June, while file 2 covers July and August, etc.

Can I use the tool for dispatch scheduling?

An example of dispatch scheduling is a plumbing business or perhaps an HVAC business. Here you have a variety of technicians on staff, and they visit a different client/homeowner every day. This tool can be used with minor tweaks:

- (who) – All the technicians can be entered with their appropriate (whys) such as helper, service technician, specialist, diagnostic specialist, lead plumber, quoter, etc.
- (what) – They are “working” or “servicing”
- (where) – You cannot make these the actual address of each client. There would be thousands over the course of several months. Instead, break up your days into chunks like Job1, Job2, Job3, etc. or 8am Job, 10am Job, 12pm Job, etc. or Client 1, Client 2, Client 3, etc.
- (when) – Ditto, break up the days into chunks. You might schedule a job every 2 hrs. Or dispatch specialists for longer jobs of 4 hrs each. So, you might end up with a (when) table of 8am (2hrs), 10am (2hrs), 12pm (2hrs), 2pm (2hrs), 4pm (2hrs), 8am (4hrs), 12pm (4 hrs)
- (why) – e.g., helper, service technician, specialist, diagnostic specialist, lead plumber, quoter, etc.

Then you would have to keep a separate table by date detailing the actual client address for Job 1 at 8am, Job 2 at 10am, Job 3 at 12pm, etc. The tool will schedule the right person and indicate they are working on Job 4 at 2pm for 2hrs on date xx/xx/xxxx. They would have to consult your table for the name and address of that client.

Show me examples of Round Robin or Double Round Robin Scheduling

Remember “Round Robin” means each team or player competes against all others just once. There is a “Home” and “Away” designation, but in single Round Robin it does not matter who is Home and who is Away. For Double Round Robin it does matter. Each team will play each other team in a Home and Away format.

To configure this type of scheduling start with the Options sheet and enter data such as this:

Key Scheduling Elements	
Soccer	(context)
Schedulees	(who)
Playing/Officiating	(what)
Fields	(where)
Starttime	(when)
Role	(why)

We are doing Soccer scheduling of Teams & Referees so we called them collectively "Schedulees". They will be playing each other on various "Fields" at various "Starttimes". The (why) is set to "Role" because we will be defining both Teams and Game Officials.

Core Option Name	Core Value	
# of Schedulees	15	(whocnt) Total nu
Begin Sched		(beginsched) Whe
End Sched		(endsched) End o
Period	Days	(period) Schedule
Sched Days	0101011	(sched_days) A te
Restrictions	On	(restrictions) Off
Method	Double Round Rob	(method) Assignm

The (whocnt) is set to 15 because we have 5 teams and 10 referees. We set the (sched_days) to Monday, Wednesday, and Friday. The method can be set to Round Robin or Double Round Robin (we chose Double Round Robin).

This is the (why) table:

Role Name	Max Same Day	Max Assign	Role Description	Count
Home	1	2	Home Team	5
Away	1	2	Away Team	5
Center Ref	2	2	Main Referee	10
Line Judge	2	2	Side Refs	10

You need a Home and an Away entry as the first 2 items in the above (why) table. You can make them H and A if you would like. You can also add (why's) for other game officials if you want. In this example, our sport is Soccer so we set the Max Same Day value to 1 for the teams whereas we set the Max Same Day value for the referees to 2 so they can be scheduled to do 2 games a day if needed. You can see by the count there are 5 teams and 10 referees. Each team is cable of being the Home or Away team and each referee is capable of being the center ref or either of the side refs.

This is the (when) table:

Starttime Name	Start Time	Hours
9am	9:00:00 AM	2
11am	11:00:00 AM	2

There can be one Gametime per Field or multiple (when's) per (where). Here we chose 2 different game time values of 9am and 11am each lasting 2 hours.

