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Make a set of paper bookmarks

FAMILY PROJECT 03 · OFTEN AGES 8–10 · READINESS FIRST

Measure. Group. Compare.

Make three paper strips, then use them as bookmarks or measuring models. Connect ruler distances to tens and ones, compare two lengths, and explore equal halves and quarters.

PILOT — not physically tested with families. Fit, handling, preparation time and learning outcomes are unverified. This free activity is not a validated intervention or treatment.

Prepare together

Ready to start? Try counting ten spaces on a centimeter ruler together. If that is unfamiliar, make only the 12 cm strip and model from zero. Fractions and the longer strips can wait. There is no timer or required pace.

- One plain sheet of paper at least 24 cm long and 12 cm wide (Letter or A4 works); spare paper for recording.
- A metric ruler at least 24 cm long, pencil, and scissors for the adult. No purchase, glue, small counters or power tools required.

Adult roles: supervise throughout, identify the ruler's centimeter scale and zero mark, draw/check the rectangles and do all cutting. Keep scissors out of the learner's workspace after cutting. Work at a table; paper strips are not wearable bands. Stop if materials are mouthed or anyone is distressed.

Cut list — measure, do not print to size

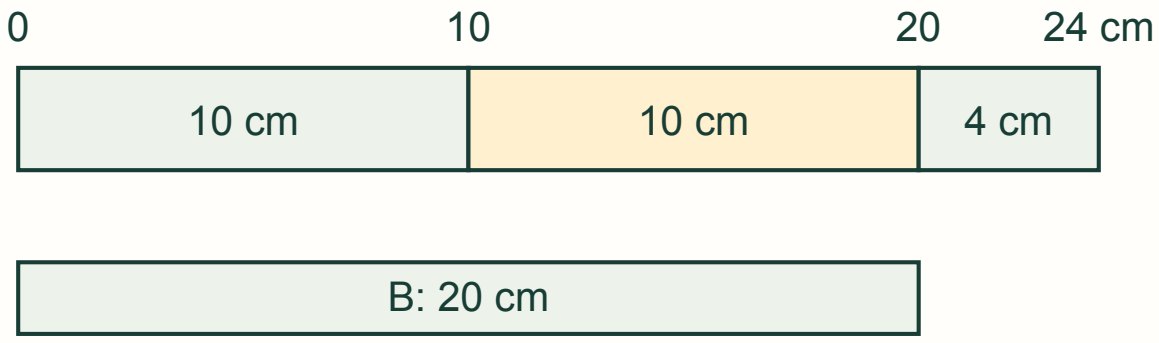
Three rectangles, each 4 cm wide

Strip	Length	Use
A	24 cm	Tens/ones and equal parts
B	20 cm	Length comparison
C	12 cm	Shorter starting task

Draw three adjacent 4 cm-wide rows along the paper's long direction; mark the required length in each row. Reuse leftover paper. Diagrams are schematics, not cutting templates.

From a real strip to a number

1. **Model zero:** align one end of A with the ruler's 0 cm line, not necessarily its plastic edge. Point to the 0–1 cm space: this distance is one centimeter. Count spaces, not the number of tick marks.
2. **Check the cut:** measure A, B and C. If a cut is off, record the actual length and have the adult adjust it or redraw. The worked answers assume the planned sizes.
3. **Group A:** mark 10 cm and 20 cm from the same end. Trace two 10 cm sections and the 4 cm remainder. Say "two tens of centimeters and four centimeters: 20 + 4 = 24." A 10 cm section is ten 1 cm lengths, not ten separate objects.
4. **Compare:** align A and B at one end. Ask "How much longer is A?" Measure the exposed part. Write 24 − 20 = 4 cm. The lengths together total 24 + 20 = 44 cm if placed end to end with no gap or overlap.



Same starting end · schematic, not actual size

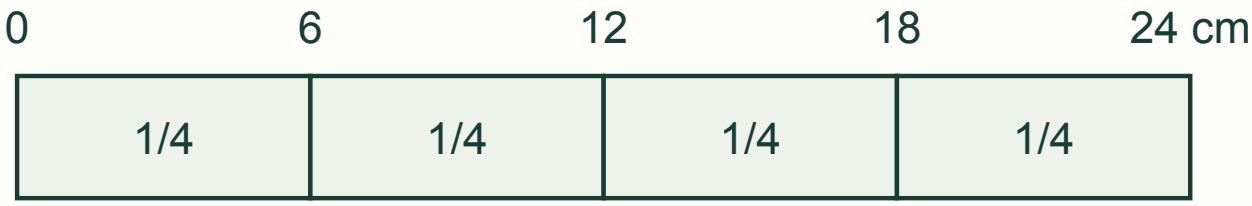
> **Show → sketch → explain:** point along the real strip, draw its sections, then connect the drawing to 24 = 20 + 4. Ask "Where is the 4 in your model?" Keep the model available when needed.

