



Vault Breakers: what stays the same?

A 30-minute game segment for P5 before–after word problems

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Five papers, five gaps, ranked by marks lost

Papers affected

1

Before-after and compare word problems

One sum on the “before” numbers, or no start at all



2

Answering an in-between quantity

Interest instead of total; apples instead of oranges



3

Triangle area in composite figures

Wrong base / height pair, three times in one paper



4

Unit conversion with decimals

6 ℓ 29 mℓ → 6290; 10.52 kg → 10 kg 52 g



5

Reading tiered rate tables

“\$10 per hour for the first 2 hours” read as \$10



Why before-after: it is where the long questions are lost

21

marks lost on change and compare problems in papers 2, 3 and 5

0 / 10

Paper 5, Section C: three before-after items, no method marks

What the wrong answers have in common

One sum on a “before” number

$240 \div 3$ for a ribbon after a cut; $5.80 \div 3$ for buns; 4.8×3 for a bag after a transfer

Before and after mixed in one model

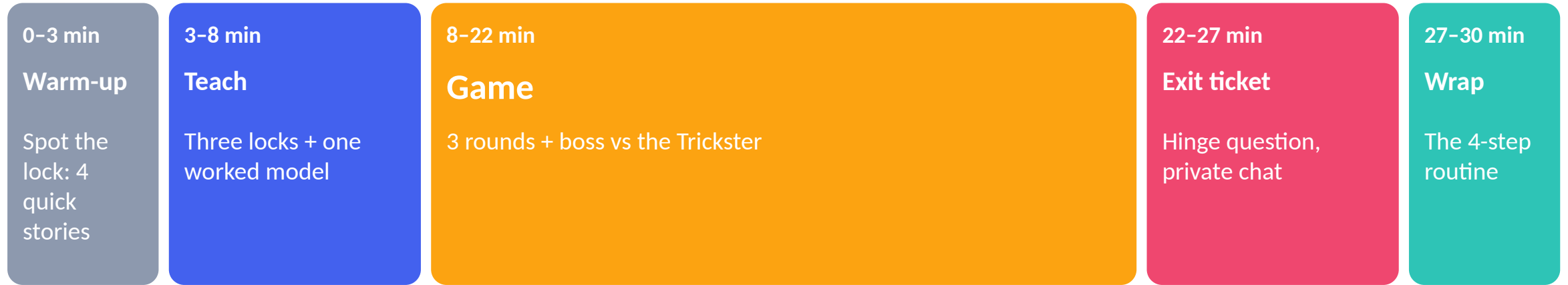
A model is drawn, but of the wrong moment: the student never asks what changed

No way in

Blank or crossed-out working on fraction-of-remainder and equal-at-the-end items

The insight: the two strongest scripts solved their before-after items. Students who find what stays the same can solve these; the others start dividing the given numbers.

The 30-minute segment at a glance



**Find the lock before drawing**

Every story has one thing that does not change: the total, the difference, or one person. Students name it first.

**Wrong answers are real ones**

The Trickster's answers are the exact mistakes from the five scripts. Explaining his mistake earns points.

**Every option diagnoses**

Each wrong exit-ticket answer points to one misconception and one follow-up for next class.

Set-up: 4-8 students • teacher shares this screen • students answer in chat and annotate on the shared screen • one class score

Vault Breakers

Every story hides one thing that stays the same. Find it, and the lock opens.



Round 1



Round 2



Round 3



Boss round

Warm-up: what stays the same? (practice, no points)

1 Ali gives Ben 5 sweets.

2 Both sisters get \$10 more pocket money.

3 Dad spends \$20. Mum spends nothing.

4 Kai and his mum, 4 years from now.

Type in the chat:

T = Total

D = Difference

O = One person

The three locks



TOTAL lock

Something moves from one person to the other.

Clue words: gives to • transfers • pours into



DIFFERENCE lock

Both change by the same amount.

Clue words: both add • both cut the same • ages



ONE-SIDE lock

Only one of them changes.

Clue words: only Sam gives away • only Dad spends

Rule: find the lock first, then draw it the SAME size in your “before” and “after” models.

Watch me: draw the lock

Jar A has 50 marbles. Jar B has 30. 10 marbles move from A to B.

Before



After



Total 80
locked

That's the lock. Both rows are the same length: the marbles moved, but nobody added or took any. If both jars got 10 more instead (A 60, B 40), the gap of 20 would be the lock.

