

Name: _____

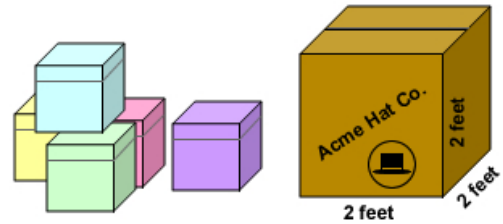
Date: _____

Student Exploration: Balancing Blocks

Vocabulary: area, balance, dimension, prism, product, rectangular prism, volume

Prior Knowledge Questions (Do these BEFORE using the Gizmo.)

Lucille works at the Acme Hat Factory. Each hat fits in a box that measures 1 foot on each side. Lucille's job is to put the hat boxes into a larger box that measures 2 feet long, 2 feet wide, and 2 feet tall.

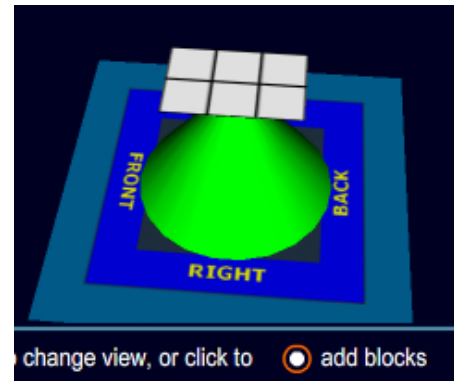


- How many hat boxes will cover the bottom of the larger box? _____
- How many hat boxes will fit into the larger box, total? _____

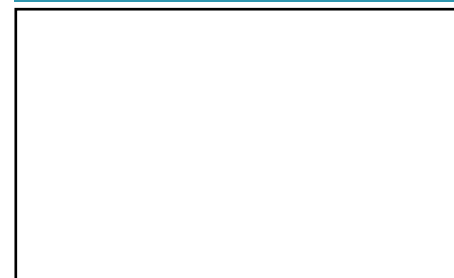
Gizmo Warm-up

The *Balancing Blocks* Gizmo™ gives you the challenge of balancing a collection of blocks on the point of a cone. To get started, practice using the Gizmo.

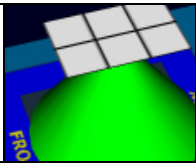
- Change your viewpoint by clicking and dragging the blue mat that the cone sits on.
- Select **add blocks** at the bottom of the Gizmo and click the model to add blocks. Notice that the model tilts when you add blocks. When the blocks are in **balance**, the cone turns green.
- Select **delete blocks** and click the model to remove blocks.



- Next to **GOAL**, click **Show**. Can you balance 12 blocks on the 3 × 2 platform? _____ Click **Count blocks** to check. Then sketch your blocks to the right.



- Under **BASE**, use the ▲ or ▼ arrows to set the base **dimensions** (measurements) to 3 × 3. Can you balance 12 blocks now? _____ How? _____

Activity A: Volume of small prisms	<u>Get the Gizmo ready:</u> <ul style="list-style-type: none"> • Under BLOCKS, click Clear. • Set the BASE dimensions to 3 × 2. • Next to GOAL, turn off Show. 	
---	--	---

- Look at the 3 × 2 base.
 - How many total squares do you see? _____ This number is the **area** of the base.
 - What does 3 × 2 equal? _____
 - What do you think is the area of a 5 × 4 base? _____ Check this in the Gizmo.
 - If you know the length and width of a rectangle, how do you find its area? _____


- Set the **BASE** dimensions back to 3 × 2. Under **BLOCKS**, click **Stack** to stack one layer of blocks. You have created a shape called a **rectangular prism**, like a box or a brick. A rectangular prism can be described by three dimensions: length (l), width (w), and height (h).
 - What are the dimensions of this rectangular prism? l : _____ w : _____ h : _____
 - The **volume** (V) of an object is equal to the number of unit blocks that can fit inside.
 Count the blocks. What is the volume of this rectangular prism? _____ blocks
- Set **Stack** to **2 layers**. In the spaces below, list the dimensions and volume of the prism.
 Length (l): _____ Width (w): _____ Height (h): _____ Volume (V): _____
- What will the volume be if you stack 5 layers of blocks on the 3 × 2 base? _____
 Use the Gizmo to check your answer.
- Next to **GOAL**, turn on **Show** and check that **Difficulty 1** is selected. Solve three challenges by building and balancing rectangular prisms with the given volumes. Feel free to change the dimensions of the base. Click **New** for a new challenge.

