Essential Math

Lesson Date: April 9th 2020

Lesson: Algebraic Models

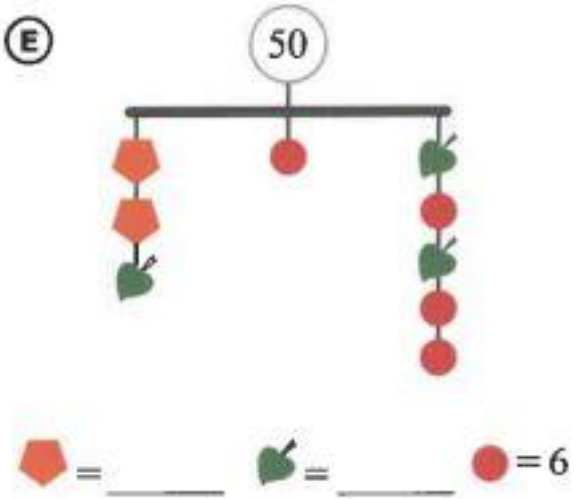
Learning Target: Students will incorporate algebraic expressions using mobiles and translate it into equations

Bell Work

Ⓓ **1, 2, 3** Latin Square

		2
3		

Ⓔ



Ⓕ MysteryGrid **0, 2, 4, 6**

16,•		0,•	
4,+		10,+	2,+
	6		
6,+		6,+	

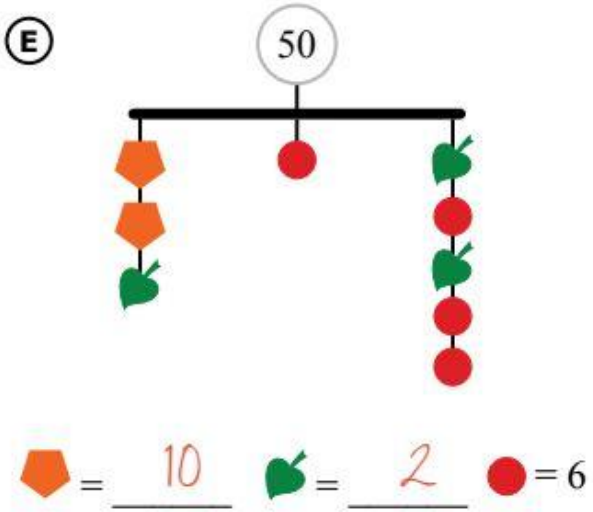
Draw an area model and use it to multiply

Bellwork Answers

Ⓓ **1, 2, 3** Latin Square

2	1	3
1	3	2
3	2	1

Ⓔ



Ⓕ MysteryGrid **0, 2, 4, 6**

16,• 2	4	0,• 0	6
4,+ 4	2	10,+ 6	2,+ 0
0	6	4	2
6,+ 6	0	6,+ 2	4

Draw an area model and use it to multiply

Directions

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

Feel free to print off the slides as well, but remember the answer key is on the following slide

Lesson 1.2: Mobiles and Equations

④ This mobile balances. Use the key to translate it into an equation.

$S +$ _____ = _____

Key:

$= m$

$= s$

$= c$

⑤ Draw the mobile that would remain if you crossed out one star and one moon on each side.

⑥ Do we know if these changes would keep the mobile balanced? Explain your reasoning.

⑦ Write an equation for your modified mobile by using the key to translate.

_____ = _____

The same logic about changes that keep mobiles *balanced* can be used to consider changes that keep equations *true*.

Lesson 1.2: Mobiles/Equations with Key

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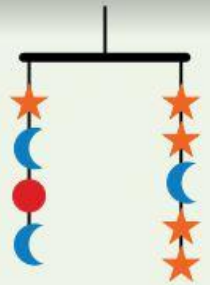
④ This mobile balances. Use the key to translate it into an equation.



$s + m + c + m = 2s + m + 2s$

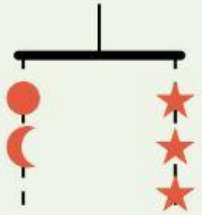
Key:

$= m$

$= s$

$= c$

⑤ Draw the mobile that would remain if you crossed out one star and one moon on each side.



⑥ Do we know if these changes would keep the mobile balanced? Explain your reasoning.

Yes, because the same weights were removed from each side.

⑦ Write an equation for your modified mobile by using the key to translate.

$m + c = 3s$

The same logic about changes that keep mobiles *balanced* can be used to consider changes that keep equations *true*.

