Structures for Belonging and Discourse

Twelve structures for any subject, and the routine inside every one of them: Think, Commit, Discuss.



Each structure has one page: how it runs, the words to start it, who it helps, and what to do when it goes wrong. This edition adds the talk ladder, and how to run the structures standing at wall whiteboards. A Word template for each structure, and 18 sample lessons for six of them, are at mattcase.org/toolkit.

Inside

Start here	2	The twelve structures	8
Think, Commit, Discuss	3	Running it online	20
Academic talk	4	Make it yours: cards, sheets and mats	21
Grouping and seating	5	How strong is the evidence?	56
Wall whiteboards	6	Sources	57
When it goes wrong	7		

Start here

The toolkit holds twelve structures for any subject, each built for belonging and for discourse: students talking with each other about the content. Each structure has one page: how it runs, the words to start it, the talk move it builds, who it helps (three students a page, most often the quiet student, the student still learning English, the student who is behind or the student who usually takes over), examples for STEM, the arts and English, and the fixes.

Have ten minutes? Read page 3, pick one structure below, and run it tomorrow with an easy question.

Structure and groups	Page	Use it when	Printables (page)
Line-Up and Fold the Line Whole class	8	you want mixed pairs or teams fast, or want to see the range of opinion in the room	22
Find the Fiction Teams of four	9	you are reviewing something where the common mistakes are the point (properties, facts, rules), or a new team is getting to know each other	23
Timed Pair Share Pairs	10	the question has more than one good answer: an opinion, a prediction, something from students' own lives, a method	25
RoundTable (and RoundRobin) Teams of four	11	students are brainstorming, listing, or building one product that has many right answers	28
Numbered Heads Together Teams of four	12	you are checking understanding, reviewing, or discussing a question with one best answer	31
RallyCoach Pairs	13	students are practicing with a worksheet or a set of problems that have right answers	36
Sage-N-Scribe Pairs	14	the work has several steps and saying each step aloud builds understanding	39
Showdown Teams of four	15	you are reviewing or practicing and every student should produce an answer	41
Quiz-Quiz-Trade Whole class	16	you are reviewing facts, vocabulary or short problems	43
Team-Pair-Solo Teams of four	17	you are teaching a new kind of task and want the support to fade step by step	45
Fan-N-Pick Teams of four	18	you are reviewing with a deck of questions that have clear answers	48
Match Mine Pairs	19	students are practicing precise vocabulary: positions, shapes, graphs, diagrams	53

Before you start

1. Use the words each structure page gives you to start it, word for word, the first few times. Students learn the routine faster when the directions are the same every time.
2. Give thirty seconds of silent thinking before anyone talks, so everyone has something to say.
3. Run a new structure once with an easy question before you use it with new content.
4. Watch who talks as well as what gets said: the Who it helps lines say which students to watch.

How the parts fit

The routine, Think, Commit, Discuss (page 3), is what every student does, in every structure. The twelve structures (pages 8 to 19) are twelve ways to run the routine. The talk ladder (page 4) is what good talk sounds like, from "I think …" to answering someone else with evidence. Wall whiteboards (page 6) are one place to run the routine standing up, if your room has them. Grouping and seating (page 5) says who sits with whom, When it goes wrong (page 7) has the fixes, and Running it online (page 20) moves it to Canvas. At the back: Make it yours (page 21), every card and sheet from our packs ready to print, with blank cards to type over in the Word copy; then How strong is the evidence? (page 56) and the sources (page 57), one list A to Z. **Word template and sample lessons: mattcase.org/toolkit**

The structures are Kagan Cooperative Learning structures (Spencer Kagan and Miguel Kagan, Kagan Publishing). Standing at wall whiteboards in random groups of three comes from Building Thinking Classrooms (Peter Liljedahl). The team mat and the Fan-N-Pick mat are redrawn from Kagan Publishing's, and the cartoons on them and on the desk sheets are Kagan Publishing's. The steps, examples and cards are our own.

Every structure here is a way to run one routine: think alone, commit to an answer, discuss it, and answer for the group. Each step below says what to do, the words to say, and why it works.



1 Think

Ask the question, then give thirty seconds of silent thinking: everyone thinks or writes alone, no hands up.

> *"Thirty seconds, in your head or on paper. No hands yet."*

Everyone has an answer before anyone speaks. Later, when you ask a quick question aloud, wait at least three seconds before you call on anyone.

2 Commit

Everyone shows an answer at the same moment: on a small whiteboard, on paper, or with 1, 2 or 3 fingers for a choice.

> *"On three, show me. One, two, three."*

Once students commit, each has a position to defend or change, and nobody can wait for someone else's answer.

3 Discuss

Partners or the table argue with a reason. Then everyone answers again, beside the first answer, without erasing.

> *"Convince your partner. Then show me again."*

In a college genetics course, most students who changed a wrong answer to a right one after talking with neighbors then got a new question on the same idea right on their own.[19]

4 Call

After the group has talked, call a seat number from 1 to 4. Do not take volunteers. The student in that seat answers for the group.

> *"Number 3s: what did your table decide, and why?"*

Any seat may be called, so the group makes sure every member can explain the answer before you call.

To begin. Teach the subject's key words first and expect them in the talk (page 4). For a new procedure, show a worked example first. **To finish.** End with one problem each student does alone (in English, one claim with its evidence; in art, one sketch with a reason), then show the answer or a model so each student can check it.

Which steps each structure carries

Structure (page)	Where	Think	Commit	Discuss	Call	Printables (page)
Line-Up and Fold the Line (8)	Open floor	●	●	●	○	22
Find the Fiction (9)	Desks or wall whiteboards	●	●	●	○	23
Timed Pair Share (10)	Desks	●	○	●	○	25
RoundTable (and RoundRobin) (11)	Desks or wall whiteboards	○	●	●	○	28
Numbered Heads Together (12)	Desks or wall whiteboards	●	●	●	●	31
RallyCoach (13)	Desks or wall whiteboards	○	●	●	○	36
Sage-N-Scribe (14)	Desks or wall whiteboards	○	●	●	○	39
Showdown (15)	Desks or wall whiteboards	●	●	●	○	41
Quiz-Quiz-Trade (16)	Open floor	○	●	●	○	43
Team-Pair-Solo (17)	Desks or wall whiteboards	○	●	●	○	45
Fan-N-Pick (18)	Desks	●	●	●	○	48
Match Mine (19)	Desks or wall whiteboards	○	●	●	○	53

A filled circle means the structure has the step; under Commit, each student gives an answer of their own before the talk, in turn or all at once. An open circle means it does not, so add it. Under Think: give thirty seconds of silent thinking first. Under Commit: everyone writes a one-line answer before the talk. Under Call: at the end, call a seat number, or a student's name on the open floor.

19. Smith and others (2009). In one college genetics course, 350 students answered a question alone, talked, answered again, then tried a similar one alone. Of those wrong first and right after talking, 77% got the similar one right. Limits: one course, no comparison group. Full reference on page 58.

Academic talk

Academic talk is students talking with each other about the content, in the subject's own words. The talk ladder is our own way to describe it: four steps, from saying what you think to answering someone else with evidence.

1 Share
"I think …"
says an answer

2 Explain
"… because …"
gives a reason

3 Back it up
"The evidence is …"
in the subject's words

4 Respond to someone
"I agree with ___ and add …"
"I disagree with ___ because …"
"I heard you say …"
answers what someone said

Most talk starts on steps 1 and 2. Academic talk reaches steps 3 and 4: evidence, in the subject's words, and an answer to what someone else said.

What it sounds like

	STEM	The arts	English
The question	*Dropped together from the same height, which lands first: a basketball or a tennis ball?*	*Which of these two portraits feels closer to you?*	*What is the theme of The Tortoise and the Hare?*
1 Share	"I think they land at the same time."	"I think the left portrait feels closer."	"I think the theme is that steady effort beats talent that gets lazy."
2 Explain	"Because gravity speeds up both balls at the same rate."	"Because she fills the whole frame."	"Because the hare loses even though he is faster."
3 Back it up	"When we dropped them from the bleachers, they hit the ground almost together."	"The crop cuts off the top of her head, and her eyes look straight at us."	"The hare stops for a nap because he is sure he cannot lose."
4 Respond to someone	"I agree with Sam, and the air slows both balls about the same, so they still land together."	"I disagree with Ana: the eye line in the right one pulls me in more."	"Adding to Jo's idea: the tortoise never stops, even when he is far behind."

Key words first

1. Pick a small set of academic words the talk needs, about five to eight, to teach over several days and use in talk and writing.
2. Say each word, show it (a picture, an example, a sentence), and have every student use it once.
3. Post the words, then expect them in the answers: "Say it again with our word."

A U.S. Department of Education guide for teachers of English learners in kindergarten to grade 8 rates this as strongly supported: a few words, taught in depth over several days.[1]

Sentence starters

We use sentence starters to help a student begin, such as a student still learning English; the evidence for them is limited (page 56). Post them where everyone can see them, and take them down once students use the words on their own.

STEM	My claim is ___. The evidence is ___ (a measurement, a calculation, a result).
The arts	I notice ___ in the ___ (line, color, rhythm, tempo), which makes me think ___.
English	On page ___, ___ says "___", which shows ___.

One question, three levels of support

Everyone answers the same question. Post all three versions, and each student picks the one they need.

As asked
Dropped together from the same height, which lands first: a basketball or a tennis ball? Why?

With a starter
Add: "I think ___ because ___." In the arts and English, use their starter above.

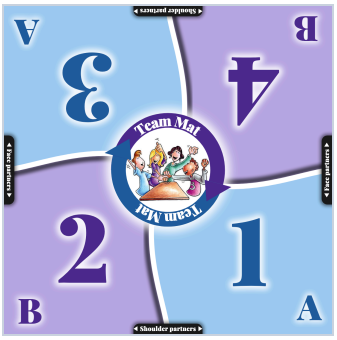
With a starter, words and a picture
Add a word bank (gravity, mass, air resistance) and a drawing of the two balls side by side.

1. Baker and others (2014). A U.S. Department of Education panel rated the evidence strong for teaching a small set of academic words in depth over several days, through speaking, listening and writing. Limit: the studies are of English learners in kindergarten to grade 8. Full reference on page 57.

Grouping and seating

How students are grouped decides who talks to whom. Mix them on purpose, and change the mix.





Kagan's team mat (page 35): seats 1 to 4, partners A and B.

Teams of four

Most structures here run in fours, at the numbered seats on the team mat: shoulder partners side by side, face partners across the table, and partners A and B for turns in pairs. Give each team a shared goal, and check each student alone at the end. In studies of students aged about 12 to 15, working toward a shared goal went with higher achievement and better relationships with classmates than competing or working alone.[15]

Threes and fours

Seat teams of four at desks. A structure run at the boards uses the groups its own page gives; random groups of three are for a board task like the one on page 6. When a class does not split into fours, make some groups of three: the last line of each desk sheet says what changes (the table on page 21 gives each sheet's page). In Numbered Heads Together, a team of three counts off 1, 2, 3, and if you call a 4, seat 1 answers.

Making groups fast

Deal playing cards (same number, same group), count off around the room, or use Line-Up and Fold the Line (page 8). Do it where students can see you, so they know nobody was picked. For a short practice block, group by what students need next, then go back to mixed teams.

Mixing on purpose

For teams that stay together, build each one with a mix: a student strong in the subject, one who needs support, two in between, and a mix of who talks most and least. For a quick pair, let a line or a card decide.

Arranging the room

Desks stay in fours for every structure run at desks, pairs included. Line-Up and Fold the Line and Quiz-Quiz-Trade need open floor. Keep the walls clear if you use the whiteboards. Move the furniture once, at the start of class: each structure page says whether it runs at desks, on open floor or at the wall whiteboards.

When to change

Our rhythm: keep teams of four for four to six weeks so the routines settle, then remix. Change pairs often; Line-Up and Fold the Line and Quiz-Quiz-Trade do it for you.

Who works with whom

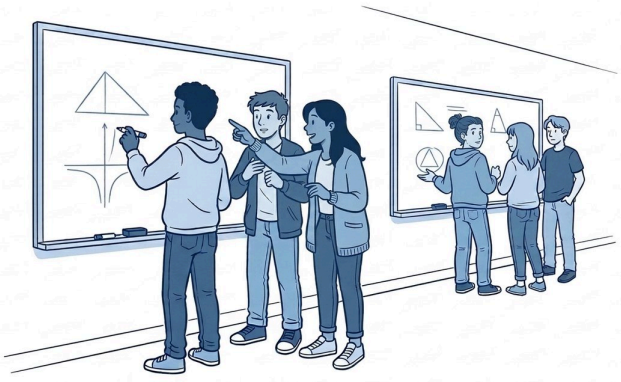
Shoulder partners	Seats 1 and 2, seats 3 and 4: side by side
Face partners	Seats 1 and 4, seats 2 and 3: across the table
Partners A and B	Seats 1 and 3 are Partner A. Seats 2 and 4 are Partner B. Every pair, shoulder or face, has one A and one B.

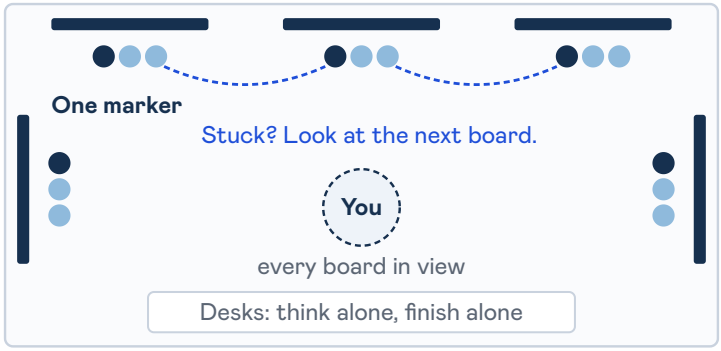
15. Roseth, Johnson and Johnson (2008). It reviewed 148 studies of more than 17,000 students in grades 6 to 9. Working toward a shared goal went with higher achievement and better relationships with classmates than competing or working alone. Limit: it did not test team size. Full reference on page 58.

Wall whiteboards

If your room has whiteboards on the walls, most of these structures can run standing up. The idea is from Building Thinking Classrooms (Peter Liljedahl), a book written for math classrooms. Standing groups can see each other's work, and you can see every group from the middle of the room.

This way of working comes from classroom practice, and no controlled trial we could find has tested its effect on learning.[12] So each board task here ends the way the routine does, with one problem each student does alone (page 3).





Whiteboards on every wall. The room has no front.

How a board task runs

1. Deal playing cards where students can see you, three of each number: same number, same board.
2. Give the task out loud. Each student writes a first answer alone before the group goes to the board.
3. One marker a group. The holder writes only what the other two say, and passes it on after each part.
4. With each task, give the group a written check: the answer partway through, or what a good board must show. A group that does not match fixes its board.
5. Done? Compare boards with the next group, then get the next task.
6. To finish, talk the class through two or three boards. Then everyone sits and does one problem alone.

Say this to start

> *"Groups of three, by your card. One marker: the holder writes only what the other two say, and passes it after each part. Stuck? Look at the next board."*

Stand at the boards for: a new kind of task, a brainstorm, comparing two methods, or finding the mistake. Show a worked example first for a new procedure.

Sit at desks for: thinking alone first, the mat and cards in Fan-N-Pick (page 18), notes, and the one problem alone at the end.

No wall whiteboards? Tape chart paper to the wall, write on the windows with dry-erase markers, or stand small whiteboards against the wall.

What goes on the board

STEM	A set of problems that get harder one small step at a time. A group moves on when its board is right.
The arts	Three quick thumbnail sketches for one brief. The group chooses one and writes why beside it.
English	One quotation in the middle of the board. The group builds the claim, the evidence and the explanation around it.

While the groups work

1. Stand in the middle of the room, where you can see every board.
2. Answer a question with a question, or send the group to look at the board next to theirs.
3. When a group is done, give it the next task, one small step harder.

The Where column on page 3 shows which structures can run at the wall whiteboards, and each structure page says how to run it there.

Help every student in. Tape each key word beside the part of a picture or model it names, at each board, for students still learning English and students with learning plans.

Keep the work. Take a photo of each board before it is erased, for students who were absent and for the next lesson.

12. Liljedahl (2020). Building Thinking Classrooms is Peter Liljedahl's book of 14 classroom practices, among them random groups of three and standing at wall whiteboards with one marker. It comes from classroom practice. We found no controlled trial of its effect on learning. Full reference on page 58.

When it goes wrong

Start from what you saw in the room. Each row gives a fix to try and the pages that have it. Every structure page ends with its own fixes too.

