



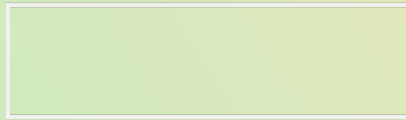
Math Virtual Learning

Essential Math 2

Balancing Mobiles

April 8, 2020

Logic of Algebra



Objective

You will explore the basic rules of algebraic manipulations by imagining a balanced mobile puzzle.

DIRECTIONS

Click through the slides and in a math journal/separate sheet of paper write down your answers.

Mental Mathematics: Activity 1 Doubling

PURPOSE

This activity introduces halves to the number that is doubled, requiring you to keep track of the extra “1” generated by doubling $\frac{1}{2}$.

DIRECTIONS

You perform the operation (given in title) on the number in white.

Mental Math * Activity 1: Doubling

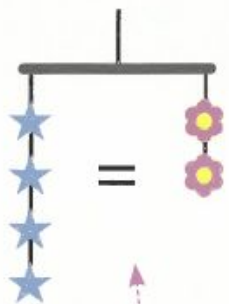
| | |
|----------------|-----|
| 2 | 4 |
| -3 | -6 |
| -8 | -16 |
| 4 | 8 |
| $4\frac{1}{2}$ | 9 |

| | |
|-----------------|-----|
| -6 | -12 |
| $-6\frac{1}{2}$ | -13 |
| -5 | -10 |
| $-5\frac{1}{2}$ | -11 |
| 7 | 14 |

| | |
|------------------|-----|
| $7\frac{1}{2}$ | 15 |
| $10\frac{1}{2}$ | 21 |
| -11 | -22 |
| $-11\frac{1}{2}$ | -23 |
| 20 | 40 |

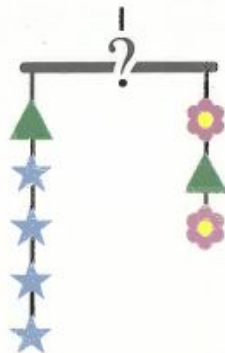
| | |
|-----------------|----|
| $20\frac{1}{2}$ | 41 |
| 24 | 48 |
| $24\frac{1}{2}$ | 49 |
| 43 | 86 |
| $43\frac{1}{2}$ | 87 |

① This mobile balances.



Based on this mobile, you can consider whether other mobiles balance.

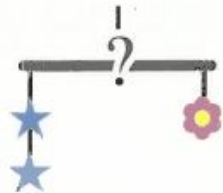
① a



Can we say for sure that this mobile balances?

Why or why not?

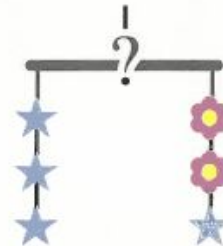
① b



Can we say for sure that this mobile balances?

By what reasoning?

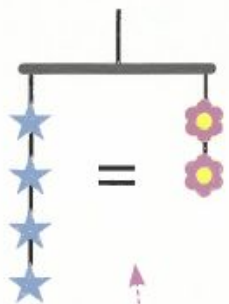
① c



Can we say for sure that this mobile balances?

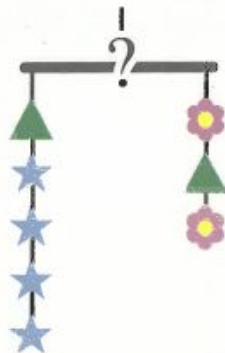
Why or why not?

① This mobile balances.



Based on this mobile, you can consider whether other mobiles balance.

① a



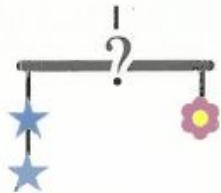
Can we say for sure that this mobile balances?

Yes

Why or why not?

Equal weight was added to both sides.

① b



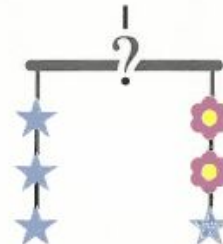
Can we say for sure that this mobile balances?

Yes

By what reasoning?

Both sides were halved - divided by 2.

① c



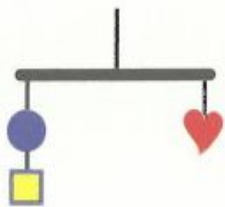
Can we say for sure that this mobile balances?

No.

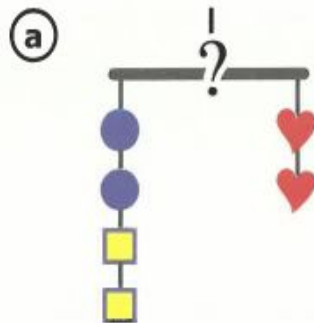
Why or why not?

