PROBLEM ONE: RICE

Imagine that you sell bananas. You use a balance scale to weigh the bananas. You have (only) the following weights available:
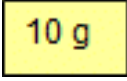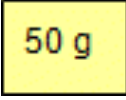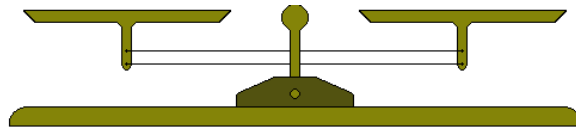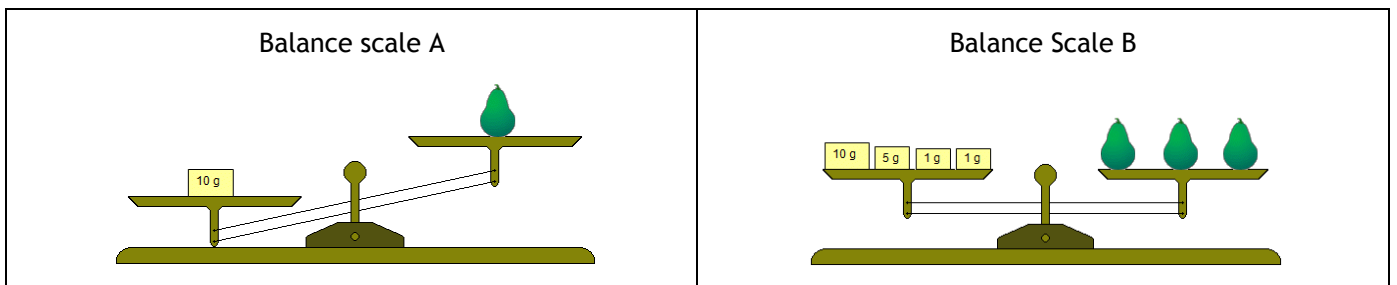
Two 1g weights	One 5g weight	One 10g weight	One 50g weight
1g 1g	5 g	10 g	50 g

A customer comes in and wants to buy 39g of bananas. On the balance scale below, show how you can weigh 39g of bananas.

PROBLEM TWO: PEARS

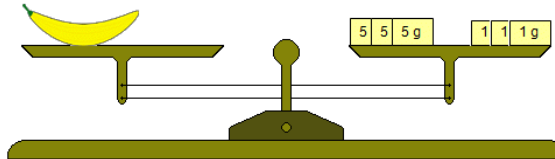| Balance scale A	Balance Scale B
10 g	10 g 5 g 1 g 1 g

Which balance scale can you use to find the weight of one pear: Balance Scale A or Balance Scale B? *Explain why you chose the scale that you did*

PROBLEM THREE: KEEPING THE BALANCE

This scale is balanced:

5 5 5g   1 1 1g

What would the scale look like if you added 1g on the left side? Draw a picture below:	Describe *two* ways that you could make the scale balance again.

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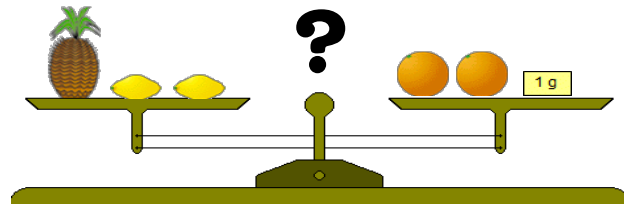www.fapeck.com | www.RMEintheclassroom.com

PROBLEM FOUR: IS IT BALANCED?

For each pair of scales below, the top scale is balanced. Will the bottom scale be balanced? How do you know?

(a)
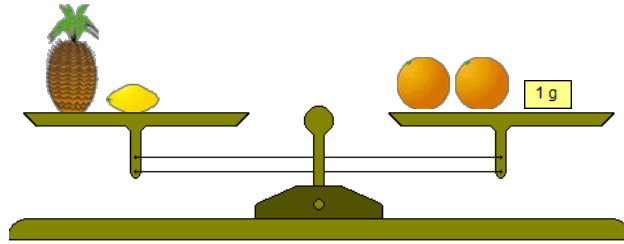
This scale is balanced	
Will this be balanced? How do you know?	

