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SPEA-V348 Management Science · Week 8 review

# **Solver, and the report that explains it**

Both sessions, every slide, fully revealed. Read it without me in the room.

Mon Oct 12 and Wed Oct 14, 2026

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# The week at a glance

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|                   |                                                                                                                                   |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| <b>Mon Oct 12</b> | What a feasible plan is and the plug-and-check, the three cells Solver needs, standard form, and one worked Solver run            |
| <b>Wed Oct 14</b> | Solver's corner walk, the Answer Report, a 25-minute preview of coefficient endpoints and resource values, then the midterm brief |
| <b>Reading</b>    | Taylor 13e, Chapter 3, pp. 97 to 104, skipping QM for Windows                                                                     |
| <b>Due</b>        | The Week 8 workbook, on Canvas. Tier 1: AI as a tool, with disclosure. The Tier 2 debug practice is optional                      |

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ON THE SITE · the Week 8 page

The three widgets, the two self-checks, both workbook downloads, and the exam link all live here.

[v348.jima.me/week/w08/](https://v348.jima.me/week/w08/)



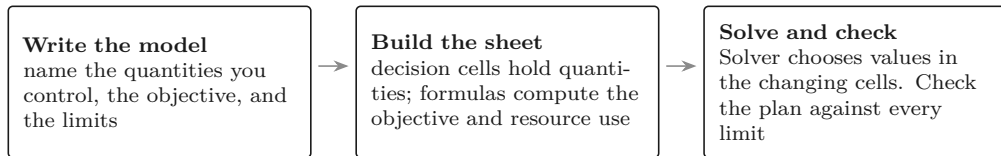
# Session 1

Mon Oct 12

# From a model to Solver

*Variables, objective, and constraints each get cells*

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*Real problems have dozens of variables, too many to draw. Solver does not do different math; it does the **same** math at a size you cannot graph.*

# The tutoring nonprofit

*The question this session answers*

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## PUZZLE

Each week you schedule **reading** sessions ( $x$ ) and **math** sessions ( $y$ ). A reading session delivers **2** impact points, a math session **3**. Room A holds at most **4 reading** sessions, Room B at most **5 math** sessions, and you have volunteers for at most **7 sessions** in total.

**What weekly schedule delivers the most impact?**

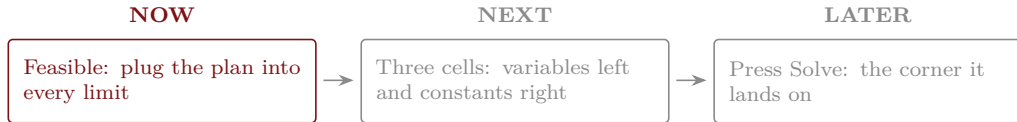
Let  $x$  count reading sessions and  $y$  math sessions: maximize  $2x + 3y$  subject to  $x \leq 4$ ,  $y \leq 5$ ,  $x + y \leq 7$ ,  $x, y \geq 0$ .

*Before optimizing, you need to recognize a plan that is **allowed** at all.*

## Where we are

*Three blocks today, in this order*

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*The puzzle asks for the best weekly schedule. The first block tells you which schedules are allowed at all, the second hands an allowed model to Solver as three kinds of cell, and the third presses the button on that model and reads the three numbers that land in its cells.*

## Feasible means it breaks none of the limits

*The ten-second check: is 3 reading and 5 math a legal week?*

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| Constraint                 | At the plan (3, 5) | Verdict       |
|----------------------------|--------------------|---------------|
| Reading room, $x \leq 4$   | $3 \leq 4$         | fine          |
| Math room, $y \leq 5$      | $5 \leq 5$         | fine, exactly |
| Volunteers, $x + y \leq 7$ | $3 + 5 = 8 \leq 7$ | <b>broken</b> |

Eight sessions need eight volunteers and you have seven. One violation is enough: the plan is **infeasible**, however good its impact score would have been.

*Substitute the plan into **every** constraint. A plan is feasible only if it is on the right side of every line at once.*

# Feasibility, on your laptop

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## IN CLASS

Open the first widget on the Week 8 page and **drag the dot**. It starts at 5 reading and 4 math, which is already over the reading-room and volunteer lines; watch which limits turn red as you move, and find the shaded region where none do. Then park the dot on  $(3, 5)$  and confirm the readout names the volunteers as the broken limit.

