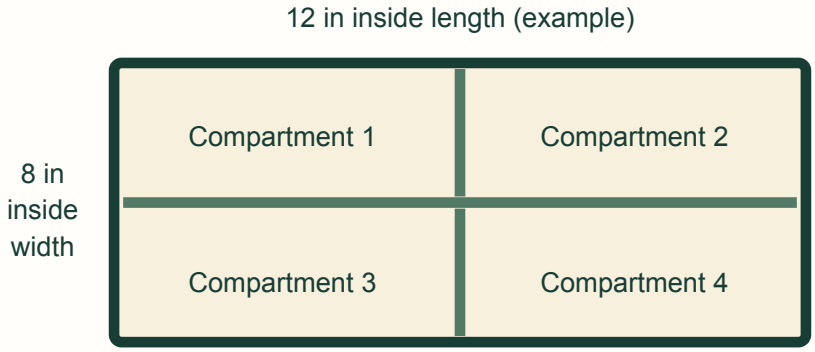
SHOP CLASS MATH / FAMILY PROJECT 01

# Build something useful. Make math make sense.

# The drawer organizer

A parent-led project in measuring, dividing space, and making adjustments. Turn a shallow cardboard box into four useful compartments.




Top view • not a full-size cutting pattern

**Review prototype — physical family testing pending.** Dimensions and examples have been checked mathematically. Assembly, timing, and parent usability have not yet been tested with families.

## What you will practice

Measure inside dimensions; locate halfway points; distinguish length from area; allow room for real materials.

## What to expect

Suggested for middle/high-school learners with parent help. Plan two short sessions; allow roughly 45–75 minutes total as an untested estimate.

**No student login. No power tools. No timer.** Start with a ruler and a willingness to adjust a first attempt.

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# Before you start

Use a shallow, open-top cardboard box or box lid that already fits the drawer. The box is the organizer's outer wall and base; you only add dividers.

| Gather | Quantity / selection |
|---|---|
| Shallow box or lid | 1; stable base, square corners, no sharp staples |
| Clean cardboard | Enough for one long and two short strips; begin with spare material |
| Paper strips | 3 for trial-fit patterns |
| Masking or paper tape | 1 roll; tape is part of the finished joints |
| Ruler or tape, pencil, straightedge | 1 each; choose inch or metric markings for the whole build |
| Scissors and protected work surface | Adult cuts any material too stiff for the learner to cut comfortably |

> **Before buying:** check what you already have. Materials are not included. Reused materials may avoid new purchases; local costs vary. This is not a heavy-duty storage product.

## Parent setup

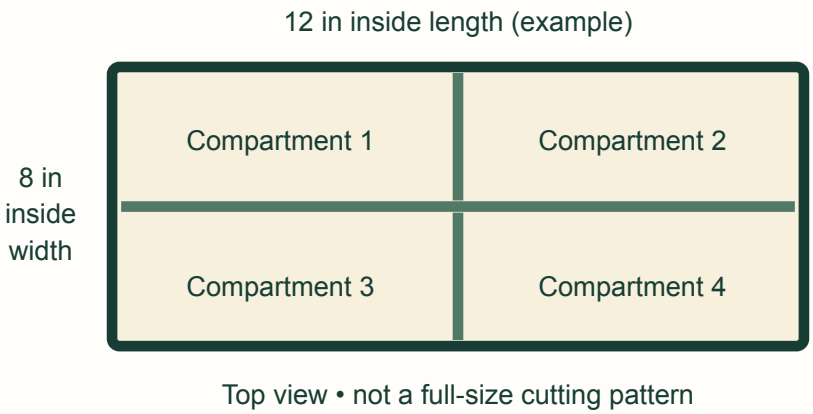
- Check that the box and proposed dividers clear the drawer opening and moving parts. Close the empty drawer slowly before building.
- Choose cardboard that can be cut with scissors. This guide does not require a knife. Do not force scissors through thick cardboard.
- Work outside the drawer. Keep hands out of the cutting path; adults handle difficult cuts. Store light, dry items only.

## Choose a manageable starting point

Recognizing halves and reading a ruler helps, but you can model both. Start in whole centimeters if inch fractions distract from the first build; the optional inch examples can wait.

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# Measure first. Make a cut list.




Top view • not a full-size cutting pattern

Record the **inside** length L and width W of your box. Pick divider height H no taller than the box wall and low enough to clear the drawer. Measure at the base and at the intended divider height; tapered boxes need trial fitting.

| Part | Quantity | How to find its size |
|---|---|---|
| Long divider A | 1 | Height H. Trial-fit a paper strip along the inside length; leave a little end clearance. Copy its fitted length to cardboard. |
| Short dividers B and C | 2 | Height H. After A is taped in, measure each clear gap from A's face to the box wall. Trial-fit paper, then copy. The two lengths may differ. |

> **Ask:** "Why measure inside instead of outside?"
> **Listen for:** the parts must fit in the space between the walls; the walls themselves take up room.

## Worked long-divider example

A rectangular box measures 12 in inside. A starting end allowance of ⅛ in gives **12 − ⅛ = 11⅞ in** for A. If centered end-to-end, that leaves $\frac{1}{16}$ in at each end. Trial-fit before copying; this allowance is an example, not a guarantee for every box.

Drawings are schematic, not full-size templates. Do not cut cardboard using the printed picture as a pattern.

