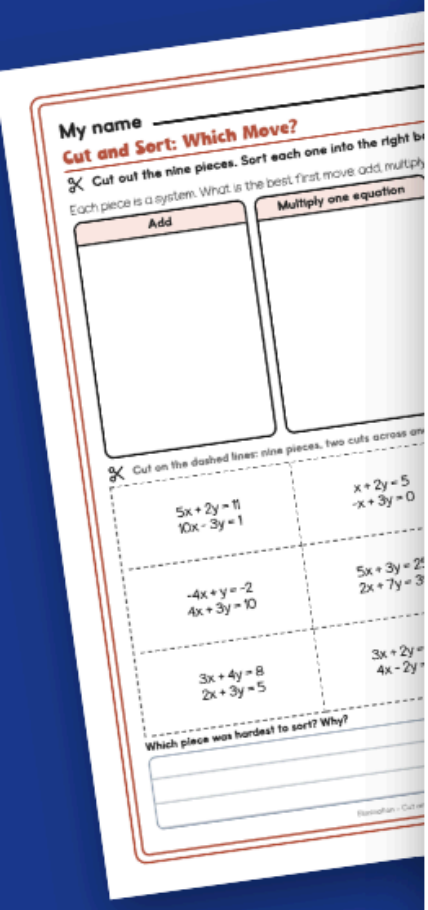
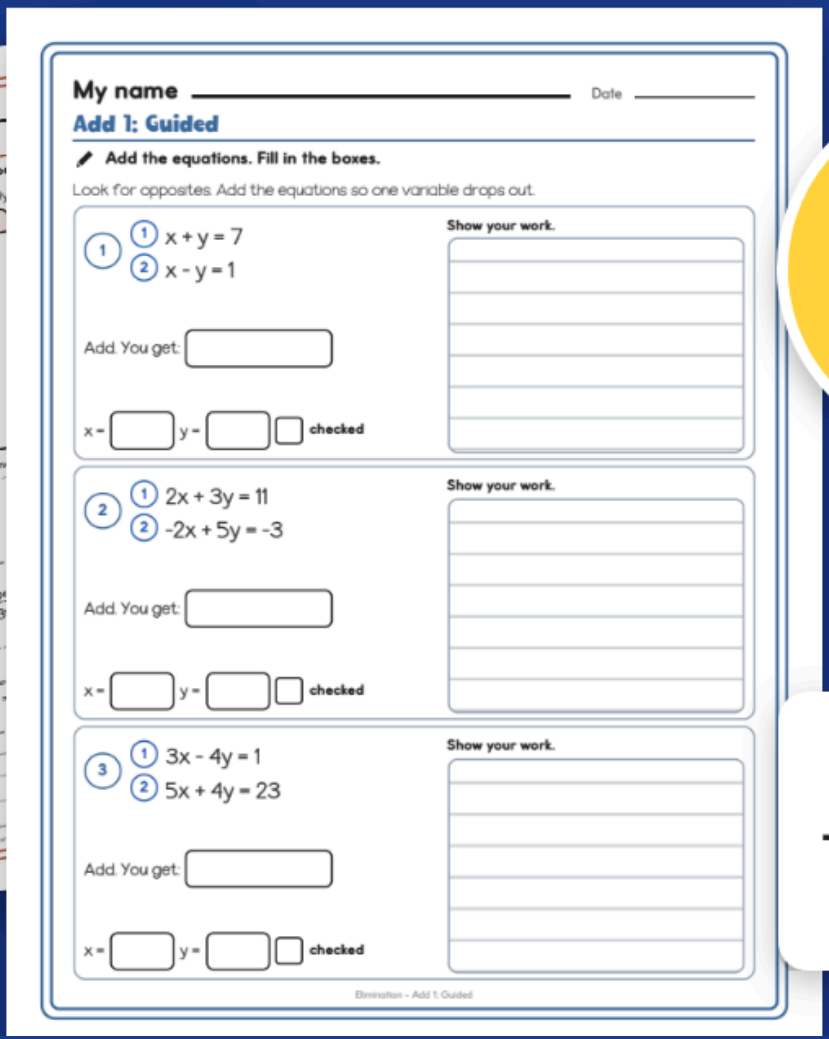
SOLVING SYSTEMS OF EQUATIONS BY ELIMINATION

GRADES 8-9





40 PAGES

$$x + y = 7$$
$$x - y = 5$$
$$2x = 12$$

solution (6, 1)

Bright Path Sped

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PREVIEW

How To Read a Page

The parts of a student page, then the kinds of sheet in the order they come.

