

If you like puzzles, this lab is for you.

- 1) You will travel to several stations. At each one, you will find cups filled with different amounts of pennies and several of the **same type** of objects. Both cups and their objects have been balanced on a scale and each cup weighs the same.
- 2) Your job will be to find how many pennies one of the objects "weighs." To keep the cups balanced on the scale, you must always **remove the same** amount of items **from both cups**. For example, you could take 3 pennies out of both the left and right cup and the scale would stay balanced.

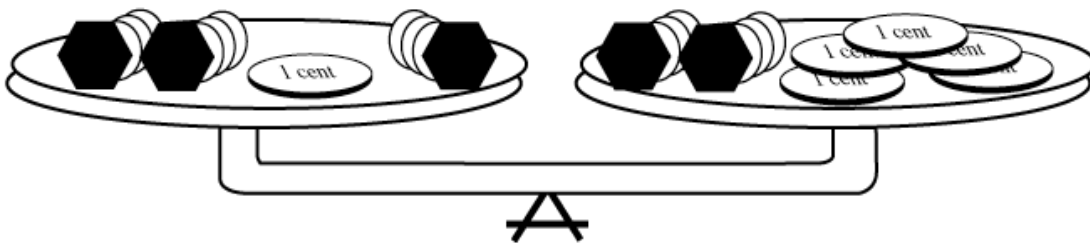
Continue doing this until you end up with **only pennies in one cup** and **only the objects** in the other. Then you only need to **divide up the pennies into matching piles** with one of the objects.

Since this is important, reread this paragraph **several times** and then check here. _____

- 3) If you took three bolts from the **left cup**, then took two from the **right cup** and put one back in the **right cup**, would the scale still be balanced? _____

If no, which side would be the heaviest? _____

- 4) On the scale below, make a few mental transfers and you will be able to see the **weight of one bolt**.



- a) How many pennies does each bolt weigh? _____
 - b) What did you do first? I took away two _____ from each side.
 - c) Then I took away _____ from _____.
 - d) After that it was easy to see that each bolt was the same weight as _____ pennies.
- 5) As you go to each station in this lab, you will **tell me what you did** to find the weight. Here is how to describe your steps using **both words AND algebra** for the one above.

Write the equation: 3 Bolts + 1¢ = 2 Bolts + 5¢ or just $3B + 1 = 2B + 5$

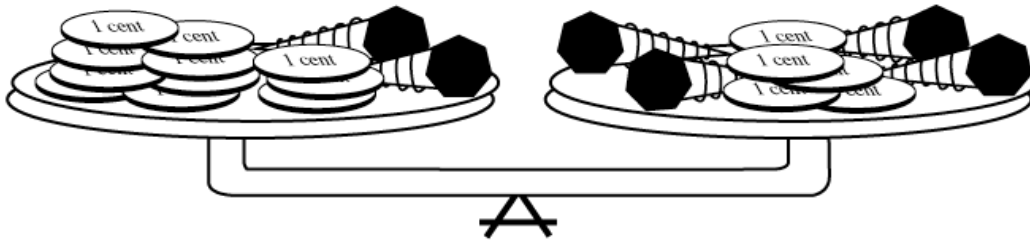
Now I took away 2 bolts from each container. $3B + 1 - 2B = 2B + 5 - 2B$

$$1B + 1 = 5$$

Then just take away a penny from both sides. $1B + 1 - 1 = 5 - 1$

$$1B = 4 \text{ ¢ (It's the same as #4d.)}$$

6 a) This time you will find the weight of one lag bolt. Can you do it in your head? $1B = \underline{\hspace{2cm}}\text{¢}$



b) Now it is your job to explain it to me. I'll show you two ways to do it.

The steps I am thinking:

Here is the equation:

I will take two lag bolts from both sides.

Here is what I get.

Now I just need to take 5¢ from both sides.

I get this.

If 2 Lag bolts weigh 6¢, I will divide both sides into 2 piles,

So it is clear that 1 lag bolt "weighs" 3¢

Showing my work with algebra:

$$2B + 11\text{¢} = 4B + 5\text{¢}$$

$$2B + 11 - 2B = 4B + 5 - 2B$$

$$\underline{\hspace{2cm}} = \underline{\hspace{1cm}}B + \underline{\hspace{1cm}}$$

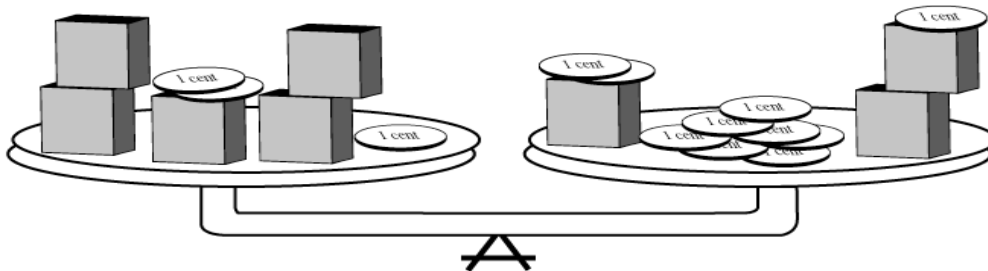
$$11 - 5 = 2B + 5 - \underline{\hspace{1cm}}$$

$$\underline{\hspace{2cm}} = 2B$$

$$\frac{6}{2} = \frac{2B}{* \underline{\hspace{1cm}}}$$

$$\underline{\hspace{2cm}} = 1B$$

7) Here are some pennies and cubes on a scale. How many pennies does each cube weigh?