What you see	Try this	Go to (page)
The same few students do all the talking	Give each student a timed turn that no one can talk over, or call a seat number after the group has talked: no volunteers.	Timed Pair Share (10), Numbered Heads Together (12)
A student won't talk at all	Have them write first and rehearse with one partner, then speak. Give them the key words.	Timed Pair Share (10), RoundTable (and RoundRobin) (11), Academic talk (4)
The talk drifts off task or gets loud	Give each turn a set time and say whose turn it is. Give every seat a job. Use the quiet signal: you raise a hand, and students freeze and raise theirs.	Timed Pair Share (10), Fan-N-Pick (18), Quiz-Quiz-Trade (16)
Everyone copies the strongest student	Have everyone commit to an answer alone before anyone talks.	Showdown (15), Numbered Heads Together (12), Think, Commit, Discuss (3)
The talk stays social	Ask for a claim with evidence, in the subject's key words.	Find the Fiction (9), Academic talk (4)
Students still learning English go quiet	Teach the key words first, and give a sentence starter and a picture. Let them rehearse with a partner before they speak to the room.	Timed Pair Share (10), Match Mine (19), Academic talk (4)
A student is behind in the content	Give support that fades: a coach beside them, then a partner, then alone.	RallyCoach (13), Team-Pair-Solo (17)
One student takes over the group	Give roles and turns: one pen color each, one job each.	RoundTable (and RoundRobin) (11), Sage-N-Scribe (14), Fan-N-Pick (18)
One student takes over a wall whiteboard	Use one marker. The student holding it writes only what the others say, and passes it after each part.	Wall whiteboards (6), Sage-N-Scribe (14)
A group is stuck and calls you over	Send them to look at the board next to theirs before you help.	Wall whiteboards (6)
Students argue past each other	Have each one say back what they heard first, "I heard you say …", then answer it.	Timed Pair Share (10), Academic talk (4)
A wrong answer spreads through a group	Have everyone answer alone and show it at once, then check each answer against your key.	Showdown (15), Numbered Heads Together (12)
Groups finish at different times	Have a group that is done compare boards with the next group, then give it the next task, a step harder.	Wall whiteboards (6)
The coach shows the answers and the partner copies	Give coaches questions to ask, with the answers hidden on the back of the card. End with one problem alone.	RallyCoach (13)
One partner does all the work	Give each partner a job: one solves aloud, the other writes or coaches. Swap after every problem.	Sage-N-Scribe (14), RallyCoach (13)
A team has three students	Use the line for a group of three at the foot of the structure's desk sheet.	Make it yours (21), Grouping and seating (5)
Nothing shows what each student can do alone	End with one problem each student does alone, then show the answer or a model so they can check it.	Think, Commit, Discuss (3), Team-Pair-Solo (17)

Still not working after two tries?

1. Have a student repeat the directions first.
2. Run it once more with an easy question, so the routine is the only new thing.
3. Use the words to start it exactly as the structure page gives them.
4. Print the structure's desk sheet (page 21 lists them), one for each pair or team, and leave it on the desk.

Why one problem alone at the end

In classroom studies, including high school classes, students who took practice quizzes did better on later tests than students who did not, and better still when they were shown the right answers.[22]

22. Yang and others (2021). It reviewed 222 classroom studies, elementary school to college. Classes that took practice quizzes did better on later tests, in high school too, and more so when students saw the right answers. Ungraded quizzes helped as much as graded ones. Full reference on page 58.

Line-Up and Fold the Line

Students line up along a scale, then the line folds so each end meets the other.

Use it when you want mixed pairs or teams fast, or want to see the range of opinion in the room.

Why it works: Nobody gets picked last, because the line makes the groups. And the two ends of the line end up talking to each other.

Groups and materials: Whole class, then pairs or fours. Open floor along one wall, and a sign for each end.

Talk move: Explain your thinking. Sentence starter: "I'm standing here because …" Talk ladder step 2 (page 4).

Think, Commit, Discuss (page 3): this one uses Think, Commit and Discuss.

Signs: page 22.

Word template: mattcase.org/toolkit

How it runs

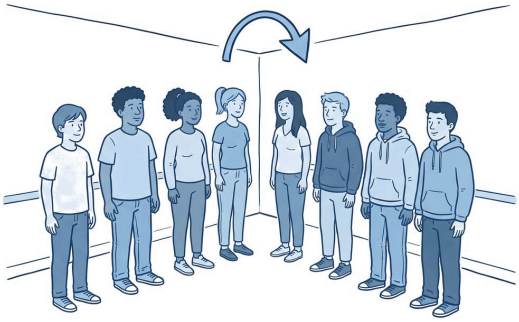
1. Name the line: "Line up by ___" (a number, a date, or how strongly you agree), and point to each end.
2. Give thirty seconds of silent thinking to choose a spot. Then students talk to find their place; nobody takes a spot without talking.
3. Check the line: neighbors tell each other why they stand where they do.
4. Fold: the first half of the line walks down to face the second half, the first person facing the last. Each student's partner is the person across. With an odd number, the student left at the middle joins the pair beside them.
5. For teams of four, two pairs standing side by side join up.
6. Partners tell each other where they stood and why, then sit together for the next task.

Say this to start

> *"Line up by how strongly you agree with this statement: strongly agree by the window, strongly disagree by the door. You will have to talk to find your spot."*

Closing the talk: Ask two or three pairs for their reasons, and give the answer if the question has one.

At a wall whiteboard: The line needs open floor. Afterward, send each folded pair straight to a board for the next task.



Who it helps

The student without friends in the class. The line decides the partners, so nobody waits to be picked or ends up alone, and the fold pairs people who would not have chosen each other.

The quiet student. The first talk is one small fact, their number or their opinion, said to the two people beside them. That is an easy first thing to say out loud.

The student still learning English. The sentence is short and the same every time ("I'm standing here because …"), and they hear it from their neighbors before they have to say it.

In STEM, the arts and English

STEM: Line up by your estimate: how many seconds does a bowling ball take to fall 5 meters? (About one second.)
Common trap: A heavier ball falls faster, so it must take less time.

The arts: Line up by how much the color choices change this painting's mood, from "not at all" to "completely."
Common trap: "I just like it," with nothing pointed to in the painting.

English: Line up by how much you agree: "The narrator can be trusted."
Common trap: A position with no line from the text behind it.

If it goes wrong

Students shuffle into place without talking.
Everyone says their number or reason to both neighbors before the fold.

A student won't pick a spot.
They stand by someone and say, "I'm with them because …" A borrowed reason still counts.

The line takes too long.
Give a time limit and one sentence each: "I'm standing here because …"

Find the Fiction

Each student writes three statements on a topic, two true and one false; the team has to agree on the fiction before the author reveals it.

Use it when you are reviewing something where the common mistakes are the point (properties, facts, rules), or a new team is getting to know each other.

Why it works: Writing a believable fiction takes real understanding, and every student gets a turn as the author.

Groups and materials: Teams of four. A statement slip for each student.

Talk move: Argue with evidence. Sentence starters: "I think number ___ is the fiction because …" "I disagree, because …" Talk ladder step 4 (page 4).

Think, Commit, Discuss (page 3): this one uses Think, Commit and Discuss.

How it runs

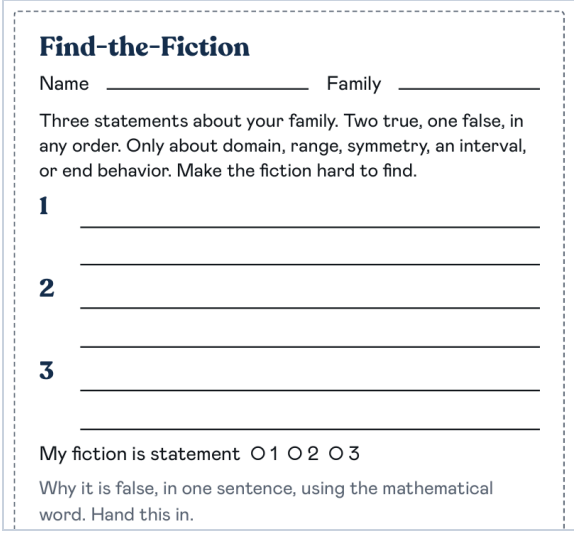
1. Each student writes two true statements and one fiction on a slip, in any order. The fiction should be hard to find.
2. Seat 1 is the first author. The author stands and reads all three aloud.
3. Teammates think alone. The author counts to three, and on three the teammates show 1, 2 or 3 fingers at once: the statement they think is the fiction.
4. Fingers don't match? Each student gives a reason, and the team argues until it agrees on one statement. Still split after two minutes? Go on to the reveal.
5. The author reveals the fiction, says why it is false, and sits.
6. The next student is the author, in seat order.

Say this to start

> *"Write three statements about our topic: two true, one false. Make the fiction believable. Read yours aloud; your team has to agree on the fiction before you reveal it."*

Checking the answer: The author says which statement was the fiction and why it is false. Collect the slips: a "true" statement that is wrong needs correcting with the whole class.

At a wall whiteboard: For a team version another day, each team writes its three statements on a board. Teams move one board over, show fingers, argue and circle the one they agree is the fiction. Then each team goes back to its own board and tells the class which statement was the fiction, why it is false, and whether the visitors found it.



Find-the-Fiction

Name _____ Family _____

Three statements about your family. Two true, one false, in any order. Only about domain, range, symmetry, an interval, or end behavior. Make the fiction hard to find.

1 _____

_____

2 _____

_____

3 _____

_____

My fiction is statement ○ 1 ○ 2 ○ 3

Why it is false, in one sentence, using the mathematical word. Hand this in.

A statement slip from our 1.02 function families pack: three statements, then which one is the fiction and why.

Desk sheet: page 23. **Slips:** page 24.
Word template: mattcase.org/toolkit



Who it helps

The quiet student. Every student gets a turn as the author, and the team has to listen to them before anyone can guess.

The student who is behind. Two of their three statements are things they already know, so they start from what they are sure of.

The student who usually takes over. They cannot call the answer for the team: the teammates show fingers at the same moment, and the team has to agree before the author reveals.

In STEM, the arts and English

STEM: Three statements about photosynthesis, one of them false.
Common trap: Plants get their food from the soil.

The arts: Three statements about a piece's tempo, dynamics and meter, one of them false.
Common trap: Louder means faster: mixing up dynamics and tempo.

English: Three statements about a character's motive, each with a line from the text, one of them false.
Common trap: Mixing up what a character says with what the character wants.

If it goes wrong

The fiction is obviously silly.
The fiction must sound true: change one word or one number of a true fact.

One student calls the answer before anyone thinks.
Think alone first; the author counts to three and the teammates show fingers at once.

A student can't write three statements.
Give them two true ones on the slip; they write only the fiction.

Timed Pair Share

Partners take turns talking for a set time while the other only listens, then the listener thanks them by repeating one thing they said.

Use it when the question has more than one good answer: an opinion, a prediction, something from students' own lives, a method.

Why it works: Every student gets the same time to talk, and a partner whose only job is to listen.

Groups and materials: Pairs, face to face. Partner A is seats 1 and 3 on the team mat (page 35); Partner B is seats 2 and 4. A timer everyone can see, and a prompt card for each pair.

Talk move: Revoice (say back what you heard). Sentence starter: "Thanks. I heard you say …" Talk ladder step 4 (page 4).

Think, Commit, Discuss (page 3): this one uses Think and Discuss.

How it runs

1. Ask the question, then give thirty seconds of silent thinking.
2. Partner A talks for the set time, 60 or 90 seconds. Partner B only listens: no questions, no "me too."
3. Partner B, 15 seconds: "Thanks. I heard you say …" and one thing A said.
4. Switch: Partner B talks for the same time and gives their own answer. Partner A only listens.
5. Partner A thanks B the same way.

Say this to start

> *"Ninety seconds each, and the listener says nothing. When the timer goes, the listener says, 'Thanks. I heard you say …' and one thing their partner said. Then switch."*

Closing the talk: After both turns, call on two or three students to tell the class one thing their partner said.

At a wall whiteboard: Run it seated. After board work, pair students from different boards: each says what their board found.

A golf ball is hit from the ground. After t seconds, it is f(t) feet above the ground, where $f(t) = -16t^2 + 128t$.

A When does it land? **B** What is the greatest height it reaches, and when?

Which feature answers A? Which answers B?

Say the feature, the form that shows it with no work, why the other two forms don't, and what its numbers mean for the ball.

1. **Partner A, 90 seconds.** Talk about A and B. Partner B only listens.
2. **Partner B, 15 seconds.** "Thanks. I heard you say …"
3. **Partner B, 90 seconds.** Talk about A and B, adding what Partner A left out. Partner A only listens.
4. **Partner A, 15 seconds.** "Thanks. I heard you say …"

The prompt card from our 2.02 quadratic functions pack. The cards to print change turn 3: Partner B gives their own answer.

Desk sheet: page 25. **Cards:** pages 26 and 27.

Word template and sample lessons: mattcase.org/toolkit



Who it helps

The quiet student. They get a full turn that nobody can talk over, and they say it to just one person.

The new student. Every round is a real conversation with one classmate, and the thanks line tells them they were heard.

The student who usually takes over. For half the time their only job is to listen, and then they have to repeat back what they heard.

In STEM, the arts and English

STEM: A website poll says 80% of students want school to start later. Can we trust it?
Common trap: Trusting the 80% without asking who answered the poll.

The arts: What do you notice first in this piece, and what choice did the artist make to pull your eye there?
Common trap: Naming the subject ("a boat") instead of a choice (contrast, placement, line).

English: Is Romeo and Juliet's love real, or is it impulse? Use one moment from the play.
Common trap: An opinion on love, with nothing from the play.

If it goes wrong

The listener jumps in with a question or a story of their own. The listener says nothing until the timer goes; the thanks line is their turn.

The talker runs out after twenty seconds. Give the think time, and a fallback on the board: "Say why" or "Give an example."

A student still learning English goes quiet. Seat them as Partner B, so they go second: they hear an answer first, and "I heard you say …" gives them words to borrow.

RoundTable (and RoundRobin)

Teammates take turns adding to one shared sheet (RoundTable) or aloud (RoundRobin).

Use it when students are brainstorming, listing, or building one product that has many right answers.
Why it works: Everyone writes something, and with a pen color each, you can see who wrote what.
Groups and materials: Teams of four. One sheet per team and a different pen color for each student.
Talk move: Build on an idea. Sentence starter: "Adding to ___'s idea, ..." Talk ladder step 4 (page 4).
Think, Commit, Discuss (page 3): this one uses Commit and Discuss.

How it runs

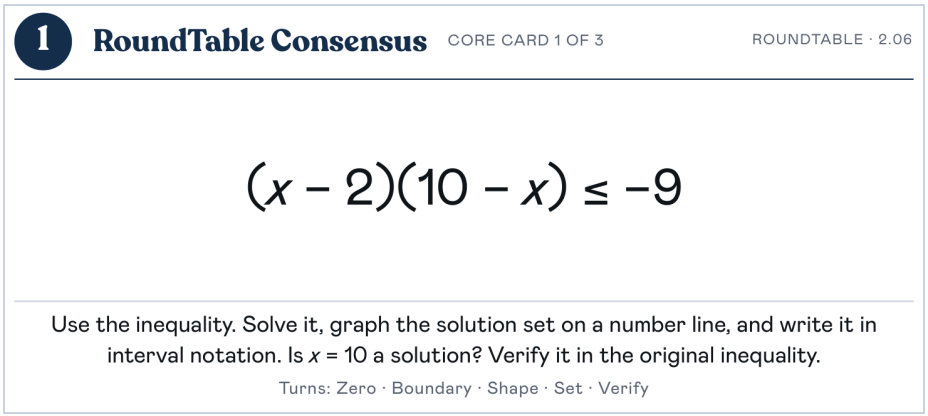
1. Give a prompt with many possible answers, and say how long: a set time or a set number of times around.
2. Whoever has the next birthday writes one answer, says it aloud, and passes the sheet left.
3. The sheet keeps going around. Each student reads what is there, then adds one new answer.
4. No skipping a turn: a stuck student asks the team for help or writes a question instead.
5. The team reviews: star the one answer everyone would choose, sort the list, or write a summary.

RoundRobin is the same turns aloud, with no sheet. RoundTable Consensus (the card pictured) uses a problem: each turn is one step, written only when the team agrees.

Say this to start

> *"In turn, write one answer and say it aloud, then pass the sheet left. No skipping: if you are stuck, your team can coach you, or write a question."*

Checking the answer: Each team reads its starred answer, sorted list or summary aloud. Check any right answers with your key.
At a wall whiteboard: One board per team and a marker color each, but only the student whose turn it is holds a marker. The others put theirs down until their turn. For round two, teams move one board over and add.



A core card from our 2.06 quadratic inequalities pack: one card per team, one step per turn.
Desk sheet: page 28. **Cards and sheet:** pages 29 and 30.
Word template and sample lessons: mattcase.org/toolkit



Who it helps

The quiet student. Every turn is theirs to write, and nobody can talk over a pen.
The student still learning English. Writing gives them time to find the words, and they can borrow words already on the sheet.
The student who usually takes over. They get one turn like everyone else, and they have to read what the others wrote before they add again.

In STEM, the arts and English

STEM: Every sign that a chemical change has happened, each with an example.
Common trap: Melting ice, which is still water.

The arts: Every way a set, costume or prop could show the play happens in the 1920s.
Common trap: Costumes, and nothing else. Push for sets and props too.

English: Every reason a character might lie, each with a character from something you have read.
Common trap: A reason, with no character to show it.

If it goes wrong

A student passes without writing.
Writing a question always counts as a turn, so there is always something to add.

Everyone repeats the easy answer.
Second time around, each turn must add to an idea already on the sheet.

One student rewrites the others' answers.
One pen color each, and nobody writes in another color.

Numbered Heads Together

Teams put their heads together until anyone can answer, then the teacher calls a number.

Use it when you are checking understanding, reviewing, or discussing a question with one best answer.

Why it works: Anyone might be called, so everyone gets ready, and whoever is called has just talked it over with their team.

Groups and materials: Teams of four at the numbered seats on the team mat (page 35), with a number card each. A small whiteboard each, question cards, and a die if you roll the number.

Talk move: Explain for the team. Sentence starter: "Our table thinks ___ because …" Talk ladder step 2 (page 4).

