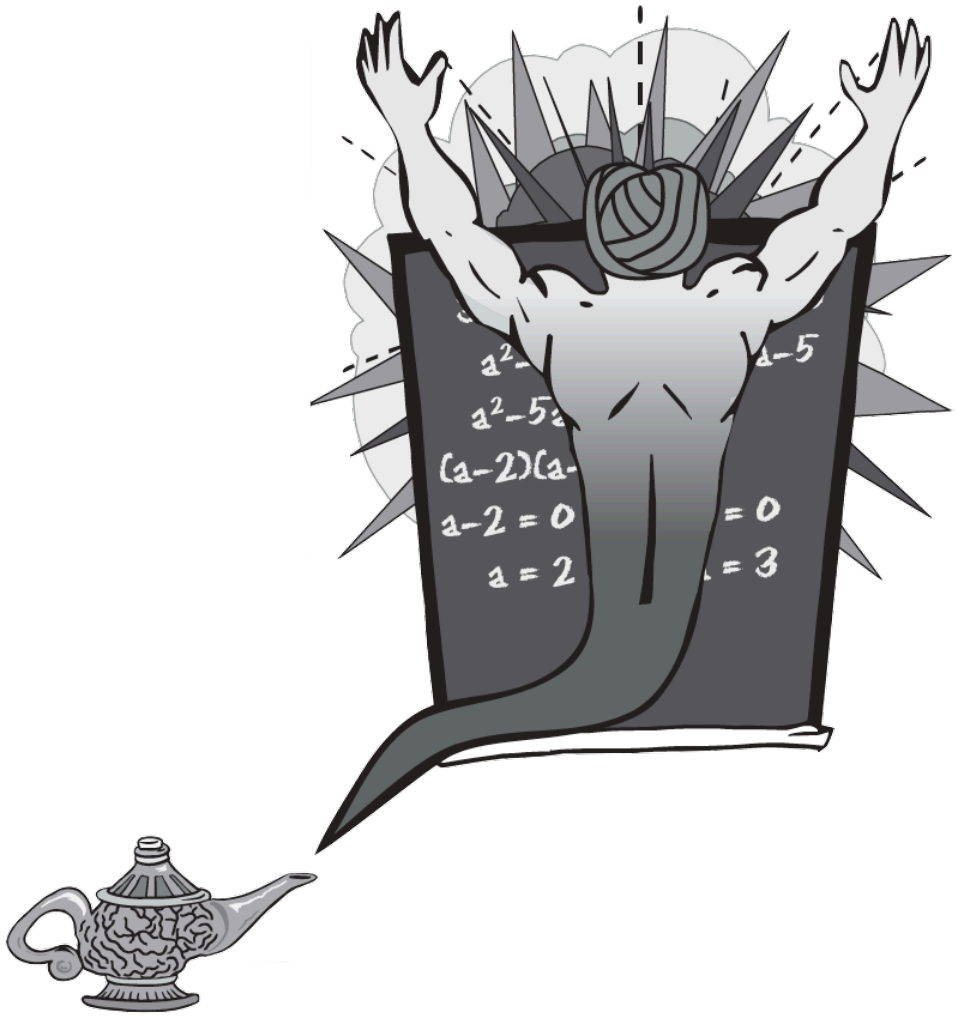
Ultimate Cosmic Power:

In An Itty-Bitty Thinking Space

Algebraic Reasoning for OK-MAP, June 2017



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#OKMAP2017

Ultimate Cosmic Power
in an Itty-Bitty Thinking Space

OK-MAP, June 2017,
Chris Shore, shore@mathprojects.com

- **What is your Million Dollar Talent?** They are that _____!

  We are that _____!

- **What is algebraic reasoning?**

- **Why teach algebraic reasoning?**

- **How could you best teach algebraic reasoning?**

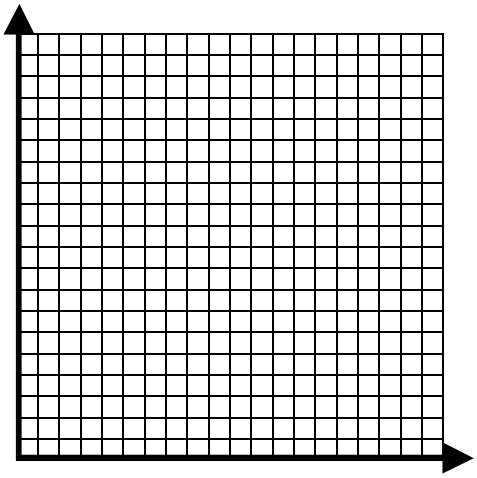
- **What lessons and techniques will you use to teach algebraic reasoning?**

- **Your Call to Action:**

"With the faith that they can learn it, and that we can teach it to them."