This is the (where) table:

		Role Names from the Role table above										
Fields Name	Starttime Name	Home	Away	Center Ref	Line Judge							Total
Field 1	9am	1	1	1	2							
Field 2	9am	1	1	1	2							
Field 1	11am	1	1	1	2							
Field 2	11am	1	1	1	2							

The (where) table will list the various Fields you have available to schedule teams to play on. Here we have 2 fields and each field hosts 2 games, one at 9am and one at 11am. The key in this type of scheduling is to code 1 Home team vs 1 Away team. You can see we are trying to schedule 1 center ref and 2 side refs per game.

ID	Schedulees	Only Schedule Restrictions (Include)	Never Schedule Restrictions (Exclude)	Role(s)
1	Team 1			Home, Away
2	Team 2			Home, Away
3	Team 3			Home, Away
4	Team 4			Home, Away
5	Team 5			Home, Away
6	Charlie			Center Ref, Line Judge
7	James			Center Ref, Line Judge
8	Susan			Center Ref, Line Judge
9	Alice			Center Ref, Line Judge
10	Bob			Center Ref, Line Judge
11	Larry			Center Ref, Line Judge
12	Bobby D.			Center Ref, Line Judge
13	Mr. Jones			Center Ref, Line Judge
14	Kathy			Center Ref, Line Judge
15	Mary			Center Ref, Line Judge

On the Names sheet we see 5 teams listed and 10 referees listed.

Sports Scheduling Notes

In single Round Robin, each team plays (n-1) times, so with 5 teams each would be scheduled to play 4 times. With Double Round Robin each team plays (n*2)-2 times (with 5 teams each team would play 8 times).

Let us look at what happened when we tried to schedule this using the above example inputs:

	Field 1 (9am) [Home] #1	Field 1 (9am) [Away] #1	Field 1 (9am) [Center Ref] #1	Field 1 (9am) [Line Judge] #1	Field 1 (9am) [Line Judge] #2	Field 2 (9am) [Home] #1	Field 2 (9am) [Away] #1	Field 2 (9am) [Center Ref] #1	Field 2 (9am) [Line Judge] #1	Field 2 (9am) [Line Judge] #2	Field 1 (11am) [Home] #1	Field 1 (11am) [Away] #1	Field 1 (11am) [Center Ref] #1	Field 1 (11am) [Line Judge] #1	Field 1 (11am) [Line Judge] #2	Field 2 (11am) [Home] #1	Field 2 (11am) [Away] #1	Field 2 (11am) [Center Ref] #1	Field 2 (11am) [Line Judge] #1	Field 2 (11am) [Line Judge] #2
Monday, June 21, 2021	1	2	13	10	6	3	4	7	11	14	5	C	13	15	14	C	C	6	10	7
Wednesday, June 23, 2021	1	3	15	8	6	2	4	7	9	10	5	C	8	15	9	C	C	6	10	7
Friday, June 25, 2021	3	1	11	15	6	2	5	7	8	12	4	C	12	8	9	C	C	6	15	7
Monday, June 28, 2021	5	1	9	10	15	2	3	6	7	8	4	C	10	8	9	C	C	6	11	15
Wednesday, June 30, 2021	1	4	12	10	7	3	2	9	15	8	5	C	7	10	12	C	C	13	11	8
Friday, July 2, 2021	1	5	9	15	10	2	C	11	6	12	3	C	9	15	10	4	C	12	6	11
Wednesday, July 7, 2021	2	1	14	7	9	3	5	10	6	15	4	C	14	15	7	C	C	8	6	9
Friday, July 9, 2021	4	5	8	10	7	C	1	9	6	11	C	2	10	11	7	C	3	8	12	6
Monday, July 12, 2021	4	1	8	15	7	5	2	9	10	11	C	3	9	10	6	C	C	7	15	8
Wednesday, July 14, 2021	4	2	6	15	7	5	3	8	9	10	C	C	9	10	6	C	C	7	15	8
Friday, July 16, 2021	4	3	6	11	12	5	C	8	15	9	C	C	9	7	6	C	C	10	11	8
Monday, July 19, 2021	5	4	12	15	11	C	C	13	6	7	C	C	8	7	12	C	C	13	15	11
Wednesday, July 21, 2021	C	C	14	10	6	C	C	8	11	13	C	C	14	15	6	C	C	13	10	7
Friday, July 23, 2021	C	C	15	7	6	C	C	8	9	10	C	C	8	15	6	C	C	9	10	7
Monday, July 26, 2021	C	C	11	15	6	C	C	7	8	9	C	C	8	15	6	C	C	9	10	7
Wednesday, July 28, 2021	C	C	10	11	15	C	C	6	7	8	C	C	8	15	6	C	C	9	10	7
Friday, July 30, 2021	C	C	12	10	9	C	C	11	15	7	C	C	8	11	12	C	C	13	10	7

