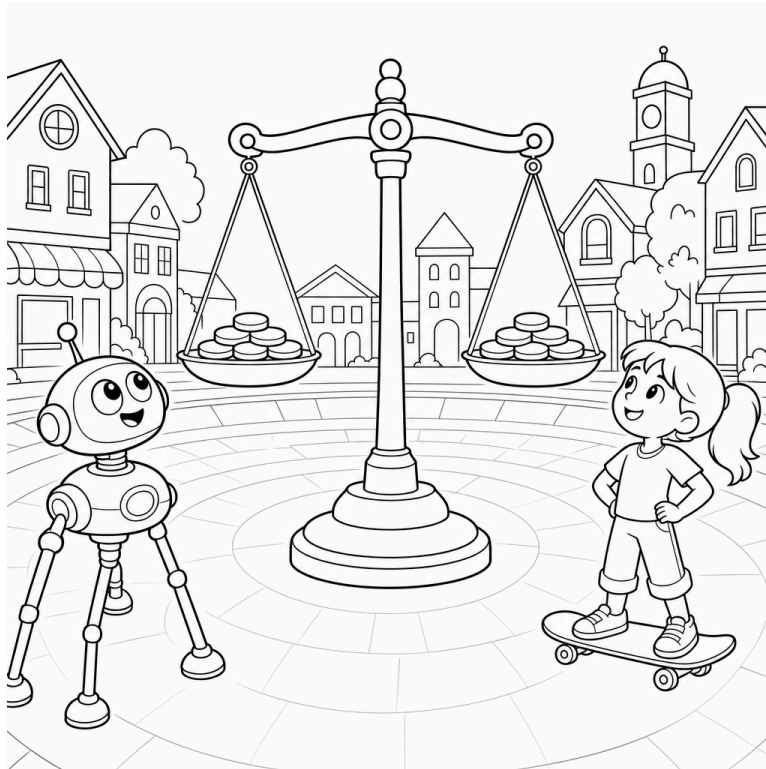


THE GREAT BALANCE

The Case of the Crooked Equals Sign



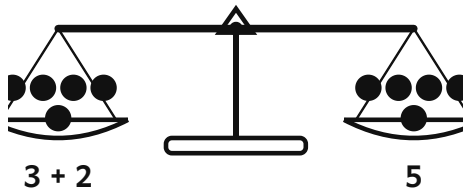
Lead Agent: Penelope

Shortchange Sam is tricking all of Maplewood. He whispers that the equals sign = means “the answer comes next” — so people keep writing longer and longer, and the town’s **Great Balance** is tipping over. The truth: = means **both sides weigh the same**. Learn to read the balance, and catch him in a crooked equation.

What the Equals Sign Really Means

The equals sign is a balance. Both sides must weigh the same.

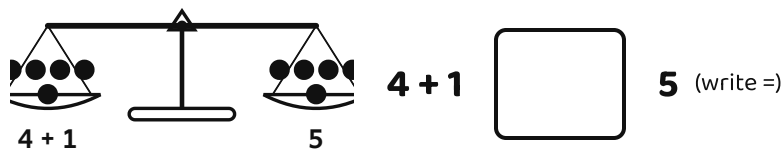
THE BIG IDEA



Put 3 counters and 2 more on the left pan, and 5 on the right pan. The scale sits **level** — both pans weigh the **same**.

That is exactly what $=$ means. Read it out loud as “**is the same as**”: **3 + 2 is the same as 5**. And it works both ways — $5 = 3 + 2$ is just as true. The equals sign does not mean “the answer comes next.”

- 1 Warm-up. This scale is **level**. Fill the sentence to match it, and say “is the same as” out loud.

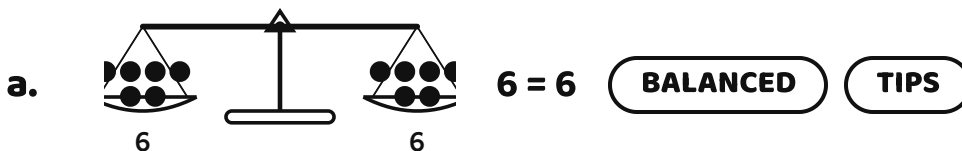


Is it **BALANCED** or does it **TIP**?