Think, Commit, Discuss (page 3): this one uses all four steps: Think, Commit, Discuss and Call.

How it runs

1. Each student's number is their seat on the team mat; with no mat, teams count off 1 to 4, clockwise.
2. Ask the question. Everyone works alone and silent for thirty seconds to a minute, on their own whiteboard.
3. Say, "Markers down." Heads together: teams stand, boards in the middle, and compare every board or the line you name. Teammates teach each other. Nobody erases: a fix goes beside the old work. When everyone can explain it, the team sits.
4. When every team is seated, or time is up, call or roll a number (on a 5 or 6, roll again).
5. The student with that number at each table wipes their board and writes the team's answer and how they got it, alone. On "Show," every called board goes up at once, and one or two explain.

Say this to start

> *"Think alone first. Then put your heads together so that anyone at your table could answer for the team. When I call a number, that person writes the answer alone and holds it up. Make sure every number is ready."*

Checking the answer: The called boards go up together, so you see every team's answer. Confirm it before moving on.

At a wall whiteboard: Students work alone on paper first. The team writes its agreed answer on one board, with any fix beside the old line, and steps back when everyone can explain it. The student whose number is called explains the board.



Heads Card ON TOP OF THE FIRST STACK — NUMBERED HEADS · 2.04

1. **Alone.** Work the card on your own board. Silent.
2. **Heads together.** Boards to the middle. Read the named line on every board.
3. **Different?** Nobody erases. Fix it beside the old line.
4. **Sit** when everyone can explain that line.
5. **Your number?** Wipe your board. Write the step word, the line, then the answer.
6. **Show.** Every called board up at once.

Step words: Split · Power · Cycle · Combine · Read · Distribute · i^2 · Pair · Multiply · Verify

The Heads Card from our 2.04 complex numbers pack: the steps each team follows.

Desk sheet: page 31. **Cards and team mat:** pages 32 to 35.
Word template: mattcase.org/toolkit

Who it helps

The quiet student. They think alone first, then hear the team agree. If their number is called, the answer they give is one they have just talked through with the team.

The student who is behind. The team's job is to get every number ready, so teammates teach them before anyone is called.

The student who usually takes over. They cannot answer for the team unless their number comes up. Their best move is getting everyone else ready.

In STEM, the arts and English

STEM: Dropped together from the same height, which lands first: a basketball or a tennis ball? Why?
Common trap: The heavier ball lands first.

The arts: In this painting, where is the light coming from? Point to two shadows that show it.
Common trap: The brightest spot, with no shadow pointed to.

English: What is the theme of this fable? Give one line of evidence.
Common trap: Naming a topic ("friendship") as the theme.

If it goes wrong

One strong student answers for everyone.
Call the number only after heads together, and ask the speaker to explain why.

The student called says "I don't know."
"Check with your team; I'll come back to you." Then come back before moving on.

Teams agree too fast.
Every board shows a reason beside the answer.

Partners take turns: one solves out loud, the other coaches with questions. Each ends with one problem alone.

Use it when students are practicing with a worksheet or a set of problems that have right answers.

Why it works: Every student takes a turn as the coach, so getting help is just part of the routine, and the last problem, done alone, shows what each student can do.

Groups and materials: Pairs. Partner A is seats 1 and 3 on the team mat (page 35); Partner B is seats 2 and 4. One problem sheet and one pencil per pair. A coach card for each partner, written before class: the questions and a praise line for the other partner's problems, with the answers on the back. For the last problem, an On your own card and a pencil for each student.

Talk move: Coach with questions. Sentence starters: "What's your next step?" "How do you know?"

Think, Commit, Discuss (page 3): this one uses Commit and Discuss.

How it runs

1. Partner A solves the odd problems, Partner B the even ones. Each partner keeps a coach card for the other partner's problems, flat on the desk, and never shows it.
2. Partner A solves problem 1 out loud: say each step, then write it. Only the solver holds the pencil.
3. Partner B coaches from the card: asks the question for the step, waits five seconds, and checks the box on hearing A say it. If A is stuck, B points to where to look. If a line is wrong, B says, "Check that line again." B never says the answer.
4. When A finishes, B turns the card over. Wrong? B says, "Check your steps again." Right? B reads the praise line out loud, and the pencil and the problem sheet pass to B.
5. Partner B solves problem 2 the same way while A coaches. Keep taking turns to the end of the set.
6. Last, each student does one problem alone and silent.

Say this to start

> *"Partner A solves the odd problems, Partner B the even ones. Solver: say each step out loud, then write it. Coach: keep your card flat and never show it. Ask, listen, and check the box when you hear the step. The last problem you each do alone."*

Checking the answer: The answers are on the back of the coach card. You check the last problem, the one done alone.

At a wall whiteboard: The solver writes. The coach stands beside and never shows the card. Both sit for the last problem.

1 PARTNER A SOLVES — **Dashed for Less Than**

$$y < 2x + 1$$

1 ASK FIRST — *"What do you do first?"*

2 HINT — Is y alone? Yes. So find m and b.

3 STEPS

- ☐ 1. What is m? What is b?
  Listen for: $m = 2$ and $b = 1$. Plot (0, 1).
- ☐ 2. The slope is 2. How do you move?
  Listen for: Up 2, right 1. Plot (1, 3).
- ☐ 3. The sign is <. Solid or dashed?
  Listen for: Dashed.
- ☐ 4. Less than. Shade above or below?
  Listen for: Below the line.
- ☐ 5. Pick a point below. Plug it in. Is it true?
  Listen for: Any point below. For (3, 0): $0 < 2(3) + 1$, so $0 < 7$. True.

WATCH OUT — (0, 1) is on the dashed line. It does not work.

Problem 1 on a coach card from our 4.8 graphing linear inequalities pack: the question for each step, what to listen for, and a box to check.

Desk sheet: page 36. **Coach cards, On your own card and problem sheet:** pages 37 and 38.

Word template and sample lessons: mattcase.org/toolkit



Who it helps

The student who is behind. They get a classmate as a coach on every other problem, without asking for help in front of the room.

The quiet student. They talk to one partner, and the coach card gives them the exact question to ask.

The student who usually takes over. As coach they hold questions and no pencil, so the only help they can give is a question.

In STEM, the arts and English

STEM: Balance each chemical equation, taking turns as solver and coach.
Common trap: Changing the small numbers inside a formula instead of the numbers in front.

The arts: Clap and count each rhythm, taking turns.
Common trap: Giving a dotted half note two beats instead of three.

English: Fix the punctuation in each sentence.
Common trap: Joining two sentences with only a comma.

If it goes wrong

The coach shows the card or takes the pencil.
The card stays flat on the coach's side and the pencil stays with the solver. The coach's only tool is a question.

The solver writes without talking.
The coach checks a box only for a step said aloud. A silent line gets, "Say that step to me."

One partner leans on the other for every step.
Say at the start that the last problem is done alone and that you will check it.

Sage-N-Scribe

One partner (the Sage) says each step; the other (the Scribe) writes exactly what the Sage says; they switch each problem.

Use it when the work has several steps and saying each step aloud builds understanding.

Why it works: The Sage has to put each step into words, and the Scribe has to listen closely enough to write it down.

Groups and materials: Pairs. Partner A is seats 1 and 3 on the team mat (page 35); Partner B is seats 2 and 4. One pencil, one sheet of paper and one problem card; the Scribe holds the pencil. In a group of three, the third student reads the step words and checks each line.

Talk move: Say each step exactly. Sentence starters: "First I ___, because ..." "Can you say that step again?" Talk ladder step 2 (page 4).

Think, Commit, Discuss (page 3): this one uses Commit and Discuss.

How it runs

1. The pair reads the whole problem aloud. Partner A is the first Sage.
2. The Sage says the first step out loud, with its step word from the card (on the card below: Zero, then Count, then Solve). The Sage never touches the pencil.
3. The Scribe writes exactly that step, and asks if a step is missing or unclear.
4. Continue step by step until the problem is done. The Scribe says one thing the Sage did well.
5. Switch jobs for the next problem. Keep going until you call time.

Say this to start

> *"The Sage talks, the Scribe writes. Sage: say every step out loud. Scribe: write only what you hear, and if a step is missing, ask for it."*

Checking the answer: When you call time, show each card's answer. A pair that differs finds the step where it went off.

At a wall whiteboard: Work in threes with one marker. The Scribe holds it and writes only what the Sage says, the third student reads the step words and checks each line, and the jobs move one person on every problem.



$$5x^2 + 25 = 4x$$

State the number and type of solutions. Then solve, in the form $a \pm bi$.

Sage: Zero · Count · Solve

A card from our 2.05 complex solutions pack: the Sage reads it and says each step; the Scribe writes.

Desk sheet: page 39. **Cards:** page 40.

Word template and sample lessons: mattcase.org/toolkit

Who it helps

The student still learning English. As Sage they practice saying each step to one person who is listening closely; as Scribe they hear each step said before they write it.

The student who is behind. As Scribe they get the steps one at a time, and they are allowed to ask for a step that was skipped.

The student who usually takes over. As Scribe they may only write what they hear, so the Sage does the thinking out loud.

In STEM, the arts and English

STEM: Find the density of a rock from its mass and the water it pushes up, one step at a time.
Common trap: Dividing the volume by the mass.

The arts: Build a major scale from its whole and half steps, one letter at a time.
Common trap: Using a letter twice, as in A-sharp where F major needs B-flat.

English: Make a claim about a quotation, then give the evidence and explain it.
Common trap: Retelling the quotation in place of explaining it.

If it goes wrong

The Sage is stuck or says a wrong step.
The Scribe waits to write and asks, "What does the step word tell you to do?" Then the Scribe writes only what the Sage says.

The Sage skips a step.
The Scribe writes only what is said, so the gap shows; the Scribe asks for the missing step.

The Scribe stays silent.
The Scribe asks one "Why that step?" question on every problem.

Showdown

Everyone answers alone on their own whiteboard; on "Showdown!" all reveal at once; the team checks and coaches.

Use it when you are reviewing or practicing and every student should produce an answer.

Why it works: Everyone commits to an answer before seeing anyone else's, and a wrong answer gets sorted out at the table.

Groups and materials: Teams of four. A small whiteboard and marker each, a deck of question cards, and the key in an envelope.

Talk move: Compare answers. Sentence starter: "I got ___. How did you get ___?" Talk ladder step 4 (page 4).

Think, Commit, Discuss (page 3): this one uses Think, Commit and Discuss.

How it runs

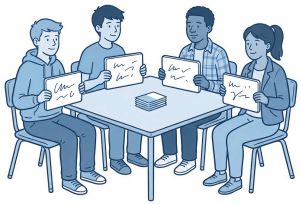
1. The Showdown Captain reads the top card aloud. The first Captain is whoever has the next birthday.
2. Everyone works alone with the board flat on the desk. Each student writes their method or reason, then the answer, then turns the board face down and caps the marker.
3. When every marker is capped, the Captain says "Showdown!" and all the boards go up together.
4. All the same? Celebrate. Different? Nobody erases: the team finds the first place where the boards differ and coaches until everyone agrees.
5. The deck passes left; that student is the next Captain. Deck done or time called? Open the key and check every card.

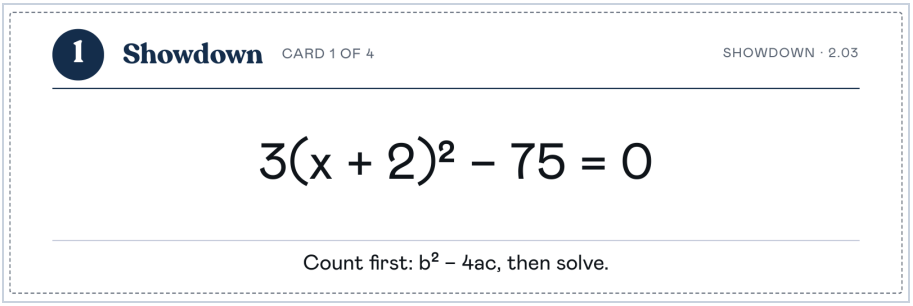
Say this to start

> *"Write your own answer and turn your board over. When everyone is ready, the Captain says 'Showdown!' and you all show at once. Same? Celebrate. Different? Coach until you agree."*

Checking the answer: Every card gets checked, even the ones the team agreed on: each team opens its key at the end. No envelopes? Fold each key in half and clip it under its deck.

At a wall whiteboard: Solve and reveal at desks. When boards differ, copy both side by side on a wall whiteboard.





A Showdown card from our 2.03 quadratic equations pack: the Captain reads it, and everyone works it alone.

Desk sheet: page 41. **Cards:** page 42.
Word template: mattcase.org/toolkit

Who it helps

The quiet student. Everyone writes alone first, and "Showdown!" shows every board at once, so nobody has to speak first to be counted.

The student who usually takes over. They cannot set the team's answer. When the boards differ, they have to explain theirs like everyone else.

The student afraid of being wrong. A wrong board is one of four on the table, and it gets sorted out at the table before the class ever sees it.

In STEM, the arts and English

STEM: Add one third and one fourth.
Common trap: Two sevenths, from adding the tops and adding the bottoms.

The arts: Name the art movement from the image on the card.
Common trap: Calling every loosely painted picture Impressionism.

English: Name the literary device in the line on the card.
Common trap: Mixing up simile and metaphor.

If it goes wrong

Students copy a neighbor.
Boards stay face down until "Showdown!"

A student leaves the board blank.
Write anything: a first step, a guess or a question. A blank board is not ready.

The team argues without settling.
The student with the different answer explains first; then the team agrees on one.

Quiz-Quiz-Trade

Each student holds a card (question on the front, answer on the back), quizzes a partner, gets quizzed, trades cards and finds a new partner.

Use it when you are reviewing facts, vocabulary or short problems.

Why it works: In five minutes each student talks with three or four classmates, often ones they don't usually sit with.

Groups and materials: Whole class, standing and moving in pairs. One card for each student: the question on the front, the worked answer on the back.

Talk move: Hint before you tell. Sentence starter: "Here's a hint: …"

Think, Commit, Discuss (page 3): this one uses Commit and Discuss.

How it runs

1. Each student gets a card.
2. Stand up, hand up, pair up: find a partner who also has a hand up. High-five, and both put your hands down.
3. Whoever has the next birthday is Partner A for this pair, whatever their seat. A shows the front of the card and asks. Partner B answers and says why.
4. A checks the back. Right? A praises. Stuck? A gives a hint and lets B try once more. Still not it? A reads the answer aloud.
5. Switch: B asks from B's own card, and A answers.
6. Only now trade cards. Thank your partner, put a hand up, and find someone new. Repeat.
7. Stop after about five minutes, enough for three or four partners.

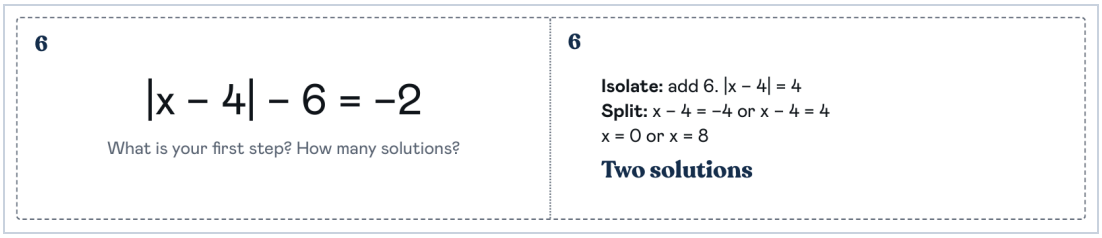
Say this to start

> *"Stand up, hand up, pair up. Ask your question. If your partner is stuck, give a hint before the answer. Then switch, trade cards, and find someone new."*

Checking the answer: The worked answer is on the back of every card, so the student asking can check it on the spot. Listen in on a few pairs for the card most students miss, and go over that one with the class.

At a wall whiteboard: Keep it on the open floor. Students are on their feet, moving between partners with a card in hand.





A card from our 1.05 absolute value pack: the question faces your partner, the worked answer faces you.

Desk sheet: page 43. **Cards:** page 44.

Word template and sample lessons: mattcase.org/toolkit

Who it helps

The new student, or the one without friends in the class. In five minutes they talk with three or four classmates, one at a time, and every conversation has a script.

The student who is behind. After each trade they hold the card they have just answered, with the worked answer on the back, so they quiz the next partner on a question they have already worked once.

The quiet student. Every talk is one-on-one, short, and starts with a question they read off a card.

In STEM, the arts and English

STEM: What element is K? Fe? Na? Ag?
Common trap: K is krypton (krypton is Kr; K is potassium).

The arts: What does each art word mean: hue, value, saturation, emphasis?
Common trap: Value means bright (it means light or dark).

English: Which literary device does this line use, and how do you know?
Common trap: Naming the device with no clue from the line.

If it goes wrong

Students stay with their friends.
Say, "Find someone you have not worked with yet."

Partners flip to the answer straight away.
Hint before you tell: a hint first, the answer last.

The room gets loud.
Use the quiet signal between trades: you raise a hand, and students freeze and raise theirs. Then they find the next pair.

Team-Pair-Solo

A team solves a problem together, then pairs solve a similar one, then each student solves one alone.

Use it when you are teaching a new kind of task and want the support to fade step by step.

Why it works: By the time students work alone, they have already done one like it with the team and one with a partner.

Groups and materials: Teams of four, then shoulder partners, then alone. Three problems of the same kind, on cards kept face down: one team card for each team, a pair card for each pair and a solo card for each student. Paper for the team, each pair and each student.