The parts of a page

- **The answer box.** A bordered box for a number, a letter or a point. Click it to type, or print and write in it.
- **The ruled work box.** Lines 0.34 inch apart for steps. Write one step to a line: the multiply line, the add line, the solve line.
- **The check box.** Mark it when the answer has been put back in both equations; or pick true or false, works or does not.
- **The guided pages.** The first page of each move has fill-in boxes for what to multiply and what you get after adding.
- **The cut line.** Nine pieces in a short grid, edge to edge: two straight cuts across and two down.

Kind of sheet	How many	What the student does
References and words	3 sheets	The four steps, which move to use, six words to match.
Worked examples	3 sheets	One for each move, every step shown, with the check in both equations.
Add	7 systems	Opposites are already there. Add and solve.
Multiply one	7 systems	Multiply every term of one equation, then add.
Multiply both	7 systems	Multiply both equations to make opposites, then add.
Pick and mix	6 to pick, 4 to solve	Choose the move, then solve a mix.
Special cases and checks	4 systems, 8 points	0 = a number or 0 = 0; test a point in both equations.
Word problems	2 problems	Write the system, then eliminate.
Checks and mistakes	12 items	True or false, and Devon's four mistakes to find.
Writing, quiz, sort	3 prompts, 6 items, 9 pieces	Explain-its with five ruled lines each, a quiz, exit tickets, one sort.

Untimed, unscored on the page

No student page has a timer or a score on it. The keys and the tracker are for you. The answer keys are on pages 29 to 33, and every key line shows the move, the new equation and both numbers.

Explain-its

Their keys (page 33) say what to look for, not one right sentence. Accept any answer that uses opposites, multiplying every term or a check in both equations correctly.

Printing and the type-in fields

The name line, every answer box, every ruled box and every check box are type-in fields in any PDF reader: click one, type, then save. You can also print and write by hand. This is a fillable PDF, not a slideshow or a word-processor file.

Room to work

Every system has its own ruled work box. The guided pages give each system a wide box beside it. If a student needs more room, hand over one page a day.

PREVIEW

Preview · Bright Path Sped

My name _____ Date _____

The Four Steps

Read the four steps. Look at the example.

Elimination means making one variable disappear. These are the four steps.

1 Line up
Write both equations with x under x, y under y and = under =.

2 Make opposites
Pick x or y. Multiply an equation by a number, every term, so the two terms are opposites, like 3y and -3y. If they already are, skip this step.

3 Add and solve
Add the two equations. One variable disappears. Solve for the one that is left.

4 Find the other, then check
Put your answer in an original equation to find the second number. Check the point in BOTH equations.

PREVIEW

Example (made up for practice)

1 $x + y = 7$ 2 $x - y = 5$

Add: Add the two equations. The y terms drop out: 2x = 12. **Solve:** Divide both sides by 2: x = 6. **Find y:** Put x = 6 in equation 1: x + y = 7 becomes y + 6 = 7. So y = 1.

Say the four steps in your own words.

My name _____ Date _____

Elimination Words

Match each word to what it means.

Write the letter of the meaning in the box. The four steps page can help.

1	**system of equations**		**A**	Two numbers that add to 0, like 4 and -4.
2	**solution**		**B**	Two or more equations that use the same variables.
3	**eliminate**		**C**	Equations with the same solutions, like $x + y = 3$ and $2x + 2y = 6$.
4	**opposites**		**D**	An ordered pair (x, y) that makes both equations true.
5	**coefficient**		**E**	The number multiplied by a variable, like the 3 in 3x.
6	**equivalent equations**		**F**	To make a variable disappear by adding the equations.

Use two of the words in one sentence about a system.

PREVIEW

Preview · Bright Path Sped

My name _____ Date _____

Worked Example 2: Multiply One

Read the example. Follow each step.

The system (made up for practice)

① $2x + 3y = 7$ ② $4x + y = 9$

Multiply one equation first, then add. Then check in both equations.

Step 1

The x terms are **2x** and **4x**. Not opposites yet. Multiply equation 1 by **-2** and they will be.

Step 2

Multiply EVERY term, both sides: $2x + 3y = 7$ becomes $-4x - 6y = -14$. Now the x terms are -4x and 4x.

Add

Add the two equations. The x terms drop out: $-5y = -5$.

Solve

Divide both sides by -5: $y = 1$.

