Linear Equations: Weekly Planning for Teachers (Online)

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How the chapter runs

This plan covers Chapter 3, *One-Variable Linear Equations*, taught online: 13-year-olds with five maths lessons a week of about 55 minutes, each student working on a device in the Linear Equations app. It takes **6 weeks (30 lessons)**: 28 teaching lessons and 2 buffer lessons at the end. A plan for schools without devices, using the printed materials, will follow separately.

Every day is a normal lesson. Monday to Friday, each lesson teaches one skill (sometimes two small ones, or half of a harder one) with the same 55-minute plan. When a skill is finished, its mastery check is the last part of that lesson. The app marks the check straight away.

Students who fall behind catch up at home. A student below the pass mark gets that skill's practice again in the app as homework, then retakes the check at the end of the next lesson, with new questions. Nobody else gets homework.

Two routes. The *mandatory route* is 23 skills for every student; the chapter is mastered when all of them are. The *advanced route* is 7 optional skills. The app invites students automatically after full marks on the first try at the week 3 and 4 checkpoints, and they work on it in class when they finish the day's practice early.

Week	Focus	Skills
1	What an equation is	Entry check, LE01 to LE05, LE07
2	One-step moves, then two steps	LE06, LE08, MX01, LE09, LE10
3	Letters on both sides, brackets, fractions	LE10, LE11, LE12, LE14
4	Checkpoint, then words to equations	LE13 checkpoint, LE16 to LE19
5	Word-problem families	LE20 to LE24
6	Review and chapter check	MX02, MX03, chapter check, 2 buffer lessons

Numbering. Skills are numbered LE01 to LE30. Mixed practice and review sessions are numbered MX01, MX02, MX03: they practise several skills at once and have no mastery check of their own, so they are not skills.

What you do

- In each lesson: lead the Learn part with the class, then walk round while students practise in the app. There is nothing to prepare, print or mark.
- After each lesson, five minutes in the class view: who is "not yet", which mistakes were most common, who was invited to the advanced route (see *The class view after each lesson*).
- Use what you see there in the next lesson's Do now.

A normal lesson

Every lesson, Monday to Friday, follows the same four parts, so students know what to expect and you never plan from scratch.

Minutes	Part	Students	You
0 to 8	**Do now**	Answer 3 or 4 quick questions on earlier skills: one from the last lesson, one from last week, one from about a month ago	Put the questions on the board (each week's plan says which skills to review), or add the mistake the class view showed most often yesterday. Go through the answers in a minute
8 to 20	**Learn**	Open the day's skill in the app and follow the lesson together: the explanation, a worked example, and the activity (term inspector, balance tester, number line, choose the move)	Lead it from the front on your own screen. Ask "why is that step allowed?" more than "what is the answer?"
20 to 45	**Practise**	Work through the practice in the app, easiest first. Each answer gets instant feedback that names the mistake; hints are there when stuck. Students who finish early do the optional extra practice, or open their advanced skill if they have an invitation	Walk round. Look for the mistakes listed in the day's plan and stop the class if you see one several times
45 to 55	**Exit**	If the skill finishes today: its **mastery check** in the app (about 10 minutes), plus any retakes. Otherwise: redo, without hints, the hardest practice question they got right	Make sure everyone submits before the bell. The app marks the checks and gives every student different questions

A student who finishes the practice early may take the mastery check before the Exit; the app opens it as soon as the practice is done.

Mastery checks and catching up

1. **Check at the end of the skill.** On the day a skill finishes, its mastery check takes the last 10 minutes of the lesson. The app builds a new set of questions for every student and every attempt, so there is nothing to copy.
2. **The app marks it.** Students see their score, which rows they missed and why, straight away. A row counts only when it is exactly right. The result appears in the class view at the same moment.
3. **Below the pass mark: catch-up homework.** The app sets that skill's practice again as homework, aimed at the rows the student missed (20 to 30 minutes). Once it is done, the retake opens, and the student takes it at the end of the next lesson, again with new questions.

4. **Full marks on the first try at a checkpoint: an advanced invitation.** From week 3, the app shows the student a "Ready for a challenge?" card for the advanced skill that opens there. Accepting is optional, and the advanced skill never counts towards chapter mastery.

Some students cannot get online at home. Let them do catch-up homework in a lunchtime or after-school session on the school's devices.

Week 1: What an equation is

Students learn what makes an equation linear, how to test a possible solution, and the first moves for solving: undoing an addition, a subtraction or a multiplication. The entry check on Monday shows who is missing a skill from earlier chapters.