Talk move: Explain a line. Sentence starter: "This line comes from …" Talk ladder step 3 (page 4).

Think, Commit, Discuss (page 3): this one uses Commit and Discuss.

How it runs

1. Team problem: one card in the middle and one recorder, whoever has the next birthday. The team says each step out loud before the recorder writes it. Anyone may be asked to explain the last line.
2. Say "Pair cards." Shoulder partners work the same kind of task with new details, taking turns one step each. The partner looks over each line before the pencil passes.
3. Say "Solo cards." Each student works a third problem alone and silent, then checks it. Done early? Turn the card over and wait.
4. Say "Pencils down." Students check the solo work against the team's and the pair's.

Say this to start

> *"First as a team, then with your partner, then on your own. By the time you go solo, you have already done two with help."*

Checking the answer: In the pair round the partner checks each line before the pencil passes. For the solo problem, post a key or have students put the answer back into the problem.

At a wall whiteboard: The team works its problem standing at one board with one marker. Pairs then take half a board each. Everyone sits down for the solo problem.

One card in the middle, one recorder. Talk each step through before the recorder writes it. Anyone may be asked to explain the last line.

The graph of $y = x^2 + 6x + 10$ is drawn on the grid. Find how many real solutions the system $y = x^2 + 6x + 10$ and $2x + y = -6$ has. Then solve the system, and verify by graphing $2x + y = -6$ on the grid.

Equal Get y alone in both equations. Set the two expressions equal.

Zero Zero on one side.

Count $b^2 - 4ac$: how many real solutions?

Solve Find each x.

Pair Each x needs its y.

Verify In the other equation. Then on the grid: two points from y alone, a third to verify.

The top of the team card from our 2.07 quadratic systems pack, without its grid. Its pair and solo cards give less help.

Desk sheet: page 45. **Cards:** pages 46 and 47.

Word template and sample lessons: mattcase.org/toolkit



Who it helps

The student who is behind. They work the problem with a team, then a partner, before they try one alone.

The student afraid of being wrong. By the time they work alone, they have already done two like it with help.

The student who usually takes over. Only the recorder writes, the team has to say each step before it is written, and anyone may be asked to explain the last line.

In STEM, the arts and English

STEM: Work a Punnett square: as a team, then a pair, then alone.
Common trap: Counting only TT as tall, when Tt is tall too.

The arts: Name the major key from its key signature: as a team, then a pair, then alone.
Common trap: Naming the last flat (the key is the flat before it).

English: Join two sentences with when, because or although: as a team, then a pair, then alone.
Common trap: No comma after an opening "because" clause.

If it goes wrong

The team does the problem for one student.
Ask a student who has not spoken to explain the last line. The team's job is to get every member ready for that.

Pairs rush to the solo card.
Check one line of each pair's work before you say "Solo cards."

A student is still stuck when solo.
They compare with their pair card line by line, then try again.

Fan-N-Pick

Four jobs rotate around a deck of fold-over cards, the question on one side and the tutor's steps on the other: one fans, one picks and reads, one answers, one tutors.

Use it when you are reviewing with a deck of questions that have clear answers.

Why it works: Nobody sits out a card, and because the jobs rotate, each student answers some cards and tutors others.

Groups and materials: Teams of four at a table. A deck of fold-over cards, the Fan-N-Pick mat with its four job cards, and a small whiteboard for the Answerer.

Talk move: Tutor without telling. Sentence starter: "What could you try first?"

Think, Commit, Discuss (page 3): this one uses Think, Commit and Discuss.

How it runs

1. The Fan fans the cards, question sides out: "Pick a card, any card!" The first Fan is whoever has the next birthday.
2. The Picker picks one, reads the question aloud, and hands it to the Tutor. The Tutor holds it up like a wall, the question facing the Answerer. Everyone thinks in silence for thirty seconds before the Answerer speaks.
3. The Answerer works it out loud on the small whiteboard, one step at a time, and says why.
4. The Tutor follows the tutor side, on the back of the card. Right: ask why, then praise. Wrong: find the step that went off. Stuck: read the Ask first question, then the first step only, and give the answer last.
5. The jobs move one seat clockwise for the next card. Keep going until you call time.

Say this to start

> *"Fan, pick, answer, tutor. Fan the cards; pick one, read it aloud and hand it to the Tutor; think for thirty seconds in silence; answer it out loud; tutor from the back of the card. Then the jobs move one seat."*

Checking the answer: The steps and the answer are on the tutor side of every card, so the Tutor can follow each line as the Answerer works.

At a wall whiteboard: Keep it at desks. The team needs a table for the mat, the fanned cards and the job cards.

1 QUESTION	1 TUTOR SIDE	
$\lvert x - 3\rvert + 5 < 9$ Band, one ray, two rays, all real numbers or no solution, and why? Solve it and say the interval.	ASK FIRST:	*"Is the absolute value alone yet?"*
	FIRST STEP:	**Isolate:** subtract 5. $\lvert x - 3\rvert < 4$
	READ ALONG:	**Split:** $-4 < x - 3 < 4$ **Solve:** add 3, so $-1 < x < 7$ **Verify x = 3:** $\lvert 3 - 3\rvert + 5 = 5 < 9$ ✓ **Why:** Alone first: $\lvert x - 3\rvert < 4$, x within 4 units of 3: one band. Less ThAND.
	ANSWER:	**$-1 < x < 7$ · $(-1, 7)$ · band**
	PRAISE:	*"You isolated before you split."*

A fold-over card from our 1.06 inequalities pack: the question on one side, the tutor's steps on the other.

Desk sheet: page 48. **Cards, job cards and mat:** pages 49 to 52.
Word template: mattcase.org/toolkit



Who it helps

The quiet student. Answering is one of four jobs, and the jobs rotate, so they answer some cards and fan, read or tutor others.

The student who is behind. The tutor side gives a hint before the answer, so a stuck card turns into help from a teammate.

The student who usually takes over. The jobs rotate, so on three cards out of four their job is to fan, read or tutor.

In STEM, the arts and English

STEM: What does each unit measure: newton, joule, watt, pascal?
Common trap: Mixing up energy (joule) and power (watt).

The arts: What does each color term mean: complementary, analogous, tint, shade?
Common trap: Complementary means colors that look nice together (they sit opposite on the color wheel).

English: What does the word mean in this sentence from the text?
Common trap: Giving the dictionary's first meaning instead of the meaning in this sentence.

If it goes wrong

The Tutor reads out the answer.
Follow the tutor side in order: the Ask first question, then the first step only, and the answer last.

Students lose track of whose job is which.
The four job cards sit on the Fan-N-Pick mat. After each card, turn the mat one seat clockwise, and the job cards move with it.

One student never answers.
Nobody answers for the Answerer. If they are stuck, the Tutor reads the Ask first question and waits five seconds.

Match Mine

Partners sit with a barrier between them: one describes a card, the other recreates it from the words alone; then they compare.

Use it when students are practicing precise vocabulary: positions, shapes, graphs, diagrams.

Why it works: The Sender has to use exact words, and when the drawings don't match, the pair can see which word was unclear.

Groups and materials: Pairs. A barrier (a standing folder), a Sender card, and a Receiver card or a blank page to draw on.

Talk move: Use the exact words. Sentence starter: "It is ___ above and ___ to the left of …"

Think, Commit, Discuss (page 3): this one uses Commit and Discuss.

How it runs

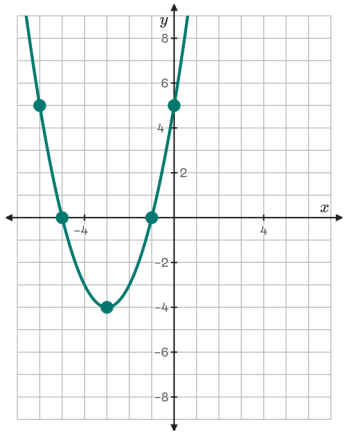
1. Put up the barrier. The first Sender is whoever has the next birthday.
2. The Sender describes the card in the subject's words, with no pointing and no peeking, and never names the whole thing: on the card below, never a coefficient or the word "equation"; on a cell diagram, never the word "cell."
3. The Receiver draws or builds from the words alone, and may ask about the parts: "Where is it, exactly?"
4. Take the barrier down and lay the two side by side. Which words worked, and which did not?
5. Switch jobs with a new card. Keep going until you call time.

Say this to start

> *"Sender, describe what you see using our vocabulary; no pointing, no peeking. Receiver, build it from the words alone, and ask questions. Then we compare."*

Checking the answer: The pair lays the drawing beside the Sender's card and names the biggest difference.

At a wall whiteboard: The Receiver draws on the board while the Sender sits facing away, card in hand. Then both compare.



$y = (x + 3)^2 - 4$

Your description, in order

1. **What your equation shows with no work.** Find it on the graph first, then say it.
2. **Up or down.** Narrower or wider than $y = x^2$, or the same.
3. **Every dot,** as "x equals, y equals", with its name: the vertex, an x-intercept, the y-intercept, its mirror image, or a point.

Never a coefficient. Never the word equation.

A Sender card from our 2.02 quadratic functions pack: the Sender describes the graph; the Receiver never sees it.

Desk sheet: page 53. **Cards:** pages 54 and 55.

Word template: mattcase.org/toolkit



Who it helps

The student still learning English. They practice exact words with one partner, and a mismatch shows which word was unclear.

The student who is behind. The task is a drawing or a model, so there is something to show before the vocabulary is solid.

The student who usually takes over. Neither partner can finish alone: the Sender depends on the Receiver's questions, and the Receiver on the Sender's words.

In STEM, the arts and English

STEM: Describe a labeled diagram of a cell so your partner can draw it.
Common trap: "The circle thing" instead of "the nucleus."

The arts: Describe a composition, what goes where and how big, so your partner can sketch it.
Common trap: "Over there" instead of "the upper left third."

English: Describe a setting using only the text's words, so your partner can sketch it.
Common trap: Adding details the text never gives.

If it goes wrong

The Sender points or peeks.
The barrier stays up; words only.

The Sender uses vague words: "that thing over there."
Put the key words on the card; the Sender must use them.

The Receiver never asks a question.
The Receiver asks at least two questions before the barrier comes down.

Running it online

The routine works on a screen too. Here is each step online, the structures that move online easily, and how to set up a Canvas discussion and three of those structures.



The routine online

Think	A timer on the screen. Students write their answer in their notes before they open the discussion.
Commit	A Canvas discussion set so students must post before they see anyone else's reply, a quick form, or a poll.
Discuss	A shared Google Doc with one table per team and one color per student, or replies in the thread that start "I heard you say …".
Call	Seat numbers still work: "Number 2s, post your team's answer."

The structures online

RoundTable	A shared Doc, one color each, one line per turn.
Showdown	Everyone answers in a form, then you show all the answers at once.
Timed Pair Share	Audio or video replies in Canvas, then a written "I heard you say …".
Keep in the room	Quiz-Quiz-Trade needs people moving, and so does Line-Up and Fold the Line. Fan-N-Pick needs a team at one table with a mat and a deck of cards.

A Canvas discussion that commits first

1. Create the discussion and ask one question worth arguing about.
2. In its options, turn on the setting that makes students post before they can see anyone's replies.
3. After posting, each student replies to one classmate: "I heard you say …", then agrees, disagrees or adds.

A RoundTable in a Google Doc

1. Make one copy per team with a table: a row per turn, a column for initials.
2. Give each student a text color. Turns go in seat order, 1 to 4.
3. Second time around, each line must build on a line already there.

A Showdown in a form

1. Everyone answers the same question alone, in a form or a one-question Canvas quiz.
2. Show all the answers at once on the screen, with no names.
3. Teams argue about the answers that differ, then everyone answers again.

A Timed Pair Share with recorded replies

1. Post one question and a time limit: one minute each.
2. Each student records a short audio or video reply in the Canvas discussion, using the media button in the reply box.
3. Each student listens to one classmate and writes back "I heard you say …", then adds one idea.

A question worth arguing about

STEM	Dropped together from the same height, which lands first: a basketball or a tennis ball?
The arts	What pulls your eye first in this painting, and which choice made it do that?
English	Agree or disagree: the narrator can be trusted.

Paste this into the discussion

> *Answer the question below on your own first. You will see your classmates' posts once you have posted. Then reply to one classmate: start with "I heard you say …", then agree, disagree or add one idea, and give your reason.*

Across studies of students working together, the gains were smaller when the work was done through digital technology, so use online work to add to the talk in class.[6]

6. Education Endowment Foundation (2021). It summarizes 212 studies of students working together in small groups: about five extra months of progress in a year, three when the work ran through digital technology. Limit: the Foundation rates its confidence in this evidence as low. Full reference on page 57.

Make it yours

Here is every card, sheet and mat from our packs, ready for your own content. Every structure but Line-Up and Fold the Line has a desk sheet: the page that lies on each pair's or team's desk, with the jobs, how to do them, and good things to say. Then come its cards: the card from our pack first, then the same card for another subject (all but Match Mine), then blank cards to type over in the Word copy.

How to use the printables

1. Find your structure in the table below. Print its desk sheet, one for each pair or team, and leave it on the desk while they work.
2. Print its cards. Use ours to try the structure, or another subject's to see how it works in yours.
3. To make your own, open the Word copy and type over the words in [brackets]. Need more cards? Copy a whole card and paste it below. In Word, put the cursor in the card's top line, choose Layout, Select, Select Table, then copy and paste. In Google Docs, drag across the card, then copy and paste.
4. Print the cards one-sided, on cardstock. Cut on the dashed lines and fold on the dotted ones.

Every printable, by structure

Structure	Desk sheet	Cards, sheets and mats
Line-Up and Fold the Line page 8	None	Line-Up signs, page 22
Find the Fiction page 9	page 23	Find the Fiction slips, page 24 Team mat, page 35
Timed Pair Share page 10	page 25	Timed Pair Share prompt cards, page 26 Timed Pair Share prompt cards, blank, page 27 Team mat, page 35
RoundTable (and RoundRobin) page 11	page 28	RoundTable sheet, page 29 RoundTable Consensus cards, page 30
Numbered Heads Together page 12	page 31	Numbered Heads Together: question cards, page 32 Numbered Heads Together: the Heads Card, page 33 Numbered Heads Together: number cards, page 34 Team mat, page 35
RallyCoach page 13	page 36	RallyCoach coach cards, page 37 RallyCoach cards, blank, page 38 Team mat, page 35
Sage-N-Scribe page 14	page 39	Sage-N-Scribe cards, page 40 Team mat, page 35
Showdown page 15	page 41	Showdown cards, page 42
Quiz-Quiz-Trade page 16	page 43	Quiz-Quiz-Trade cards, page 44
Team-Pair-Solo page 17	page 45	Team-Pair-Solo cards, page 46 Team-Pair-Solo cards, English and blank, page 47 Team mat, page 35
Fan-N-Pick page 18	page 48	Fan-N-Pick cards, page 49 Fan-N-Pick cards, blank, page 50 Fan-N-Pick job cards, page 51 Fan-N-Pick mat, page 52
Match Mine page 19	page 53	Match Mine cards, page 54 Match Mine cards, blank, page 55

Word template and sample lessons: mattcase.org/toolkit. The Word copy of this toolkit is there too.

One page makes both signs: cut on the dashes and tape one at each end of the line. Before you print, type your ends and scale over the [brackets] in the Word copy.

Line-Up and Fold the Line

THIS END

[Lowest, newest or strongly disagree]

Line up by: [your scale, such as your estimate, how many years, how strongly you agree]

Say it to both neighbors: “I’m standing here because ___.”

Line-Up and Fold the Line

THAT END

[Highest, longest or strongly agree]

Line up by: [your scale, such as your estimate, how many years, how strongly you agree]

Say it to both neighbors: “I’m standing here because ___.”

Find the Fiction

Your team's desk sheet



Two true, one fiction. Seat 1 is the first author, then 2, 3 and 4.

1 Write

Write three statements on your slip: two true, one fiction. Make the fiction hard to find.

2 Read

You are the author. Stand up and read all three. Then count: "One, two, three."

3 Fingers

Not the author? Think alone. On three, show 1, 2 or 3 fingers at once: the one you think is the fiction.

4 Argue, then reveal

Fingers don't match? Argue with a reason. When you agree, or after two minutes, the author reveals the fiction, says why it is false, and sits.

How to argue

CLAIM	Say the number you think is the fiction.
BECAUSE	Give a reason from what you know or what you read.
DISAGREE	Say why you see it another way, and keep it about the statement.
AGREE	Say what changed your mind.

Good things to say

"I think number ___ is the fiction because ___."

"I disagree, because ___."

"What made you pick that one?"

"That was a good fiction."

No mat? Count off 1 to 4 from the next birthday. Team of three? Same steps.

Find the Fiction slips

Contents: page 2

One slip per student, four to a page, as our 1.02 pack printed them.

Example: from our 1.02 function families pack

Find-the-Fiction

Name _____ Family _____

Three statements about your family. Two true, one false, in any order. Only about domain, range, symmetry, an interval, or end behavior. Make the fiction hard to find.

1 _____

_____

2 _____

_____

3 _____

_____

My fiction is statement ○ 1 ○ 2 ○ 3

Why it is false, in one sentence, using the mathematical word. Hand this in.

Example: English

Find the Fiction

Name _____ Character _____

Three statements about your character. Two true, one false, in any order. Only about what they do, say, or want. Make the fiction hard to find.

