

RESOURCE CALCULATIONS:

Effort, Duration, and Capacity



Clear formulas • Practical examples

Effort, Duration & Capacity

Know what you are measuring before you calculate.

01 THREE DIFFERENT QUESTIONS

EFFORT

How much work?

Total work required across all people.

Unit: person-hours

Example: 120 person-hours

DURATION

How long?

The span of working time from start to finish.

Unit: working days

Exclude nonworking days.

CAPACITY

How much is available?

Work time available from the team in a given period.

Here: person-hours/day

Use actual task availability.

02 THE CORE RELATIONSHIP

Effort = Daily capacity × Duration

Duration = Effort ÷ Daily capacity

Daily capacity = People × Hours/day × Allocation

Allocation is a fraction of each person's working time: 75% = 0.75.

03 WORKED EXAMPLE — ESTIMATE THE DURATION

Task effort: 120 person-hours

Team: 3 people · Working day: 8 hours · Task allocation: 75%

1 Daily capacity = $3 \times 8 \times 0.75 = 18$ person-hours/day

2 Duration = $120 \div 18 = 6.67$ working days

If planning in whole working days, allow 7 days.

04 USE THE RESULT CORRECTLY

Effort is not calendar time.

120 person-hours does not mean 120 hours from start to finish. Use the working calendar to turn duration into a finish date.

This simple model assumes:

Steady availability, comparable skills and work that can be shared. Dependencies, handoffs and rework may extend the schedule.

Keep the units consistent

Convert effort first; calculate the working duration second.

01 DEFINE YOUR TIME BASIS

A person-hour is one hour of work by one person. Person-days and person-weeks are effort units only when their hours are defined.

This handbook uses an 8-hour day in examples unless stated otherwise. Your actual calendar may use a different number.

Notation: E = effort; D = working duration; C = task capacity per working day. Always write the units beside the result.

02 CONVERSION FORMULAS

Person-days = Person-hours ÷ Hours per day

Person-hours = Person-days × Hours per day

Duration in days = Person-hours ÷ C

Capacity must be in person-hours per working day. Do not divide person-days by hours/day without converting first.

03 WORKED EXAMPLE

Input	Value
Effort estimate	96 person-hours
Defined working day	8 hours
Team task capacity	12 person-hours/day

Effort = 96 ÷ 8 = 12 person-days

Duration = 96 ÷ 12 = 8 working days

12 person-days of effort can fit into 8 working days.

04 CHECK BEFORE USING THE RESULT

A 6-hour working day changes the effort conversion: 96 ÷ 6 = 16 person-days. It does not change the original 96 person-hours.

State whether a day means a working day or a calendar day. Record working hours, holidays and the hours available to this task.

Build the effort estimate

Break the deliverable into work you can estimate and review.

01 START WITH THE WORK

List the work packages, their quantities and an estimated effort per unit. Add review, integration and handover explicitly when they are in scope.

Use comparable completed work or an expert estimate. Keep the quantity and effort-per-unit assumptions visible so that changes can be traced.

These are illustrative estimates, not industry productivity benchmarks.

02 BOTTOM-UP FORMULAS

Package effort = Quantity × Effort per unit

Total effort = Sum of all package efforts

Revised effort = Base effort + Added work

Count the same activity once. Do not add a separate review allowance if the unit estimate already includes that review.

03 WORKED EXAMPLE

Work package	Calculation	Effort
Prepare 12 items	12 × 3 hours	36 ph
Review 12 items	12 × 1 hour	12 ph
Integration	One allowance	12 ph

Total = 36 + 12 + 12 = 60 person-hours

At 10 ph/day: Duration = 60 ÷ 10 = 6 days

ph means person-hours throughout this handbook.

04 MAKE THE ESTIMATE REVIEWABLE

For each package, record its owner, assumptions and completion criteria. Confirm whether rework, meetings and acceptance checks are included.

Do not divide total effort by a team average when a specialist or a dependency controls completion. Check those constraints separately.

Calculate individual capacity

Start from the real calendar, then remove unavailable time once.

01 GROSS TIME AND TASK TIME

Gross working hours come from the person’s calendar for the selected period. Leave, holidays and other commitments reduce the hours available to your task.

Choose one consistent method: deduct specific unavailable hours, or apply an availability fraction that already represents those deductions.