Day	Lesson	Do now	Exit	Watch for
Mon	**Entry check** (20 min, one question for each of the eight prerequisite skills), then **LE01 Recognise linear equations (the remaining 35 minutes)**	None: the entry check replaces it	Hardest practice question	Thinking a letter on both sides makes an equation non-linear. Calling $3/x = 6$ linear because no power is written
Tue	**LE02 Check a solution by substitution**	**LE01 check** (8 min)	LE02 check	Substituting a negative without brackets ($3m$ with $m = -2$ read as $3 - 2$). Working out both sides but not comparing them
Wed	**LE03 Solve in your head** and **LE04 Model on a number line** (about 16 minutes each, then both checks)	LE02; LE01; the number line (PRE07)	LE03 and LE04 checks (15 min)	Reversing the order: $12 - k = 5$ answered as $5 - 12$. Losing the sign when the answer is negative. Moving the wrong way on the number line
Thu	**LE05 Isolate with addition and subtraction**	LE03 and LE04; LE02; balances (PRE06)	LE05 check	Doing something to one side only. Using the same operation instead of the opposite one
Fri	**LE07 Isolate by dividing by the coefficient**	LE05; LE03; fractions and reciprocals (PRE02)	LE07 check	Subtracting the coefficient: $3x = 15$ answered as $x = 12$. Dividing the wrong way round

The app sets students with a gap in the entry check a short review of that prerequisite as homework.

Week 2: One-step moves, then two steps

Students complete the toolkit of one-step moves, practise choosing the right move for each equation, and start equations that need two steps or have the letter on both sides.

Day	Lesson	Do now	Exit	Watch for
Mon	**LE06 Simplify each side first**	LE07; LE02; combining like terms (PRE04)	LE06 check	Combining terms across the equals sign
Tue	**LE08 Multiply by the reciprocal**	LE06; LE04; reciprocals of negatives (PRE02)	LE08 check	Using 3 instead of −3 to clear −x/3. Multiplying by the numerator only
Wed	**MX01 Mixed one-step practice** (covers LE05 to LE08): one-step equations in a random order, so each may need a different move. Before solving, students write the move, for example "4x = 18: divide both sides by 4"	LE08; LE05; LE01	Hardest practice question; retakes	Students who always add or always divide, whatever the equation needs
Thu	**LE09 Solve two-step equations**	LE08; LE05; negative numbers (PRE01)	LE09 check	Dividing only one term: 7r − 8 = 55 turned into r − 8 = 55/7
Fri	**LE10 Collect the letter on one side** (part 1)	LE09; LE06; combining like terms (PRE04)	Hardest practice question	"Moving" a term across without changing its sign

Week 3: Letters on both sides, brackets and fractions

Students finish collecting the letter on one side, then handle brackets and fractions, and learn what it means when the letter cancels out. Clearing fractions gets two lessons because it is the hardest single move in the chapter. The first advanced invitations come on Thursday.

Day	Lesson	Do now	Exit	Watch for
Mon	**LE10 Collect the letter on one side** (part 2: decimals and negatives)	LE10; LE07; LE02	LE10 check	Dropping the sign: −x = −15 answered as x = −15
Tue	**LE11 Expand brackets or divide out a factor**	LE10; LE09; expanding brackets	LE11 check	−3(r + 7) expanded as −3r + 7. Expanding when dividing both sides first would be much quicker

Day	Lesson	Do now	Exit	Watch for
		(PRE05)		
Wed	**LE12 Clear fractions with the LCD** (part 1)	LE11; LE08; common denominators (PRE08)	Hardest practice question	Multiplying only the fraction terms by the LCD
Thu	**LE12 Clear fractions with the LCD** (part 2)	LE12; LE10; LE03	LE12 check. **Full marks first time: invitation to LE28**	Losing the bracket on a numerator: 15 · (x − 7)/5 written as 3x − 7
Fri	**LE14 Spot no-solution and all-solution cases**	LE12; LE11; LE06	LE14 check	Answering z = 0 when the z terms cancel. Swapping the two cases

Week 4: The checkpoint, then words to equations

The week opens with the most important skill of the chapter: LE13, *Solve any linear equation*, which brings every move together. Its check on Tuesday is the checkpoint for the whole chapter. From Wednesday, students learn to turn a story into an equation, one step at a time.

Day	Lesson	Do now	Exit	Watch for
Mon	**LE13 Solve any linear equation** (part 1)	LE14; LE12; LE09	Hardest practice question	Following the steps as a ritual without knowing why each one is allowed: ask "why can we do that?"
Tue	**LE13 Solve any linear equation** (part 2: mixed equations, choosing the quickest order, checking every answer)	LE13; LE11; LE05	**Checkpoint: LE13 check.** Full marks first time: invitation to LE25 and LE30, and to LE15 if LE14 was also full marks	Skipping the check at the end
Wed	**LE16 Translate phrases into expressions**	LE13; LE10; LE02	LE16 check	"Three less than 2x" written as 3 − 2x. Reversing "she has three times as many as I do"
Thu	**LE17 Define the unknown precisely** and **LE18 Express related quantities**	LE16; LE12; LE14	LE17 and LE18 checks (15 min)	Vague definitions such as "x = apples". One letter used for two quantities (an age now and six years ago)
Fri	**LE19 Build the equation**	LE18;	LE19 check	Writing an expression and never

Day	Lesson	Do now	Exit	Watch for
		LE13; LE11		forming an equation. Setting cents equal to euros

Week 5: Word-problem families

Monday completes the five steps for word problems: check the answer against the story. Then each day is one family of word problems with its own pattern. Students use the same five steps every time; what changes is how the quantities relate.