The steps I am thinking:

Here is the equation:

I will take $\underline{\hspace{1cm}}$ cubes from both sides.

Here is what I get.

Now I need to take away $\underline{\hspace{1cm}}$ from $\underline{\hspace{1cm}}$

I get.

If 2 cubes weigh 7¢, just divide both sides into 2 piles.

So 1 cube "weighs" $\underline{\hspace{1cm}}$

Showing my work with algebra:

$$\underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

$$5C + 3 - \underline{\hspace{1cm}} = 3C + 10 - \underline{\hspace{1cm}}$$

$$\underline{\hspace{1cm}} + \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$$

$$2C + 3 - \underline{\hspace{1cm}} = 10 - \underline{\hspace{1cm}}$$

$$\underline{\hspace{2cm}} = 7$$

$$\frac{\underline{\hspace{1cm}}}{2} = \frac{7}{* \underline{\hspace{1cm}}}$$

$$\underline{\hspace{2cm}} = \underline{\hspace{1cm}} \text{ ¢}$$

Now it is time to start the lab. You and your partner will go to six stations. At each station, you will find a **balanced scale** with two containers holding pennies and various objects. Your job will be to find the "weight" of one of each object in pennies, just like we did on the first two pages.

Since one goal of AMME applied math is to help you develop critical communication skills, you need to explain how you found the weight of each object. Follow the examples of questions six and seven.

1st Station Objects in the containers _____ and pennies. Cup # _____

For you to really understand this lab, **it is IMPORTANT that you write each step IMMEDIATELY after you move objects** from one container to another.

The steps I am thinking:

Showing my work with algebra:

Here is the original equation:

_____ = _____

I will take _____ from both sides.

_____ - _____ = _____ - _____

Here is what I get.

_____ = _____

Now I need to take _____ from both sides.

_____ - _____ = _____ - _____

I get.

_____ = _____

If _____ weighs _____¢, I'll divide both sides into _____ piles

$\frac{*}{*}$ _____ = $\frac{*}{*}$ _____

So I _____ "weighs" _____

_____ = _____

BEFORE YOU MOVE, use your equation to **set up the containers as they were** at the start.

2nd Station Objects in the containers _____ and pennies. Cup # _____

IMMEDIATELY write an equation describing what you found.

The steps I am thinking:

Showing my work with algebra:

Here is the original equation:

_____ = _____

I will take _____ from both sides.

_____ - _____ = _____ - _____

Here is what I get.

_____ = _____

Now I just need to _____ from both sides.

_____ - _____ = _____ - _____

I get.

_____ = _____

If _____ weighs _____¢, I'll divide both sides into _____ piles

$\frac{*}{*}$ _____ = $\frac{*}{*}$ _____

So I _____ "weighs" _____

_____ = _____

BEFORE YOU MOVE, use your equation to **set up the containers as they were** at the start.

On these stations, you will only have to **explain each step you did with algebra**. It will take concentration. **Take out the examples from page 2 to follow while you do these last stations.**

3rd Station Pennies and _____

Cup # _____

Showing my work with algebra:

Here's my equation...

$$\begin{aligned} & \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \\ & \underline{\hspace{2cm}} - \underline{\hspace{1cm}} = \underline{\hspace{2cm}} - \underline{\hspace{1cm}} \\ & \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \\ & \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \\ & \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \\ & \frac{*}{*} \underline{\hspace{1cm}} = \frac{*}{*} \underline{\hspace{1cm}} \\ & \underline{\hspace{1cm}} = \underline{\hspace{1cm}} \end{aligned}$$

So 1 _____ "weighs" _____

4th Station Pennies and _____

Cup # _____

Showing my work with algebra:

Here's my equation...

$$\begin{aligned} & \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \\ & \underline{\hspace{2cm}} - \underline{\hspace{1cm}} = \underline{\hspace{2cm}} - \underline{\hspace{1cm}} \\ & \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \\ & \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \\ & \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \\ & \frac{*}{*} \underline{\hspace{1cm}} = \frac{*}{*} \underline{\hspace{1cm}} \\ & \underline{\hspace{1cm}} = \underline{\hspace{1cm}} \end{aligned}$$

So 1 _____ "weighs" _____

Reset station 3 before moving on.

Reset this station.

5th Station Pennies and _____

Cup # _____

Showing my work with algebra:

Here's my equation...

$$\begin{aligned} & \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \\ & \underline{\hspace{2cm}} - \underline{\hspace{1cm}} = \underline{\hspace{2cm}} - \underline{\hspace{1cm}} \\ & \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \\ & \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \\ & \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \\ & \frac{*}{*} \underline{\hspace{1cm}} = \frac{*}{*} \underline{\hspace{1cm}} \\ & \underline{\hspace{1cm}} = \underline{\hspace{1cm}} \end{aligned}$$

So 1 _____ "weighs" _____

6th Station Pennies and _____

Cup # _____

Showing my work with algebra:

Here's my equation...

$$\begin{aligned} & \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \\ & \underline{\hspace{2cm}} - \underline{\hspace{1cm}} = \underline{\hspace{2cm}} - \underline{\hspace{1cm}} \\ & \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \\ & \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \\ & \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \\ & \frac{*}{*} \underline{\hspace{1cm}} = \frac{*}{*} \underline{\hspace{1cm}} \\ & \underline{\hspace{1cm}} = \underline{\hspace{1cm}} \end{aligned}$$

So 1 _____ "weighs" _____