An 8-hour day does not automatically provide 8 hours for one project task.

02 TWO VALID METHODS

Task capacity = Gross hours – Unavailable hours

Or: Task capacity = Gross hours × Allocation

Allocation must describe the same calendar and period. If the calendar already excludes a holiday, do not subtract that holiday again.

Do not apply both methods to the same unavailable hours.

03 WORKED EXAMPLE: ONE WEEK

Item	Hours
Five working days × 8 hours	40
Leave	-8
Other tasks and meetings	-6

Available task capacity = 40 - 8 - 6 = 26 ph

Equivalent allocation = 26 ÷ 40 = 65%

40 × 0.65 gives the same 26 person-hours.

04 PLAN THE HOURS ON ACTUAL DAYS

The weekly total is useful for planning, but it does not show which days contain capacity. A person on leave Monday cannot complete Monday’s urgent work.

Use the daily calendar for near-term scheduling. Recheck the capacity after any change to leave, support duties or task assignments.

Add up team capacity

Sum individual availability; do not assume everyone has the same day.

01 BUILD A RESOURCE-BY-PERIOD VIEW

Calculate each person’s available task hours for the same period, then add them. Use individual calendars when hours, leave or assignment levels differ.

A team total is a useful first check. It does not prove that the right skills are available for every work package.

Only add hours that can actually support the scope being estimated.

02 TEAM CAPACITY FORMULAS

Team capacity = Sum of individual capacities

If identical: $C = \text{People} \times \text{Hours/day} \times \text{Allocation}$

Period capacity = Sum of capacity in each period

The identical-resource shortcut requires equal hours and allocation. Otherwise, calculate people separately.

03 WORKED EXAMPLE: FIVE WORKING DAYS

Person	Available task time	Weekly capacity
A	6 hours/day × 5	30 ph
B	4 hours/day × 5	20 ph
C	5 hours/day × 4	20 ph

Weekly capacity = 30 + 20 + 20 = 70 ph

Demand of 80 ph leaves a gap of 10 ph

A 10-hour gap needs a real scheduling decision.

04 ACT ON THE GAP

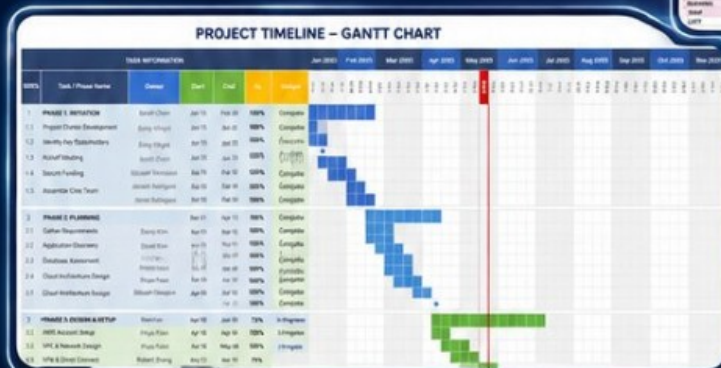
Reduce or defer scope, move eligible work, or secure additional qualified hours. Record the decision and update the period-level plan.

Do not silently label the team as “3 full-time people.” Person C is available for four days, and none of the three is assigned 8 task hours per day.

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GET LIFETIME ACCESS

Headcount and FTE

Count people separately from the equivalent amount of full-time work.

01 WHAT EACH MEASURE TELLS YOU

Headcount is the number of people. Full-time equivalent, or FTE, converts a quantity of hours into an equivalent number of full-time schedules.

Always define the full-time hours and the period. Here, one full-time weekly schedule is 40 hours. Other organizations may use another basis.

FTE summarizes time. It does not measure skill, output or the number of people you can hire.

02 FTE FORMULAS

FTE = Total hours ÷ Full-time hours per period

Capacity hours = FTE × Full-time period hours

FTE gap = Required FTE - Available FTE

Use hours for the same week or month. Specify whether the numerator is contracted hours, available hours or assigned project hours.

03 WORKED EXAMPLE: PROJECT ASSIGNMENTS

Person	Assigned hours/week	Project FTE
A	40	1.00
B	24	0.60
C	16	0.40

Total hours = 40 + 24 + 16 = 80

Project FTE = 80 ÷ 40 = 2.00

Headcount = 3 people; project allocation = 2.0 FTE.