1 _____

_____

2 _____

_____

3 _____

_____

My fiction is statement ○ 1 ○ 2 ○ 3

Why it is false, in one sentence, with a line from the text. Hand this in.

Your card: type over the [brackets] in the Word copy

Find the Fiction

Name _____ [Topic] _____

[Three statements about your ___. Two true, one false, in any order. Only about ___. Make the fiction hard to find.]

1 _____

_____

2 _____

_____

3 _____

_____

My fiction is statement ○ 1 ○ 2 ○ 3

[Why it is false, in one sentence, using ___. Hand this in.]

Your card: type over the [brackets] in the Word copy

Find the Fiction

Name _____ [Topic] _____

[Three statements about your ___. Two true, one false, in any order. Only about ___. Make the fiction hard to find.]

1 _____

_____

2 _____

_____

3 _____

_____

My fiction is statement ○ 1 ○ 2 ○ 3

[Why it is false, in one sentence, using ___. Hand this in.]

Timed Pair Share

Your pair's desk sheet



One talks, one listens. Then switch. The timer runs the turns.

1 Think

Thirty seconds, silent. Think about what you will say.

2 Talk

Partner A talks until the timer goes. Partner B only listens: no questions, no "me too."

3 Thank

Partner B says, "Thanks. I heard you say …" and one thing Partner A said.

4 Switch

Partner B talks until the timer goes: their own answer. Then A thanks B the same way.

How to listen

EYES	Look at your partner while they talk.
QUIET	Hold your questions. Your turn is coming.
CATCH ONE THING	Hold on to one thing they said, so you can say it back.

Good things to say

"Thanks. I heard you say ___."

"One thing I would add is ___."

"I agree with ___ because ___."

"I see it another way: ___."

Group of three? Two listen while one talks. Everyone gets a turn.

Timed Pair Share prompt cards

Contents: page 2

One per pair. The listener says nothing until the timer goes; the thanks line is their turn.

Example: from our 2.02 quadratic functions pack, adapted

Timed Pair Share EXAMPLE 2, BEFORE IT IS WORKED — 2.02 QUADRATIC FUNCTIONS

A golf ball is hit from the ground. After t seconds, it is f(t) feet above the ground, where $f(t) = -16t^2 + 128t$.

A When does it land?

B What is the greatest height it reaches, and when?

Which feature answers A? Which answers B?

Say the feature, the form that shows it with no work, why the other two forms don't, and what its numbers mean for the ball.

1. **Partner A,** 90 seconds. Talk about questions A and B. Partner B only listens.
2. **Partner B,** 15 seconds. "Thanks. I heard you say …"
3. **Partner B,** 90 seconds. Talk about questions A and B: your own answer. Partner A only listens.
4. **Partner A,** 15 seconds. "Thanks. I heard you say …"

Example: English

Timed Pair Share BEFORE THE DISCUSSION — ENGLISH 10 · "THE LOTTERY"

Every June 27th, the villagers gather in the square for the lottery, and no one stops it.

A Why does no one stop the lottery?

B What does the black box stand for?

Which details answer A? Which answer B?

Say the detail, where it is in the story, and what it shows about the village.

1. **Partner A,** 90 seconds. Talk about questions A and B. Partner B only listens.
2. **Partner B,** 15 seconds. "Thanks. I heard you say …"
3. **Partner B,** 90 seconds. Talk about questions A and B: your own answer. Partner A only listens.
4. **Partner A,** 15 seconds. "Thanks. I heard you say …"

Example: visual art

Timed Pair Share LOOKING AT THE PAINTING — VISUAL ART · GIRL WITH A PEARL EARRING

Vermeer's Girl with a Pearl Earring (about 1665), on the screen: a girl looks back over her shoulder against a dark background.

A Where does your eye go first, and why?

B What does the dark background do?

Which choices pull your eye?

Say the spot, the choice that pulls you there (light, contrast, color, placement), and what the background adds.

1. **Partner A,** 90 seconds. Talk about questions A and B. Partner B only listens.
2. **Partner B,** 15 seconds. "Thanks. I heard you say …"
3. **Partner B,** 90 seconds. Talk about questions A and B: your own answer. Partner A only listens.
4. **Partner A,** 15 seconds. "Thanks. I heard you say …"

Timed Pair Share prompt cards, blank

Contents: page 2

Three blank prompt cards. Keep the four turns; change the situation and the questions.

Your card: type over the [brackets] in the Word copy

Timed Pair Share [WHEN IN THE LESSON] [YOUR CLASS]

[The situation or text]

A [The first question]

B [The second question]

[The question that ties A and B together]

[What a full answer says]

1. **Partner A,** [90] seconds. [What to talk about.] Partner B only listens.
2. **Partner B,** 15 seconds. "Thanks. I heard you say …"
3. **Partner B,** [90] seconds. [What to talk about.] Partner A only listens.
4. **Partner A,** 15 seconds. "Thanks. I heard you say …"

Your card: type over the [brackets] in the Word copy

Timed Pair Share [WHEN IN THE LESSON] [YOUR CLASS]

[The situation or text]

A [The first question]

B [The second question]

[The question that ties A and B together]

[What a full answer says]

1. **Partner A,** [90] seconds. [What to talk about.] Partner B only listens.
2. **Partner B,** 15 seconds. "Thanks. I heard you say …"
3. **Partner B,** [90] seconds. [What to talk about.] Partner A only listens.
4. **Partner A,** 15 seconds. "Thanks. I heard you say …"

Your card: type over the [brackets] in the Word copy

Timed Pair Share [WHEN IN THE LESSON] [YOUR CLASS]

[The situation or text]

A [The first question]

B [The second question]

[The question that ties A and B together]

[What a full answer says]

1. **Partner A,** [90] seconds. [What to talk about.] Partner B only listens.
2. **Partner B,** 15 seconds. "Thanks. I heard you say …"
3. **Partner B,** [90] seconds. [What to talk about.] Partner A only listens.
4. **Partner A,** 15 seconds. "Thanks. I heard you say …"

RoundTable

Your team's desk sheet



One sheet, a pen color each. Write one, say it, pass it left.

1 Write

Next birthday goes first. Write one answer on the sheet, in your color.

2 Say

Say it out loud as you write it.

3 Pass

Pass the sheet to the left. No skipping a turn.

4 Star

When time is called, star the one idea your team would all choose.

Second time around: build on an idea

1 READ	Read the ideas already on the sheet.
2 PICK ONE	Choose one idea to add to.
3 BUILD	Add one thing: a reason, an example, a detail.
STUCK?	Your team can help. Or write a question instead.

Good things to say

"Adding to ___'s idea, ___."

"What about ___?"

"Can you say more about that?"

"I agree, and ___."

Using a Consensus card? Each turn is one step, in the order of the step words on the card. Say your step. Write it only when the whole team agrees, then pass. Team of three? Same turns. Keep going around until your teacher calls time.

RoundTable sheet

Contents: page 2

One per team, a pen color each, so you can see who wrote what. Type your prompt over the [brackets] in the Word copy.

Prompt: [your prompt, one with many right answers]

In turn, write one answer and say it aloud, then pass left. Stuck? Write a question instead.

#	Our answers	Initials
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

RoundTable Consensus cards

Contents: page 2

One card per team at a time. Each turn is one step, in the order of the step words on the card. Say your step, and write it only when the whole team agrees.

Example: from our 2.06 quadratic inequalities pack

1 **RoundTable Consensus** CORE CARD 1 OF 3 ROUNDTABLE · 2.06

$$(x - 2)(10 - x) \leq -9$$

Use the inequality. Solve it, graph the solution set on a number line, and write it in interval notation. Is x = 10 a solution? Verify it in the original inequality.

Turns: Zero · Boundary · Shape · Set · Verify

Example: English

1 **RoundTable Consensus** CARD 1 OF 3 ROUNDTABLE · ENGLISH

"Hope" is the thing with feathers

What does Dickinson compare hope to, and what does the comparison say about hope? Agree on one answer with two lines of evidence.

Turns: Compare · Line · Line · Meaning · Agree

Your card: type over the [brackets] in the Word copy

[#] **RoundTable Consensus** CARD [#] OF [#] ROUNDTABLE · [YOUR CLASS]

[The problem]

[The task: what the team has to agree on and write]

Turns: [one step word for each turn]

Your card: type over the [brackets] in the Word copy

[#] **RoundTable Consensus** CARD [#] OF [#] ROUNDTABLE · [YOUR CLASS]

[The problem]

[The task: what the team has to agree on and write]

Turns: [one step word for each turn]

Your card: type over the [brackets] in the Word copy

[#] **RoundTable Consensus** CARD [#] OF [#] ROUNDTABLE · [YOUR CLASS]

[The problem]

[The task: what the team has to agree on and write]

Turns: [one step word for each turn]

Numbered Heads Together

Your team's desk sheet



Your seat number on the team mat is yours. No mat? Count off 1 to 4 from the next birthday, clockwise. Then follow these four steps for every card.

1 Alone

Turn up the card your teacher names. Work it on your own whiteboard, silently: your answer and how you got it. Keep going until your teacher says "Markers down."

2 Heads together

Stand up. Boards in the middle. Read every board, or the line your teacher names. Somebody's different? Don't erase it. Write the fix beside it and say why.

3 Teach it

Keep teaching each other. Your teacher will call one number, and it could be anybody's, so ask: "Can you say it to me?" When everyone can explain it, sit down.

4 Your number?

If your number is called, wipe your board. Write your team's answer and how you got it, alone. Hold it up on "Show." Be ready to say how you know.

How to explain a board

SAY IT	Read your answer, or the named line, out loud from your board.
SAY WHY	Explain why it is right, as well as what you wrote.
CHECK	Does your answer fit the question? Check it if you can.
OWN IT	If your board went off somewhere, say where. That is a good thing to say, and the room learns from it.

Good things to say

"Our table thinks ___ because ___."

"Read me your answer."

"Say it back to me."

"Mine is different. Look here."

"Does it work?"

"Can you explain it? You might be called."

Team of three? Count off 1, 2, 3. If the teacher calls a 4, the 1 answers.

Numbered Heads Together: question cards

Contents: page 2

One deck per team. Each card has its number, the problem, and what every board must show.

Example: from our 2.04 complex numbers pack

5 **Numbered Heads** CARD 5 OF 6 NUMBERED HEADS · 2.04

$$(4 - 7i)^2$$

Simplify. Write it in the form a + bi.

Example: social studies

2 **Numbered Heads Together** CARD 2 OF 6 NUMBERED HEADS TOGETHER · US HISTORY

The Missouri Compromise, 1820

What did it decide? Give one reason it did not last.

Your card: type over the [brackets] in the Word copy

[#] **Numbered Heads Together** CARD [#] OF [#] NUMBERED HEADS TOGETHER · [YOUR CLASS]

[The problem or question]

[What every board must show]

Your card: type over the [brackets] in the Word copy

[#] **Numbered Heads Together** CARD [#] OF [#] NUMBERED HEADS TOGETHER · [YOUR CLASS]

[The problem or question]

[What every board must show]

Your card: type over the [brackets] in the Word copy

[#] **Numbered Heads Together** CARD [#] OF [#] NUMBERED HEADS TOGETHER · [YOUR CLASS]

[The problem or question]

[What every board must show]

Your card: type over the [brackets] in the Word copy

[#] **Numbered Heads Together** CARD [#] OF [#] NUMBERED HEADS TOGETHER · [YOUR CLASS]

[The problem or question]

[What every board must show]

Numbered Heads Together: the Heads Card

Contents: page 2

One per team, on top of the deck. Change the step words to the words your students write before each line.

Example: from our 2.04 complex numbers pack

Heads Card

1. **Alone.** Work the card on your own board. Silent.
2. **Heads together.** Boards to the middle. Read the named line on every board.
3. **Different?** Nobody erases. Fix it beside the old line.
4. **Sit** when everyone can explain that line.
5. **Your number?** Wipe your board. Write the step word, the line, then the answer.
6. **Show.** Every called board up at once.

Step words: Split · Power · Cycle · Combine · Read · Distribute · i^2 · Pair · Multiply · Verify

Example: science

Heads Card

1. **Alone.** Work the card on your own board. Silent.
2. **Heads together.** Stand up. Boards to the middle. Read the named line on every board.
3. **Different?** Nobody erases. Fix it beside the old line.
4. **Sit** when everyone can explain that line.
5. **Your number?** Wipe your board. Write the step word, the line, then the answer.
6. **Show.** Every called board up at once.

Step words: Given · Find · Formula · Substitute · Units

Your card: type over the [brackets] in the Word copy

Heads Card

1. **Alone.** Work the card on your own board. Silent.
2. **Heads together.** Stand up. Boards to the middle. Read the named line on every board.
3. **Different?** Nobody erases. Fix it beside the old line.
4. **Sit** when everyone can explain that line.
5. **Your number?** Wipe your board. Write the step word, the line, then the answer.
6. **Show.** Every called board up at once.

Step words: [The words your students write before each line of work]

Your card: type over the [brackets] in the Word copy

Heads Card

1. **Alone.** Work the card on your own board. Silent.
2. **Heads together.** Stand up. Boards to the middle. Read the named line on every board.
3. **Different?** Nobody erases. Fix it beside the old line.
4. **Sit** when everyone can explain that line.
5. **Your number?** Wipe your board. Write the step word, the line, then the answer.
6. **Show.** Every called board up at once.

Step words: [The words your students write before each line of work]

Numbered Heads Together: number cards

Contents: page 2

One set per team. Cut into four; each student keeps the number of the seat they sit at.

Number NUMBERED HEADS TOGETHER

1

Number NUMBERED HEADS TOGETHER

2

Number NUMBERED HEADS TOGETHER

3

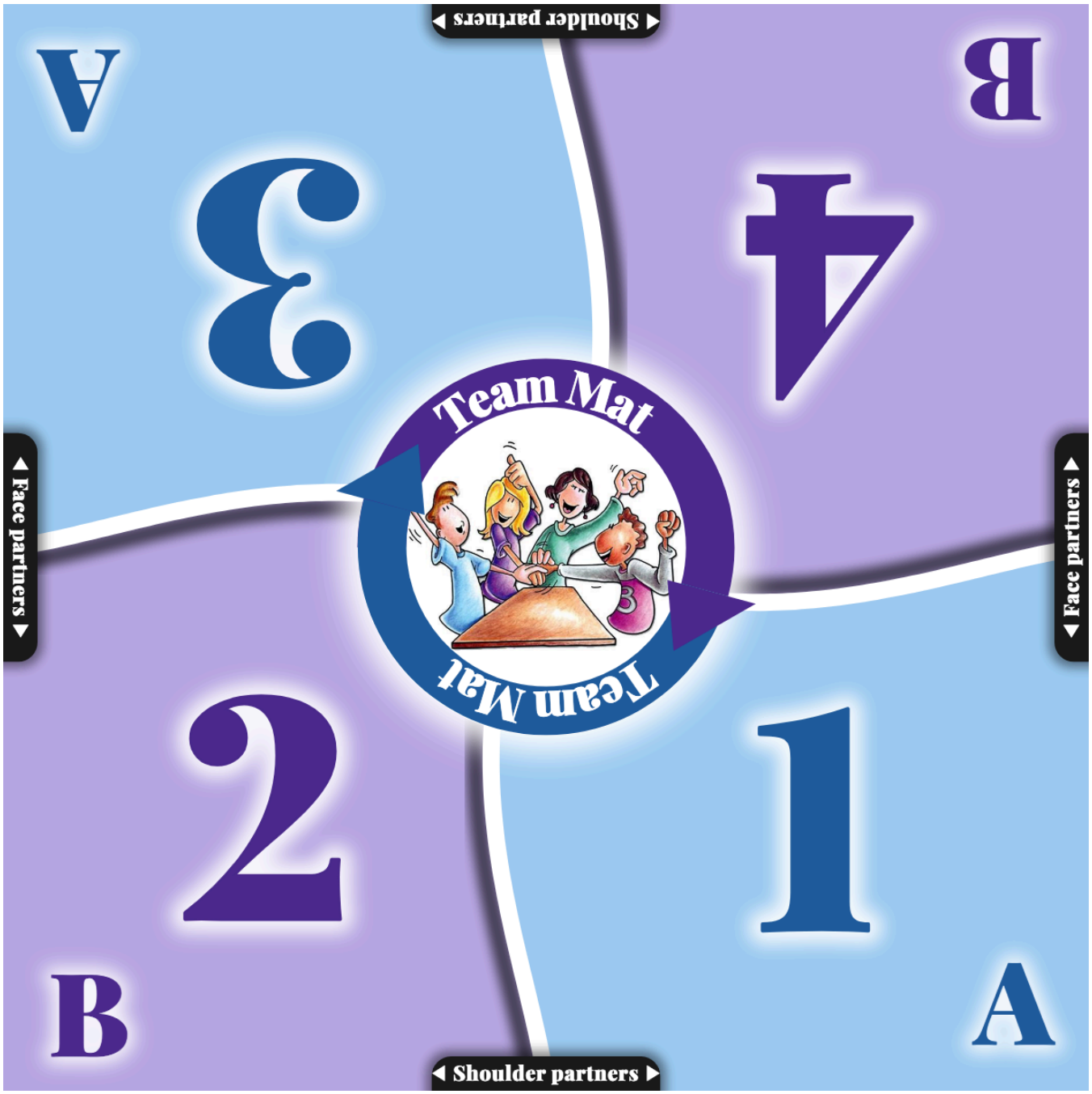
Number NUMBERED HEADS TOGETHER

4

Team mat: seats 1 to 4, partners A and B

Contents: page 2

One per team, in the middle of the table, on cardstock. Each student sits at a seat number. The mat and its cartoon are Kagan Publishing's.