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# Build, with a pause for thinking

1. **Plan the compartments.** Lay the items beside the box. Sketch four spaces. Ask: “Would equal spaces actually suit these items?” Start with equal spaces for this first build.
2. **Locate the middle.** On both short end walls, mark halfway across the inside width. For an 8-in width, halfway is 4 in. Draw a light centerline along the base between the marks.
3. **Fit divider A.** Make the paper pattern, then cut the cardboard. Center the *thickness* of A over your line —not one face. Check fit without bending it.
4. **Tape A upright.** Use short pieces of tape bent into an L: half on the divider, half on the base. Add tape tabs on both sides and at the end walls as needed. Tape bridges small end gaps. Check that the drawer still closes.
5. **Size B and C from the real gaps.** Measure separately from each face of A to its box wall. Trial-fit paper before cutting cardboard. Trim gradually rather than forcing a piece into place.
6. **Divide the length in half.** Mark halfway along the inside length on both long walls. Place B and C across the two lanes at these marks; center their thickness over the marks. Tape their bases and ends, including where they meet A.
7. **Test and adjust.** Add a few light items, slide the organizer into the drawer, and close slowly. If anything rubs or leans, remove it and adjust. Record one change and why it helped.

> **When a piece does not fit:** “Is it too long, too tall, or is the box narrower here?” Measure the mismatch together. Treat the adjustment as useful evidence, not a failed project.

Parents: the joints and suggested sequence still need a physical trial. If tape will not hold the chosen cardboard, stop and record that finding instead of adding tools or stronger construction steps.

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# The math conversation

## 1. Object → sketch → numbers

Point to the full inside width. Lay paper across it and fold the paper in half. Sketch the two equal lengths. Then write **8 ÷ 2 = 4**.

**Ask:** “What does the 4 measure?” It locates the middle, not necessarily the finished clear compartment width.

## 2. Materials take up space

Optional extension: with an 8-in inside width and a centered ⅛-in-thick divider, clear width per lane is **(8 − ⅛) ÷ 2 = $3\frac{15}{16}$ in**.

Measure the real gaps. Cardboard can compress and tape adds thickness, so actual fit takes priority.

## 3. A cut allowance is not the compartment size

For a measured $3\frac{15}{16}$-in gap, a sample $\frac{1}{16}$-in total clearance gives a **3⅞-in short divider**. The gap remains $3\frac{15}{16}$ in; shortening the part does not change the box.

## 4. Length and area tell different stories

The example box’s inside footprint is **12 × 8 = 96 square inches**. Before accounting for divider thickness, four equal regions would each be **24 square inches**. Do not describe this idealized figure as the actual usable area after assembly.

## 5. Make a buying decision

**Illustrative prices, not a shopping quote:** cardboard $2.40 and tape $3.60 total $6.00. From a $10 budget, $4 remains. A spare cardboard sheet would bring the total to $8.40 and the remainder to $1.60.

> **Keep it conversational.** Let the learner point, sketch, explain aloud, or use a calculator. Model one example, then ask a similar question. These are general teaching suggestions, not a tested intervention or a diagnostic assessment.

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# Student sheet • plan and build

Name or initials (optional): _____ Date: _____

**Our unit:** inches / centimeters (circle one; use it consistently)

Inside length L: _____

Halfway across the width: _____

Inside width W: _____

Fitted length of divider A: _____

Chosen divider height H: _____

Drawer clearance checked by: _____

| After A is installed | Measured gap | Fitted short-divider length |
|---|---|---|
| Lane B | _____ | _____ |
| Lane C | _____ | _____ |

**Sketch the top view and label your dimensions:**

**Estimate:** Which item needs the most space? Why?

**One adjustment we made, and the measurement that helped:**

You can explain aloud or draw instead of writing. A parent can record your words. This sheet stays with your family; no upload is required.

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# Student sheet • explain and transfer

Use a sketch, objects, words, or calculations. This is a conversation, not a timed test.

1. A box is 10 in wide inside. Where is the halfway line?

2. A 14-in inside length needs a sample total end clearance of ⅛ in. How long is the fitted divider?

3. Why might a divider cut from the box's outside length not fit?

4. A box has a 10-in by 6-in inside footprint. What is its area? Before allowing for divider thickness, what is one quarter of that area?

5. Using the example prices ($2.40 cardboard, $3.60 tape), how much remains from $10 after buying both?

6. **Optional stretch:** A box is 8 in wide inside; a centered divider is ¼ in thick. How wide is each clear lane?

## Explain the real project

Show someone which measurement determined one piece. Explain why you kept it or changed it.

## Try a new situation another day

Choose a different box. Before measuring, predict which divider lengths will change. Check your prediction. No new build is required.

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# Parent answers & pilot feedback

## Worked answers to the student check

1. **5 in:** 10 ÷ 2 = 5.
2. **13⅞ in:** 14 − ⅛ = 13⅞. This is a sample fitting allowance, not a universal rule.
3. **Outside includes the walls.** The divider must fit the smaller inside space. A tapered box can also have different widths at different heights.
4. **60 in²; idealized quarter 15 in²:** 10 × 6 = 60; 60 ÷ 4 = 15. Real dividers occupy some area.
5. **$4:** $2.40 + $3.60 = $6; $10 − $6 = $4.
6. **3⅞ in:** (8 − ¼) ÷ 2 = 7¾ ÷ 2 = 3⅞.

## What did you observe?

For each skill, note **modeled together / with a prompt / explained independently / not tried**. This is a record of this activity, not a mastery score or diagnosis.

☐ Measured the inside dimension using consistent units.

☐ Located a midpoint and explained what it meant.

☐ Used a measurement to adjust a real part.

☐ Distinguished a length from an area.

## Before this becomes a finished product

Record actual build time, tools/materials used, any failed joint, confusing instruction, and whether the drawer closed. Ask the parent: “Could you lead this without extra help?” Ask the learner: “Which measurement mattered most?”

**Pilot notes:**

Original project-guide prototype by Shop Class Math. No claims of physical validation, measured learning gains, or dyscalculia treatment. Family feedback should omit children’s identifying details.