04 READ THE NUMBER CAREFULLY

Two FTE may represent two full-time people or several part-time assignments. Their calendars can create very different completion dates.

An average of two FTE over a month does not guarantee two FTE every day. Check the periods in which the work is actually required.

When capacity changes

Calculate period by period before choosing a finish date.

01 USE THE CALENDAR YOU ACTUALLY HAVE

Effort divided by daily capacity works directly when capacity is steady. If staffing or working hours change, accumulate the available hours over time.

Use the first period in which cumulative capacity covers the required effort. Account for weekends, holidays and part-day availability separately.

The example assumes divisible work, no waiting and unchanged productivity.

02 VARIABLE-CAPACITY METHOD

Cumulative capacity = $C1 + C2 + \dots + Cn$

Remaining effort = Total effort - Completed effort

Last-period fraction = Remaining effort ÷ Cn

Here $C1$, $C2$ and Cn are available task hours in successive working days. Apply the fraction only to the unfinished final day.

03 WORKED EXAMPLE: 50 PERSON-HOURS

Working day	Daily capacity	Cumulative
Day 1	12 ph	12 ph
Day 2	12 ph	24 ph
Day 3	18 ph	42 ph
Day 4	18 ph	60 ph

After Day 3: $50 - 42 = 8$ ph remain

Final-day fraction = $8 \div 18 = 0.44$

Finish during Day 4; exact time needs shift calendars.

04 AVOID AVERAGE-CAPACITY TRAPS

A monthly average can hide an early shortage. Capacity arriving after a deadline cannot complete work due before that deadline.

Recompute the remaining periods after a person joins, leaves or changes assignment. Preserve actual completed work when updating the forecast.

How many people are needed?

Convert a deadline and effort estimate into a staffing requirement.

01 DEFINE THE STAFFING ASSUMPTIONS

Use a fixed effort estimate, the available working days and the daily task hours per person. The formula assumes equally capable people and shareable work.

A fractional result represents an equivalent staffing level. If only whole people can be assigned at the stated allocation, round up.

Check onboarding, workspace, tools and specialist roles before committing.

02 REQUIRED-STAFFING FORMULAS

Per-person capacity = Days × Hours/day × Allocation

Required people = Effort ÷ Per-person capacity

Whole people = Round the result up

Do not round down. A nominally small shortfall can still prevent completion before the deadline.

03 WORKED EXAMPLE: A 10-DAY DEADLINE

Effort = 240 ph; day = 8 hours; task allocation = 75%.

Per person = $10 \times 8 \times 0.75 = 60$ ph

Required people = $240 \div 60 = 4$

If effort rises to 250 ph: $250 \div 60 = 4.17$

At the same allocation, 250 ph requires 5 whole people.

04 A STAFFING RESULT IS NOT A COMPLETE SCHEDULE

Five people may provide more hours than needed, but the spare hours are usable only if assignments and skills allow. Consider a qualified part-time contribution.

Validate the task sequence. Adding people cannot remove a mandatory waiting period or make one indivisible task run in parallel with itself.

Allocation and utilization

State the numerator, denominator and period before using a percentage.

01 KEEP THESE METRICS DISTINCT

Allocation is the planned share of available time assigned to work. Utilization describes the share actually used for a defined category of activity.

Organizations define utilization differently. This handbook uses actual project hours divided by available working hours for the same period.

Billable utilization uses billable hours instead. Do not compare percentages with different definitions.

02 CLEARLY DEFINED PERCENTAGES

Allocation = Planned task hours ÷ Available hours

Utilization = Actual project hours ÷ Available hours

Percentage = Fraction x 100

Use calendar-adjusted available hours. Keep leave out of the denominator if your metric definition excludes leave.

03 WORKED EXAMPLE: ONE PERSON, ONE WEEK

Measure	Hours
Available working time	40
Planned project assignment	30
Actual project time	28

Planned allocation = 30 ÷ 40 = 75%

Actual project utilization = 28 ÷ 40 = 70%

The 5-point difference is not automatically lost output.

04 ASK WHAT THE HOURS REPRESENT

The remaining hours may be training, support, meetings or unused capacity. Review the categories before drawing a performance conclusion.

High utilization does not prove useful delivery. Track accepted output and quality separately, and retain realistic room for interruptions and uncertainty.