Common mix-up: if a strip begins at the ruler's 2 cm mark and ends at 14 cm, its length is 14 − 2 = 12 cm, not 14 cm. Start at zero for the first task; try the shifted example only after that is comfortable.

Equal parts of one whole

Use **A's entire 24 cm length as the whole**. Turn it over so the tens-and-ones marks do not compete with the fraction marks. Keep it in one piece; no extra cutting is needed.

1. Mark the midpoint 12 cm from the starting end. Check both lengths with the ruler: 12 cm + 12 cm = 24 cm. Each is one half of the whole length.
2. Mark 6 cm and 18 cm from the same starting end. The marks at 6, 12 and 18 cm make four equal lengths of 6 cm. Each is one quarter of the whole length.
3. Ask "How many quarters reach the halfway mark?" Trace two 6 cm lengths: two quarters equal one half of this same whole.
4. Compare C's 12 cm length with half of A. The lengths match if the cuts match the plan. The whole C strip has the same length as half of A; "half" always refers to a chosen whole.



12 cm = 1/2 of this whole length

Every quarter has the same length: 6 cm

> **Check the idea:** ask "Would four unequal sections be quarters?" No: four parts must have equal length to be quarters of this whole length. Naming four pieces alone is not enough.

Optional decoration: add a simple symbol to each strip and use it in a book. The learning goal is the measurement explanation, not neat handwriting or decoration.

Pause or adapt: start with halves of C: 6 cm + 6 cm = 12 cm. Return to quarters later. Do not remove the ruler or drawing merely because the learner is older.

My measuring sheet

A parent may read and record. Point, sketch or explain aloud. Keep the strips and ruler beside this page. No name, login, upload or score is needed.

Check your real strips

Strip	Planned length	Measured length
A	24 cm	_____ cm
B	20 cm	_____ cm
C	12 cm	_____ cm

1. Group A: 24 cm = ____ cm + ____ cm + ____ cm.

2. Compare: A is ____ cm longer than B. Show how you know.

3. Equal parts: one half of A's length is ____ cm. One quarter is ____ cm. Draw the equal sections.

4. Explain: why do we align the start with zero rather than the ruler's outer edge?

Optional later example: an 18 cm strip has its midpoint at ____ cm. A 16 cm strip is ____ cm shorter than it. Show with a drawing or an adult-prepared strip.

For prompts 1–3 use the planned sizes after checking the cuts. If you keep different sizes, record them and ask the parent to adapt the questions. These few examples do not establish mastery or retention.

Parent answers, support and evidence

Worked answers: A: 10 + 10 + 4 = 24 cm (two tens and four ones in centimeters). Difference: 24 − 20 = 4 cm; together end to end: 44 cm. Half of A: 24 ÷ 2 = 12 cm. Quarter: 24 ÷ 4 = 6 cm; 2 × 6 = 12 cm, so two quarters equal one half. Half of C: 12 ÷ 2 = 6 cm. Later example: 18 ÷ 2 = 9 cm; 18 − 16 = 2 cm.

Zero: ruler edges sometimes extend beyond the zero line; using that edge adds unmeasured distance. Each centimeter is a space between adjacent centimeter marks. If starting at 2 and ending at 14, subtract: 14 − 2 = 12 cm.

If a step is difficult

Access: enlarge labels, cover unused ruler markings, give one spoken direction at a time, steady the paper and record answers for the learner. A calculator can reduce calculation load when comparing measurements is the goal. Record its use; it does not demonstrate unaided arithmetic.

Instruction: model a 0–1 cm interval, then ask the learner to show the next one. For place value, trace each 10 cm group and its relation to 20 + 4. For fractions, return to one whole and two equal lengths before four. These teach the target idea rather than only changing how the learner responds.

Slow measuring or difficulty reading a ruler does not identify dyscalculia, math anxiety, attention/working-memory difficulty or reading/language difficulty. These are distinct, sometimes overlapping concerns. Discuss persistent difficulties with the learner's teacher or a qualified professional; this pack cannot diagnose or treat them.

Selected-source basis and limits

Fuchs, L. S., et al. (March 2021). *Assisting Students Struggling with Mathematics: Intervention in the Elementary Grades*, WWC 2021006. Official IES guide · Full text. Recommendations 1–4 concern systematic instruction, clear language, representations and number lines; see especially pp. 21–28 on explicitly connecting representations to notation and retaining them when understanding is incomplete.