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Lesson 1.2 Mobiles/Equations with Key

8 If the equation $s + m + c + m = 2s + m + 2s$ is true, then which of these equations are true? (Mark True or False

a $2s + m + 2s = s + m + c + m$

b $4s + m = 2m + s + c$

c $5s + m = 2m + c$

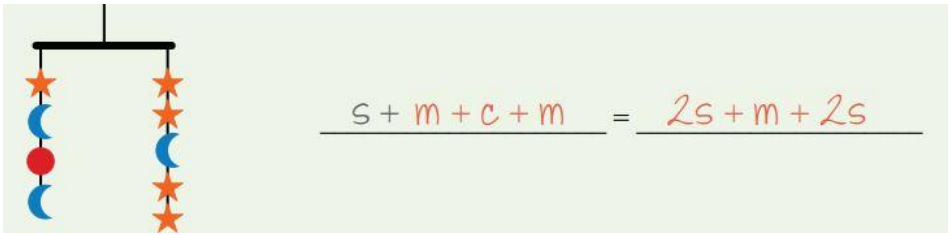
d $s + 2m + c = 4s + m$

e $4s = s + m + c$

f $3s = c + m$

Key Points

1. **Follow your rules**
2. **8a. Is just a rewrite of your original equation only reversed so we know it must be true**
3. **8b. Is the original equation (only with like terms combined and reversed) so we know that it must be true**
4. **Practice**



Lesson 1.2 Mobiles/Equations with Key

⑧ If the equation $s + m + c + m = 2s + m + 2s$ is true, then which of these equations are true? (Mark True or Fals

ⓐ $2s + m + 2s = s + m + c + m$ True

ⓑ $4s + m = 2m + s + c$ True

ⓒ $5s + m = 2m + c$ False (unless $s = 0$)

ⓓ $s + 2m + c = 4s + m$ True

ⓔ $4s = s + m + c$ True

ⓕ $3s = c + m$ True

Combining like terms or using a mirror image is ok just as long as it is consistent with the other side

Example: **a + b = 2c** and the mirror image is **2c= a+b**
Both expressions mean the same thing so both are true

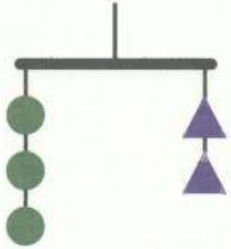
Using the same example of a + b = 2c I can **NOT** say that 2c + b= a
You have to be consistent with what the equation is saying in order to keep it in balance

Lesson 1.2 Mobiles/Equations with Key

Use this key to choose shapes and translate the mobiles to algebra in problems 9 through 12.

Key: ▲ = t ● = c ♥ = h ★ = s ◆ = k ⬟ = p

9 This mobile balances.



Create a new, balanced mobile based on this mobile.

10 Translate both mobiles into equations.

11 This mobile balances, too.

Create a new, balanced mobile based on this mobile.

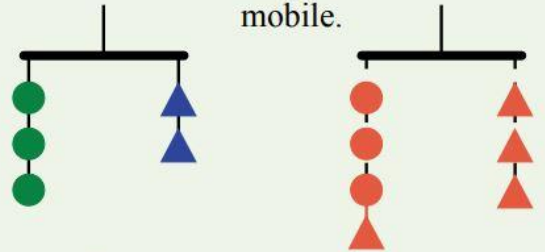
12 Translate both mobiles into equations.

Lesson 1.2 Mobiles/Equations with Key

Use this key to choose shapes and translate the mobiles to algebra in problems 9 through 12.

Key: ▲ = t ● = c ♥ = h ★ = s ♦ = k ⬟ = p

9 This mobile balances. Create a new, balanced mobile based on this mobile.

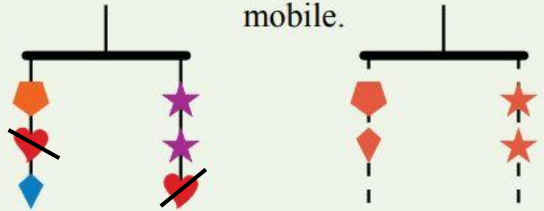


Responses may vary.

10 Translate both mobiles into equations.

$3c = 2t$ $3c + t = 3t$

11 This mobile balances, too. Create a new, balanced mobile based on this mobile.



Responses may vary.

12 Translate both mobiles into equations.

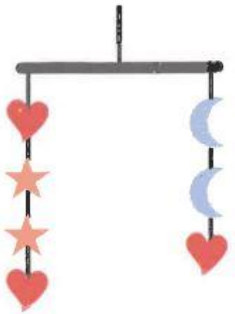
$p + h + k = 2s + h$ $p + k = 2s$

Note: In order to create a balanced mobile equal actions had to be taken to both sides

1. In question 9 a triangle was added to the left side, so a triangle had to be added to the right side
2. In question 10 a heart was subtracted from the left, so in order to stay balanced a heart had to be subtracted from the right.