A star switched sides, to the right side might be heavier.

② This mobile also balances.

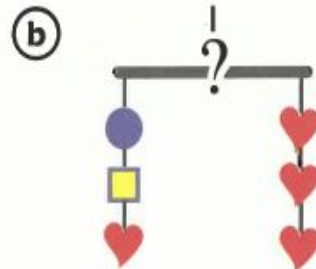


We don't have enough information to solve any of these mobile puzzles. (Why not?) But we can still talk about the relationships between the shapes.



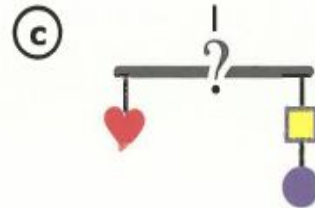
Can we say for sure that this mobile balances?

By what reasoning?



Can we say for sure that this mobile balances?

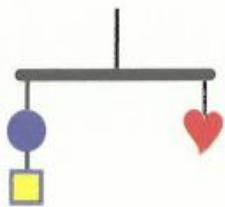
Why or why not?



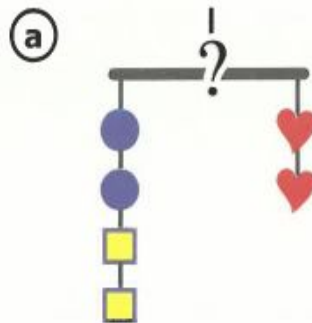
Can we say for sure that this mobile balances?

By what reasoning?

② This mobile also balances.



We don't have enough information to solve any of these mobile puzzles. (Why not?) But we can still talk about the relationships between the shapes.

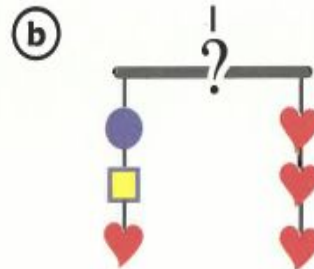


Can we say for sure that this mobile balances?

Yes

By what reasoning?

Both sides were doubled.

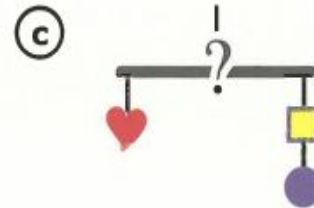


Can we say for sure that this mobile balances?

No.

Why or why not?

2 Heart added to one side, 1 heart added to the another.



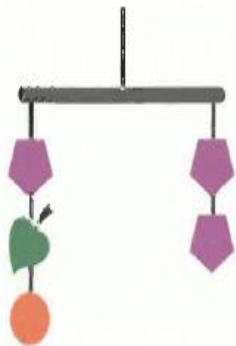
Can we say for sure that this mobile balances?

Yes.

By what reasoning?

Entire sides are swapped or rearrange.

- ③ Which of the following changes would keep this mobile balanced? Circle all that apply.



- Ⓐ Add a pentagon to both sides.
- Ⓑ Add 5 leaves to both sides.
- Ⓒ Move all the pentagons to the right side.
- Ⓓ Switch the leaf and circle.
- Ⓔ Add a circle to the right side.
- Ⓕ Remove one pentagon from both sides.

- ③ Which of the following changes would keep this mobile balanced? Circle all that apply.



(A) Add a pentagon to both sides.

(B) Add 5 leaves to both sides.

(C) ~~Move all the pentagons to the right side.~~

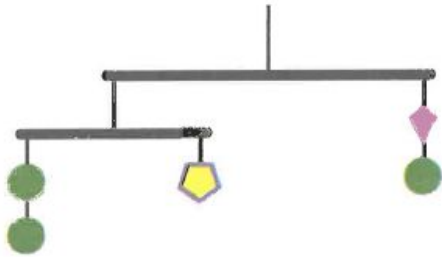
(D) Switch the leaf and circle.

(E) ~~Add a circle to the right side.~~

(F) Remove one pentagon from both sides.

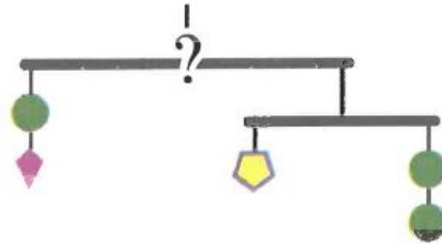
Practice & Answer Key

15 This mobile balances.



Why can't we find the weight of the shapes on this balanced mobile?