How to play



1 CIRCLE

Circle what the question asks for.



2 LOCK

Type T, D or O in the chat. 20 seconds.



3 DRAW

Draw the model with the lock the same size, then solve.



4 TICK

Does my answer match what I circled?



Meet the Trickster

He always answers first, and he is always wrong.
His answers are mistakes real P5 students made.

+1 right lock

+2 right answer

+1 explain the Trickster's mistake

One class score. Get the right answer to beat the Trickster and win the lock. 3 locks + the boss = the vault opens.

One round, step by step

1 READ

30 s

Teacher

*"Read it with me, twice.
The Trickster has already
answered..."*

Trickster: $96 \div 3 = 32!$

no points yet

2 CIRCLE

30 s

Teacher

*"Circle what the question
wants on the shared
screen."*

circled: Ali at first

no points yet

3 LOCK

20 s

Teacher

*"Total, difference or one
person? Type T, D or O."*

Aisyah: T

Ravi: T

Sara: D

+1 most chose T

4 DRAW + TICK

2 min

Teacher

*"Draw, solve, type it. Does
it match what you circled?"*

Wei Ming: 36

Sara: 24 → oops, 36

+2 right answer

5 BEAT HIM

30 s

Teacher

*"Who can tell us why the
Trickster is wrong?"*

Ravi: "3 times" is AFTER

+1 explained it



Class score this round: 4 points, and the right answer beat the Trickster → Lock 1 opens.

Round 1

Ali and Ben had 96 marbles altogether. Ali gave Ben 12 marbles. Then Ben had 3 times as many marbles as Ali. How many marbles did Ali have at first?



Trickster says:

$$96 \div 3 = 32$$

Why is he wrong?

CIRCLE

30 s

LOCK in chat

20 s

DRAW + solve

2 min

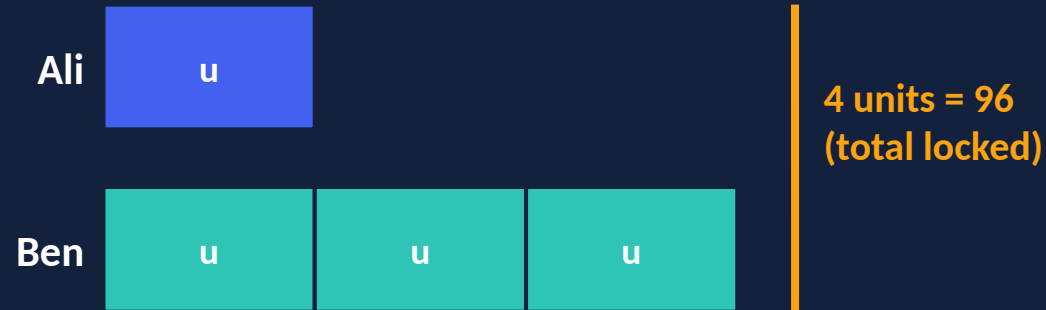
TICK

10 s

Round 1 • how to solve it

Lock: TOTAL (96)

After



Ali at first = after + the 12 he gave

1. Marbles only move, so the total stays 96.
2. After: Ali 1 unit, Ben 3 units → 4 units = 96.
3. 1 unit = $96 \div 4 = 24$ (Ali after).
4. Ali at first = $24 + 12 = 36$ marbles.

Trickster's mistake: "3 times" describes AFTER, and it makes 4 units, not 3. He also never undid the 12.

TICK: The question asks for Ali at FIRST: 36, not 24. Stopping at 24 is the in-between trap.

Round 2

Rope A was 300 cm long. Rope B was 120 cm long. The same length was cut from each rope. Then Rope A was 4 times as long as Rope B. How long was Rope B in the end? Give your answer in metres.



Trickster says:

$$300 \div 4 = 75 \text{ cm}$$

Why is he wrong?