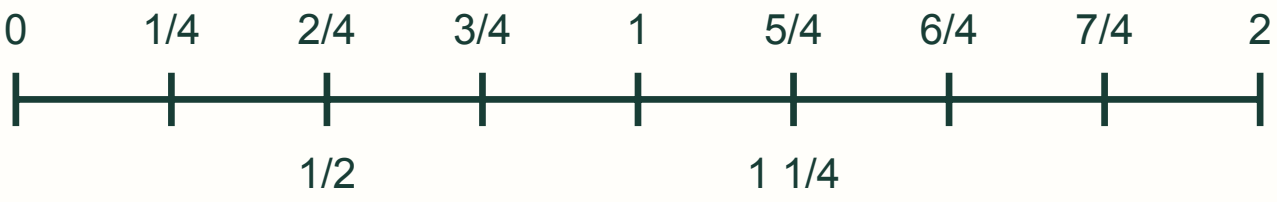
This is an original activity with a selected-source teaching note, not an experiment or systematic review. The guide synthesizes school-based K–6 intervention evidence for students struggling with mathematics, not a trial of our home bookmark project, a single age-8–10 sample, or proof of effectiveness for a particular diagnosis or for teenagers. Choosing centimeters, strip sizes and this sequence is our editorial adaptation. The guide also discusses word problems and timed fluency; this untimed measuring project is not a complete intervention program.

Use the private observation sheet: note the actual example, access supports, what was modeled and what was independent. More parent guidance and evidence limits · Choose another starting point.

Optional follow-up: fractions on a line

Ready? First show halves and quarters of A. Reuse the ruler, pencil, A (24 cm) and C (12 cm), plus spare paper. The adult prepares the line; no more cutting or new materials are needed. Work at the supervised table as before.

1. On spare paper draw a 24 cm line, marking every 3 cm. Choose **C's 12 cm length as one unit**. Label the start 0, the 12 cm point 1, and the 24 cm point 2. This is a new unit choice: A spans two units here.
2. Align C from 0 to 1. Divide that distance into four equal intervals. Each 3 cm interval represents 1/4 of a unit. There are five boundary marks from 0 to 1, but only four intervals.
3. Trace two intervals from zero: 2/4 reaches the same point as 1/2, at 6 cm. Trace three: 3/4 is at 9 cm. Since it is farther right, 3/4 is greater than 1/2.
4. Continue the same-size intervals beyond 1. Five quarter-unit intervals reach 5/4 = 1 1/4, at 15 cm. Fractions can be greater than one. Do not restart the labels after 1.



Schematic: 0 to 1 represents 12 cm, not 1 cm

> **Ask:** "Where is one whole unit? What does one interval mean?" If the learner counts marks, trace each space together. If the unit changes accidentally, realign C from 0 to 1 before continuing.

Access: read labels aloud, steady the strip and allow pointing instead of writing. **Instruction:** model the equal intervals and explicitly connect distance to fraction notation. Record modeled steps separately from independent responses.

Try, explain, then revisit

Keep the line and strips available. A parent may record spoken answers. These are optional practice examples, not a placement or diagnostic test.

1. On the 0–2 line, circle 3/4. How far is it from zero in centimeters? _____

2. Mark 1/2 and 2/4. Why do they land at the same point?

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3. Circle 5/4. Is it less than or greater than 1? Explain using intervals.

Later example: on a new 20 cm line, choose 10 cm as one unit and label 0, 1 and 2. Where are 1/2 and 3/2? Let the learner draw or point before offering a model. Difficulty with this new unit is a reason to revisit the idea, not a diagnosis.

Parent answers

1. Three quarter-unit intervals: 3 × 3 = **9 cm**. 2. Both reach **6 cm**: two of four equal intervals cover half the 12 cm unit. 3. **5/4 > 1**: five quarter-unit intervals are one more than the four that make 1; distance is 15 cm. Later: 1/2 is **5 cm** from zero; 3/2 is **15 cm**. The physical unit changed from 12 to 10 cm; the fraction labels still describe multiples of the chosen unit.

Why add a number line? Selected-source note

Siegler, Carpenter, Fennell, Geary, Lewis, Okamoto, Thompson & Wray (September 2010), *Developing Effective Fractions Instruction for Kindergarten Through 8th Grade*, NCEE 2010-4039. Official IES guide · Full text, recommendation 2, pp. 19–23.

The guide recommends connecting measurement and number lines so fractions are understood as numbers with magnitudes, not just pieces. It rates this recommendation **moderate evidence**, but the supporting studies mainly concern whole numbers in preschool/early elementary and decimals in grades 5–6. The panel extends these findings to fractions; direct fraction studies discussed on pp. 20–21 had design limitations or mixed findings. Its K–8 scope is not a single age-8–10 sample or evidence for teenagers.

This is our original selected-source adaptation, not a systematic review, tested home lesson, or proof of effectiveness for dyscalculia or another diagnosis. The line dimensions and follow-up sequence are editorial choices. The entire project remains an untested PILOT. Use the private observation guide to record the example, access supports, instruction and next step without assigning a mastery score.