4 x 4
Modified

1)



Input	Output

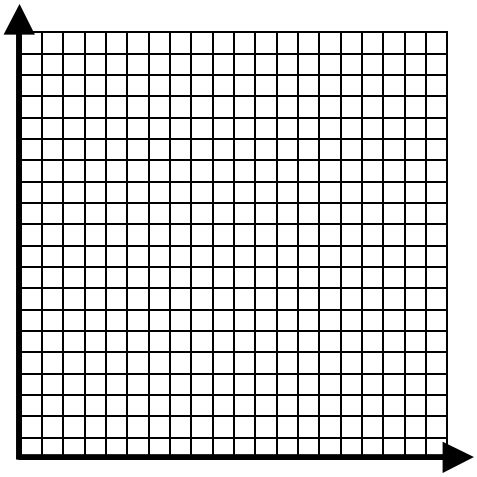
Rule (expressions): **x + 2**

Rule (words): Add two

Pattern:

1 2 3 4

2)



Input	Output
1	**3**
2	**6**
3	**9**
4	**12**

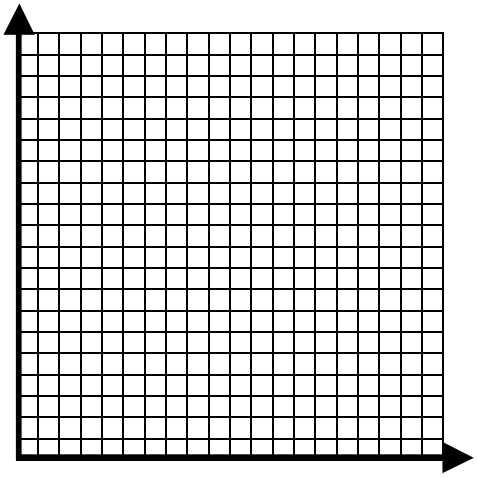
Rule (expressions): _____

Rule (words): _____

Pattern:

1 2 3 4

3)



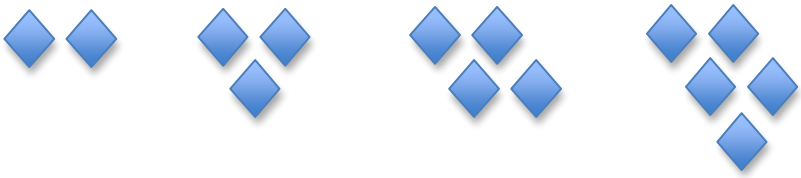
Input	Output

Rule (expressions): _____

Rule (words): _____

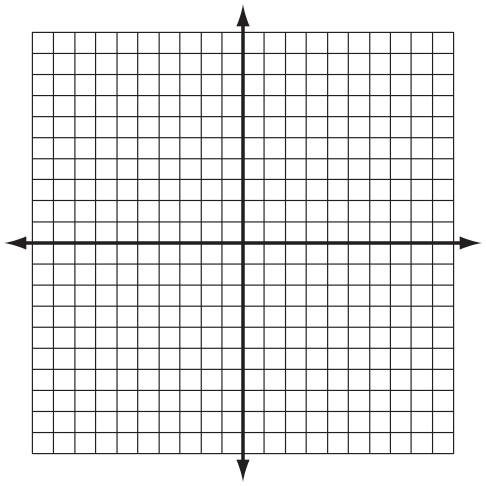
Pattern:

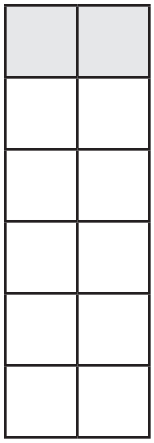
1 2 3 4



4 × 4 From Scenarios/Words

1)