CIRCLE

30 s

LOCK in chat

20 s

DRAW + solve

2 min

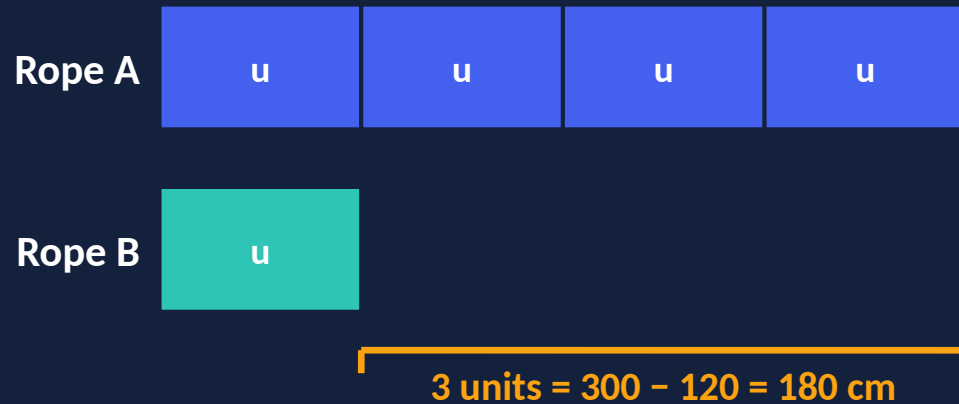
TICK

10 s

Round 2 • how to solve it

Lock: DIFFERENCE (180 cm)

End



1. Both lose the same length, so the difference stays $300 - 120 = 180$ cm.

2. End: A 4 units, B 1 unit $\rightarrow$ difference = 3 units.

3. 3 units = 180 cm $\rightarrow$ 1 unit = 60 cm.

4. Rope B in the end = 60 cm = 0.6 m.

Trickster's mistake: 300 cm is the length BEFORE the cut. "4 times" is only true at the end.

TICK: The question wants Rope B, at the END, in METRES: 0.6 m, not 60 or 240.

Round 3

Sam had 3 times as many stickers as Tia. Sam gave away 48 stickers. Then Sam had the same number of stickers as Tia. How many stickers did Sam have at first?



Trickster says:

$$48 \div 3 = 16$$

Why is he wrong?

CIRCLE

30 s

LOCK in chat

20 s

DRAW + solve

2 min

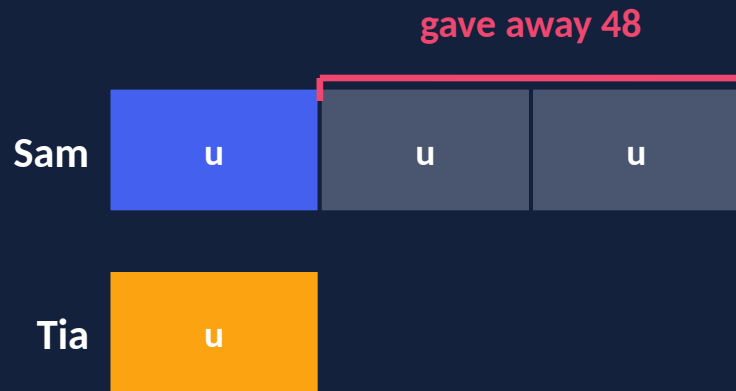
TICK

10 s

Round 3 • how to solve it

Lock: ONE SIDE (Tia)

Before



Tia never changes: her bar is the lock.

1. Only Sam changes, so Tia stays the same: 1 unit.
2. Sam 3 units $\rightarrow$ after giving, Sam = Tia = 1 unit.
3. He gave away 2 units = 48 $\rightarrow$ 1 unit = 24.
4. Sam at first = 3 units = 72 stickers.

Trickster's mistake: 48 is 2 units, not 3. He shared 48 into the wrong number of parts.

TICK: Sam at FIRST = 72. 24 is Tia (and Sam after): the wrong person.

Boss round: two people change

Mia had 90 more cards than Leo. Mia gave away $\frac{2}{3}$ of her cards and Leo gave away $\frac{1}{3}$ of his. Then they had the same number of cards. How many cards did Leo have at first?



Trickster says:

$$90 \div 3 = 30$$

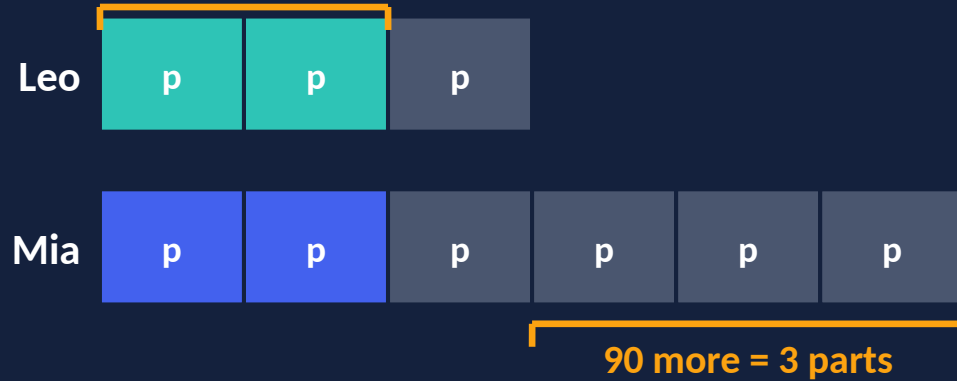
Why is he wrong?

