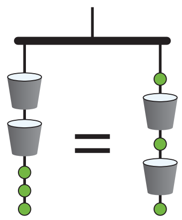
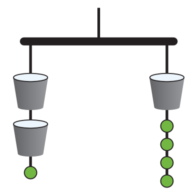
NCSM Transition to Algebra Puzzles & Dialogues

Mobile Puzzles

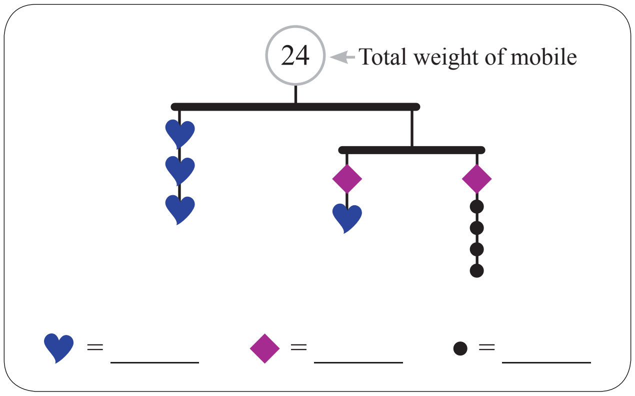
This mobile *always balances*. Why?

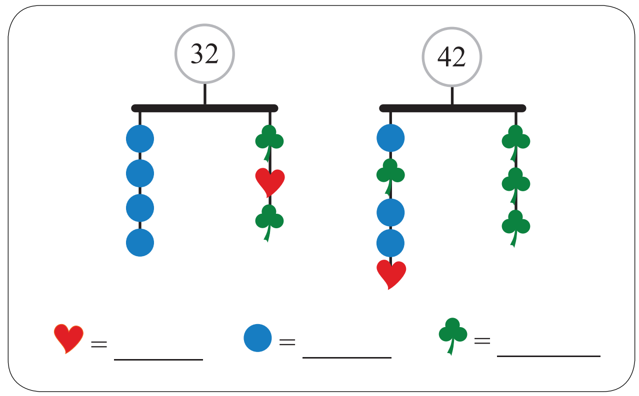


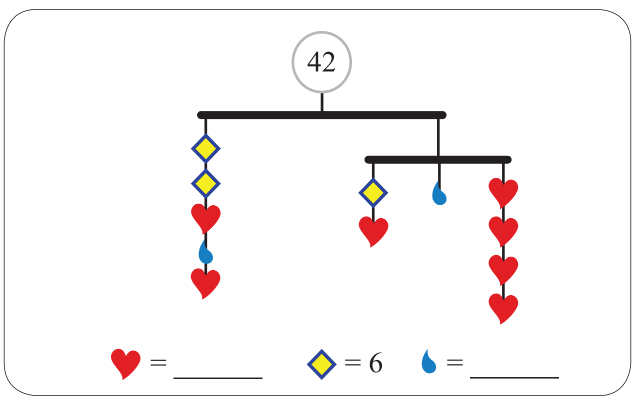
Does this mobile balance *always, sometimes, or never?*

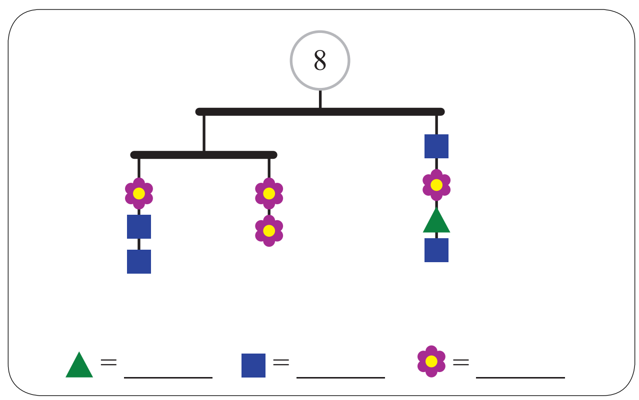


If sometimes, *when?*

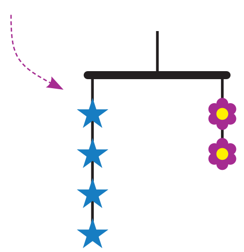




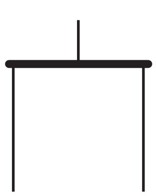




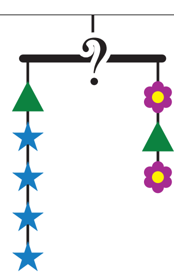
This mobile is balanced. What does that tell us about these?



Create a balanced mobile based on the mobile above.

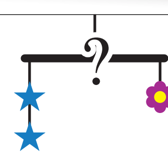


Which mobiles can you say balance for sure?



Do we know if this mobile is balanced?

Why or why not?



Do we know if this mobile is balanced?

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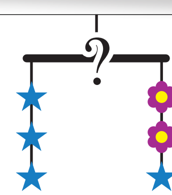

Do we know if this mobile is balanced?