Find x

Put $y = 1$ in equation 1: $2x + 3y = 7$ becomes $2x + 3 = 7$. So $x = 2$.

Check

Put (2, 1) in BOTH equations. Equation 1: $2 \times 2 + 3 \times 1 = 7$. Equation 2: $4 \times 2 + 1 \times 1 = 9$. Both are true, so **(2, 1)** is the solution.

Say it in your own words: why do we check in BOTH equations?

PREVIEW

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My name _____ Date _____

Add 1: Guided

Add the equations. Fill in the boxes.

Look for opposites. Add the equations so one variable drops out.

1

1. $x + y = 7$
2. $x - y = 1$

Add. You get: ☐

x = ☐ y = ☐ ☐ **checked**

Show your work.

2

1. $2x + 3y = 11$
2. $-2x + 5y = -3$

Add. You get: ☐

x = ☐ y = ☐ ☐ **checked**

Show your work.

3

1. $3x - 4y = 1$
2. $5x + 4y = 23$

Add. You get: ☐

x = ☐ y = ☐ ☐ **checked**

Show your work.

PREVIEW

Preview · Bright Path Sped

My name _____ Date _____

Multiply One 1: Guided

Multiply one equation. Then add.

Multiply every term of ONE equation to make opposites. Then add.

1

1) $2x + 3y = 9$
2) $4x + y = 13$

Multiply equation ☐ by ☐

Add. You get: ☐

x = ☐ y = ☐ ☐ **checked**

Show your work.

2

1) $5x + 3y = 13$
2) $2x - 6y = -2$

Multiply equation ☐ by ☐

Add. You get: ☐

x = ☐ y = ☐ ☐ **checked**

Show your work.

3

1) $3x + 2y = 10$
2) $3x - 5y = 17$

Multiply equation ☐ by ☐

Add. You get: ☐

x = ☐ y = ☐ ☐ **checked**

Show your work.

PREVIEW

Preview · Bright Path Sped

My name _____ Date _____

Multiply Both 1: Guided

Multiply both equations. Then add.

Multiply BOTH equations to make opposites. Then add.

1

1. $2x + 3y = 12$
2. $3x + 2y = 13$

Eq 1 × ☐ Eq 2 × ☐

Add. You get: ☐

x = ☐ y = ☐ ☐ **checked**

Show your work.

2

1. $3x + 5y = 17$
2. $2x - 3y = 5$

Eq 1 × ☐ Eq 2 × ☐

Add. You get: ☐

x = ☐ y = ☐ ☐ **checked**

Show your work.

3

1. $4x + 3y = 15$
2. $5x - 2y = 13$

Eq 1 × ☐ Eq 2 × ☐

Add. You get: ☐

x = ☐ y = ☐ ☐ **checked**

Show your work.

PREVIEW

Preview · Bright Path Sped

My name _____ Date _____

Pick the Move

Look at each system. Check the best move.

Do not solve. Just pick the move that gets one variable to drop out with the least work.

1

1. $8x + 3y = 14$
2. $2x + 5y = 12$

- ☐ **add**
- ☐ **multiply one**
- ☐ **multiply both**

2

1. $3x + 2y = 10$
2. $2x + 5y = 3$

- ☐ **add**
- ☐ **multiply one**
- ☐ **multiply both**

3

1. $3x + y = 9$
2. $-3x + 2y = 0$

- ☐ **add**
- ☐ **multiply one**
- ☐ **multiply both**

4

1. $2x + 7y = 3$
2. $5x + 3y = -7$

- ☐ **add**
- ☐ **multiply one**
- ☐ **multiply both**

5

1. $x + 4y = 13$
2. $2x - 4y = 2$

- ☐ **add**
- ☐ **multiply one**
- ☐ **multiply both**

6

1. $2x + 3y = 11$
2. $x + 6y = 10$

- ☐ **add**
- ☐ **multiply one**
- ☐ **multiply both**

Pick one system. Tell why you chose that move.

PREVIEW

Preview · Bright Path Sped

My name _____ Date _____

No Solution or Many?

Eliminate. What happens? Check one box.

Multiply if you need to. Add. If both variables disappear, look at the number that is left.

1

1. $2x + 3y = 5$
2. $4x + 6y = 7$

Show your work.

After adding I get: ☐

☐ **one solution** ☐ **no solution**

☐ **infinitely many**

2

1. $x - 2y = 3$
2. $-3x + 6y = -9$

Show your work.