New lock: the parts that are LEFT are equal. Draw the “left” parts the same size first.

Boss round, solved

Lock: the parts LEFT are equal

left: 2 parts



grey = given away

1. Leo keeps $\frac{2}{3}$: 3 parts, 2 left.
2. Mia keeps $\frac{1}{3}$, and it equals Leo's 2 parts $\rightarrow$ Mia has 6 parts.
3. $\text{Mia} - \text{Leo} = 3 \text{ parts} = 90 \rightarrow 1 \text{ part} = 30$.
4. Leo at first = 3 parts = 90 cards.

Trickster's mistake: 30 is ONE part. He found a unit and stopped.

TICK: Leo at FIRST = 90. Check: Mia 180 $\rightarrow$ 60 left; Leo 90 $\rightarrow$ 60 left. Equal $\checkmark$

Exit ticket: on your own, 3 minutes

On your own • send letters to the teacher in a private chat (e.g. "C, B")

Q1

Ribbon A is 150 cm long. Ribbon B is 60 cm long. The same length is cut from each ribbon. Then Ribbon A is 4 times as long as Ribbon B. How long is Ribbon B now?

(A) 37.5 cm

(B) 90 cm

(C) 30 cm

(D) 120 cm

Q2

Mum is 28 years older than Kai. In 5 years, Mum will be 3 times as old as Kai. What stays the same?

(A) the total of their ages

(B) the difference in age

(C) Mum's age

(D) Kai's age



Vault open! Your routine

CIRCLE what is asked · find the LOCK · DRAW it the same size · TICK your answer

Reading the exit ticket: every answer has a next step

Answer	What it tells the teacher	Code	Next class
Q1 (C) 30 cm	Found the difference lock and answered the right unknown	✓	Stretch: two equal-at-first problems (two items with different prices)
Q1 (A) 37.5 cm	Did one sum on a “before” number ($150 \div 4$)	BA1	5-min re-teach: sort before / after cards, then redo Round 2
Q1 (B) 90 cm	Found the difference, then stopped	SS	Warm-up drill: “What did the question ask?” (circle and tick only)
Q1 (D) 120 cm	Solved it, but answered for the wrong ribbon	SS	Same TICK drill; mark the circled unknown on every working
Q2 not (B)	Cannot yet pick the lock	BA2	Lock-sorting mini-game: 6 stories, T / D / O, at the start of next class

One week later: two parallel items (new numbers and stories) in the warm-up. At least 75% of the class correct → move on. Otherwise re-teach with new stories, then check again.

Exit-ticket tracker

After class • every answer has a next step. The teacher types each student's two letters; the code and next step follow from the table on the previous slide.

Student	Q1	Q2	Code	Next class
Student 1 (example)	C	B	✓	Stretch: two equal-at-first problems
Student 2 (example)	B	A	SS + BA2	Warm-up drill: “What did the question ask?” (circle and tick only) • Lock-sorting mini-game
Student 3 (example)	A	B	BA1	5-min re-teach: sort before / after cards, then redo Round 2
Student 4				
Student 5				
Student 6				

BA1 = one sum on a “before” number • BA2 = picks the wrong lock • SS = stops short or answers the wrong unknown. Re-check in one week with parallel items; aim for 75%.

What I would do next



Time it with a real class

Run it once with 4–8 students, time each round, and cut the boss round if Rounds 1–3 run long.



Build a story bank

30 short stories tagged by lock (T / D / O / equal-ends), so warm-ups and re-checks never repeat.



Make the lock a game mechanic

In an Ottodot game: drag the gold lock onto the bar that does not change before you can draw the rest.



Next segments from the same papers

Triangle base and height in composite figures; unit conversion with decimals (6 ℓ 29 mℓ).