As we just mentioned, each team will only play 8 times and with 5 teams and Double Round Robin format, there will be a total of 20 matches which you can see on the Compete sheet). We allow for 4 matches per day (2 on Field 1 and 2 on Field 2). However, we set the Max Same Day values for the Home and Away teams to 1, so no one team will be able to play twice on the same day. That presents a problem for scheduling the 11 am games on Field 1 and Field 2. There just are not enough teams, so we see a “C” for “Conflict” in those columns. The referee’s Max Same Day value was set to 2 so we never have a “C” in a referee column. You can see on the first date Monday, June 12th referee 13 was chosen twice that day for a 9am game and an 11 am game.

It takes up to Wed July 21 using 3 play days per week to get all the required 20 matches scheduled.

Location of Matches

When we schedule Round Robin or Double Round Robin matches, the location can be a neutral site or the actual location of the Home team. The (where) table can be filled out with multiple Fields indicating we are at a neutral site or with just one Field (perhaps named “Home Team Field”) indicating the game is being played at the Home team’s field. If you have many teams, it

becomes impossible to list the actual locations of each Home team, so we handle it by just saying “Home team field”

What if the version gets updated?

If I post a newer version of Scheduling-123.xlsx and you are actively using an older version, you can either wait to upgrade until you are ready to make a new schedule or download the new version now and populate it with your current data. Either way we are talking about copying data from the old file into the new file:

- All the green cells on the Options sheet need to be copied and pasted into the new file
- The Holidays table needs to be copied (since this in in the future, take this time to extend it or update it)
- The green cells on the Names sheet need to be copied over
- The green cells on the Override sheet need to be copied over, but remember that is the prior schedule. You may wish to not do this and have the new version generate a new schedule.

Fellow Excel Geeks

I wrote this to learn about dynamic arrays and this tool uses them extensively. Any cell with a background fill of yellow uses a dynamic array in some way. If you want to learn how to use them study these cells.

The key assignment formula

On the Flat Assign sheet in column C you will see a formula like below. I will try to explain pieces of it. Each row in Flat Assign represents a different scheduling slot based on date, who, where, when, and why. If we have 10 total employees, we want to find the first one without any scheduling restrictions that could be scheduled into this slot. We examine multiple arrays of the same length. Here is an example where we have 10 employees:

Employee ID	1	2	3	4	5	6	7	8	9	10
Bad_day=””	True	False	True	True	True	False	False	True	True	True
Bad_where=””	False	True	True	True	False	True	True	True	True	False
Assigned_in_period<max	True	True	True	True	True	True	False	False	True	True
Assigned_in_date=0	True	True	True	True	True	False	True	True	True	True
Correct_role=true	True	True	True	False	True	False	False	True	True	True

- Bad_day=”” – we determine if each employee considers this date a bad day or bad date
- Bad_where=”” – we determine if each employee considers the where/when combo of the scheduling slot to be bad
- Assigned_in_period<max – we look back at previously scheduled slots to see how many times each employee was scheduled and test that against the max
- Assigned_in_date – we look back at scheduling slots for this same date to see if each employee was already scheduled on this date (we cannot schedule them twice on the same day)