BALANCED

TIPS

- 2 Look at each scale. Is it **balanced** (level) or does it **tip**? Circle one.



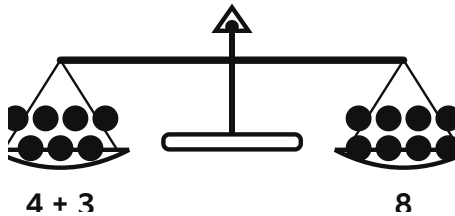
- 3 Detective eye. One pan has $5 + 3$, the other has 6. Which way does it tip — and is $5 + 3 = 6$ true or false?



Make the Scale Balance

When a scale tips, the two sides are *NOT* equal. Fix it so they match.

FIX THE TIP



One pan holds $4 + 3$. The other holds 8 . Does it balance? $4 + 3 = 7$, not 8 — so the 8 pan is heavier and **sinks**. The scale **tips**.

To make it balance, add **1** more counter to the $4 + 3$ side (now 8), or take **1** off the 8 side (now 7). When a scale tips, = **is false** until you fix it.

- 1 Read the scale above. It TIPS toward the 8 side. To balance it, how many more

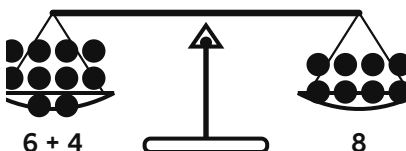
counters must you add to the light ($4 + 3$) pan?

- 2 Each scale is tipping. Write how many counters to **add to the lighter pan** to make it level.

a. add to the $3 + 4$ pan

b. add to the $5 + 2$ pan

- 3 Sam's trap: he built this scale and yelled "it's balanced, so $6 + 4 = 8$!" Is he right? Circle, then say what's really true.



$6 + 4 = 8$ is

TRUE

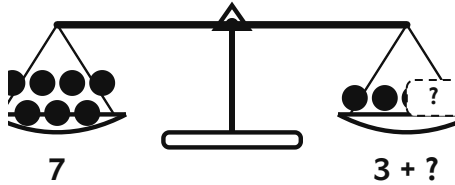
FALSE

What's the real weight of the $6 + 4$ pan? So the scale tips toward the _____ pan.

The Missing Counters

One pan is short. Draw in just enough counters to make it balance.

BALANCE IT



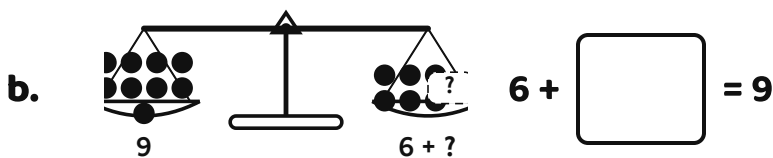
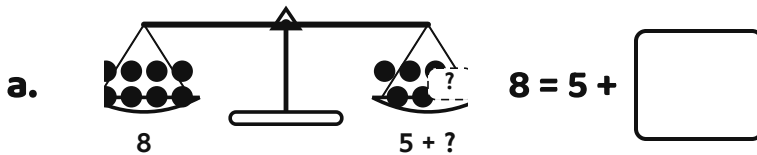
The left pan holds **7**. The right pan has **3** and some **empty spots**. How many counters must you drop in so it **balances**?

Count up from 3 to 7 — you need **4** more. So $3 + 4 = 7$, and the missing number is **4**. Writing it as a puzzle: $3 + ? = 7$, and $? = 4$.

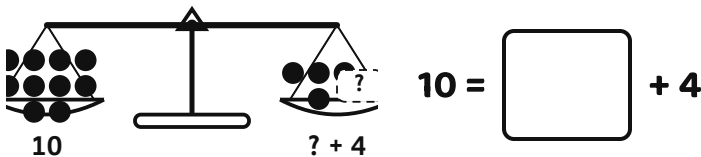
- 1 In the picture above, how many counters did the empty pan need? . Then $3 +$

$\square = 7$, and the missing number is .

- 2 Each scale is level, but a pan is missing counters. Write how many the empty pan needs.