Write the volumes and dimensions of each prism below.

Volume (V): _____ Length (l): _____ Width (w): _____ Height (h): _____

Volume (V): _____ Length (l): _____ Width (w): _____ Height (h): _____

Volume (V): _____ Length (l): _____ Width (w): _____ Height (h): _____

Activity B: Volume of large prisms	<u>Get the Gizmo ready:</u> <ul style="list-style-type: none"> • Under BLOCKS, click Clear. • Set the BASE dimensions to 4×5. • Next to GOAL, turn off the Show checkbox. 	
---	---	---

1. Look at the 4×5 base. What is its area? _____ squares

2. Set **BLOCKS** to **2 Layers** to make a rectangular prism of blocks.
 - A. How many blocks do you have? _____ Click **Count** to check.
 - B. What is the **product** of the dimensions of the prism, $4 \times 5 \times 2$? _____

3. Try different combinations of base dimensions and stacked layers. Record the volume of each rectangular prism. For the last two, choose your own dimensions.

Base	Height	Volume (blocks)
4×5	3	
4×5	4	
4×5	5	
2×4	1	
2×4	2	

Base	Height	Volume (blocks)
2×4	3	
2×4	4	
2×4	5	

4. Look at your table. In general, how do you calculate the volume of a rectangular prism if you know its length, width, and height? _____

5. Calculate the volumes of the following rectangular prisms. Use the Gizmo to check answers.

Length (l): 2 Width (w): 3 Height (h): 5 Volume (V): _____

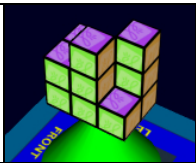
Length (l): 5 Width (w): 5 Height (h): 3 Volume (V): _____

6. Next to **GOAL**, turn on **Show** and check that **Difficulty 2** is selected. Solve three challenges by building and balancing rectangular prisms with the given volumes. Write down 3 goal volumes and your solutions.

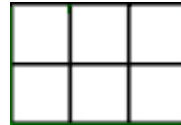
Volume (V): _____ Length (l): _____ Width (w): _____ Height (h): _____

Volume (V): _____ Length (l): _____ Width (w): _____ Height (h): _____

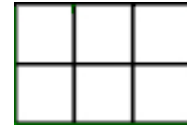
Volume (V): _____ Length (l): _____ Width (w): _____ Height (h): _____

<p>Activity C: Odd shapes</p>	<p><u>Get the Gizmo ready:</u></p> <ul style="list-style-type: none"> • Under BLOCKS, click Clear. • Set the BASE dimensions to 3 × 2. • Next to GOAL, turn off the Show checkbox. 	
---	--	---

1. On the 3 × 2 base, try to create a balanced stack of 10 blocks that is no more than 2 layers high. On the diagrams at right, color in the blocks you placed on level 1 and level 2.



Level 1



Level 2

- On your computer, open a new document in a word-processing program. Add your name and a title, such as “Balanced Blocks.”
- Next to **GOAL**, turn on **Show**. Select **Difficulty 3**. Try at least three challenges. (Feel free to change the dimensions of the base.) When you build and balance each one, click the **camera** in the upper right corner to take a snapshot. In your document, choose **Paste**.
- Turn off **Show**. Find at least three different ways to balance 28 blocks. Take a snapshot of each, and paste each one in your document.
- Try to make a balanced stack of 11 blocks on a 2 × 2 base. Can you do it? _____

Explain: _____

- For each challenge below, circle “Possible” if it is possible to create a balanced stack, and “Impossible” if it isn’t. If it is possible, paste a snapshot of your solution into your document.

A. 23 blocks on a 5 × 2 base	Possible	Impossible
B. 16 blocks on a 3 × 3 base	Possible	Impossible
C. 19 blocks on a 1 × 5 base	Possible	Impossible
D. 20 blocks on a 2 × 3 base	Possible	Impossible

- Now make some general rules by stating which are possible and which are impossible:
 - An even number of blocks on a base with an even area: _____
 - An even number of blocks on a base with an odd area: _____
 - An odd number of blocks on a base with an even area: _____
 - An odd number of blocks on a base with an odd area: _____