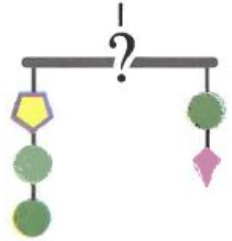
a



Based on that mobile, can we say for sure that this mobile balances?

Why or why not?

b

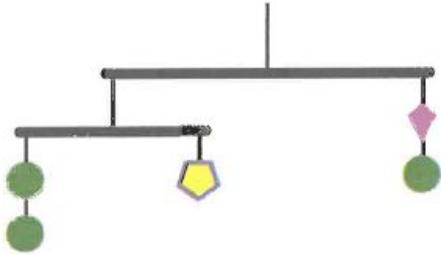


Can we say for sure that this mobile balances?

Why or why not?

Practice & Answer Key

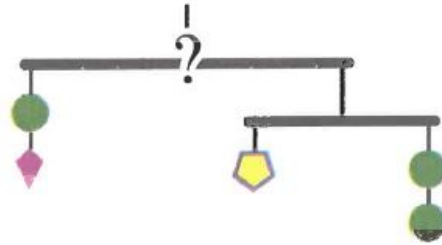
15 This mobile balances.



Why can't we find the weight of the shapes on this balanced mobile?

Do not have enough given information.

a



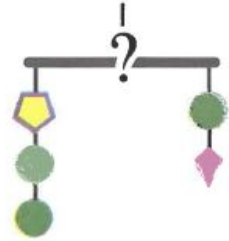
Based on that mobile, can we say for sure that this mobile balances?

Yes

Why or why not?

Rearrangements do not affect balance.

b



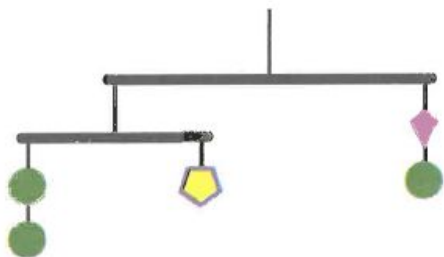
Can we say for sure that this mobile balances?

Yes

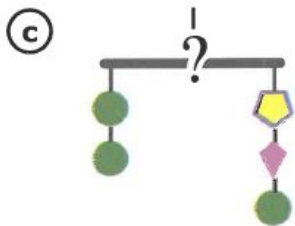
Why or why not?

Same side was combined - Rearrangement.

15 This mobile balances.

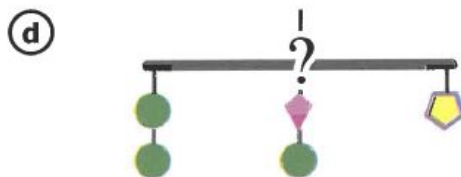


Practice & Answer Key



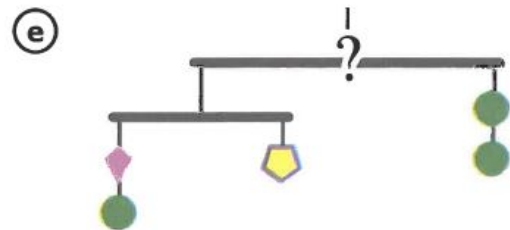
Can we say for sure that this mobile balances?

Why or why not?



Still based on the first mobile, can we say for sure that this mobile balances?

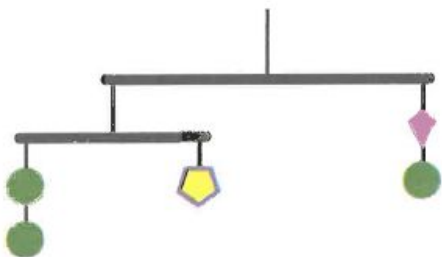
Why or why not?



Can we say for sure that this mobile balances?

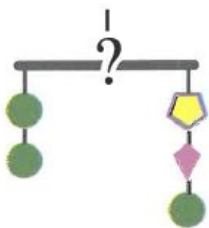
Why or why not?

15 This mobile balances.



Practice & Answer Key

c



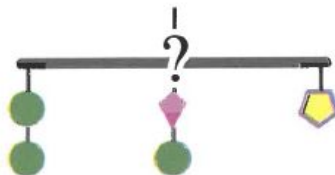
Can we say for sure that this mobile balances?

No

Why or why not?