Why or why not?

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Latin Squares and MysteryGrids

Use the clues to fill in each grid so that every row and every column contains all of the numbers in the title.

4, 5, 6 Latin Square

4		5
	5	
5		6

a*, *b*, *c Latin Square

a		
	b	
		c

MysteryGrid **1, 2, 3, 6**

3,×		24,×	
36,×		6	
		9,×	
2	5,−		

MysteryGrid **4, 5, 6**

20,×		30,×
15,+		
	24,×	

MysteryGrid **1, 3, 5, 7** Puzzle

49, x		$\frac{6}{10}$, ÷	
	$\frac{10}{6}$, ÷	3, x	
$\frac{5}{3}$, ÷		7	
	13, +		

MysteryGrid **2, 3, 5**

20,×		10,+
	45,×	

MysteryGrid x^2, $4x^2$, x^3, $5x^3$

$4x^4$, •		$7x^3$, +	
$5x^8$, •	$20x^5$, •		
	$5x^3$	$5x^2$, +	
	$4x^5$, •		x^2

MysteryGrid $\frac{1}{4}$, $\frac{1}{2}$, **2**

$\frac{3}{4}$, +		2
2, x	1, +	

Good MysteryGrid puzzles can be a bit trickier to make up...

MysteryGrid x, x^2, x^3

x^2	x^3+2x, +	
x^6, •		
	x^5, •	

NCSM Transition to Algebra Puzzles & Dialogues

Dialogues

	40	3
2	80	

$2 \bullet 43 = 2(40 + 3) =$ ______

	$4x$	3
2	$8x$	

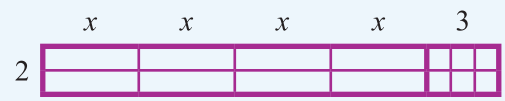
$2(4x + 3) =$ __________

Thinking Out Loud

Michael: I get why we can break up 43 into 40 and 3, but why can't we break up $4x$ into 4 and x?

Lena: Well, 43 equals 40 *plus* 3, so we can treat it like distance. But $4x$ equals 4 *times* x. It's 4 copies of x.

Michael: So, what would 2 times $4x + 3$ look like? Let's draw a model *(draws a model)*.



I don't know what x really is, so I'm just drawing it this way. Whatever it is, that's four of them.

Jay: That's how I think to double 43. I think: double 40, double 3, and then add them together.

Lena: Great! That picture makes sense to me. Since we're starting with 4 x's, it makes sense that doubling them will give us 8 x's just the same way that doubling 3 gives 6. So, $2(4x + 3) =$ __________.

Jay: Hey look! $4x + 3$ is 4 x's plus 3. And 43 is 4 tens plus 3. So 43 is like $4x + 3$.

Lena: And they're exactly the same if $x = 10$.

Creating Dialogues

Thinking Out Loud

NCSM Transition to Algebra Puzzles & Dialogues

Creating Mobiles

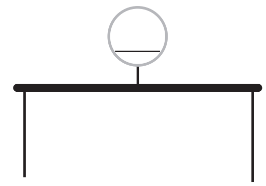
Make a small mobile with two shapes and one beam.

(a) You're making the puzzle, so work backwards. Start by making up the answers first:

● = ________

☆ = ________

(b) Now make up a balanced mobile, and write in the total weight at the top:



(c) Try to solve your mobile. Was it solvable?

Some mobiles have no solutions (no numbers will work) and some have multiple solutions (many numbers work), but **the best mobiles have only one solution** (only one set of numbers works). If you can't solve your mobile, it might be a mobile with no solution or with many solutions.

(d) If your mobile doesn't have exactly one solution, change it or make a new one. Then cover your answer and give your mobile to someone else to solve here:

● = ________

☆ = ________

NCTM Presentation

Thursday, April 18, 2013
9:45 am – 11:00 am
Hyatt Regency, Centennial Ballroom E

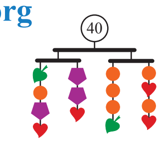
Strategies for Engaging Algebra Learners: Puzzles that Promote Mathematical Reasoning

This presentation will introduce the design philosophy and most successful classroom activities of the Transition to Algebra project. Participants will solve algebraic puzzles collaboratively, learn about the theory of using puzzles to support algebraic skill development and the transition from arithmetic to algebra, hear research findings, create puzzles of their own to share, and take away strategies and resources for using puzzles to engage students in fun, algebraic, logical reasoning.

Participants of this workshop will explore puzzles as though they were students in the classroom, collaborating to solve them and creating algebraic puzzles of their own to share with each other and their students.

Related Resources

Transition to Algebra curriculum information and presentation documents: **ttalgebra.edc.org**



Related EDC projects:

- Implementing the Mathematical Practice Standards: mathpractices.edc.org
- iPuzzle math apps coming soon: ipuzzle.edc.org
- ThinkMath! elementary curriculum: thinkmath.edc.org
- CME project high school curriculum: cmeproject.edc.org

EDC Learning transforms lives.