ON THE SITE · the feasibility widget

The three limits, the feasible region shaded blue, and a readout that flags each broken limit in red.

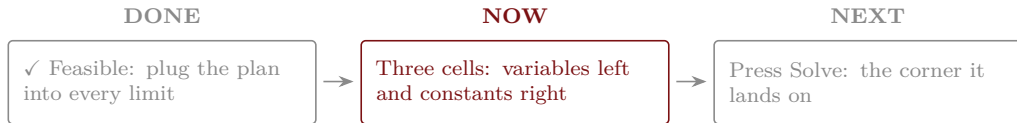
[v348.jima.me/week/w08/](https://v348.jima.me/week/w08/)



# Where we are

*One block down, two to go*

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*You can tell in ten seconds that 3 reading and 5 math is not a legal week: it needs 8 volunteers and you have 7. Solver has to be told the same three limits, and it reads them as cells compared to cells, not as sentences.*

# The three cells Solver needs

*One for each ingredient, in the same order*

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## Changing cells

one cell per decision variable,  $x$  and  $y$ . These are the cells Solver is allowed to alter

## Objective cell

one formula that references the changing cells,  $=2*x + 3*y$ , and a direction: Max

## Constraint cells

one left-hand-side formula per limit,  $=x + y$ , compared to its right-hand side,  $\leq 7$

*Solver **chooses** the changing cells and touches nothing else; the objective and constraint cells are **computed** from them. If you can write the model, you can set up Solver.*

Taylor 13e, pp. 97 to 100. Excel's own dialog says Set Objective, By Changing Variable Cells, Subject to the Constraints.

## Standard form first

*Variables on the left, the constant on the right; no slack variable needed*

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| A rule the director might add                                                | As first written | Standard form      |
|------------------------------------------------------------------------------|------------------|--------------------|
| Spending on math (\$30 a session) must not exceed spending on reading (\$25) | $30y \leq 25x$   | $25x - 30y \geq 0$ |
| Choose a total $z$ as well as its reading/math split                         | $x + y = z$      | $x + y - z = 0$    |
| No more than twice as many reading as math sessions                          | $x/y \leq 2$     | $x - 2y \leq 0$    |

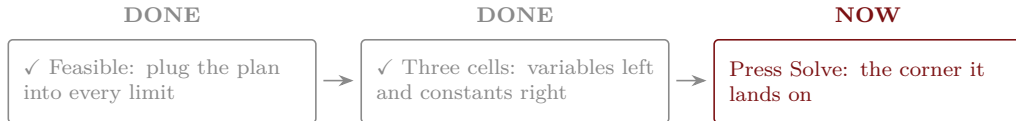
*The tutoring limits are already in standard form. A variable stranded on the right, or a ratio, is the step students trip on most: tidy it **before** you touch the spreadsheet.*

Taylor 13e, pp. 100 to 101, on constraints that are not in proper form.

## Where we are

*Two blocks down, one to go*

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*Variables, objective and constraints now each have their own sort of cell, and Solver fills only the changing cells. The tutoring limits are already in standard form; a rule the director adds gets tidied first,  $25x - 30y \geq 0$  and not  $30y \leq 25x$ . Nothing is solved yet: the last block types the model in and presses the button.*

## A worked Solver run: the schedule, cell by cell

*The same model, typed into the three kinds of cell*

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|   | A                     | B            | C      | D |
|---|-----------------------|--------------|--------|---|
| 1 | Reading sessions, $x$ |              |        |   |
| 2 | Math sessions, $y$    |              |        |   |
| 3 | Total impact          | $=2*B1+3*B2$ |        |   |
| 4 | Reading room          | $=B1$        | $\leq$ | 4 |
| 5 | Math room             | $=B2$        | $\leq$ | 5 |
| 6 | Volunteers            | $=B1+B2$     | $\leq$ | 7 |

*Changing cells, B1 and B2: the only cells Solver may alter*

*Objective cell, B3: a formula over B1 and B2, set to Max*

*Constraint cells, B4 to B6: one formula per limit, held against column D*

*Two changing cells feed the objective and three resource formulas. Test those connections before Solve.*

Taylor 13e, pp. 97 to 100. The dialog: Set Objective B3, Max; By Changing B1:B2; Subject to B4:B6  $\leq$  D4:D6; Make Unconstrained Variables Non-Negative ticked; solving method Simplex LP.