- Correct_role=true – we examine the (why) value of the scheduling slot and compare that to each employee to make sure they have that (why) recorded in the Names sheet
- Each column is multiplied rendering a TRUE or FALSE answer (actually and 1 or 0 answer)
- We then look for the first TRUE answer (1) going left to right and take that Employee ID as the person we assign to the work slot. In the above example, we would have chosen Employee ID #3.
- A note about the correct role being true… the work slot for this row could call for a "Staff" employee and employee ID 3 for example, could have blank in their role entry on the Names sheet meaning they are a Staff employee, or they could have "Staff" recorded. We account for either or both.
- We arrange the list of IDs in the array based on the assignment (method). This changes for each row. Here is an example of what the array might look like for the next work slot (row) based on different (method) values:

Method 1	2	3	4	5	6	7	8	9	10	1
Method 2	3	5	7	9	2	4	6	8	10	2
Method 3	5	9	3	7	1	5	9	3	7	1
Method blank	6	3	1	10	8	2	7	4	5	8

  - Changing the order ensures that if all columns calculate to TRUE and we are picking the first TRUE from left to right, we get a different employee ID from the last row.
- When we added Round Robin Scheduling this formula changed to account for the player vs player matches that were previously scheduled. We use helper column G for this. We can no longer just look back at the previous days of scheduling to see if a single ID was scheduled or not. Instead, we take each employee ID, pair it with a H or A (Home or Away) and count how many times that ID was scheduled. We must also see who it was scheduled against. For example, ID 5 was found 2 times as 5H and 1 time as 5A so it has not yet met its limit. And we intend to pair it with 3A for a "5H vs 3A" matchup. Well, we cannot do that if "3H vs 5A" was already scheduled or if "5H vs 3A" was already scheduled. It is complicated but the formula figures it out.

```
"=IF($A2="""","""",IF(E2<>"""",E2,
LET(rpos,FIND(""[",B2),thiswhy,MID(B2,rpos+1,FIND(""]"",B2)-rpos-1),
hva,IF(rr=FALSE,"""",IF(MID(thiswhy,1,1)=""H"",""H"",IF(MID(thiswhy,1,1)=""A"",""A"","""))),
whymax_period,VLOOKUP(thiswhy,Options!$A$52:$C$61,3,0),
whymax_date,IF(VLOOKUP(thiswhy,Options!$A$52:$C$61,2,0)=0,1,VLOOKUP(thiswhy,Options!$A$52:$C$61,2,0)),
wpos,FIND(""("",B2),thiswhen,MID(B2,wpos+1,FIND("")"",B2)-wpos-1),
factor,IF(OR(rr,method="""),MOD(ROW(C2)*A2,whocnt),method),n,MOD(ROW(C2)*factor,whocnt),start_who,IF(n=0,whocnt,n),
try,SEQUENCE(whocnt,,start_who),next_who,IF(try>whocnt,try-whocnt,try),
date_pos,MATCH($A2,'Bad Dates'!$B$3#,0),
bad_day,INDEX('Bad Dates'!$C$3#,date_pos,next_who),
where_name,MID($B2,1,FIND("")"",$B2)),
where_pos,MATCH(where_name,'Bad Where (When)'!$A$3#,0),
bad_where,INDEX('Bad Where (When)'!$B$3#,where_pos,next_who),
```

```
why_names,INDEX(name_whys,next_who,1),

past_rows,IF(ROW(C1)<(rowcnt*at_where_cnt),ROW(C1),(rowcnt*at_where_cnt)-1),

past_range_date,OFFSET(A2,-1*past_rows,0,past_rows,1),past_range_where,OFFSET(B2,-
1*past_rows,0,past_rows,1),past_range_id,OFFSET(C2,-1*past_rows,0,past_rows,1),

assigned_in_date,COUNTIFS(past_range_id,next_who,past_range_date,A2)+COUNTIFS(past_range_id,next_who,past_range_date,A2
,past_range_where,""*(""&thiswhen&"")*""),

assigned_in_period,IF(hva<>"""",next_who*0,COUNTIFS(past_range_id,next_who)),

rrcnt,IF(hva="""",next_who>0,IF(drr,COUNTIFS(F$1:F1,""*""&next_who&hva&""*"")<(rrwhos-
1),(COUNTIFS(F$1:F1,""*""&next_who&""H*"")+COUNTIFS(F$1:F1,""*""&next_who&""A*""))<(rrwhos-1))),

rrtest,IF(hva="""",next_who>0,IF(hva=""A"",NOT(ISNUMBER(MATCH(C1&""H vs.
""&next_who&""A"",F$1:F1,0)))*IF(drr,next_who>0,NOT(ISNUMBER(MATCH(next_who&""H vs.
""&C1&""A"",F$1:F1,0)))),next_who>0)),

rrself,IF(hva="""",next_who>0,next_who<>C1),

good_conditions,(bad_day="""")*(bad_where="""")*(assigned_in_period<whymax_period)*(assigned_in_date<whymax_date)*(IF(t
hiswhy=default_why,(why_names="""")+(ISNUMBER(SEARCH(default_why,why_names))),ISNUMBER(SEARCH(thiswhy,why_names))))*rrc
nt*rrtest*rrself,

first_good,MATCH(1,good_conditions,0),

IF(ISNA(first_good),""C"",INDEX(next_who,first_good)))))"
```