Shoulder partners	Seats 1 and 2, and seats 3 and 4: side by side.
Face partners	Seats 1 and 4, and seats 2 and 3: across the table.
Partners A and B	Seats 1 and 3 are Partner A. Seats 2 and 4 are Partner B.
Seat numbers	Numbered Heads Together calls a seat number, and the student in that seat on every team answers. In Find the Fiction, seat 1 is the first author, then 2, 3 and 4.
Who uses which	Timed Pair Share, RallyCoach and Sage-N-Scribe use Partners A and B. Team-Pair-Solo's pair round uses shoulder partners.

RallyCoach

Your pair's desk sheet



Coach with questions. Partner A solves the odd problems. Partner B solves the even ones.

1 Solve
Hold the pencil. Say each step out loud, then write it.

2 Coach
Keep the coach card for your partner's problems. Never show it. Ask and listen.

3 Trade
After each problem, pass the pencil and the problem sheet.

4 Alone
Last, each of you does one problem alone and silent. Your teacher checks it.

How to coach: read your coach card, top to bottom

1 ASK	Read the question for the step. Wait five seconds.
2 LISTEN	Listen for the answer on your card. Check the box when you hear it.
3 HINT	Still stuck? Point to where to look. Never say the answer.
WRONG LINE?	Point to it and say, "Check that line again." The solver makes the fix.
WATCH OUT	Your card has a Watch out line? Read it out loud at the end of the problem. It names the most common mistake.
CHECK	Finished? Turn your card over. Wrong? Say, "Check your steps again."
PRAISE	Right? Read the praise line out loud.

Good things to say

"What's your next step?"

"How do you know?"

"First, I ___."

"Next, I ___."

"I think the answer is ___ because ___."

"Can you show me that step?"

Group of three? Two of you are Partner A: take turns solving the odd problems, and coach the even ones from A's card, one asking, one checking.

Write problems for these steps on the sheet (page 38) and the answers on each card's back. The On your own card is last.

Example: from our 4.8 graphing linear inequalities pack, adapted

Coach card

PARTNER B COACHES THE ODD PROBLEMS

This card is for your partner's problems. Keep it flat on your side and never show it. The answers are on the back.
Solver: say each step, then write it. Coach: ask the question, then check the box when you hear the step.

1	**m and b**	"Is y alone? What is m? What is b?" ☐ Listen for: y alone first, then m and b. Plot (0, b).
2	**Slope**	"What is the slope? How do you move?" ☐ Listen for: up or down the top number, right the bottom number.
3	**Line**	"What is the sign? Solid or dashed?" ☐ Listen for: dashed for < or >, solid for ≤ or ≥.
4	**Shade**	"Greater or less than? Shade above or below?" ☐ Listen for: above for > or ≥, below for < or ≤.
5	**Check**	"Pick a point. Plug it in. Is it true?" ☐ Listen for: a point in the shading makes it true.

HINT Is y alone? If not, point to the x term to move first.
WATCH OUT Dividing by a negative flips the sign.
PRAISE "Great job. You picked solid or dashed from the sign." "Great job. You checked a point in the shading."

Example: English

Coach card

PARTNER A COACHES THE EVEN PROBLEMS

This card is for your partner's problems. Keep it flat on your side and never show it. The answers are on the back.
Solver: say each step, then write it. Coach: ask the question, then check the box when you hear the step.

1	**Verb**	"Where is the verb?" ☐ Listen for: the verb named, such as "rowed" or "was."
2	**Subject**	"Who or what does it?" ☐ Listen for: the noun or pronoun that does the verb, outside any opener.
3	**Opener**	"Does a phrase or a clause come before the subject?" ☐ Listen for: "Yes, so a comma goes after it," or "No."
4	**Join**	"Do two whole sentences meet at and, but, or, so or yet?" ☐ Listen for: a comma before the joining word.
5	**Read**	"Read it aloud. Does each comma have a reason?" ☐ Listen for: a reason for each comma, after an opener or before a joining word.

HINT Point to each verb and ask who or what does it.
WATCH OUT Two sentences joined with only a comma.
PRAISE "You found the verb and its subject before you placed a comma."

Your card: type over the [brackets] in the Word copy

[#] On your own

RALLYCOACH · [YOUR CLASS]

Alone, no talk. Everyone ends with one problem on their own.

[The last problem: the same kind as the set, one for each student]

RallyCoach cards, blank

Contents: page 2

Two blank coach cards, one for each partner, then the problem sheet the pair shares. Write the answers on the back of each coach card before class.

Your card: type over the [brackets] in the Word copy

Coach card

PARTNER [A OR B] COACHES THE [ODD OR EVEN] PROBLEMS

This card is for your partner's problems. Keep it flat on your side and never show it. The answers are on the back.
Solver: say each step, then write it. Coach: ask the question, then check the box when you hear the step.

1	**[Step]**	"[The question the coach asks]"	☐ Listen for: [what the solver must say aloud]
2	**[Step]**	"[The question the coach asks]"	☐ Listen for: [what the solver must say aloud]
3	**[Step]**	"[The question the coach asks]"	☐ Listen for: [what the solver must say aloud]

HINT [Where to point, without saying the answer]
WATCH OUT [The mistake students make most]
PRAISE "[A praise line naming the move they made]"

Your card: type over the [brackets] in the Word copy

Coach card

PARTNER [A OR B] COACHES THE [ODD OR EVEN] PROBLEMS

This card is for your partner's problems. Keep it flat on your side and never show it. The answers are on the back.
Solver: say each step, then write it. Coach: ask the question, then check the box when you hear the step.

1	**[Step]**	"[The question the coach asks]"	☐ Listen for: [what the solver must say aloud]
2	**[Step]**	"[The question the coach asks]"	☐ Listen for: [what the solver must say aloud]
3	**[Step]**	"[The question the coach asks]"	☐ Listen for: [what the solver must say aloud]

HINT [Where to point, without saying the answer]
WATCH OUT [The mistake students make most]
PRAISE "[A praise line naming the move they made]"

Your card: type over the [brackets] in the Word copy

[#] Problem sheet

ONE A PAIR

RALLYCOACH · [YOUR CLASS]

Solve out loud, one step at a time. Say it, then write it: "First, I ___." "Next, I ___." "I think the answer is ___ because ___."

[The task: what to do with each problem]

1. Partner A: [the problem]
2. Partner B: [the problem]
3. Partner A: [the problem]
4. Partner B: [the problem]
5. Partner A: [the problem]
6. Partner B: [the problem]

Sage-N-Scribe

Your pair's desk sheet



One pencil, one card, one sheet of paper. The Sage talks, the Scribe writes. Partner A is the first Sage. Switch on every card.

1 Sage
Say each step out loud, one at a time, with its step word. Hands off the pencil.

2 Scribe
Hold the pencil. Write exactly what the Sage says. A step missing? Ask for it.

3 Praise
Card done? The Scribe says one thing the Sage did well.

4 Switch
Next card: the Scribe is the Sage.

How to work a card

1 READ	Read the whole card out loud.
2 STEP WORDS	Each step word on the card is one line. Do them in order.
3 SAY, THEN WRITE	The Sage says the line first. The Scribe writes only what the Sage says.
CHECK	Read the lines back together. Does the last line answer the question?

Good things to say

"First I ___, because ___."

"Can you say that step again?"

"What comes next?"

"You said every step. Nice."

Group of three? One Sage, one Scribe, and one checker who reads the step words and checks each line. Rotate each card.

Sage-N-Scribe cards

Contents: page 2

One card per pair at a time. The Sage says each step word and its line; the Scribe writes only what the Sage says. On our 2.05 card, 1A has a twin, 1B, with the same steps on new numbers: Partner A is the Sage on 1A, Partner B on 1B. Slot 1 is the first of the lesson's two practice times.

Example: from our 2.05 complex solutions pack

1A **Sage-N-Scribe** CARD 1A · SLOT 1 — SAGE-N-SCRIBE · 2.05

$5x^2 + 25 = 4x$

State the number and type of solutions. Then solve, in the form a ± bi.

Sage: Zero · Count · Solve

Example: science

1 **Sage-N-Scribe** CARD 1 OF 4 — SAGE-N-SCRIBE · PHYSICS

A 2 kg cart speeds up at 3 m/s².

What net force acts on it? Give the answer with its unit.

Sage: Given · Formula · Substitute · Units

Example: music

1 **Sage-N-Scribe** CARD 1 OF 4 — SAGE-N-SCRIBE · MUSIC

G major

Build the scale up one octave, whole and half steps W W H W W W H. Name its sharps or flats.

Sage: Start · Pattern · Letters · Sharps or flats

Your card: type over the [brackets] in the Word copy

[#] **Sage-N-Scribe** CARD [#] OF [#] — SAGE-N-SCRIBE · [YOUR CLASS]

[The problem]

[The task]

Sage: [the step words, in order]

Your card: type over the [brackets] in the Word copy

[#] **Sage-N-Scribe** CARD [#] OF [#] — SAGE-N-SCRIBE · [YOUR CLASS]

[The problem]

[The task]

Sage: [the step words, in order]

Showdown

Your team's desk sheet



One card at a time. Everybody works it alone, then the boards go up together.

1 Captain

Whoever has the next birthday is Captain for card 1. Read the card out loud and say "Boards flat." After each card the deck passes left.

2 Work it alone

Board flat, no peeking. Write your method or reason, then your answer. Stuck? Write what you have. Then turn your board face down and cap your marker.

3 Showdown!

The Captain says "Showdown!" once every marker is capped. All the boards go up together and stay up until everyone has looked.

4 Same or different

Same? High-five. Different? Nobody erases: find where you split and coach until you agree. Deck done or time called? Open the key and check every card, agreed ones too.

How to work a card

1 READ	Say what the card asks in your own words.
2 PLAN	Name your method or reason before you start.
3 WORK	One line at a time, so your team can follow your board.
CHECK	Does your answer fit the question? Check it if you can.

Good things to say

"I got ___. How did you get ___?"

"Where did our boards split?"

"Nobody erase."

"Show me your first line."

"How can we check it?"

Team of three? Three boards go up, and you take turns as Captain.

Showdown cards

Contents: page 2

One deck per team, its key in an envelope. The Captain reads the card; all work alone, boards face down until "Showdown!"

Example: from our 2.03 quadratic equations pack

1 **Showdown** CARD 1 OF 4 — SHOWDOWN · 2.03

$$3(x + 2)^2 - 75 = 0$$

Count first: $b^2 - 4ac$, then solve.

Example: science

2 **Showdown** CARD 2 OF 4 — SHOWDOWN · CHEMISTRY

$$Fe + O_2 \rightarrow Fe_2O_3$$

Count the atoms on each side first, then balance it.

Your card: type over the [brackets] in the Word copy

[#] **Showdown** CARD [#] OF [#] — SHOWDOWN · [YOUR CLASS]

[The problem]

[What to do first, then the task]

Your card: type over the [brackets] in the Word copy

[#] **Showdown** CARD [#] OF [#] — SHOWDOWN · [YOUR CLASS]

[The problem]

[What to do first, then the task]

Your card: type over the [brackets] in the Word copy

[#] **Showdown** CARD [#] OF [#] — SHOWDOWN · [YOUR CLASS]

[The problem]

[What to do first, then the task]

Your card: type over the [brackets] in the Word copy

[#] **Showdown** CARD [#] OF [#] — SHOWDOWN · [YOUR CLASS]

[The problem]

[What to do first, then the task]

Quiz-Quiz-Trade

Your desk sheet



Read this at your desk. Then everybody stands, everybody holds one card.

1 Stand up, hand up, pair up

Find a partner with a hand up. High-five, and put your hands down.

2 Quiz

Next birthday is Partner A. A: show the front and ask the question on the card. B: answer, and say why.

3 Coach

A: check the back. B right? Say one thing B did well. B stuck? Give a hint and let B try once more. Still not it? Read the answer out loud.

4 Switch

Now B quizzes and coaches, with B's card.

5 Trade

Swap cards, thank your partner, hand up, and find someone new.

6 Stop

Your teacher calls time after about five minutes, enough for three or four partners.

Good things to say

"Here's a hint: ___."

"How do you know?"

"Say why."

"Thanks. Good one."

Odd number? Make one group of three. Each of you quizzes the person on your left, then all three trade and find someone new.

Quiz-Quiz-Trade cards

Contents: page 2

One card per student. Cut on the dashed lines and fold on the dotted line, printed sides out, so the answer is on the back.

Example: from our 1.05 absolute value pack

5

$|x + 3| + 4 = 10$

What is your first step? How many solutions?

5

Isolate: subtract 4. $|x + 3| = 6$

Split: $x + 3 = -6$ or $x + 3 = 6$

$x = -9$ or $x = 3$

Two solutions

Example: science

5

Na

Name the element. Where does its symbol come from?

5

Name: sodium

Symbol: from its Latin name, natrium

Sodium

Example: visual art

6

Complementary colors

What does it mean? Give an example.

6

Means: colors opposite each other on the color wheel

Example: red and green, blue and orange

Opposites on the wheel

Your card: type over the [brackets] in the Word copy

[#]

[The item]

[The same question on every card]

[#]

[Step]: [the first line]

[Step]: [the next line]

[The answer]

Your card: type over the [brackets] in the Word copy

[#]

[The item]

[The same question on every card]

[#]

[Step]: [the first line]

[Step]: [the next line]

[The answer]

Team-Pair-Solo

Your team's desk sheet



Your cards stay face down. Turn over the next one only when your teacher says so.

1 Team

One card in the middle. Say each step out loud before the recorder writes it. Your teacher may ask any of you to explain the last line. Stay until your teacher says "Pair cards."

2 Recorder

Only the recorder writes for the team: whoever has the next birthday. Next round, the next person clockwise.

3 Pair

Turn to your shoulder partner. Take turns, one step word each. The other partner looks over each line before the pencil passes. Stay until "Solo cards."

4 Solo

On your own and quiet. Work the whole card, then check it. Done early? Turn it over and wait. Stop at "Pencils down."

How to work a card

1 READ IT TWICE	Read the whole card out loud, then say what it asks in your own words.
2 STEP WORDS	Each step word on the card is one line you write. Do them in order. The solo card has none: you know them now.
CHECK	Done with the steps? Ask: does your answer fit the question?
STUCK?	On the team or pair card, ask for help, then read the next step word again and take one small step. On the solo card, no talking: look back at your pair card line by line, then try again.

Good things to say

"This line comes from ___."

"Say that step out loud."

"Why that step?"

"Show me the check."

"Which step went off?"

"Whose turn for the pencil?"

Team of three? At the pair stage all three share one pair card: one writes, one looks over the line, one reads the step word. Rotate.

Team-Pair-Solo cards

Contents: page 2

Our 2.07 cards: the team card with its grid, then the pair card, then the solo card.

Example: from our 2.07 quadratic systems pack

1 Team CARD T1

TEAM-PAIR-SOLO · 2.07

One card in the middle, one recorder. Talk each step through before the recorder writes it. Anyone may be asked to explain the last line.

The graph of $y = x^2 + 6x + 10$ is drawn on the grid. Find how many real solutions the system $y = x^2 + 6x + 10$ and $2x + y = -6$ has. Then solve the system, and verify by graphing $2x + y = -6$ on the grid.

Equal Get y alone in both equations. Set the two expressions equal.

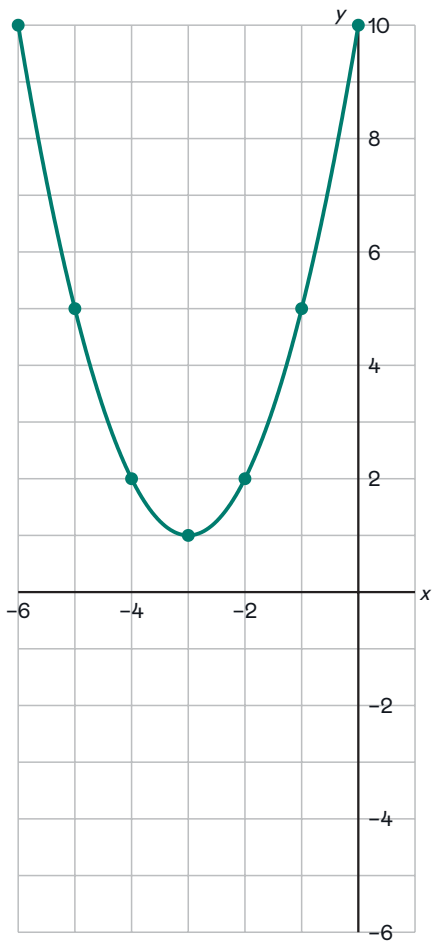
Zero Zero on one side.

Count $b^2 - 4ac$: how many real solutions?

Solve Find each x.

Pair Each x needs its y.

Verify In the other equation. Then on the grid: two points from y alone, a third to verify.



1 Pair CARD P1

TEAM-PAIR-SOLO · 2.07

A step word each. Before the pencil passes, your partner verifies the line just written and ticks it.

Find how many real solutions the system $y = -x^2 + x + 19$ and $2x - y = -7$ has. Then give each solution as an ordered pair, and verify each in both equations.