## Test the formulas before Solve

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| Cell and formula | Trial: B1=3, B2=5 | Then B1=2        | Limit    |
|------------------|-------------------|------------------|----------|
| B3: =2*B1+3*B2   | 21 impact points  | 19 impact points | maximize |
| B4: =B1          | 3                 | 2                | $\leq 4$ |
| B5: =B2          | 5                 | 5                | $\leq 5$ |
| B6: =B1+B2       | 8                 | 7                | $\leq 7$ |

The first plan fails the volunteer limit:  $8 > 7$ . Changing B1 must update B3, B4 and B6; B5 depends only on B2.

*A typed 19 cannot respond to a new plan. Repair the formula connections before optimizing.*

Week 8 page, worked Solver run.

## Press Solve

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|   | A                     | B         | C      | D |
|---|-----------------------|-----------|--------|---|
| 1 | Reading sessions, $x$ | <b>2</b>  |        |   |
| 2 | Math sessions, $y$    | <b>5</b>  |        |   |
| 3 | Total impact          | <b>19</b> |        |   |
| 4 | Reading room          | <b>2</b>  | $\leq$ | 4 |
| 5 | Math room             | <b>5</b>  | $\leq$ | 5 |
| 6 | Volunteers            | <b>7</b>  | $\leq$ | 7 |

*Solver's pick: 2 reading sessions and 5 math*

*The objective cell follows:  $2(2) + 3(5) = 19$*

*Every limit met:  $2 \leq 4$ ,  $5 \leq 5$ ,  $7 \leq 7$ . Two rows sit exactly on their limit*

*19 is the most a legal week can score, two short of the illegal 21: Solver only looks at plans that pass every row. Which rows it ran into is Wednesday's report.*

Taylor 13e, pp. 97 to 100. Wednesday illustrates one valid simplex route to this corner.

## The same three cells in a city office

*Staffing emergency warming centers*

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| Solver needs     | The cell                                         | From the brief                                 |
|------------------|--------------------------------------------------|------------------------------------------------|
| Changing cells   | $x$ regular evening shifts, $y$ overnight shifts | the two kinds of shift to staff                |
| Objective cell   | service-hours, $6x + 10y$ , maximize             | 6 and 10 hours of service a shift              |
| Constraint cells | $900x + 1,600y \leq 14,400$ ;<br>$x + y \leq 10$ | the labor budget in dollars; ten trained leads |

*Solver is not doing different math from the graph. It is scaling the same translation, variables to objective to constraints, to a staffing decision.*

## In practice: a model is only as good as its inputs

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### IN PRACTICE

**Where do the coefficients come from?** “2 impact points per reading session” is an estimate. If it is really a range, the optimum may move; Wednesday shows how far.

**Whole numbers.** Nothing asks for them: give the volunteers time for 7.5 sessions and Solver schedules 2.5 reading. If half a session is meaningless you need integer programming, Week 10, not rounding: 3 reading needs 8 volunteer sessions.

**The four quiet assumptions.** Proportionality (twice the sessions, twice the impact), additivity (no interaction between  $x$  and  $y$ ), divisibility (fractions allowed), certainty (the coefficients are known, not guessed). Break one and the model still returns a confident answer.

*Every constraint a tidy sum of terms, every coefficient with a source.*

## Back to the tutoring schedule

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- The best weekly schedule is **2 reading and 5 math sessions, 19 impact points**. Solver found it once the brief was a region and three sorts of cell, and the illegal 21 was never on offer.
- What you cannot yet say is why that corner and not another, or which limits it ran into. Wednesday answers both: the corner walk says why that one, and Solver's report names the limits.

*Writing the limits down correctly stays your job: Solver only ever searches the plans your constraint cells allow.*

## cells

one per variable: what  
Solver may alter

## objective

one formula, one  
direction

## LHS $\leq$ RHS

one constraint cell per  
limit

## tidied

variables left, constants  
right

*Wednesday shows what happened between your click and the 19: Solver walked the corners. Then it reads the **Answer Report**: which limits bind, and how much of the others is left over.*

## Group practice

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### IN CLASS

A taco stand by the stadium sells **tacos** and **burritos** at \$4 and \$6 profit. Tortillas are scarce (3 per taco, 2 per burrito, 24 on hand) and so is grill time (2 and 3 minutes, 26 available). Write the model in standard form, map each part onto the cells Solver needs, then test two candidate plans against both constraints. Compare their profits and explain your recommendation. **Every member's name goes on the sheet**; one of you photographs it and **uploads the photo to Canvas** before leaving. One participation point, half today's attendance record.