After adding I get: ☐

☐ **one solution** ☐ **no solution**

☐ **infinitely many**

3

1. $3x + 2y = 12$
2. $5x - 2y = 4$

Show your work.

After adding I get: ☐

☐ **one solution** ☐ **no solution**

☐ **infinitely many**

4

1. $5x - 10y = 20$
2. $-x + 2y = 3$

Show your work.

After adding I get: ☐

☐ **one solution** ☐ **no solution**

☐ **infinitely many**

PREVIEW

My name _____ Date _____

Word Problems

Write a system. Solve it by elimination.

Let x and y stand for the two unknown numbers. Write two equations. Then use elimination.

1 A school play sold 10 tickets. Student tickets cost 3 dollars and adult tickets cost 5 dollars. The tickets brought in 38 dollars. How many student tickets (x) and how many adult tickets (y) were sold?

Equation 1: ☐ Equation 2: ☐

Show your work.

x = ☐ y = ☐ ☐ **checked in both**

x = student tickets. y = adult tickets.

2 2 pens and 3 notebooks cost 13 dollars. 4 pens and 1 notebook cost 11 dollars. What does one pen (x) cost? What does one notebook (y) cost?

Equation 1: ☐ Equation 2: ☐

Show your work.

x = ☐ y = ☐ ☐ **checked in both**

x = dollars for a pen. y = dollars for a notebook.

PREVIEW

Preview · Bright Path Sped

My name _____ Date _____

Find the Mistake

Find the mistake. Then fix it.

Devon is made up for practice. Each answer has one mistake.

1 **Devon was asked:**

Eliminate x in x + y = 5 and 3x + 2y = 13. Multiply equation 1 by -3.

Devon wrote: -3x + y = 5. He multiplied only the x term.

What is wrong?

Write it the right way.

2 **Devon was asked:**

Solve x + 2y = 7 and x - y = 1. Devon added the equations.

Devon wrote: 2x + y = 8. Neither variable dropped out.

What is wrong?

Write it the right way.

3 **Devon was asked:**

Solve x + y = 7 and x - y = 3.

Devon added, got 2x = 10, x = 5, and wrote: the solution is x = 5.

What is wrong?

Write it the right way.

4 **Devon was asked:**

Is (2, 4) a solution of 2x + y = 8 and x - y = 1?

Devon checked only equation 1, found it true, and said yes.

What is wrong?

Write it the right way.

PREVIEW

Preview · Bright Path Sped

My name _____ Date _____

Quiz

Pick the best answer. Write its letter.

Take your time. Guess if you are not sure.

1 What do you get when you add the equations x + y = 9 and x - y = 3?

A 2y = 12
B 2x = 12
C 2x = 6

2 To make the x terms opposites in 2x + y = 7 and 4x - 3y = -1, what do you do first?

A Multiply equation 1 by -2
B Multiply equation 1 by 2
C Multiply equation 2 by -2

3 What is the solution of 3x + y = 13 and x - y = 3?

A (1, 4)
B (4, 2)
C (4, 1)

4 What is the best first move for 3x + 4y = 17 and 5x - 4y = 7?

A Multiply one equation first
B Add the equations
C Multiply both equations first

5 Is (2, 1) a solution of 2x + y = 5 and x + 3y = 5?

A Yes, it works in both
B No, it works in only one
C No, it works in neither

6 After you eliminate a variable you get 0 = 5. How many solutions does the system have?

A One solution
B Infinitely many solutions
C No solution

PREVIEW

My name _____ Date _____

Cut and Sort: Which Move?

Cut out the nine pieces. Sort each one into the right box.

Each piece is a system. What is the best first move: add, multiply one equation, or multiply both?

Add	Multiply one equation	Multiply both equations

Cut on the dashed lines: nine pieces, two cuts across and two cuts down.

$5x + 2y = 11$ $10x - 3y = 1$	$x + 2y = 5$ $-x + 3y = 0$	$4x + 5y = 14$ $3x - 2y = -1$
$-4x + y = -2$ $4x + 3y = 10$	$5x + 3y = 25$ $2x + 7y = 39$	$x + 3y = 6$ $2x - 9y = -3$
$3x + 4y = 8$ $2x + 3y = 5$	$3x + 2y = 12$ $4x - 2y = 2$	$4x + 3y = 6$ $2x - y = 8$

Which piece was hardest to sort? Why?