Equal · Zero · Count · Solve · Pair · Verify

1 Solo CARD S1

TEAM-PAIR-SOLO · 2.07

Alone, no talk. Done? Verify each point in the other equation, then wait.

Find how many real solutions the system $y = 2x^2 - 4x$ and $4x - y = 6$ has. Then give each solution as an ordered pair, and verify each in both equations.

Team-Pair-Solo cards, English and blank

Contents: page 2

An English set for a story told in the first person, then a blank set. Each card gives less help than the one before.

Example: English

1 Team CARD T1 — TEAM-PAIR-SOLO · ENGLISH

One card in the middle, one recorder. Talk each step through before it is written. Anyone may be asked to explain the last line.

Read paragraph 1. What does the narrator want most? Write a claim and support it with one quotation.

Claim Answer the question in one sentence.
Quote Copy the words that prove it, in quotation marks.
Explain One sentence: how do those words prove your claim?
Check Read your three sentences together. Do they answer the question?

1 Pair CARD P1 — TEAM-PAIR-SOLO · ENGLISH

A step word each. Before the pencil passes, your partner checks the line just written.

Read paragraph 2. How does the narrator see the setting? Write a claim and support it with one quotation.

Claim · Quote · Explain · Check

1 Solo CARD S1 — TEAM-PAIR-SOLO · ENGLISH

Alone, no talk. Done? Check that your explain sentence says how the quotation proves your claim, then wait.

Read paragraph 3. What changes for the narrator? Write a claim and support it with one quotation.

Your card: type over the [brackets] in the Word copy

[#] Team CARD T[#] — TEAM-PAIR-SOLO · [YOUR CLASS]

[How the team works the card: one card in the middle, one recorder, talk each step through first]

[The problem]

[Step] [What to do]
[Step] [What to do]
[Step] [What to do]

[#] Pair CARD P[#] — TEAM-PAIR-SOLO · [YOUR CLASS]

[How the pair takes turns: a step word each, the partner checks the line]

[A problem like the team's, with new numbers or details]

[The step words]

[#] Solo CARD S[#] — TEAM-PAIR-SOLO · [YOUR CLASS]

[Alone, no talk. What to do when done]

[A problem like the pair's]

Fan-N-Pick

Your team's desk sheet



Four jobs. After every card, the jobs move one seat clockwise.

1 Fan

Next birthday starts as the Fan. Fan the cards out, question sides out. Say: "Pick a card, any card!"

2 Pick

Pick one and read the question out loud. Then hand it to the Tutor.

3 Answer

Everyone thinks in silence for thirty seconds. Then talk it through, step by step, on the whiteboard. Thinking out loud is the job.

4 Tutor

Hold the card up: the question faces the Answerer, the tutor side faces you. Follow it, and help them reach the answer on their own.

How to tutor: follow the tutor side, top to bottom

1 ASK FIRST	Stuck? Read the question in quotes. Give them five seconds.
2 FIRST STEP	Still stuck? Read the first step only. Wait again.
3 READ ALONG	Follow their work line by line. Let them say what comes next.
ANSWER	Same answer? Ask why. Another way is fine. Different? Find the step that went off. Still stuck? Read them the answer.
PRAISE	Got it right? Read the praise line out loud, and mean it.

Good things to say

"What could you try first?"

"How do you know?"

"Talk me through it."

"You found the first step yourself."

Keep playing until your teacher calls time. Team of three? The Picker fans too.

One deck per team. Cut on the dashed lines and fold on the dotted line, printed sides out.

Example: from our 1.06 inequalities pack, adapted

1

$$|x - 3| + 5 < 9$$

Band, one ray, two rays, all real numbers or no solution, and why? Solve it and say the interval.

1 TUTOR SIDE

ASK FIRST	"Is the absolute value alone yet?"
FIRST STEP	Isolate: subtract 5. $\|x - 3\| < 4$
READ ALONG	Split: $-4 < x - 3 < 4$ Solve: add 3, so $-1 < x < 7$ Verify $x = 3$: $\|3 - 3\| + 5 = 5$, and $5 < 9$ Why: Alone first: $\|x - 3\| < 4$, x within 4 units of 3: one band. Less ThAND.
ANSWER	**$-1 < x < 7$ · $(-1, 7)$ · band**
PRAISE	"You isolated before you split."

Example: English

1

After the storm, the old lighthouse keeper rowed to shore.

What is the subject of this sentence, and how do you know?

1 TUTOR SIDE

ASK FIRST	"What is the action in this sentence?"
FIRST STEP	Find the verb: rowed.
READ ALONG	Ask who or what rowed: the old lighthouse keeper. Check: "After the storm" tells when. The subject is never inside a phrase like that. Why: the subject is who or what does the verb.
ANSWER	**the old lighthouse keeper (the simple subject: keeper)**
PRAISE	"You found the verb first."

Your card: type over the [brackets] in the Word copy

[#]

[Your question]

[What the Answerer has to say or show]

[#] TUTOR SIDE

ASK FIRST	"[A question that leads to the first step]"
FIRST STEP	[The first step only]
READ ALONG	[The rest of the work, one line at a time] [How to check the answer] [Why it works]
ANSWER	**[The answer]**
PRAISE	"[A line that names the move they made]"

Your card: type over the [brackets] in the Word copy

[#]

[Your question]

[What the Answerer has to say or show]

[#] TUTOR SIDE

ASK FIRST	"[A question that leads to the first step]"
FIRST STEP	[The first step only]
READ ALONG	[The rest of the work, one line at a time] [How to check the answer] [Why it works]
ANSWER	**[The answer]**
PRAISE	"[A line that names the move they made]"

Fan-N-Pick cards, blank

Contents: page 2

Five blank cards. Need more? In the Word copy, copy a whole card and paste it below.

Your card: type over the [brackets] in the Word copy

[#]

[Your question]

[What the Answerer has to say or show]

[#] TUTOR SIDE

ASK FIRST	"[A question that leads to the first step]"
FIRST STEP	[The first step only]
READ ALONG	[The rest of the work, one line at a time] [How to check the answer] [Why it works]
ANSWER	**[The answer]**
PRAISE	"[A line that names the move they made]"

[#]

[Your question]

[What the Answerer has to say or show]

[#] TUTOR SIDE

ASK FIRST	"[A question that leads to the first step]"
FIRST STEP	[The first step only]
READ ALONG	[The rest of the work, one line at a time] [How to check the answer] [Why it works]
ANSWER	**[The answer]**
PRAISE	"[A line that names the move they made]"

[#]

[Your question]

[What the Answerer has to say or show]

[#] TUTOR SIDE

ASK FIRST	"[A question that leads to the first step]"
FIRST STEP	[The first step only]
READ ALONG	[The rest of the work, one line at a time] [How to check the answer] [Why it works]
ANSWER	**[The answer]**
PRAISE	"[A line that names the move they made]"

[#]

[Your question]

[What the Answerer has to say or show]

[#] TUTOR SIDE

ASK FIRST	"[A question that leads to the first step]"
FIRST STEP	[The first step only]
READ ALONG	[The rest of the work, one line at a time] [How to check the answer] [Why it works]
ANSWER	**[The answer]**
PRAISE	"[A line that names the move they made]"

[#]

[Your question]

[What the Answerer has to say or show]

[#] TUTOR SIDE

ASK FIRST	"[A question that leads to the first step]"
FIRST STEP	[The first step only]
READ ALONG	[The rest of the work, one line at a time] [How to check the answer] [Why it works]
ANSWER	**[The answer]**
PRAISE	"[A line that names the move they made]"

Fan-N-Pick job cards

Contents: page 2

Two sets a page, one set per team. Each card sits in front of the student doing that job and moves with it.

Fan

FAN-N-PICK JOB

Fan the cards out, question sides out. Say: “Pick a card, any card!”

THE JOBS MOVE ONE SEAT AFTER EACH CARD

Pick

FAN-N-PICK JOB

Pick one and read the question out loud. Then hand it to the Tutor.

THE JOBS MOVE ONE SEAT AFTER EACH CARD

Answer

FAN-N-PICK JOB

After thirty seconds of silent thinking, talk it through out loud, one step at a time, and say why. Use your whiteboard.

THE JOBS MOVE ONE SEAT AFTER EACH CARD

Tutor

FAN-N-PICK JOB

Hold the card up: the question faces the Answerer, the tutor side faces you. Stuck? Read the Ask first question, then the first step only. The answer comes last.

THE JOBS MOVE ONE SEAT AFTER EACH CARD

Fan

FAN-N-PICK JOB

Fan the cards out, question sides out. Say: “Pick a card, any card!”

THE JOBS MOVE ONE SEAT AFTER EACH CARD

Pick

FAN-N-PICK JOB

Pick one and read the question out loud. Then hand it to the Tutor.

THE JOBS MOVE ONE SEAT AFTER EACH CARD

Answer

FAN-N-PICK JOB

After thirty seconds of silent thinking, talk it through out loud, one step at a time, and say why. Use your whiteboard.

THE JOBS MOVE ONE SEAT AFTER EACH CARD

Tutor

FAN-N-PICK JOB

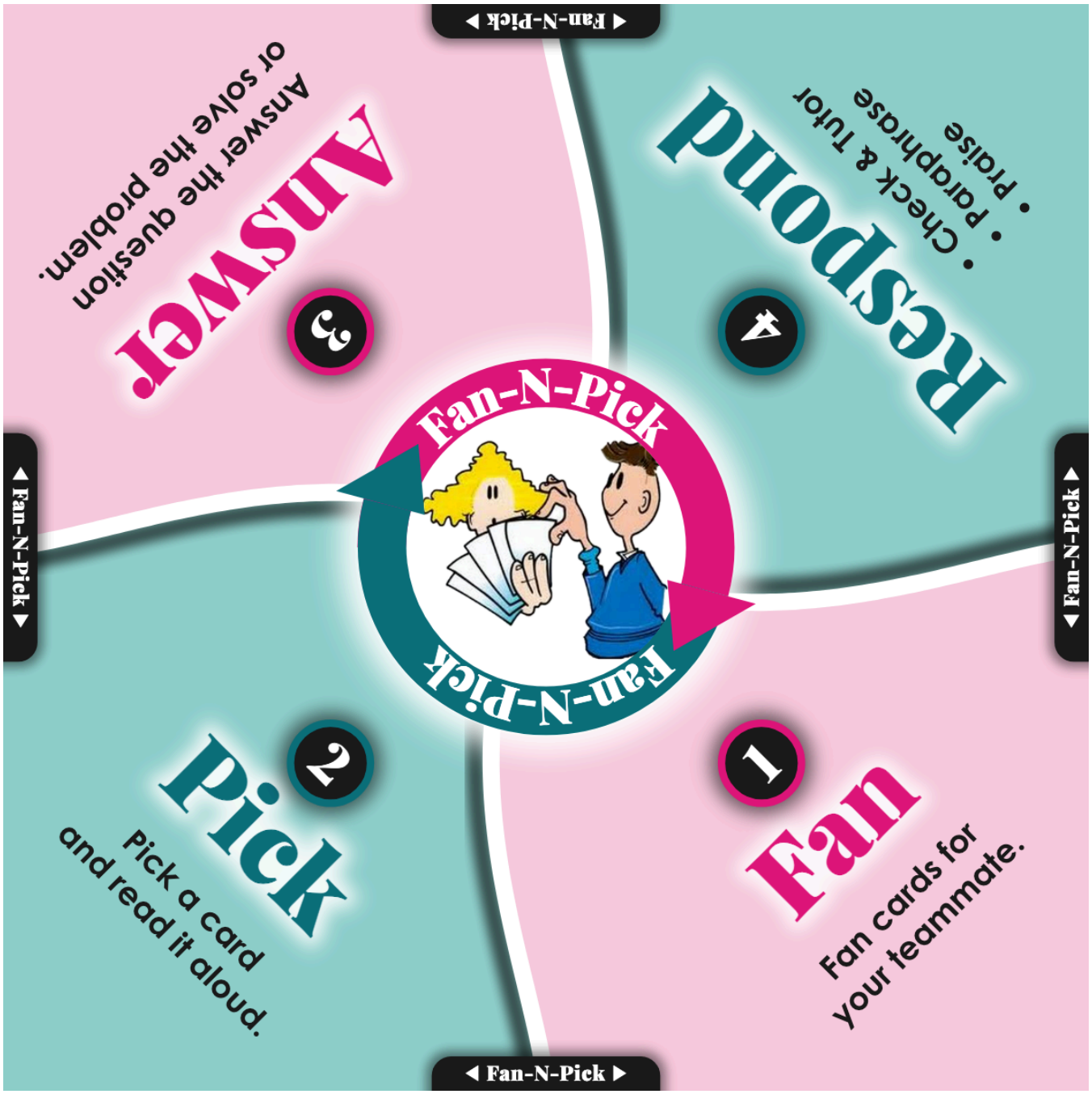
Hold the card up: the question faces the Answerer, the tutor side faces you. Stuck? Read the Ask first question, then the first step only. The answer comes last.

THE JOBS MOVE ONE SEAT AFTER EACH CARD

Fan-N-Pick mat

Contents: page 2

One per team, in the middle of the table, on cardstock. Each seat faces its job. After each card, turn the mat one seat clockwise. The mat and its cartoon are Kagan Publishing's.



Fan	Fan the cards out, question sides out. Say: "Pick a card, any card!"
Pick	Pick one and read the question out loud. Then hand it to the Tutor.
Answer	After thirty seconds of silent thinking, talk it through out loud, one step at a time, and say why. Use your whiteboard.
Tutor	The mat calls this job Respond. Hold the card up: the question faces the Answerer, the tutor side faces you. Stuck? Read the Ask first question, then the first step only. The answer comes last.
After each card	Turn the mat a quarter turn clockwise, so each job moves one seat, and the job cards move with it. The first Fan is whoever has the next birthday.

Match Mine

Your pair's desk sheet



Two jobs, Sender and Receiver. The first Sender is whoever has the next birthday. Switch jobs on every card.

1 Barrier up

Stand a folder up between you. The Sender's card and the Receiver's page never cross it.

2 Sender talks

You see the picture. Describe it in the subject's words only. Never say what it is called as a whole.

3 Receiver draws

You see a blank page or grid. Draw what you hear. Ask about the parts only. Never ask what it is called as a whole.

4 Barrier down

Lay the two side by side. Name the biggest difference: "Mine …, yours …". Then switch jobs.

Say it with these words

WHERE	Top, bottom, left, right, center.
WHAT	Each part's name, in the subject's words.
HOW BIG	Bigger, smaller, or the same as ___.
CHECK	"Say that back to me."

Good things to say

"It is ___ above and ___ to the left of ___."

"Say that again, slower."

"Where is it, exactly?"

"What do you call that?"

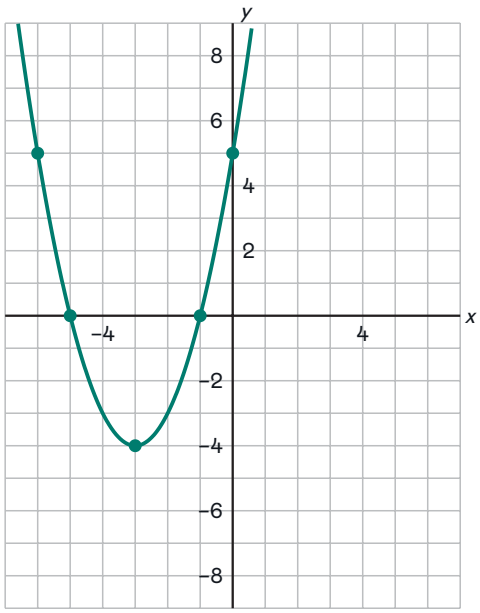
"Mine is ___ there. Yours?"

Team of three? One Sender, two Receivers, a page each.

The Sender's card stays behind the barrier; the Receiver draws on the grid.

Example: from our 2.02 quadratic functions pack

1 Match Mine SENDER · BEHIND THE BARRIER MATCH MINE · 2.02 QUADRATIC FUNCTIONS



$y = (x + 3)^2 - 4$

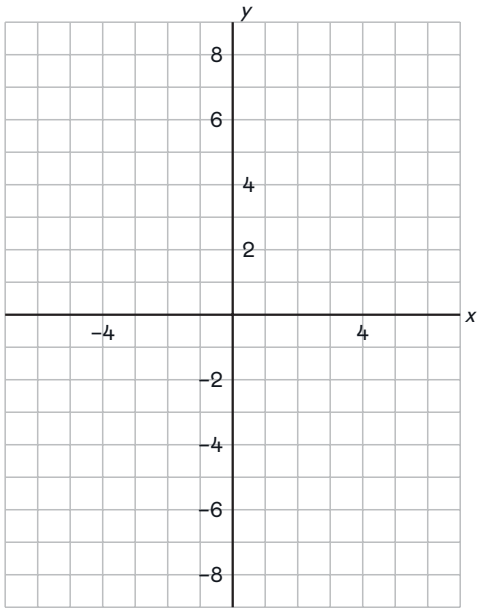
Your description, in order

1. What your equation shows with no work. Find it on the graph first, then say it.
2. Up or down. Narrower or wider than $y = x^2$, or the same.
3. Every dot, as "x equals, y equals", with its name: the vertex, an x-intercept, the y-intercept, its mirror image, or a point.

Never a coefficient. Never the word equation.

Example: from our 2.02 quadratic functions pack, adapted

1 Match Mine RECEIVER · YOUR SIDE OF THE BARRIER MATCH MINE · 2.02 QUADRATIC FUNCTIONS



Draw what you hear

1. Plot each dot you hear, then one smooth curve through them. Draw nothing you did not hear.
2. Ask about features only. Never ask for the equation: if you do, the round is over.