ON THE SITE · Week 8 practice sheet

The same sheet is on the site if you want it on a screen.

[v348.jima.me/assets/docx/v348-w08-s1-group-practice.docx](https://v348.jima.me/assets/docx/v348-w08-s1-group-practice.docx)



## Photograph your attempt, then check it together

*Two minutes to capture your work; eight for the instructor's demonstration*

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### IN CLASS

Check every member's name and photograph your group's own attempt before the solution is shown. One member uploads the photo to Canvas by the end of class.

*We close by checking the method, the main results with units, and a common mistake. Participation credit is for attempting the work.*

# Session 2

Wed Oct 14

## You press Solve and a schedule appears

*The question this session answers*

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### PUZZLE

Monday you wired the tutoring model into Solver, maximize  $2x + 3y$  subject to  $x \leq 4$ ,  $y \leq 5$ ,  $x + y \leq 7$ , and pressed **Solve**: 2 reading, 5 math and 19 impact points landed in the cells.

A number is not an explanation. A director will ask why that schedule, what is holding it back, and what would change it.

*How do you know Solver found the **best** schedule, and what does it tell you besides the answer?*

## Where we are

*Three blocks today, in this order*

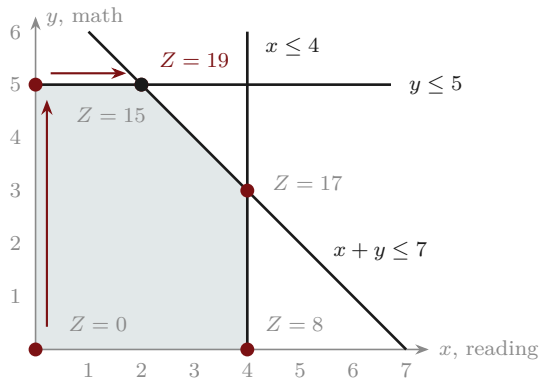
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*The director's three questions are the three blocks. Why that schedule is the corner walk, what is holding it back is the Answer Report, and what would change it is one coefficient and one more unit of a bottleneck, moved one at a time.*

# Solver walks the corners

*The simplex method: hop to a better corner until no neighbor improves*



**Five corners; one is optimal.**

This is one valid simplex route

**Start at the origin.** Follow the edge that climbs fastest, math at 3 a session, up to  $(0, 5)$

**Hop along the top** to  $(2, 5)$ ,  $Z = 19$ . Its neighbors score 15 and 17, so stop: two hops

Taylor 13e, p.97. Excel may take another route; the optimum is the same.

# The walk, on your laptop

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## IN CLASS

Open the first Session 2 widget on the Week 8 page and press **Walk corners**: the marker stops at the origin, at  $(0, 5)$  and at  $(2, 5)$ , the slide's two hops, and leaves the two edges and each stop's  $Z$  on the chart. Then press **Maximize** and watch the objective line slide out to that same corner. Two views of one fact: the best plan is a corner, and it is that one.

**ON THE SITE** · the corner-walk widget

The tutoring region with Walk corners and Maximize, and the Answer Report just below it.

[v348.jima.me/week/w08/](http://v348.jima.me/week/w08/)



## Where we are

*One block down, two to go*

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*Our illustrated walk reached  $(2, 5)$  and  $Z = 19$  in two hops and stopped because no neighboring corner did better, which is how you know it is the best schedule. The walk does not say which limits are holding it at that corner; the report does.*

# The Answer Report

*One page, three sections, for the tutoring optimum*

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| Section        | Item                       | Value | Status      | Slack |
|----------------|----------------------------|-------|-------------|-------|
| Objective cell | total impact               | 19    |             |       |
| Variable cells | reading $x$                | 2     |             |       |
| Variable cells | math $y$                   | 5     |             |       |
| Constraints    | reading room, $x \leq 4$   | 2     | Not Binding | 2     |
| Constraints    | math room, $y \leq 5$      | 5     | Binding     | 0     |
| Constraints    | volunteers, $x + y \leq 7$ | 7     | Binding     | 0     |

Value, plan, then each limit's **status** and **slack**: slack is available minus used.

