

# Substitute Guide: Linear Relationships in Four Forms

**Grade:** 8 **Subject:** Mathematics **Time:** ~45 min core + ~15 min extension Math

## Learning goal (plain language)

Students practice **linear relationships** — connecting the same "straight-line" relationship across a **table**, a **graph**, an **equation** ( $y = mx + b$ ), and a **real-world story**. They find the **slope** (the rate,  $m$ ), the **y-intercept** (the starting amount,  $b$ ), and tell whether a relationship is **proportional** (through the origin) or **not**. **You do not need a math background to run this.** Every formula and a worked example are printed in the student packet. Students **show their work**; you do not need to teach the method — the packet does the teaching. Your job is to hand it out, read the start script, keep the room on task, and collect the packets.

## Standards alignment

**Framework:** 19 TAC §111.28 (Grade 8 Mathematics). Knowledge & skills **8.4** and **8.5** — proportional and non-proportional linear relationships, slope, and y-intercept.

- **Primary — 8.4A:** use similar right triangles / rates to develop the idea of slope as a constant rate of change (rise over run).
- **Primary — 8.4C:** use data to write an equation in the form  $y = mx + b$  and interpret slope ( $m$ ) and y-intercept ( $b$ ) in context.
- **Primary — 8.5I:** distinguish proportional ( $y = kx$ , through the origin) from non-proportional ( $y = mx + b$ ,  $b \neq 0$ ) linear relationships across tables, graphs, and equations.

Provisional — pending educator verification against the current official TAC source.

(Standards are paraphrased here, not quoted. Please confirm codes and wording against your official source.)

## Setup Before class (5 min)

- Count and hand out one **student packet** per student.
- Confirm each student has a **pencil**. A **basic calculator is allowed but not required**; students who have one may use it.
- Write the date on the board and remind students to fill in the name line.
- Keep the **answer key** with you — it is a separate file and is **not** in the student packet.

## Materials What's needed

- Printed student packet (4–6 pages) per student.
- Pencil per student; a basic four-function calculator is optional.
- This guide and the separate answer key (teacher only).
- No technology, no internet, no special supplies.

## Timing Suggested pacing (~45–60 min)

| Segment                    | Time             | What students do                                       |
|----------------------------|------------------|--------------------------------------------------------|
| Start — Retrieval warm-up  | 5 min            | Q1–Q2 (evaluate a rule; read a point off the line)     |
| Build — Study the math     | 5–10 min         | Read reference box, worked example, graph; Q3          |
| Apply — Use what you know  | 20–25 min        | Q4–Q6 (four forms, error analysis, predict from model) |
| Explain — Justify (CER)    | 5–10 min         | Q7 claim/evidence/reasoning                            |
| Close — ACE                | 5 min            | Articulate / Connect / Extend                          |
| Continue — early finishers | optional ~15 min | Write a context for $y = 8x + 15$                      |

## Script Read aloud to start

"Today's assignment is a paper math packet called *Linear Relationships in Four Forms*. You will work by yourself with a pencil. A basic calculator is allowed if you have one, but you do not need one. The most important rule: **show your work** — write down the numbers you use, not just a final answer. Everything you need is printed in the packet, including a worked example, a graph, and all the formulas. Start with the warm-up, then read the Build section before the Apply questions. If a question is tricky, skip it and come back. Put your name, class period, and date at the top now. You have about 45 minutes; raise your hand if you need help reading a question."

## Support When students ask for help

- **Students show their work; you do not need to teach the method.** Point them back to the printed **reference box** and the **worked example** — the method is right there.
- **You may read any part aloud** to a student or the class.
- If a student is stuck, prompt with "What does the worked example do?" or "In  $y = mx + b$ , which number is the rate and which is the starting amount?" rather than giving the answer.
- For slope, remind them the packet shows:  $\text{slope} = \text{rise} \div \text{run} = (\text{change in } y) \div (\text{change in } x)$ , with the  $y$ -difference on top.
- It is fine if a student cannot finish the optional early-finisher challenge.

## Access Accommodations & language support

- **Read-aloud** of any question is allowed for all students.
- Point students to the **worked example**, the **formulas** in the reference box, and the **sentence stems** for Q7 and ACE.
- A **calculator is allowed** for any student who wants one — this removes the arithmetic barrier so students can focus on the reasoning.
- Extended time is fine; the core can stop after Q7 if time runs short.
- Students may show work with numbers and short phrases if writing full sentences is a barrier, as long as the reasoning is clear.
- The packet is grayscale-safe — the graph uses black lines, labeled points, and text, so it prints and reads clearly in black and white.

## Tools Allowed & not allowed

**Allowed:** pencil, the printed packet, a basic (four-function) calculator, quiet self-read-aloud. **Not needed / not allowed:** phones, internet, graphing/AI calculators, or getting answers from another student.

Collect at the end: Collect every packet, whether finished or not, with names on them. Stack them for the teacher. Note on a sticky how far most students got and any questions that caused confusion.

Answer key: The **answer key is a separate file** (answerkey.html) and is for the teacher only. Please do not hand it to students.

### **Teacher follow-up (for the returning teacher)**

The highest-value items to review next class are the **error analysis (Q5)** and the **justification (Q7)**, which reveal the reversed rise/run slope error and whether students can compare two linear models using both slope and y-intercept. Watch for **slope vs. y-intercept swaps** on the four-forms item (Q4) and the belief that **every line is proportional** (Q4d, Q7 check this — only lines through the origin are). The separate answer key lists worked steps, alternate strategies, and a 3-point rubric for Q7.

G08\_MATH\_Linear\_01 — Linear Relationships in Four Forms Substitute Guide