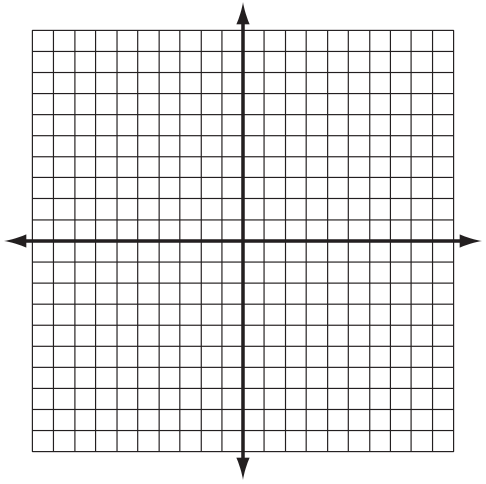


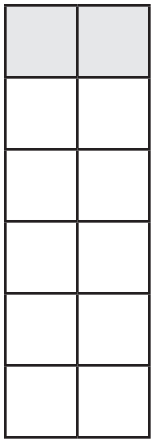
Equation:

_____

Scenario: **Fred moves into town with no friends, and makes one new friend every day.**

2)



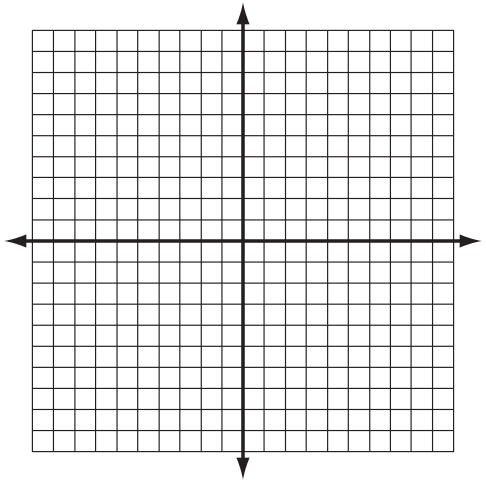


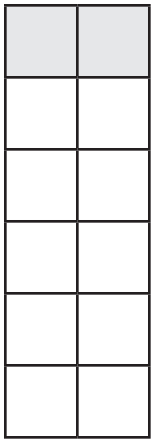
Equation:

_____

Scenario: **Jamie spent $5 to start his lemonade stand and made $3 every hour.**

3)





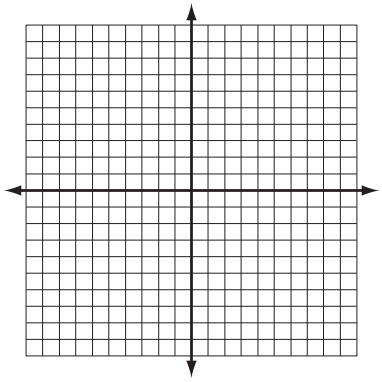
Equation:

_____

Scenario: **Ali has $10 and he spends $5 every two days.**

4 x 4 Assessment

1)



X	Y
-2	-3
0	1
2	5

Equation: _____

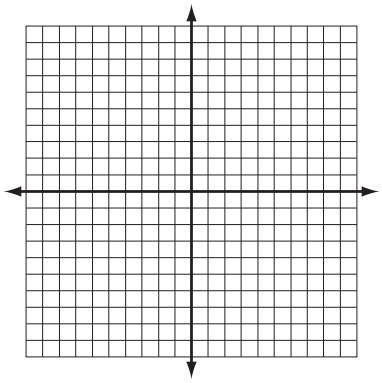
Scenario:

_____

_____

_____

2)



X	Y
-1	
0	
1	

Equation: **y = 2x + 1**

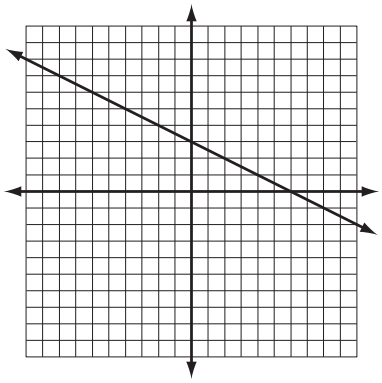
Scenario:

_____

_____

_____

3)



Equation: _____

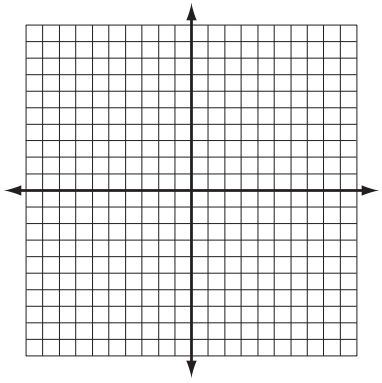
Scenario:

_____

_____

_____

4)



Equation: _____

Scenario: **Suzie enters her school with no friends, and makes 3 new friends every week.**