Find workload conflicts

Check demand against capacity in each relevant time period.

01 COMPARE LIKE WITH LIKE

Load is the assigned effort due in a period. Capacity is the qualified time available in that same period. Compare them person by person and skill by skill.

A weekly total can look feasible while two urgent tasks overlap on the same day. Inspect a time scale fine enough to reveal the conflict.

In this page, positive gap means shortage; negative gap means spare hours.

02 LOAD AND GAP FORMULAS

Capacity gap = Assigned effort - Available capacity

Load ratio = Assigned effort ÷ Available capacity

Overload hours = Maximum of 0 and the gap

A load ratio above 1.00, or 100%, signals more assigned work than the period can accommodate under the stated assumptions.

03 WORKED EXAMPLE: A SPECIALIST WEEK

Assignment	Effort due
Task A	20 ph
Task B	16 ph
Available specialist capacity	30 ph

Demand = 20 + 16 = 36 ph

Gap = 36 - 30 = 6 ph; load = 36 ÷ 30 = 120%

Six hours must move, be reduced, or gain qualified help.

04 RESOLVE THE ACTUAL CONFLICT

Check priorities and dependencies before moving work. Reassign only work that another available person is qualified to perform.

Update both the resource plan and task dates after the decision. A capacity spreadsheet that ignores the schedule cannot confirm the deadline.

Find the skill bottleneck

A sufficient team total can still hide a critical shortage.

01 GROUP WORK BY REQUIRED SKILL

Calculate demand and capacity for each essential role. Hours from one role cannot automatically replace hours from another.

For parallel, independent work streams, the slowest stream sets a lower bound on completion. Sequential streams also need their dependencies considered.

The example assumes the design and testing streams can run independently.

02 ROLE-BASED DURATION

Role duration = Role effort ÷ Role daily capacity

Parallel completion = Longest role duration

Role capacity gap = Role demand - Role capacity

The parallel formula applies only when all streams can start together and no other constraints delay their work.

03 WORKED EXAMPLE: TWO PARALLEL STREAMS

Role	Effort	Capacity/day	Duration
Design	80 ph	16 ph	5 days
Testing	40 ph	4 ph	10 days

Combined average = 120 ÷ 20 = 6 days

Actual stream limit = max(5, 10) = 10 days

The pooled 6-day estimate hides the testing bottleneck.

04 TARGET THE CONSTRAINED ROLE

If testing capacity doubles to 8 ph/day, its duration becomes 40 ÷ 8 = 5 days. Both independent streams can then finish in 5 working days.

Adding another designer alone would not fix the original testing shortage. Confirm role availability and qualification before changing the staffing plan.

Level competing assignments

Move the timing of work to fit the person’s available hours.

01 CAPACITY AND DEPENDENCIES BOTH MATTER

Resource leveling resolves overallocations by adjusting task timing, and sometimes splitting work where allowed. The project finish may move.

First try to use available slack without breaking dependencies or deadlines. If that is insufficient, review scope, staffing or the finish commitment.

Leveling changes when work happens; it does not automatically remove required effort.

02 SEQUENTIAL WORK ON ONE RESOURCE

Task duration = Task effort ÷ Resource capacity/day

Sequential duration = D1 + D2 + ... + Dn

Resource-load check: Assigned hours ≤ Available hours

Add any mandatory gaps separately. The formulas assume constant daily capacity and no overlap between that person’s tasks.

03 WORKED EXAMPLE: ONE ANALYST

Task	Effort	Capacity/day	Duration
A	24 ph	6 ph	4 days
B	18 ph	6 ph	3 days

If both start together at full assignment, demand is 12 ph/day against 6 ph/day available.

Sequential duration = 4 + 3 = 7 working days

Schedule A on Days 1-4 and B on Days 5-7.

04 CHOOSE A FEASIBLE RECOVERY

A second qualified analyst could allow independent tasks to overlap. If B requires A’s output, the dependency can still prevent that overlap.

Record the revised start and finish dates. Check downstream tasks again, because removing one overload may create another later in the schedule.

Use productivity carefully

Relate accepted output to actual effort, not simply to attendance.

01 DEFINE A COMPARABLE UNIT OF OUTPUT

A productivity rate connects useful output with the effort needed to produce it. Define what “accepted” means and keep scope and quality consistent.