Formula part	Comment
=IF($A2="","",IF(E2<>"",E2,	A2 being blank means no more dates to schedule E2 not blank means an override is present
LET(rpos,FIND("[",B2), thiswhy,MID(B2,rpos+1,FIND("]",B2)-rpos-1),	RPOS – where can we find the (why) value of this row. THISWHY – what is the (why) value of this row?
hva,IF(rr=FALSE,"",IF(MID(thiswhy,1,1)="H","H",IF(MID(thiswhy,1,1)="A","A",""))),	HVA is Home vs Away. Blank, H, or A
whymax_period,VLOOKUP(thiswhy,Options!$A$52:$C$61,3,0),	WHYMAX – The Max Assign value for THISWHY from the (why) table
whymax_date,IF(VLOOKUP(thiswhy,Options!$A$52:$C$61,2,0)=0,1,VLOOKUP(thiswhy,Options!$A$52:$C$61,2,0)),	WHYMAX_DATE – The Max Same Day value for THISWHY from the (why) table
wpos,FIND("(",B2), thiswhen,MID(B2,wpos+1,FIND(")",B2)-wpos-1),	WPOS – the position where the (when) starts. THISWHEN – the (when) value for this row
factor,IF(OR(rr,method=""),MOD(ROW(C2)*A2,whocnt),method), n,MOD(ROW(C2)*factor,whocnt), start_who,IF(n=0,whocnt,n),	FACTOR is the skipping factor - either 1-9 or mod(row()*date) N is what index in the who array to start at START_WHO becomes the index number in the who array where we start looking. If n was 0 we make it the last who.
try,SEQUENCE(whocnt,,start_who), next_who,IF(try>whocnt,try-whocnt,try),	TRY is a string of index numbers from Start_who to start_who+whocnt NEXT_WHO is a list of (who) index numbers we will use below. If we have 5 as a whocnt and our start_who is 4, this becomes 4,5,1,2,3
date_pos,MATCH($A2,'Bad Dates'!$B$3#,0),	DATE_POS is what row in the Bad Date sheet can we find this scheduling date
bad_day,INDEX('Bad Dates'!$C$3#,date_pos,next_who),	Bad_DAY is an array of blank or some code for each next_who indicating if this date or day is a bad choice for scheduling each ID
where_name,MID($B2,1,FIND(")",$B2)),	WHERE_NAME is something like Main(s1)
where_pos,MATCH(where_name,'Bad Where (When)'!$A$3#,0),	WHERE_POS is the row on the Bad Where (When) sheet where we find the where_name
bad_where,INDEX('Bad Where (When)'!$B$3#,where_pos,next_who),	BAD_WHERE is an array of blank or some code for each next_who indicating is this where_name is a bad place for them to be scheduled