(b)
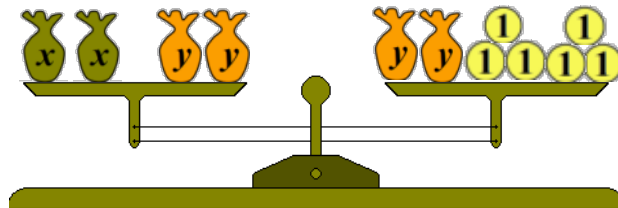
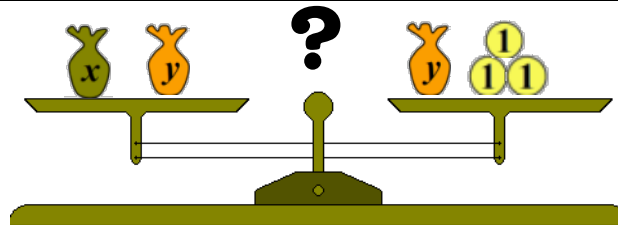| This scale is balanced	
Will this be balanced? How do you know?	

CHALLENGE PROBLEM

Go back to problem 1. Make a list of all the banana weights that you can measure using your weights. How do you know that you have all of them?

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PROBLEM FIVE: EQUATIONS ON THE BALANCE SCALE

1. Use the balance scale on the right to model the equation,

$$3x + 2 = 8$$
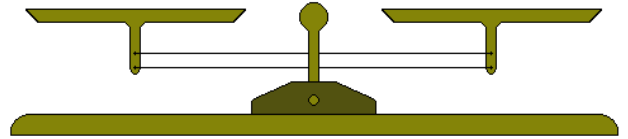
2. Then, use balance strategies to solve for x. For each step, draw the balance scale, write the equation, and explain your reasoning.

Step 1:
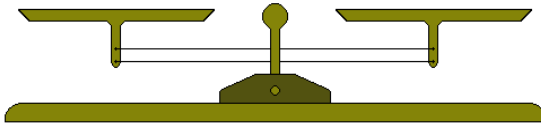
Equation: _____

What did you do?

Why will the scale remain balanced?

Step 2:
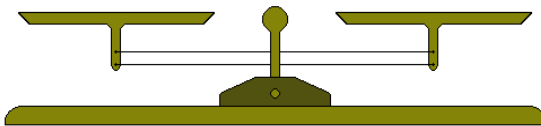
Equation: _____

What did you do?

Why will the scale remain balanced?

Step 3:
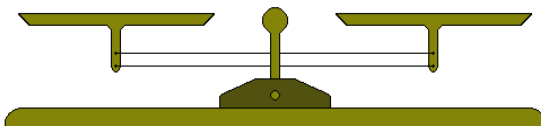
Equation: _____

What did you do?

Why will the scale remain balanced?

$$x = \text{_____}$$

PROBLEM SIX: THE LONELY PIRATE

How much money does the pirate need to get to the hotel and stay for one night?