Use measured rates from comparable work. Do not assume an unfamiliar team, a harder work package or extra overtime will achieve the same rate.

Hours available describe capacity; units delivered per hour describe productivity.

02 OUTPUT AND EFFORT FORMULAS

Productivity = Accepted units ÷ Actual person-hours

Required effort = Required units ÷ Productivity

Expected output = Available effort × Productivity

If the rate is hours per unit instead, multiply quantity by that rate. Keep the numerator and denominator visible.

03 WORKED EXAMPLE: COMPARABLE ITEMS

A team completed 120 accepted items using 60 person-hours.

Productivity = $120 \div 60 = 2$ items/ph

For 180 similar items: Effort = $180 \div 2 = 90$ ph

At 15 ph/day: Duration = $90 \div 15 = 6$ days

The 6-day estimate depends on maintaining 2 items/ph.

04 CHECK QUALITY AND REWORK

If only 100 items were accepted from the same 60 hours, accepted-output productivity is $100 \div 60 = 1.67$ items/ph, approximately.

Include effort spent on rejected work in the denominator. Separate changes in scope or complexity before comparing teams or periods.

Forecast the work remaining

Use current remaining effort and future availability at the status date.

01 RE-ESTIMATE BEFORE FORECASTING

Actual hours show effort spent, not necessarily scope completed. Review unfinished deliverables and estimate the effort still required.

Subtracting actual hours from the original estimate is valid only if that estimate remains reliable and progress follows its assumed effort profile.

A fresh remaining estimate can rise after rework or newly understood scope.

02 REMAINING-WORK FORMULAS

Forecast total effort = Actual effort + Remaining effort

Remaining duration = Remaining effort ÷ Future C

Effort variance = Forecast total - Original estimate

Future C is the available task capacity per working day after the status date. Use the period-by-period method if it changes.

03 WORKED EXAMPLE: A STATUS UPDATE

Measure	Value
Original effort estimate	160 ph
Actual effort so far	70 ph
Fresh remaining estimate	110 ph
Future capacity	22 ph/day

Forecast = 70 + 110 = 180 ph; variance = +20 ph

Remaining duration = 110 ÷ 22 = 5 working days

Do not use 160 - 70 = 90 ph without validating it.

04 TURN THE FORECAST INTO AN ACTION

Map the five working days onto the resource calendar from the status date. Recheck dependencies, review slots and any uncompleted prerequisites.

Explain whether a forecast change comes from extra scope, rework, availability or productivity. Update the estimate and record the assumptions.

Overtime and extra capacity

Count additional hours separately and test the output assumption.

01 HOURS DO NOT GUARANTEE EQUAL OUTPUT

Overtime can add available hours, but those hours may not deliver the normal rate of accepted output. Treat its benefit as an explicit scenario.

Use agreed, feasible hours and check required rest, approval and local working arrangements. Reassess quality and fatigue during delivery.

The efficiency factor below is an illustrative planning assumption, not a universal overtime rule.

02 A SIMPLE OVERTIME SCENARIO

Overtime hours = People × Extra hours/day × Days

Added equivalent effort = Overtime hours × Factor

Equivalent capacity = Normal capacity + Added effort

A factor of 0.80 means each overtime hour is assumed to deliver 80% of the normal-hour output. Keep paid hours and equivalent output distinct.

03 WORKED EXAMPLE: THREE DAYS

Four people add 2 hours/day for 3 days. Assume an overtime factor of 0.80 and normal task capacity of 72 ph over those same days.

Overtime = $4 \times 2 \times 3 = 24$ actual person-hours

Added equivalent effort = $24 \times 0.80 = 19.2$ ph

Equivalent capacity = $72 + 19.2 = 91.2$ ph

Account for 24 overtime hours, not only 19.2 hours.

04 CHECK THE WHOLE RECOVERY PLAN

If normal availability falls after the overtime period, include that reduction. Do not count the extra hours while ignoring their later effects.

Compare overtime with reducing scope, sequencing work differently or adding qualified support. Confirm the bottleneck is a shortage of usable hours.



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Test capacity scenarios

Show how assumptions change the duration before promising a date.

01 CHANGE ONE ASSUMPTION AT A TIME

A scenario is a transparent “what if” calculation. Keep effort and productivity fixed when comparing availability, then test effort uncertainty separately.