***Binding** means slack 0: used to the last unit. **Not binding** means leftover, and the number says how much. Taylor 13e, pp. 98 to 100.*

## Read each report row against its limit

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| At $x = 2, y = 5$ | Used        | Available | Slack / status            |
|-------------------|-------------|-----------|---------------------------|
| Reading room      | 2           | 4         | $4 - 2 = 2$ , not binding |
| Math room         | 5           | 5         | $5 - 5 = 0$ , binding     |
| Volunteers        | $2 + 5 = 7$ | 7         | $7 - 7 = 0$ , binding     |

The reading room has two spare slots. Renting more reading space alone cannot improve this schedule.

Math-room capacity and volunteer time are fully used. Re-solve with an extra unit to find what it would add.

*Report the plan, what binds, and the unused capacity, with units.*

# Where we are

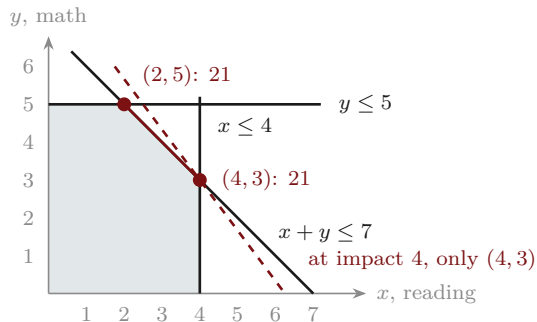
*Two blocks down, one to go*

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*The report names the math room and the volunteers as binding and leaves the reading room with slack 2. Every number on it was computed for one set of coefficients and limits; the last block moves one of each and watches whether the corner follows.*

## What if a coefficient changes?



**At 3, a tie.**  $3x + 3y$  scores 21 at  $(2, 5)$ , at  $(4, 3)$ , and all along the edge between them

**Why a whole edge.**  $3(x + y)$  runs along the volunteer line: **multiple optima**

**Past 3 it jumps.** Below 3 the corner is  $(2, 5)$ ; above 3 it hops to  $(4, 3)$ . It never drifts

*“A linear program has exactly one optimal point” is false, and this tie is the standard counterexample. How far a coefficient can move before the corner jumps is Week 9’s first question.*

# The coefficient, on your laptop

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## IN CLASS

Open the last widget on the Week 8 page and drag the **impact per reading session** slider. Below 3 the optimal corner sits at  $(2, 5)$ ; at exactly 3 the objective line lies along the volunteer edge, and the widget draws the whole tied edge from  $(2, 5)$  to  $(4, 3)$ ; above 3 the corner hops to  $(4, 3)$ . Find the value where it jumps and say which constraint the line is parallel to there. Then drag to 0: which edge does it lie along now?

## ON THE SITE · the coefficient widget

The tutoring region with the objective coefficient live, and the note on multiple optima under it.

[v348.jima.me/week/w08/](http://v348.jima.me/week/w08/)



## The tutoring coefficient has two endpoints

*Keep the resource limits fixed; change impact per reading session to  $c$*

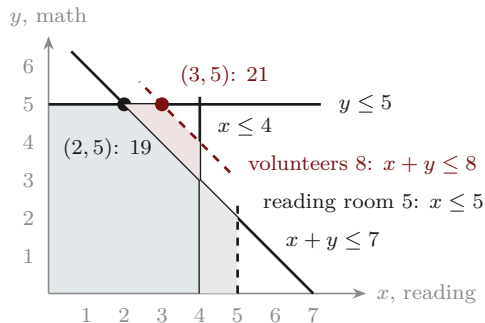
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| Plan     | Impact    | Comparison for $(2, 5)$               |
|----------|-----------|---------------------------------------|
| $(2, 5)$ | $2c + 15$ | the current plan                      |
| $(0, 5)$ | 15        | $2c + 15 \geq 15$ , so $c \geq 0$     |
| $(4, 3)$ | $4c + 9$  | $2c + 15 \geq 4c + 9$ , so $c \leq 3$ |

Inside  $0 < c < 3$ , the plan holds while total impact moves. At  $c = 0$  a segment ties with  $(0, 5)$ ; at  $c = 3$  a segment ties with  $(4, 3)$ .