Barrier down: lay the two side by side and name the biggest difference.

Match Mine cards, blank

Contents: page 2

Blank Sender cards. Put your picture in the box, then type over the [brackets].

Your card: type over the [brackets] in the Word copy

[#] Match Mine SENDER · BEHIND THE BARRIER MATCH MINE · [YOUR CLASS]

[Your picture: a graph, a diagram, a map, a shape]

[Its label]

Your description, in order

1. [What to describe first]
2. [What to describe next]
3. [Each part, with the key words the Sender must use to name it]

[The words the Sender may not say]

[#] Match Mine SENDER · BEHIND THE BARRIER MATCH MINE · [YOUR CLASS]

[Your picture: a graph, a diagram, a map, a shape]

[Its label]

Your description, in order

1. [What to describe first]
2. [What to describe next]
3. [Each part, with the key words the Sender must use to name it]

[The words the Sender may not say]

[#] Match Mine SENDER · BEHIND THE BARRIER MATCH MINE · [YOUR CLASS]

[Your picture: a graph, a diagram, a map, a shape]

[Its label]

Your description, in order

1. [What to describe first]
2. [What to describe next]
3. [Each part, with the key words the Sender must use to name it]

[The words the Sender may not say]

How strong is the evidence?

The structures are packaged versions of cooperative learning, and the twelve here are Spencer and Miguel Kagan's.[9] Most of the research tests the ingredients inside them, such as think time, committing to an answer, discussing, and each student being accountable, more than the structures by name. So this page goes practice by practice: how strong the support is, who was studied, and what the research did not test.

A small number points to a source in the list on pages 57 and 58.

What the four labels mean

Strong	Many studies pooled together, or a large trial that assigned whole classes at random, found a clear gain, or a U.S. Department of Education panel gave it its top rating.
Moderate	Support with a clear limit: lab tasks, one course or small study, small gains, or evidence its authors call weak.
Practice	A book for teachers drawn from classroom practice. It does not test what students learned.
Limited	The research found little or no effect.

What each practice rests on

What the toolkit asks for	Support	What the research found, and its limit
Everyone writes an answer alone, then all show it at once.	Moderate	In a review of 78 studies, people worked less hard in a group unless each person's own work could be seen.[10] Most were lab tasks with college students.
After a spoken question, wait three seconds or more.	Moderate	A review of studies, elementary to high school, found longer pauses went with longer, more reasoned answers.[21] Thirty seconds of silent thinking is our own practice.
Partners talk it through, then each answers again alone.	Moderate	In one college genetics course, most students who went from wrong to right after talking then got a similar question right alone.[19] There was no comparison group.
Call a seat number after the team has talked.	Moderate	In a college course, calling often on students who had not volunteered went with more volunteers and more comfort.[4] It tested neither seat numbers nor learning.
End with one problem alone, then show the answer.	Strong	Across 222 classroom studies, practice quizzes raised later scores, more so when students saw the answers.[22] Lab research and a review of study methods agree.[5,16]
Teams share a goal, and each student is still checked alone.	Strong	In grades 6 to 9, shared goals went with higher achievement and better relationships.[15] In 99 school studies, teams gained when a reward rested on each member's own learning, and almost nothing without one.[18] We give no team reward.
For a new procedure, show one worked example first.	Strong	In a review of 55 studies, students who studied worked examples outscored students who only practiced solving problems.[2] All of the studies are in math.
Key words taught over several days, aloud and in writing.	Strong	A U.S. Department of Education panel rated this strong for English learners in grades K to 8.[1] It suggests about five to eight words, as page 4 does.
The talk ladder: reasons, evidence, answering each other.	Moderate	With nine- and ten-year-olds in England, a large trial found small gains that did not last, and a small study found better reasoning.[8,13] The four steps are our own.
Sentence starters, as a support for a while.	Limited	One middle school science study found no advantage on vocabulary quizzes, and a writing gain too small to be sure of.[3] Using starters for talk is our choice.
Wall whiteboards and random groups of three.	Practice	Building Thinking Classrooms (Peter Liljedahl) comes from classroom practice. We found no controlled trial of its effect on learning.[12]
Groups of three or four.	Moderate	A summary of 212 studies found the most progress in groups of three to five.[6] It rates its confidence in this evidence as low.

On page 6, the key words go beside a picture at each board: words placed beside the part of a picture they describe helped, mostly in studies of adults.[7] The boards are for a new kind of task: in one experiment, groups learned hard tasks more efficiently than students alone, though not easy ones.[11] The list has one finding no page uses: in seventh-grade math, practice that mixed kinds of problems paid off a month later.[14]

What the toolkit leaves out, and why

Jigsaw. Five randomized experiments with sixth graders compared it with ordinary teaching or working alone. On average it made no difference to what students learned.[20]

Problem first, for a new procedure. Across 53 studies, trying a problem before being taught helped students grasp a new idea somewhat better, but not carry out a procedure.[17] For that, worked examples have the stronger evidence.[2]

Think-Pair-Share with volunteers. Think, Commit, Discuss keeps the pair talk, has every student commit to an answer first, and calls a number in place of hands.

Sources

One list, A to Z: its numbers are the small ones in the text, and page 56 cites them all. Each entry gives the reference, an address to type, its label, any other page citing it, and what it found. An effect of 0.2 is small, 0.5 medium, 0.8 large.

1. **Baker, S., Lesaux, N., Jayanthi, M., Dimino, J., Proctor, C. P., Morris, J., Gersten, R., Haymond, K., Kieffer, M. J., Linan-Thompson, S., & Newman-Gonchar, R. (2014).** Teaching academic content and literacy to English learners in elementary and middle school (NCEE 2014-4012). National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education.
   ies.ed.gov/ncee/wwc/PracticeGuide/19 · Strong · Cited on page 4.
   The panel rates the evidence strong for two practices: teaching a small set of academic words (about five to eight from a text) in depth over several days, through speaking, listening and writing, and building spoken and written English into content lessons. Limit: English learners, kindergarten to grade 8; the guide says it does not cover high school.
2. **Barbieri, C. A., Miller-Cotto, D., Clerjuste, S. N., & Chawla, K. (2023).** A meta-analysis of the worked examples effect on mathematics performance. Educational Psychology Review, 35(1), Article 11.
   doi.org/10.1007/s10648-023-09745-1 · Strong
   It reviewed 55 studies. Students who studied worked-out math examples outscored students who only practiced solving problems, a medium-sized gain (an effect of 0.48). Prompts to explain the examples went with a smaller gain. Limit: math only, mostly algebra and geometry from middle school to college; five studies were in elementary school.
3. **Block, N. C. (2020).** Evaluating the efficacy of using sentence frames for learning new vocabulary in science. Journal of Research in Science Teaching, 57(3), 454–478.
   doi.org/10.1002/tea.21602 · Limited
   Seventy-five science students in grades 6 to 8, in their usual classes, learned one unit's words with sentence starters and another unit's without. Quiz scores were no higher; a gain in writing, larger for English learners, was too small to be sure of. Its starters were for writing; we use them for talk.
4. **Dallimore, E. J., Hertenstein, J. H., & Platt, M. B. (2013).** Impact of cold-calling on student voluntary participation. Journal of Management Education, 37(3), 305–341.
   doi.org/10.1177/1052562912446067 · Moderate
   It followed 16 sections of one college accounting course, 632 students. Instructors taught as they chose; observers then sorted sections by how often they called on students who had not volunteered. More of it went with more volunteering over the term and more comfort speaking. Limits: no proof of cause; it did not test seat numbers or measure learning.
5. **Dunlosky, J., Rawson, K. A., Marsh, E. J., Nathan, M. J., & Willingham, D. T. (2013).** Improving students' learning with effective learning techniques: Promising directions from cognitive and educational psychology. Psychological Science in the Public Interest, 14(1), 4–58.
   doi.org/10.1177/1529100612453266 · Strong
   It reviewed ten study techniques. It rates two as highly useful: practice testing (quizzing yourself) and spreading practice over time. Five are rated low, among them highlighting, rereading and summarizing. Limit: it rates study techniques and did not test group structures.
6. **Education Endowment Foundation. (2021).** Collaborative learning approaches. Teaching and Learning Toolkit.
   educationendowmentfoundation.org.uk/education-evidence/teaching-learning-toolkit/collaborative-learning-approaches · Moderate · Cited on page 20.
   It summarizes 212 studies of students working together in small structured groups: about five extra months of progress in a year (six in secondary schools), most in groups of three to five, but three months when the work ran through digital technology. Caution: the Foundation rates its confidence as low, as many studies are old, not independently evaluated, or disagree.
7. **Ginns, P. (2006).** Integrating information: A meta-analysis of the spatial contiguity and temporal contiguity effects. Learning and Instruction, 16(6), 511–525.
   doi.org/10.1016/j.learninstruc.2006.10.001 · Moderate
   It reviewed 50 experiments. Words beside the part of a diagram they describe, or heard at the same moment, beat words kept apart: a large gain (an effect of 0.85), about as large in high school and technical college. Limits: mostly adults; small gain for simple material.
8. **Jay, T., Willis, B., Thomas, P., Taylor, R., Moore, N., Burnett, C., Merchant, G., & Stevens, A. (2017).** Dialogic Teaching: Evaluation report and executive summary. Education Endowment Foundation.
   educationendowmentfoundation.org.uk/projects-and-evaluation/projects/dialogic-teaching · Moderate
   It assigned 76 elementary schools in England at random, with about 5,000 students aged 9 and 10. With teachers trained to get more reasoning into class talk, students made about two extra months' progress in English and science and one in math; only science was clearly beyond chance. Caution: a 2019 follow-up on national tests found no lasting difference.
9. **Kagan, S., & Kagan, M. (2009).** Kagan cooperative learning. Kagan Publishing.
   www.kaganonline.com · Practice
   It is the handbook the structures in this toolkit come from, and teams of four with shoulder and face partners are the Kagans' too. The research elsewhere in this list tests the steps the structures carry: think time, committing to an answer, discussing, each student accountable. The steps, examples and cards here are our own.
10. **Karau, S. J., & Williams, K. D. (1993).** Social loafing: A meta-analytic review and theoretical integration. Journal of Personality and Social Psychology, 65(4), 681–706.
    doi.org/10.1037/0022-3514.65.4.681 · Moderate
    It reviewed 78 studies, mostly of college students in lab tasks such as shouting or pulling a rope. People gave less effort in a group than alone (an effect of 0.44, close to medium), unless each person's own work could be checked. In junior high and high school it was 0.38.
11. **Kirschner, F., Paas, F., & Kirschner, P. A. (2011).** Task complexity as a driver for collaborative learning efficiency: The collective working-memory effect. Applied Cognitive Psychology, 25(4), 615–624.
    doi.org/10.1002/acp.1730 · Moderate
    In one experiment, 83 learners studied biology alone or in groups, on easy and on hard tasks. On hard tasks the groups learned more efficiently; on easy tasks the learners working alone did, because sharing the thinking costs talk and coordination. Limits: one experiment in one subject; it did not test thinking alone before group talk.

12. **Liljedahl, P. (2020).** Building thinking classrooms in mathematics, grades K–12: 14 teaching practices for enhancing learning. Corwin. The research behind it: Liljedahl, P. (2016). Building thinking classrooms: Conditions for problem-solving. In P. Felmer, E. Pehkonen, & J. Kilpatrick (Eds.), Posing and solving mathematical problems: Advances and new perspectives (pp. 361–386). Springer.
doi.org/10.1007/978-3-319-28023-3_21 · Practice · Cited on page 6.
Its 14 practices include random groups of three and standing at wall whiteboards with one marker. The 2016 study, in five high school classes, rated how engaged students looked and did not measure learning. We found no controlled trial of its effect on learning (November 2026); the one study of results we found followed one class of 18.

13. **Mercer, N., Wegerif, R., & Dawes, L. (1999).** Children's talk and the development of reasoning in the classroom. British Educational Research Journal, 25(1), 95–111.
doi.org/10.1080/0141192990250107 · Moderate
Sixty children aged 9 and 10 in England were taught ground rules for talking together (give reasons, listen, challenge) and compared with 64 children in matched classes. The taught children used more reasoned talk, and their scores on a picture-puzzle reasoning test went up. Limits: a small study of young children; it measured reasoning and no school subject.

14. **Rohrer, D., Dedrick, R. F., Hartwig, M. K., & Cheung, C.-N. (2020).** A randomized controlled trial of interleaved mathematics practice. Journal of Educational Psychology, 112(1), 40–52.
doi.org/10.1037/edu0000367 · Strong
It assigned 54 seventh-grade math classes (787 students) at random. Some did worksheets that mixed kinds of problems; the rest did one kind at a time. On a surprise test a month later the mixed classes scored 61% and the others 38%. Limits: one grade, math only; teachers said the mixed worksheets took longer.

15. **Roseth, C. J., Johnson, D. W., & Johnson, R. T. (2008).** Promoting early adolescents' achievement and peer relationships: The effects of cooperative, competitive, and individualistic goal structures. Psychological Bulletin, 134(2), 223–246.
doi.org/10.1037/0033-2909.134.2.223 · Strong · Cited on page 5.
It reviewed 148 studies of more than 17,000 students in grades 6 to 9. Shared goals went with higher achievement than competing or working alone, a medium-sized gain (effects of 0.46 and 0.55), and with better peer relationships. Limit: it did not test teams of four.

16. **Rowland, C. A. (2014).** The effect of testing versus restudy on retention: A meta-analytic review of the testing effect. Psychological Bulletin, 140(6), 1432–1463.
doi.org/10.1037/a0037559 · Moderate
It reviewed 159 comparisons from lab studies, mostly of college students. Trying to recall beat rereading, a medium-sized gain (an effect of 0.50), larger when they saw the answer (0.73). With half or fewer right and no answers shown, it did not help. Limit: lab only.

17. **Sinha, T., & Kapur, M. (2021).** When problem solving followed by instruction works: Evidence for productive failure. Review of Educational Research, 91(5), 761–798.
doi.org/10.3102/00346543211019105 · Moderate
Across 53 studies, trying a problem before being taught helped students understand the new idea and use it on new problems, a small to medium gain (an effect of 0.36). It made no measurable difference to carrying out the procedure; in grades 2 to 5 teaching first worked better. Caution: it took only studies citing Kapur's papers on the method.

18. **Slavin, R. E. (1995).** Cooperative learning: Theory, research, and practice (2nd ed.). Allyn & Bacon.
www.successforall.org/wp-content/uploads/Classroom-Applications-of-CL.pdf · Strong
It reviewed 99 school studies of cooperative learning, each four weeks or more. In the 64 where a team's reward rested on what each member learned alone, the typical gain was small to medium (an effect of 0.32); with one shared product or no reward, near zero (0.07). The address is Slavin's later chapter repeating these figures.

19. **Smith, M. K., Wood, W. B., Adams, W. K., Wieman, C., Knight, J. K., Guild, N., & Su, T. T. (2009).** Why peer discussion improves student performance on in-class concept questions. Science, 323(5910), 122–124.
doi.org/10.1126/science.1165919 · Moderate · Cited on page 3.
It followed one college genetics course of 350 students. Students answered a question alone, talked it over with neighbors, answered it again, then answered a new question on the same idea alone. Of those wrong at first and right after talking, 77% got the new one right, a sign the talk built understanding. Limits: one course, no comparison group.

20. **Stanczak, A., Darnon, C., Robert, A., Demolliens, M., Sanrey, C., Bressoux, P., Huguet, P., Buchs, C., Butera, F., & PROFAN Consortium. (2022).** Do jigsaw classrooms improve learning outcomes? Five experiments and an internal meta-analysis. Journal of Educational Psychology, 114(6), 1461–1476.
doi.org/10.1037/edu0000730 · Limited
Five randomized experiments with sixth graders compared jigsaw with working alone or teaching as usual. Pooled, the effect was zero: jigsaw classes learned no more and no less. The authors had expected a gain of 0.40, between small and medium. Limit: one grade.

21. **Tobin, K. (1987).** The role of wait time in higher cognitive level learning. Review of Educational Research, 57(1), 69–95.
doi.org/10.3102/00346543057001069 · Moderate
It reviewed studies of wait time, the pause after a teacher's question and after a student's answer. When the average pause passed about 3 seconds, students said more and reasoned at a higher level, and scores on harder questions rose in science and in middle school math. Limit: it studied spoken questions, so silent writing time is outside it.

22. **Yang, C., Luo, L., Vadillo, M. A., Yu, R., & Shanks, D. R. (2021).** Testing (quizzing) boosts classroom learning: A systematic and meta-analytic review. Psychological Bulletin, 147(4), 399–435.
doi.org/10.1037/bul0000309 · Strong · Cited on page 7.
It reviewed 222 classroom studies with 48,478 students, elementary to college. Quizzed classes did better on later tests, a medium-sized gain (an effect of 0.50). It held in high school, was larger when students saw the answers, and ungraded quizzes worked as well.

About this toolkit. Second edition, built by Matt Case for Yorktown High School (Arlington Public Schools) in November 2026; every reference and address here was checked against its source that month. Word template and sample lessons: mattcase.org/toolkit. Questions: matthewgcase@gmail.com. The structures are Spencer and Miguel Kagan's, the mats and cartoons Kagan Publishing's, and the wall whiteboards Peter Liljedahl's; the steps, examples and cards are our own.