Practice 1

13 Based on this mobile, determine if these equations are true or false.



Key: ♥ = h ☾ = m ★ = s

a $h + s + s + h = m + m + h$

b $2s + h = 2m$

c $6h + 6s = 6m + 3h$

d $2m + h = h + 2s + h$

e $3s + 2h = 2m + h + s$

f $3h = 2m + 2s$

14 Based on the equation $t + 2p + 2s = 2t + 3s$, determine if these equations are true or false.

a $t + 2p + s = 2t + 2s$

b $3t + 2p = 5s$

c $2p + 2s = t + 3s$

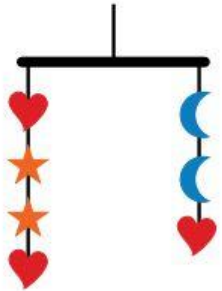
d $t + 2p = 2t + s$

e $2p + 5s = 3t$

f $2p = t + s$

Practice 1 Answer Key

13 Based on this mobile, determine if these equations are true or false.



Key: ♥ = h ☾ = m ★ = s

(a) $h + s + s + h = m + m + h$ True

(b) $2s + h = 2m$ True

(c) $6h + 6s = 6m + 3h$ True

(d) $2m + h = h + 2s + h$ True

(e) $3s + 2h = 2m + h + s$ True

(f) $3h = 2m + 2s$ False

14 Based on the equation $t + 2p + 2s = 2t + 3s$, determine if these equations are true or false.

(a) $t + 2p + s = 2t + 2s$ True

(b) $3t + 2p = 5s$ False

(c) $2p + 2s = t + 3s$ True

(d) $t + 2p = 2t + s$ True

(e) $2p + 5s = 3t$ False

(f) $2p = t + s$ True

Practice 2

20 If the equation $2x + 2b = c + b$ is true, then which of these equations are true? (Mark True or False.)

(a) $2x + b = c$ (b) $x + b = \frac{1}{2}(c + b)$ (c) $2x + b - c = 0$

(d) $2x + 3b = c$ (e) $2x + 2b - c = b$ (f) $2x = c - b$

21 Based on the equation $4s + t + m = 2t + 3m$, determine if these equations are true or false.

(a) $4s + 3t = 4m$ (b) $4s + t = 2t + 2m$ (c) $t + m = 2t + 3m - 4s$

(d) $4s + m = t + 3m$ (e) $4s + 2t + 2m = 3t + 4m$ (f) $4s = t + 2m$

Remember: Keep both sides balanced.

1. **Same action must be taken on both sides**

20a. One b (or b)was subtracted from both sides, so both sides remain equal and balanced making 20a. **True**

Practice 2 Answer Key

TOUGH STUFF (Answers to the following problems assume variables do not all equal 0.)

20 If the equation $2x + 2b = c + b$ is true, then which of these equations are true? (Mark True or False.)

(a) $2x + b = c$ True

(b) $x + b = \frac{1}{2}(c + b)$ True

(c) $2x + b - c = 0$ True

(d) $2x + 3b = c$ False

(e) $2x + 2b - c = b$ True

(f) $2x = c - b$ True

21 Based on the equation $4s + t + m = 2t + 3m$, determine if these equations are true or false.

(a) $4s + 3t = 4m$ False

(b) $4s + t = 2t + 2m$ True

(c) $t + m = 2t + 3m - 4s$ True

(d) $4s + m = t + 3m$ True

(e) $4s + 2t + 2m = 3t + 4m$ True

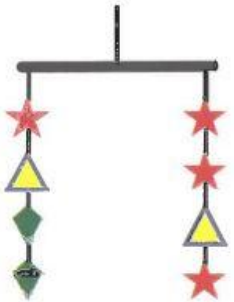
(f) $4s = t + 2m$ True

20d. 2x+ 3b = c

20d is **False** because 2b was added to the left side of equation, but 2b was not added to the right side making it unbalanced and **false**.

Practice 3

Ⓔ This mobile balances. Use the key to translate it into an equation.



Key:

▲ $= t$

◆ $= k$

★ $= s$

$2k +$ _____ $=$ _____

Ⓕ Imagine crossing out one star and one triangle on each side. Write an equation for that modified mobile.

_____ $=$ _____

Ⓖ Based on the mobile above in problem E, determine if these equations are true or false.

(i) $2k + 2t = 4s$

(ii) $2k + s = 3s$

(iii) $2k + t = 2s + t$

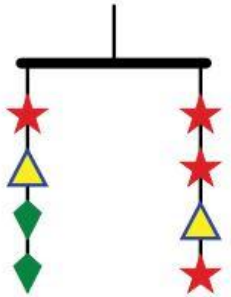
(iv) $2k = 2s$

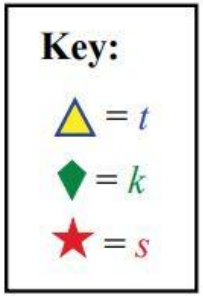
(v) $2k + t = 4s + t$

(vi) $k = s$

Practice 3 Answer Key

E This mobile balances. Use the key to translate it into an equation.





$2k + s + t = 3s + t$

F Imagine crossing out one star and one triangle on each side. Write an equation for that modified mobile.

$2k = 2s$

G Based on the mobile above in problem E, determine if these equations are true or false.

(i) $2k + 2t = 4s$ — False (unless $s = t$)

(ii) $2k + s = 3s$ — True

(iii) $2k + t = 2s + t$ — True

(iv) $2k = 2s$ — True

(v) $2k + t = 4s + t$ — False (unless $s = 0$)

(vi) $k = s$ — True