*The range protects the plan. Its endpoints can create ties; they are not a promise that the optimum is unique.*

## A preview of Week 9: what is one more unit of a bottleneck worth?



**One more volunteer:** the line moves out one, the corner slides to (3, 5), and 19 becomes 21.

**Worth 2**

**One more reading slot:** the line moves out one, the corner stays at (2, 5), and 19 stays 19.

**Worth 0**

*That 2 is the volunteer constraint's **shadow price**: what one more unit of your bottleneck is worth to the objective. A slack resource is worth nothing more at the margin, which is what the 0 says. Next week's report prints these for every constraint, and says over what range they hold.*

## More volunteers have a range too

*Keep impact rates at 2 and 3; move the volunteer limit*

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| Volunteer slots | Best plan | Impact |
|-----------------|-----------|--------|
| 7               | (2, 5)    | 19     |
| 8               | (3, 5)    | 21     |
| 9               | (4, 5)    | 23     |
| 10              | (4, 5)    | 23     |

From 7 to 9, another slot adds 2 points. Beyond 9, the rooms are full and the next slot adds zero. Changing a resource moves a boundary; changing a coefficient tilts the objective.

*Week 9 develops these local values and ranges in the full Sensitivity Report.  
The midterm question pool remains the existing Weeks 1 to 8 pool.*

## In practice: read the report, not just the number

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### IN PRACTICE

**Infeasible, unbounded.** With Simplex LP, infeasible means no plan meets every constraint; unbounded means no finite best value. Check the model: real requirements can conflict, and a missing limit can make the objective unbounded.

**Spend effort on what binds.** Extra capacity in a slack resource adds nothing by itself. Other changes can use up its slack: two more volunteers fill the reading room too. Re-read the report after a change.

**The map is not the territory.** Solver optimizes your model. If the model omits something real, equity, morale, a soft limit, the “optimal” plan can still be a poor decision.

*Sanity-check the plan against the things the model was never told.*

## Back to the schedule

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- **2 reading and 5 math sessions, 19 impact points** is the best schedule: the corner walk stopped there because both neighbors score less, 15 and 17.
- The Answer Report says what holds it back: the math room and the volunteers bind, and the reading room has 2 slots to spare.
- What would change it: a reading session worth more than 3 moves the corner to (4, 3), and one more volunteer adds 2 points while a bigger reading room adds none.

*One more volunteer slot adds 2 impact points; compare that gain with its cost.  
More reading-room capacity alone adds none.*

## This week's take-home

*One file, on Canvas, by Sunday at 11:59 PM*

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- A city **public-works department** plans street repairs with pothole and sidewalk crews, within labor, machine-day, and budget limits. **Convert** worker-days to the basis your variables use.
- Test one plan by hand and build your own **live formulas**. Search for Solver and solve. Choose Keep Solver Solution, select **Answer** in Reports, then OK.
- Identify which limits bind and how much capacity remains in the slack resource.

**ON THE SITE** · the brief and the workbook

Download the workbook here. **Tier 1:** AI as a tool, disclosed.

[v348.jima.me/week/w08/](https://v348.jima.me/week/w08/)



## Next Wednesday is the midterm

*Wed Oct 21: TA setup at 2:20; planned testing 2:40 to 3:10*

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### 20 questions    Weeks 1 to 8    LockDown    10 points

30 minutes, 0.5 point  
each

Week 9 is not on it

Respondus, on your own  
laptop

of the course's 100

Drawn from the **after-class self-checks**, verbatim, plus take-home-style items you can compute by hand; Canvas calculator, no Excel. Install LockDown Browser **before** Wednesday. The meeting is exam-only.

ON THE SITE · Exams

The full brief, the make-up rule for a documented conflict, and the link to every self-check.

[v348.jima.me/exams/](https://v348.jima.me/exams/)



## Optional: audit the AI's model

*The one Tier 2 exercise in the course*

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- A community clinic asked an AI assistant to build a scheduling LP. It recommended running **no flu-shot clinics at all**, and its model contains exactly **one** error.
- Find the flaw, fix it, re-solve, and work out what the mistake would have cost. Ungraded, and the most realistic task in the course: you will inherit someone else's model far more often than you build one.