The Clothesline

Name: _____

Date: _____

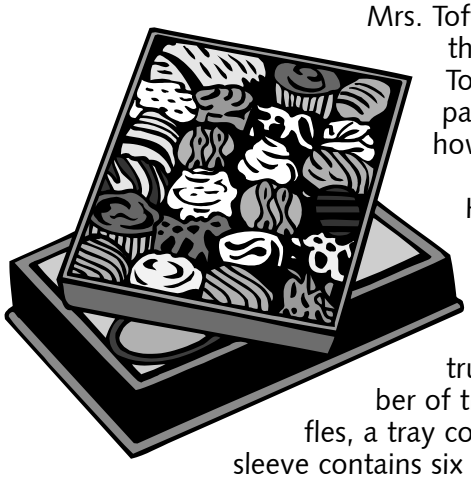
For each set, record the given values, expressions or drawings. After the discussion of their placement on the clothesline, record them on the number line.

1. _____, _____, _____

2. _____, _____, _____

3. _____, _____, _____

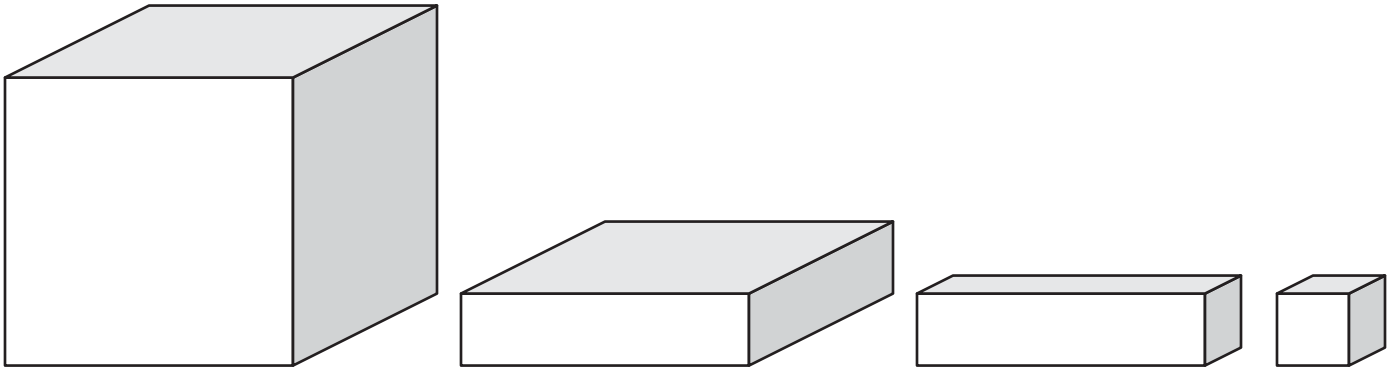
Truffles writing & simplifying expressions



Mrs. Toffee owns a chain of candy stores called True Truffles. As the name implies, the stores are famous for selling truffles. When she created the chain, Mrs. Toffee wanted each store to be unique, so she decided that each store would package the truffles in a unique fashion. In order to keep inventory simple, however, the packages needed to be named in an identical fashion.

Here is the system that she invented for her chain of truffle stores. Each store sells truffles in four different packages: a box, a sleeve, a tray, and a case. In all stores, the box contains a single truffle. The number of truffles that are contained in the other packages is different for each store. She assigned each store a different "base" which determines the number of truffles contained in a sleeve, the number of sleeves in a tray, and the number of trays in a case. For example, in her Base-2 store, a sleeve contains two truffles, a tray contains two sleeves, and a case contains two trays. In her Base-6 store, a sleeve contains six truffles, a tray contains six sleeves, and a case contains six trays.

In order to manage the stores effectively, though, she needs a method to represent the number of truffles in a box, sleeve, tray or case for any store. She has enlisted you, a manager of one of her many True Truffles stores, to develop that method.



Case **Tray** **Sleeve** **Box**

1) Complete the chart by:
   a) determining the number of truffles in each package for your store,
   b) recording the number of truffles in each package for the other stores represented by the some of the other managers,
   c) calculating the number of truffles in each package for the Base-5, and Base-10 stores,
   d) representing the number of truffles in each package for any store.