I charge $6

I charge
$10

I charge
half the
money you
have

I charge
half the
money you
have

I charge
half the
money you
have

I charge
$5

Hotel:
$25
dollars
per night

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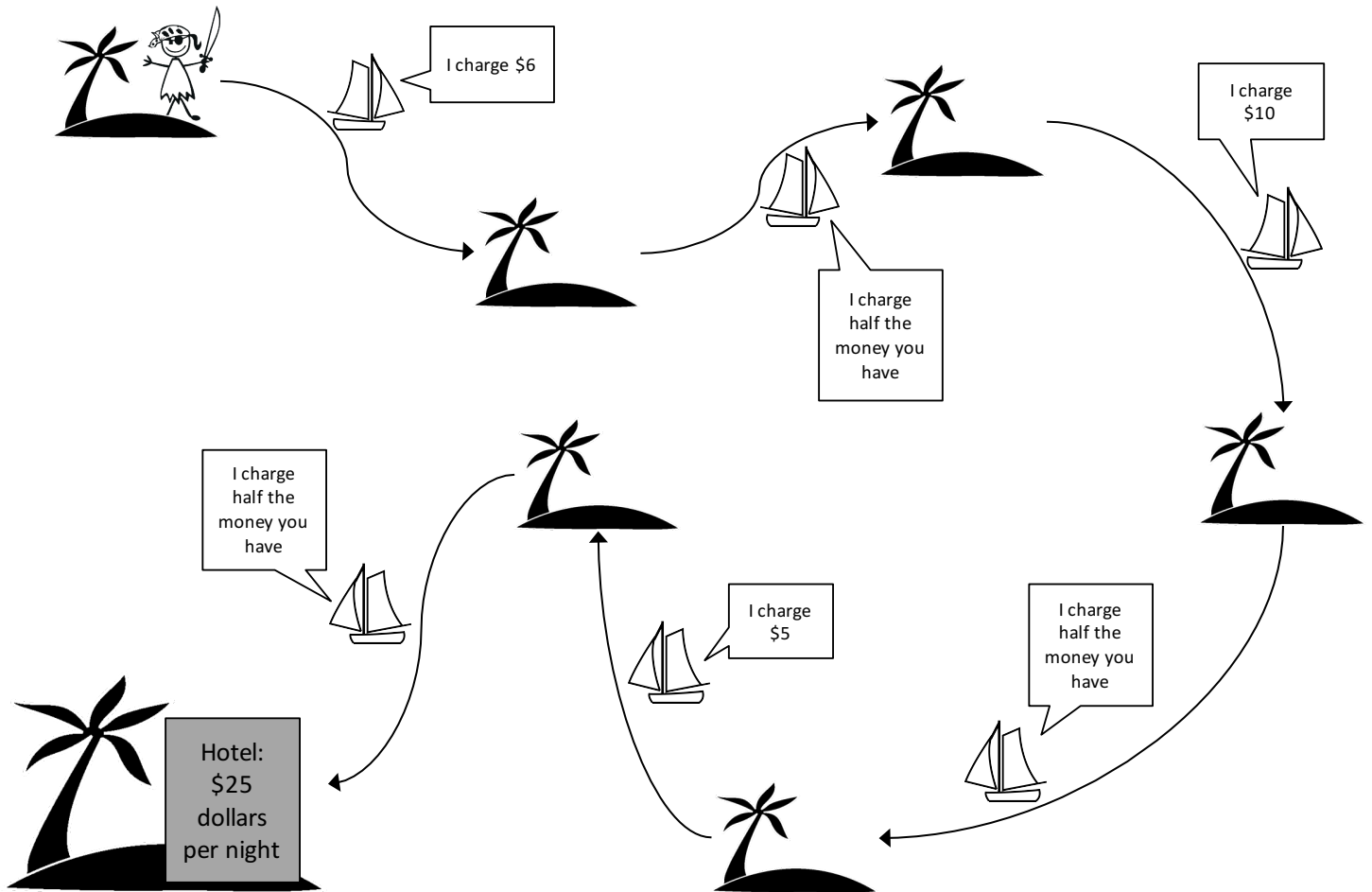
PROBLEM SEVEN: NUMBER TRICKS

Sabrina is a number magician! She takes one number and turns it into another one. One of her favorite tricks is this:

- Start with a number
- Divide it by 9
- Add 5
- Multiply by 2
- Say the new number!

She uses an arrow chain to represent this number trick:

$$\boxed{} \xrightarrow{\div\,9} \boxed{} \xrightarrow{+5} \boxed{} \xrightarrow{\cdot\,2} \boxed{}$$
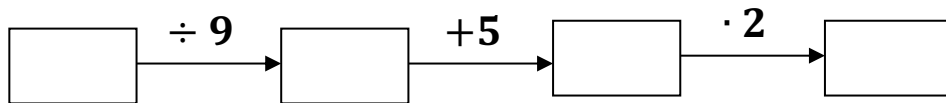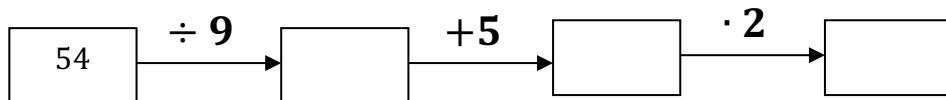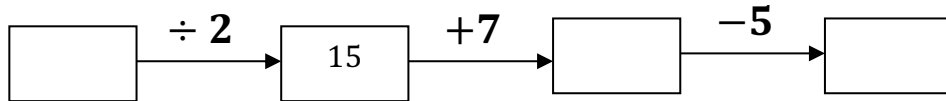
Use the arrow chain to show what happens if she starts with 54:

$$\boxed{54} \xrightarrow{\div\,9} \boxed{} \xrightarrow{+5} \boxed{} \xrightarrow{\cdot\,2} \boxed{}$$
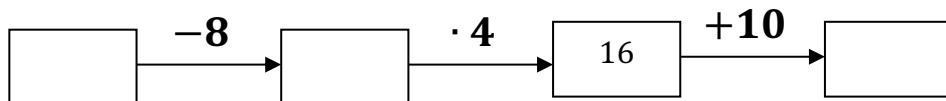
Sabrina had a bunch of number tricks diagramed, but her computer had a glitch and only some of her data were saved. Help her recover her missing data by completing the arrow chains.