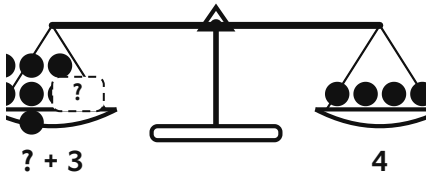
- 3 Careful — here the **total is on the LEFT** pan and the empty pan is on the right. Draw the missing counters yourself, then write how many.



Find the Unknown Anywhere

The ? can hide in any spot. Balance still finds it.

ANY POSITION



The unknown does not always come first! In $? + 3 = 7$, the missing number is the **first** one. The right pan weighs **7**; the left holds **? and 3**. So the ? must weigh **4** — because $4 + 3 = 7$.

Balance also solves take-away. $8 - ? = 3$ asks: 8 take away what leaves 3? That is **5**. Always ask: **what makes both sides the same?**

- 1 Solve for the missing number. Say “is the same as” for the = each time.

a. + 3 = 7

b. 5 + = 8

c. 9 = 4 +

- 2 Take-away balance. What number leaves the right amount behind?

8 - = 3 and 10 - = 6

- 3 Tricky one, Agent. First: what single number balances $6 = \square$? Then use it: $? + 2 = 6$. Draw the counters if it helps.

6 = so + 2 = 6

draw here if you need the picture: _____

True, False, and Sam's Trick

No pictures now. Judge each sentence: does it balance?

THE HABIT

For every number sentence, be the scale in your head: **weigh the left side, weigh the right side — do they match?** If they match, it is **TRUE**. If one side is heavier, it **TIPS** and the sentence is **FALSE**.

= means “is the same as,” never “the answer comes next.”

1 Weigh both sides. Circle TRUE or FALSE for each.

a. $8 = 8$

TRUE

FALSE

b. $5 + 2 = 6$

TRUE

FALSE

c. $4 + 3 = 3 + 4$

TRUE

FALSE

d. $9 = 5 + 4$

TRUE

FALSE

e. $7 = 10$

TRUE

FALSE

2 Fill the box to make each one **balance** (be TRUE).

a. $\square + 6 = 10$ b. $3 + \square = 2 + 6$ c. $12 = \square + 7$

3 Catch Sam in a lie. He scribbled this to make the Great Balance tip:



“Easy! $8 + 4 = 12 + 5$. You just keep going!”

Is Sam right? TRUE FALSE The left side weighs $\square$ and the right side

weighs $\square$. Do they balance? BALANCED TIPS

4 Don't over-arrest him! Sam also wrote $10 = 6 + 4$. Is THIS one a trick, or is it really true? Circle, because the total is allowed on the left.

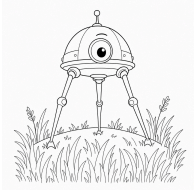
$10 = 6 + 4$ is TRUE FALSE

Case Closed at the Town Scale

Real trades in Maplewood. Only fair trades balance.

Remember the rule: = means both sides weigh the same. If a trade would tip the scale, it is not fair — and not true.

- 1 The Martian scout trades **4 shiny rocks and 3 more** for **7 apples**. Put each side on the scale. Does the trade balance?



$4 + 3 = 7$

BALANCED

TIPS

- 2 The skater has **2 stickers** and needs her pan to weigh **6** to trade. How many more stickers? Fill the puzzle.



$6 =$

+ 2 → she needs

more

- 3 **Catch Sam's crooked receipt.** A 10-cookie order should trade for 10. Sam wrote:



*"5 + 5 = 10 + 3. That's **13** you owe me!"*

Is the trade fair? **FAIR / NOT FAIR** (circle one) What should it really say? $5 + 5 =$

- 4 Don't over-arrest him! Sam's next receipt says $9 = 4 + 5$. Fair or crooked? It looks backwards — but weigh both sides first.

$9 = 4 + 5 \text{ is}$

FAIR

CROOKED

CASE CLOSED: the Great Balance stands level again. An agent who knows that = means "**the same as**" can never be tricked into a crooked trade — and can find a missing number no matter where it hides. Shortchange Sam is back in the Bureau lock-up. Outstanding work, Agent Penelope!