Store	Case	Tray	Sleeve	Box
Base-2				
Base-3				
Base-4				
Base-5				
Base-10				
Base-x				

Truffles *writing & simplifying expressions*

2) Determine the total number of truffles in each of the following customer orders.

a) a sleeve and a box

Store	Expression	Value
Base-2		
Base-3		
Base-4		
Base-5		
Base-10		
Base-x		

b) two sleeves and a box

Store	Expression	Value
Base-2		
Base-3		
Base-4		
Base-5		
Base-10		
Base-x		

c) a sleeve and 3 boxes

Store	Expression	Value
Base-2		
Base-3		
Base-4		
Base-5		
Base-10		
Base-x		

d) a sleeve with a box eaten

Store	Expression	Value
Base-2		
Base-3		
Base-4		
Base-5		
Base-10		
Base-x		

e) three sleeves and a box

Store	Expression	Value
Base-2		
Base-3		
Base-4		
Base-5		
Base-10		
Base-x		

f) two sleeves with 3 boxes eaten

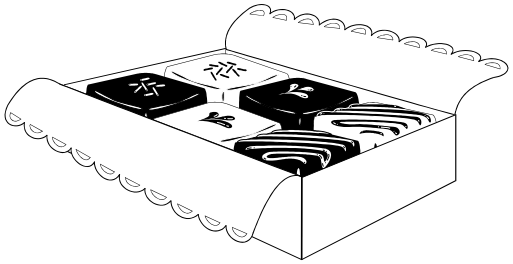
Store	Expression	Value
Base-2		
Base-3		
Base-4		
Base-5		
Base-10		
Base-x		

Truffles solving linear equations

Mrs. Toffee's chain of candy stores called True Truffles has become very popular. The idea of buying candy in packages for which the size is determined by the "base" of the store has caught on like wildfire. In fact, the store's best customer, Chuck Ulot, frequents the chain so often that he forgets from which "base" store he purchased his candy. Help Chuck to figure this out. For each scenario below:

a) write an equation that represents the scenario,
b) determine from which store Chuck bought the candy,
c) draw a diagram to represent the scenario.

1. Chuck has six candies in his pocket. He remembers that he bought a sleeve and box.



2. Chuck has ten candies after buying a sleeve and 4 boxes.

3. Chuck has seven candies in his pocket. He then buys a sleeve and now has a total of 13 candies.

4. Chuck has 12 candies after buying a sleeve and eating five candies.

5. Chuck has no candies left after buying a sleeve and eating two candies.

6. Chuck has 20 candies after buying a sleeve and 12 boxes.

7. Solve:

a) $x + 6 = 9$	b) $x + 1 = 10$	c) $5 + x = 5$
d) $x - 5 = 11$	e) $x - 1 = 11$	f) $x + 8 = 1$

Truffles solving linear equations

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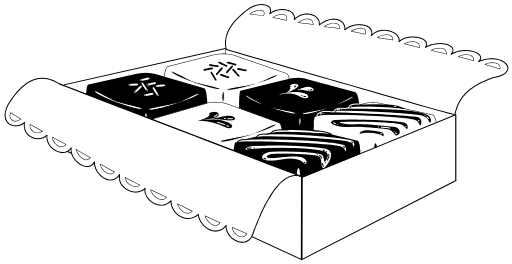
a) write an equation that represents the scenario,
b) determine from which store Chuck bought the candy,
c) draw a diagram to represent the scenario.

1. Chuck has six candies in his pocket. He remembers that he bought a sleeve and box.

2. Chuck has 28 candies in his desk drawer. He bought 4 sleeves.



3. Chuck has thirty-one candies in his refrigerator. He bought three sleeves and four boxes.

4. Chuck has nine candies in his pocket. He bought five sleeves and a box, and then ate three sleeves.

5. Yesterday, Chuck bought eight sleeves and ate 14 truffles. Today, he bought five sleeves and 10 boxes, and had the same number of truffles that was left over from yesterday.

6. Chuck buys eight boxes in the morning for breakfast. He buys a sleeve plus three boxes at both lunch and dinner. That night he has 20 candies total.

7. Solve:

a) $x + 6 = 9$	b) $3x = 45$	c) $4x - 1 = 20$
d) $7x + 5 - 3x + 2 = 15$	e) $6x - 1 = 2x + 11$	f) $7 - 3(2x - 8) = 1$

(Examples from SPED Class) Name _____

Truffles

Solving 1-Step equations

1-5) Solve for the indicated variable.

1. $8 + w = 8$
2. $t + 1 = 9$
3. $k - 3 = 10$
4. $2 + w = 6$

7. Write an equation that represents the given word problem, then sovle your equation and answer the question.

Paul could play 16 songs on his guitar. He learned some new songs. Now he can play play 23. How many new songs did Paul learn?

8. Write a word problem that can be represented by the given equation.

$x + 8 = 28$