- The *whamo-kazam* trick:

$$\boxed{} \xrightarrow{\div\,2} \boxed{15} \xrightarrow{+7} \boxed{} \xrightarrow{-5} \boxed{}$$

- The *ohh-ahh-dang!* trick:

$$\boxed{} \xrightarrow{-8} \boxed{} \xrightarrow{\cdot\,4} \boxed{16} \xrightarrow{+10} \boxed{}$$
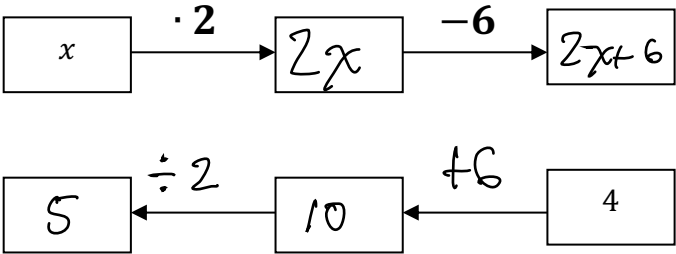
- The *can-you-believe-it* trick:

$$\boxed{} \xrightarrow{\cdot\,7} \boxed{} \xrightarrow{+5} \boxed{} \xrightarrow{\div\,3} \boxed{-4}$$

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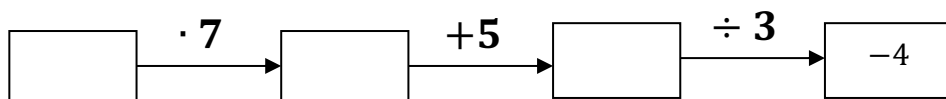
PROBLEM EIGHT: NUMBER TRICKS AND ALGEBRA EQUATIONS

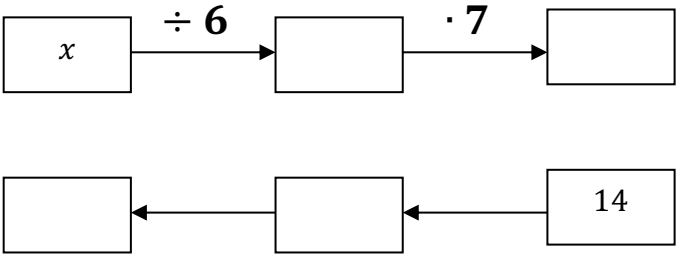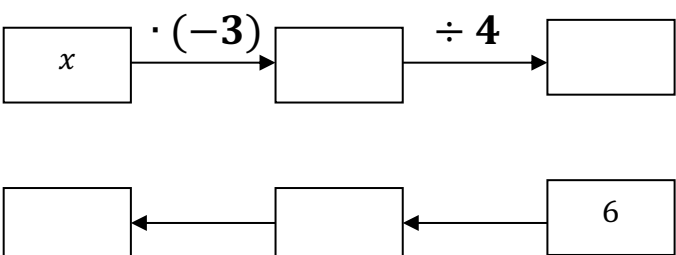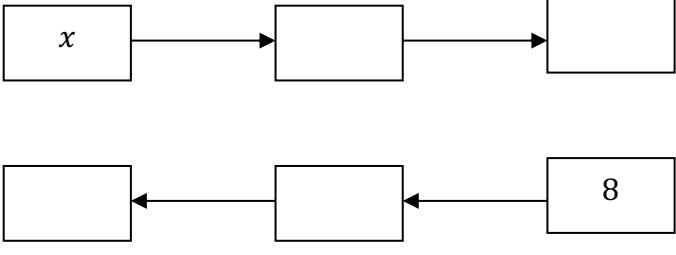We can represent number tricks three ways: in words, with arrow chains, and as algebra equations. Complete the table below by converting between these forms. Then, use backtracking on the arrow chain to solve the equation. The first row is an example.

Words	Arrow chain	Algebra equation	Solution
Start with a number Multiply by 2 Subtract 6 End up with 4	$x \xrightarrow{\cdot 2} 2x \xrightarrow{-6} 2x+6$ $5 \xleftarrow{\div 2} 10 \xleftarrow{+6} 4$	$2x - 6 = 4$	$x = 5$
Start with a number Divide by 6 Multiply by 7 End with 14	$x \xrightarrow{\div 6} \square \xrightarrow{\cdot 7} \square$ $\square \leftarrow \square \leftarrow 14$		
	$x \xrightarrow{\cdot (-3)} \square \xrightarrow{\div 4} \square$ $\square \leftarrow \square \leftarrow 6$		
	$x \rightarrow \square \rightarrow \square$ $\square \leftarrow \square \leftarrow 8$	$3x + 2 = 8$	

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