Day	Lesson	Do now	Exit	Watch for
Mon	**LE20 Check in context and answer the question**	LE19; LE16; LE09	LE20 check	Giving the value of the letter when the question asks for something else. Accepting impossible answers such as a negative age
Tue	**LE21 Number puzzles**	LE20; LE13; LE05	LE21 check	Reading a long sentence in the wrong order
Wed	**LE22 Age problems**	LE21; LE17; LE14	LE22 check	Adding the years to one person only. Mixing "now" and "then" in one equation
Thu	**LE23 Money, cost and value problems**	LE22; LE19; LE12	LE23 check	Adding the number of coins to their value. Mixing cents and euros
Fri	**LE24 Consecutive-integer problems**	LE23; LE18; LE10	LE24 check	Using n, n + 2, n + 4 for plain consecutive integers. Using steps of 1 for consecutive even or odd numbers

Week 6: Review and chapter check

The last week brings the whole chapter back together. Thursday and Friday are buffer lessons: they absorb any delay from earlier weeks, and if the class is on time they go to catch-up, the advanced route or the start of the next chapter.

Day	Lesson	Do now	Exit	What happens
Mon	**MX02 Mixed review: solving** (covers LE01 to LE14). Equations of every kind in a random order; for each one, students say which moves it needs before solving	LE01; LE05; LE07	Retakes	Students who solve well in a topic lesson but stall when the type is not announced
Tue	**MX03 Mixed review: word problems** (covers LE16 to LE24). Stories of every family, in a	LE02; LE06;	Retakes	Students who skip defining the letter

Day	Lesson	Do now	Exit	What happens
	random order	LE16		when the problem type is not announced
Wed	**Chapter check:** one or two questions from each mandatory skill, mixed (whole lesson)	None	None	Shows what students still know weeks later, not just on the day they learned it
Thu	**Buffer 1:** teach again any skill where many students are "not yet"; otherwise last retakes and advanced skills	LE03; LE10; LE20	Retakes	
Fri	**Buffer 2:** the same, or start the next chapter. Final look at the class view	Mixed	Retakes	

The class view after each lesson

This replaces marking. Five minutes after each lesson, open the class view in the app:

Look at	What it tells you	What to do
Who is "not yet" on today's check	Who has catch-up homework tonight; the app has already set it	Nothing. Next lesson, check that their retake happened
How many are "not yet"	Whether the skill landed	Half the class or more: teach it again the next day (see *If the class is behind or ahead*)
The most common mistake	What the class misunderstood	Put one question on it in the next Do now
Advanced invitations	Who was invited and who accepted	Nothing. Glance at how they are doing
Students two or more skills behind	Who is falling away from the class	Pair them with a classmate during practice

If the class is behind or ahead

Let the check results decide, not the calendar.

Behind. If half the class or more is "not yet" on a skill, teach it again the next day before moving on, and shift the plan by a day. The two buffer lessons in week 6 absorb up to two days of delay; beyond that, run MX02 and MX03 as one lesson and keep the chapter check. Two things never get cut: the two lessons on LE13 and the mastery checks.

Ahead. If most students pass first time, use the buffer lessons for the next chapter, and consider running MX02 and MX03 as one lesson. A class that is clearly fast can also do LE16 to LE19 (the first word-problem skills) as short starters during weeks 2 and 3, which frees three lessons in week 4.

Individual students. Nobody waits for the class and nobody is dragged along with it. A student who is behind does the catch-up homework and retakes with new questions; one who is ahead moves to stretch items and the advanced route. If a student is two or more skills behind, pair them with a classmate during practice.

Materials status for the pilot

This plan describes the full chapter online. Today only part of it exists, and all content is a draft waiting for review by the maths expert.

Material	Status
Skill graph for the chapter, with the mandatory and advanced routes	Ready
Linear Equations · Week 1 app with every week 1 skill (LE01 to LE05 and LE07), each sized to its time in this plan, with optional extra practice for students who finish early, and a class view of each student's progress	Ready (prototype)
Linear Equations · Week 2 app with every week 2 lesson (LE06, LE08, MX01, LE09 and LE10 part 1), each sized to its time in this plan, with an exit question on the days without a check, retakes on Wednesday, and a class view	Ready (prototype)
Practice sets for LE01, LE04, LE24 and LE30	Ready
Modules for LE10 part 2 and LE11 to LE24, the entry check, the review sessions MX02 and MX03, and the chapter check	In preparation
Catch-up homework set automatically, retakes opening once it is done, advanced invitations, "not yet" counts in the class view	Designed, not built yet
Sign-in for a whole class through the school	Part of the production platform

Every week 1 lesson is now in the app. To start week 1 online, the entry check and the automatic catch-up homework are still needed. Every week 2 lesson is now in the Week 2 app, which keeps its own progress: week 1 results do not show there yet.