PREVIEW

Answer Key: Add and Multiply One

Each line gives the move, the new equation after adding, then the two numbers. Equation 1 is the top equation. Accept any correct move that leads to the same point. Every point is checked in both equations in the code.

Item	System	Steps and answer
11.1	x + y = 7 x - y = 1	**Add**: 2x = 8, x = 4; y = 3. **(4, 3)**
11.2	2x + 3y = 11 -2x + 5y = -3	**Add**: 8y = 8, y = 1; x = 4. **(4, 1)**
11.3	3x - 4y = 1 5x + 4y = 23	**Add**: 8x = 24, x = 3; y = 2. **(3, 2)**
12.1	4x + y = 5 3x - y = 9	**Add**: 7x = 14, x = 2; y = -3. **(2, -3)**
12.2	2x + 5y = 8 3x - 5y = -13	**Add**: 5x = -5, x = -1; y = 2. **(-1, 2)**
12.3	-3x + 2y = 0 3x + 5y = 21	**Add**: 7y = 21, y = 3; x = 2. **(2, 3)**
12.4	5x + 3y = 11 -5x + 2y = -1	**Add**: 5y = 10, y = 2; x = 1. **(1, 2)**
13.1	2x + 3y = 9 4x + y = 13	**Eq 1 × -2, add**: -5y = -5, y = 1; x = 3. **(3, 1)**
13.2	5x + 3y = 13 2x - 6y = -2	**Eq 1 × 2, add**: 12x = 24, x = 2; y = 1. **(2, 1)**
13.3	3x + 2y = 10 3x - 5y = 17	**Eq 1 × -1, add**: -7y = 7, y = -1; x = 4. **(4, -1)**
14.1	x + 2y = 8 3x - 4y = -6	**Eq 1 × 2, add**: 5x = 10, x = 2; y = 3. **(2, 3)**
14.2	6x + 5y = 16 3x - 2y = -1	**Eq 2 × -2, add**: 9y = 18, y = 2; x = 1. **(1, 2)**
14.3	2x - 3y = 2 5x + 6y = 32	**Eq 1 × 2, add**: 9x = 36, x = 4; y = 2. **(4, 2)**
14.4	3x + y = 5 2x - 5y = 9	**Eq 1 × 5, add**: 17x = 34, x = 2; y = -1. **(2, -1)**

PREVIEW

Answer Key: Check the Solution, Word Problems

Each check puts the point in the equation as printed and compares it with the number on the right. In the word problems x and y are named in the problem.

Check the Solution pages 20, 21

Item	Point	Equation 1	Equation 2	Result
20.1	(3, 1)	2x + y = 7: 2 × 3 + 1 × 1 = 7, **true**	x - y = 2: 1 × 3 - 1 × 1 = 2, **true**	Solution
20.2	(4, 3)	x + y = 7: 1 × 4 + 1 × 3 = 7, **true**	x - y = 3: 1 × 4 - 1 × 3 = 1, **false**	Not a solution: works in equation 1 only
20.3	(2, -1)	3x + 2y = 4: 3 × 2 + 2 × (-1) = 4, **true**	x - y = 3: 1 × 2 - 1 × (-1) = 3, **true**	Solution
20.4	(-1, 2)	2x + y = 5: 2 × (-1) + 1 × 2 = 0, **false**	x + 3y = 5: 1 × (-1) + 3 × 2 = 5, **true**	Not a solution: works in equation 2 only
21.1	(3, 2)	4x - y = 5: 4 × 3 - 1 × 2 = 10, **false**	2x + y = 7: 2 × 3 + 1 × 2 = 8, **false**	Not a solution: works in neither
21.2	(2, 1)	5x + 2y = 12: 5 × 2 + 2 × 1 = 12, **true**	3x - 2y = 4: 3 × 2 - 2 × 1 = 4, **true**	Solution
21.3	(6, 2)	x - 2y = 2: 1 × 6 - 2 × 2 = 2, **true**	3x + y = 13: 3 × 6 + 1 × 2 = 20, **false**	Not a solution: works in equation 1 only
21.4	(1, 4)	2x + 3y = 14: 2 × 1 + 3 × 4 = 14, **true**	5x - 3y = -7: 5 × 1 - 3 × 4 = -7, **true**	Solution

Word Problems page 22

Item	System	Steps and answer
22.1	x + y = 10 3x + 5y = 38	**Eq 1 × -3, add**: 2y = 8, y = 4; x = 6. **(6, 4)** x = 6 student tickets, y = 4 adult tickets. Check: 1 × 6 + 1 × 4 = 10; 3 × 6 + 5 × 4 = 38.
22.2	2x + 3y = 13 4x + y = 11	**Eq 1 × -2, add**: -5y = -15, y = 3; x = 2. **(2, 3)** x = 2 dollars for a pen, y = 3 dollars for a notebook. Check: 2 × 2 + 3 × 3 = 13, 4 × 2 + 1 × 3 = 11.