Name the assumptions behind a base, lower-capacity and higher-capacity case. These cases are not confidence levels unless backed by a statistical model.

All three cases below use 180 ph of work, 4 people and 8-hour working days.

02 SCENARIO FORMULAS

Daily capacity = People x Hours/day x Allocation

Scenario duration = Scenario effort ÷ Daily capacity

Effort allowance = Base effort x Allowance rate

An allowance should cover a stated uncertainty. Do not count the same risk in both extra effort and reduced capacity without justification.

03 WORKED EXAMPLE: AVAILABILITY CHANGES

Allocation	Daily capacity	Duration
50%	$4 \times 8 \times 0.50 = 16 \text{ ph}$	11.25 days
75%	$4 \times 8 \times 0.75 = 24 \text{ ph}$	7.50 days
100%	$4 \times 8 \times 1.00 = 32 \text{ ph}$	5.625 days

With 10% extra effort: $180 \times 1.10 = 198 \text{ ph}$

At base capacity: $198 \div 24 = 8.25 \text{ days}$

Round up only if the schedule requires whole days.

04 USE SCENARIOS TO MAKE A DECISION

Confirm which allocation the resource owners can actually provide. A 100% assignment may be infeasible when people have other obligations.

Document the selected scenario, review date and trigger for updating it. Do not present the most optimistic calculation as a guaranteed finish.

Put the calculations together

Check both total capacity and role constraints before committing.

01 CASE: A SMALL DELIVERY PACKAGE

Two work streams can run independently from Day 1. Preparation needs 90 ph; review of a separate, already-ready batch needs 30 ph.

Three preparers provide 6 task hours/day each. One reviewer provides 3 task hours/day. All work is shareable within its required role.

The target is the end of Day 8. Availability stays constant and there are no other dependencies.

02 FIRST CALCULATE EACH STREAM

Preparation capacity = $3 \times 6 = 18$ ph/day

Preparation duration = $90 \div 18 = 5$ days

Review duration = $30 \div 3 = 10$ days

The parallel package needs 10 working days under the original staffing. The reviewer, not the preparation team, controls completion.

03 CHECK THE EIGHT-DAY TARGET

Check	Calculation	Result
Pooled 8-day capacity	$(18 + 3) \times 8$	168 ph
Review 8-day capacity	3×8	24 ph
Review shortage	$30 - 24$	6 ph

Required reviewer capacity = $30 \div 8 = 3.75$ ph/day

Additional reviewer time = $3.75 - 3 = 0.75$ h/day

The total 168 ph is enough; the role plan is not.

04 A FEASIBLE, QUALIFIED RESPONSE

Secure 0.75 additional reviewer hour/day for eight days, giving 6 extra hours, or reduce/defer 6 hours of review effort if scope permits.

With review capacity of 3.75 ph/day, review finishes on Day 8 and preparation on Day 5. Confirm review quality and actual availability before approval.

Your formula checklist

Use the formula that matches the question and its assumptions.

01 QUICK REFERENCE

Effort = Quantity × Effort per unit

Daily capacity = People × Hours/day × Allocation

Duration = Effort ÷ Daily capacity

Required people = Effort ÷ Per-person period capacity

Use consistent units and the same period. Round staffing up when whole people are required at the stated assignment level.

02 CAPACITY AND CONTROL

FTE = Period hours ÷ Full-time period hours

Capacity gap = Demand - Available capacity

Productivity = Accepted units ÷ Actual effort

Forecast total effort = Actual + Remaining effort

Check capacity by role and time period. A positive gap means shortage; idle hours in a different role may not solve it.

03 BEFORE YOU COMMIT TO A DATE

1. Confirm scope, effort and completion criteria.
2. Apply actual calendars, leave and assignment levels.
3. Check skills, dependencies and overlapping work.
4. Avoid counting the same unavailable hours twice.
5. Recheck the remaining estimate at each status date.

More people shorten work only when the work can be shared.

04 SOURCES AND READING NOTES

Microsoft Support - How Project schedules tasks: Behind the scenes

Microsoft Support - Learn more about resource units

Microsoft Support - View resource workloads and availability

Microsoft Support - Resource Leveling dialog box

Source titles are clickable in this PDF. Examples and scenarios are original, simplified teaching cases. This is a calculation guide, not software-specific setup instructions.