why_names,INDEX(name_whys,next_who,1),	WHY_NAMES is a list of (why) values for each next_who
past_rows,IF(ROW(C1)<(rowcnt*at_where_cnt),ROW(C1),(rowcnt*at_where_cnt)-1),	PAST_ROWS is how many rows backwards we must examine
past_range_id,OFFSET(C2,-1*past_rows,0,past_rows,1), past_range_date,OFFSET(A2,-1*past_rows,0,past_rows,1),past_range_where,OFFSET(B2,-1*past_rows,0,past_rows,1),past_range_id,OFFSET(C2,-1*past_rows,0,past_rows,1),	PAST_RANGE_ID is a range of those rows covering the ID column which is C
past_range_date,OFFSET(A2,-1*past_rows,0,past_rows,1),past_range_where,OFFSET(B2,-1*past_rows,0,past_rows,1),past_range_id,OFFSET(C2,-1*past_rows,0,past_rows,1),	PAST_RANGE_DATE is the same range in col A instead of C to cover the dates
assigned_in_date,COUNTIFS(past_range_id,next_who,past_range_date,A2)+COUNTIFS(past_range_id,next_who,past_range_date,A2,past_range_where,"*("&thiswhen&")*"),	ASSIGNED_IN_DATE is an array counting how many times each ID in next_who was found previously on this same date
assigned_in_period,IF(hva<>"",next_who*0,COUNTIFS(past_range_id,next_who)),	ASSIGNED_IN_PERIOD is an array counting how many times each ID in next_who was found within the scheduling period of rows
rrcnt,IF(hva="",next_who>0,IF(drr,COUNTIFS(F$1:F1,"*"&next_who&hva&"*")<(rrwhos-1),(COUNTIFS(F$1:F1,"*"&next_who&"H*")+COUNTIFS(F$1:F1,"*"&next_who&"A*"))<(rrwhos-1))),	RRCNT – is an array of True/False comparing the count of how many times each ID in next_who was scheduled as the Home or Away team versus whocnt-1. In round robin if you have 5 teams, each will only have 4 matches in single round robin (and they can be either H or A), and in double round robin they can only appear as the Home team 4 times and as the Away team 4 times.
rrtest,IF(hva="",next_who>0,IF(hva="A",NOT(ISNUMBER(MATCH(C1&"H vs. "&next_who&"A",F$1:F1,0)))*IF(drr,next_who>0,NOT(ISNUMBER(MATCH(next_who&"H vs. "&C1&"A",F$1:F1,0)))),next_who>0)),	RRTEST – this is an array of True/False but only calculated on Away lines. We look to see if each ID in next_who was already scheduled against the ID in the preceding line (which is the home team).
rrself,IF(hva="",next_who>0,if(hva=”A”,next_who<>C1,next_who>0)),	RRSELF TRUE/FALSE array – is the previous line the same as each NEXT_WHO (we can’t play ourself)
good_conditions,(bad_day="")*(bad_where="")*(assigned_in_period<whymax_period)*(assigned_in_date<whymax_date)*(IF(thiswhy=default_why,(why_names="")+(ISNUMBER(SEARCH(default_why,why_names))),ISNUMBER(SEARCH(thiswhy,why_names))))*rrcnt*rrtest*rrself,	GOOD_CONDITIONS is an array of 1 or 0 that is the result of multiplying all the previous true/false arrays against each other. So we end up with a 1 or 0 per each ID in next_who.
first_good,MATCH(1,good_conditions,0),	FIRST_GOOD is the index number in next_who of the first 1
IF(ISNA(first_good),"C",INDEX(next_who,first_good)))))	Lastly, we render the index of FIRST_GOOD in next_who to get an ID number that will fill this scheduling slot