PREVIEW

Elimination Tracker

One student, every scored sheet. Filled example: page 38.

Student _____ Teacher _____ Month _____

Page	Page type and set	Items	Right	Date	Notes
7	Elimination Words	6			
11	Add 1: Guided	3			
12	Add 2: On Your Own	4			
13	Multiply One 1: Guided	3			
14	Multiply One 2: On Your Own	4			
15	Multiply Both 1: Guided	3			
16	Multiply Both 2: On Your Own	4			
17	Pick the Move	6			
18	Mixed Practice	4			
19	No Solution or Many?	4			
20	Check the Solution 1	4			
21	Check the Solution 2	4			
22	Word Problems	2			
23	True or False	8			
24	Find the Mistake	4			
26	Quiz	6			
28	Cut and Sort: Which Move?	9			

How to fill this in

Write how many items the student got right with no prompt, and the date. A blank means not tried yet, never wrong. There are 78 items on the 17 scored sheets. Answer keys: pages 29 to 33. Filled example: page 38.

This unit we are working on (your own standard or wording)

PREVIEW

Team Note

Use this page between team meetings or when a student moves classes, to hand off what changed without writing a note from scratch. Everything below is observable, with a blank for the number or the wording your team already uses.

Student _____ Team member _____ Date _____

Kind of sheet	Covered since last note (Y/N)	Items right	Still blank
Words			
Add			
Multiply one			
Multiply both			
Pick the move, mixed			
Special cases, word problem			
Checking the solution			
True or false, mistakes			

What I saw (observable, not a conclusion)

- Solved ___ of 25 systems by elimination (pages 11 to 16 and 18).
- Picked the best move for ___ of 6 systems (page 17).
- Checked ___ of 8 points in both equations (pages 20, 21).
- Multiplied every term of an equation without a reminder: yes / no / with a reminder.

Next step

- Next page or set: ___, because ___ (what you saw).
- What to try in another class or at home: ___.
- What to keep doing because it is working: ___.
- Anything for the team meeting to decide: ___ (this page records what happened, never a label or a plan).

Summary, in one or two sentences, for whoever reads this next

A filled-in line, for reference

"Got 6 of 8 true or false sentences right on 10/20. Next step: reread the four steps on page 5 and ask why a point must work in both equations." That is the level of detail this page is built for. It matches the filled example on page 38.

PREVIEW

Jordan's Tracker (Invented Student)

Jordan P. is invented; nothing on this page describes a real student. The blank tracker is on page 34.

Student: Jordan P. (an invented student)

Teacher: Ms. Patel (invented)

Month: October

Page	Page type and set	Items	Right	Date	Notes
7	Elimination Words	6	5	10/5	Mixed up opposites and coefficient
11	Add 1: Guided	3	3	10/6	-
12	Add 2: On Your Own	4	3	10/8	Sign error when adding -3
13	Multiply One 1: Guided	3	2	10/12	Multiplied only the x term
14	Multiply One 2: On Your Own	4	3	10/14	Forgot to multiply the right side
15	Multiply Both 1: Guided	3	-	-	-
16	Multiply Both 2: On Your Own	4	-	-	-
17	Pick the Move	6	4	10/16	Picked add when one equation needed multiplying
18	Mixed Practice	4	-	-	-
19	No Solution or Many?	4	-	-	-
20	Check the Solution 1	4	4	10/19	-
21	Check the Solution 2	4	-	-	-
22	Word Problems	2	-	-	-
23	True or False	8	6	10/20	Thought one equation is enough
24	Find the Mistake	4	-	-	-
26	Quiz	6	5	10/22	Missed the best-move item
28	Cut and Sort: Which Move?	9	-	-	-

PREVIEW

How to read it

Jordan P. has done **9 of 17** scored sheets and got **35 of 44** items right with no prompt. **2** sheets were all right and **7** carry a note. Every number comes from the table.

What the table points to

The lowest sheets are Multiply One 1: Guided (2 of 3) and Pick the Move (4 of 6). That is where the next practice goes. The 8 sheets left blank are not tried yet, never wrong.