Two strings on different sides combined.

d



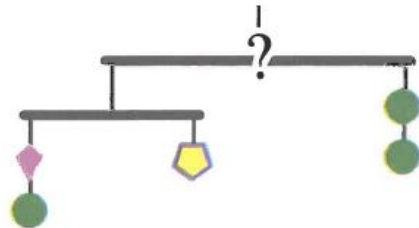
Still based on the first mobile, can we say for sure that this mobile balances?

Yes

Why or why not?

**The middle string does NOT affect the balance
1 pentagon = 2 circles**

e



Can we say for sure that this mobile balances?

No

Why or why not?

Two strings were switched across sides

A Does this mobile balance *always*, *sometimes*, or *never*?

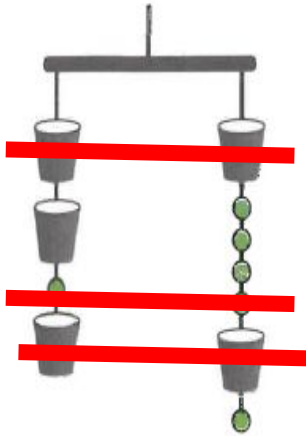


If sometimes, *when*?

B Which of the following changes would keep the mobile in problem A balanced?

- i** Add 4 green dots to both sides.
- ii** Remove a bucket from each side.
- iii** Add a bucket to both sides.
- iv** Move the dot on the left over to the right side.

A Does this mobile balance *always*, *sometimes*, or *never*?



Sometimes

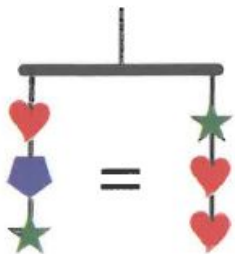
If sometimes, *when*?

Cup = 4




B Which of the following changes would keep the mobile in problem A balanced?

- (i) Add 4 green dots to both sides.
- (ii) Remove a bucket from each side
- (iii) Add a bucket to both sides.
- (iv) ~~Move the dot on the left over to the right side.~~

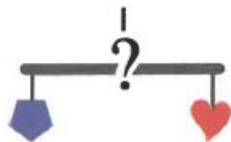
© This mobile balances.



Key:

-  = p
-  = s
-  = h

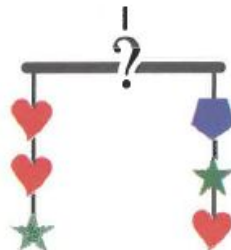
(i)



Can we say for sure that this mobile balances?

Why or why not?

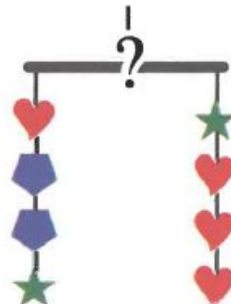
(ii)



Can we say for sure that this mobile balances?

Why or why not?

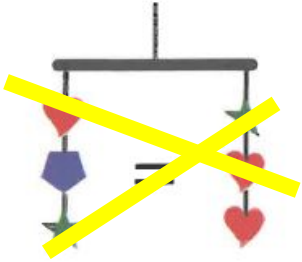
(iii)






Can we say for sure that this mobile balances?

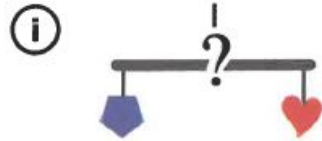
Why or why not?

© This mobile balances.



Key:

-  = p
-  = s
-  = h

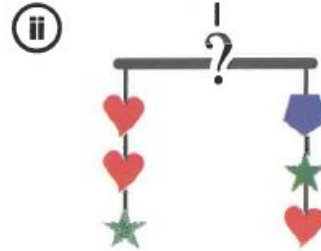


Can we say for sure that this mobile balances?

Yes

Why or why not?

Equal weight were removed from both sides.

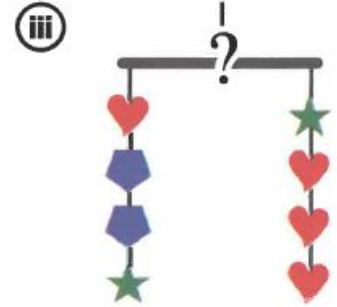


Can we say for sure that this mobile balances?

Yes

Why or why not?

Rearrangements do not change balance.



Can we say for sure that this mobile balances?

Yes

Why or why not?

**Each weight added to both sides because ...
Pentagon = heart.**

Additional Resources

You explored the basic rules of algebraic manipulations by imagining a balanced mobile puzzle.

Solve Me Mobiles

<https://solve.me.edc.org/mobiles/>

Solve Me Mystery Grids

<https://solve.me.edc.org/mysterygrid/>

Mobiles

Mystery
Grids

Who
Am I ?