ON THE SITE · the debug workbook

**Tier 2:** AI is expected here, because critiquing it is the whole task.

[v348.jima.me/week/w08/](https://v348.jima.me/week/w08/)



## Carry into Week 9

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### corner walk

what Solver does inside

### the report

value, plan, status, slack

### binding

slack 0: the real  
bottleneck

### worth 2

one more volunteer slot,  
a shadow price

*Next week Solver's **Sensitivity Report**: how far each profit can drift before the plan changes, what one more hour of a scarce resource is worth, and why a product is left out of the plan.*

# Review

Week 8

## Can you define these without looking?

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|                       |                    |                      |                       |
|-----------------------|--------------------|----------------------|-----------------------|
| feasible plan         | plug-and-check     | changing cells       | objective cell        |
| constraint cells      | standard form      | Excel Solver         | simplex method        |
| Answer Report         | binding constraint | slack, in the report | multiple optima       |
| infeasible, unbounded | shadow price       | optimal solution     | Tier 2 debug practice |

ON THE SITE · Key Concepts

Most of these have a one-line definition and a worked example behind them. Filter by week; the next two frames define most of them.

[v348.jima.me/concepts/](http://v348.jima.me/concepts/)



## Definitions: setting Solver up

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|                         |                                                                                                                     |
|-------------------------|---------------------------------------------------------------------------------------------------------------------|
| <b>Feasible plan</b>    | A plan that breaks none of the constraints. Test it by substituting into every one; a single violation rules it out |
| <b>Changing cells</b>   | One cell per decision variable: the cells Solver is allowed to alter                                                |
| <b>Objective cell</b>   | One formula referencing the changing cells, with a direction: Max or Min                                            |
| <b>Constraint cells</b> | One left-hand-side formula per limit, each compared to its right-hand side in the Solver dialog                     |
| <b>Standard form</b>    | Every variable on the left, the constant alone on the right; ratios cleared. The layout a constraint cell needs     |
| <b>Simplex method</b>   | The corner walk inside Solver: from one corner to a better neighbor until none improves                             |

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## Definitions: reading what it says

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|                              |                                                                                                                                                              |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Answer Report</b>         | Reports the objective value, decision-variable values, and each constraint's status and slack                                                                |
| <b>Binding constraint</b>    | Holds with equality at the reported plan: slack 0                                                                                                            |
| <b>Not binding</b>           | Leftover capacity, and the slack figure says how much. More of it buys nothing this week                                                                     |
| <b>Multiple optima</b>       | The objective line runs parallel to a binding edge, so two corners and everything between them tie. Taylor calls the two corners alternate optimal solutions |
| <b>Infeasible, unbounded</b> | No plan satisfies all the limits, or the objective has no finite best value. Check the model; real requirements can also conflict                            |
| <b>Shadow price</b>          | Change in the objective per extra resource unit, within its allowable range. Zero for a slack resource                                                       |

## Test yourself

*If one of these is slow, that is where to reread*

---

1. The plan  $(3, 5)$  scores  $2(3) + 3(5) = 21$ , more than the optimum's 19. Why is it not the answer?
2. A brief says “spending on math must not exceed spending on reading,” with sessions costing \$30 and \$25. Write the constraint as first read, then in standard form.
3. The Answer Report shows the reading room with slack 2. What would renting a bigger reading room buy this week, and why?
4. At an impact of exactly 3 per reading session,  $(2, 5)$  and  $(4, 3)$  tie. Which constraint is the objective line parallel to, and what is that case called?
5. Adding one volunteer slot moves the optimum from 19 to 21. What is that 2 the name for, and what is the corresponding number for the reading room?

# Numbers worth remembering

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**$(2, 5)$ , 19**

the tutoring schedule,  
two binding limits

**21, illegal**

what  $(3, 5)$  would score  
on 8 volunteers of 7

**slack 2**

the reading room, not  
a bottleneck

**worth 2**

one more volunteer slot

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## Question

## Tutoring

## The move

Is  $(3, 5)$  a legal week

no

$3 + 5 = 8$  volunteers against 7

Which limits bind

math room,  
volunteers

slack 0 in the Answer Report

When do two corners tie

impact per  
reading = 3

the objective runs parallel to  $x + y = 7$

## Carry into Week 9

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- Week 9 reads Solver's other printout, the **Sensitivity Report**: how far a profit can drift before the plan changes, what one more unit of a bottleneck is worth and over what range, and why a product is left out.
- **Wed Oct 21 is the midterm**, in an exam-only session: 20 questions in 30 minutes on Weeks 1 to 8, in Respondus LockDown Browser. Install it before then.
- The revision is the eight after-class self-checks and the workbooks you have built.

ON THE SITE · Week 9

The reading, the self-check, and the midterm note at the head of Session 2 are posted. Do the self-check before Monday.

[v348.jima.me/week/w09/](https://v348.jima.me/week/w09/)

