STEM Business Bricks

Exploring modeling and math

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In this experiment, we are going to look at how **modeling** and **math** can help a company make a **profit**. We are going to be making tables and chairs from a limited amount of building bricks. We want to see how many tables and chairs we can make in order to earn the greatest profit. We will also look at what happens when you have limited resources or **constraints** (a limitation or restriction) in a project.
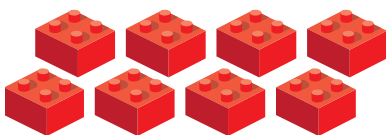
With that said, let's get building!
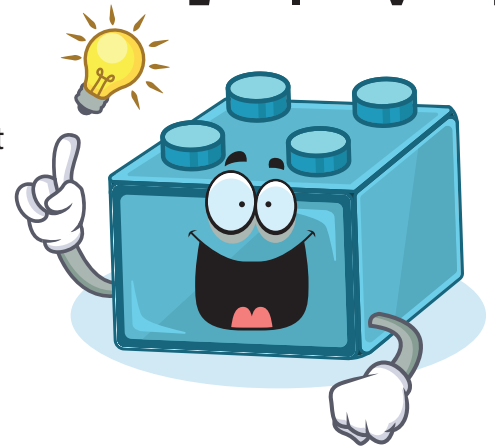
MATERIALS

- 6 x rectangle building bricks (such as LEGO® Bricks)
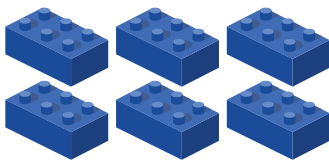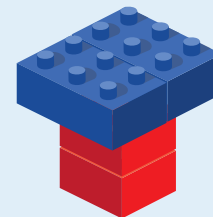
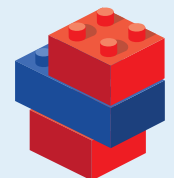- 8 x square building bricks (such as LEGO® Bricks)

INSTRUCTIONS

Step 1: Modeling with Bricks
You can use as many of your bricks as you would like. You can make any quantity/combination you like (i.e. they don't have to make 1 table and 4 chairs).

To make a table, use:
2 x rectangular bricks
2 x square bricks

To make a chair, use:
1 x rectangular brick
2 x square bricks

Question 1: How many tables and chairs can you make?

**Question 2:** Is there an advantage of them being the same?

Reminder: the challenge is to make a profit, so having a common design that will ensure the furniture matches and keeps costs to a minimum.

Now choose a final design! A suggestion is to use a common design to represent the table and chairs that uses the least amount of bricks possible, because this keeps costs to a minimum and maximizes your company profit.

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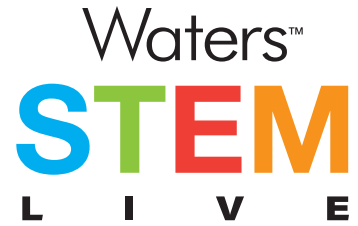
INSTRUCTIONS *(CONTINUED)*

Step 2: Developing Your Cost
Now that you have your final design, calculate how much it will cost you.

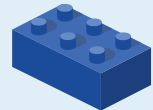A square brick costs $3 or £3.00
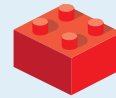
A rectangular brick costs $5 or £5.00

Question 1: How much will it cost to produce the tables and chairs that you have just made?

Example: Our design used 3 rectangular bricks = 3 x $5 = $15

Our design used 4 square bricks = 4 x $3 = $12

Total cost of our design = $15 + $12 = $27 for a table and chair set

Step 3: Dealing with Constraints
Your company wants to make as much profit as possible (by selling as many tables and chairs as possible). The number of resources available (in this case, building bricks) limits this possibility and is therefore our constraint.

In this case, your company was only able to get 600 rectangular bricks and 800 square bricks.

Being able to formulate algebraic equations for the constraints allows them to be graphed and a solution can be identified quickly.

How many total tables and chairs can you make with your design?

Equation for rectangular bricks constraint

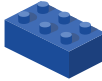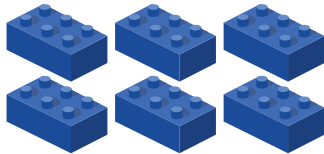R=Total used for Rectangular Bricks

Example:

(2+1) x R=600

3xR=600

R=600/3

R=200

Is there any waste with your design?

Number of rectangular bricks used		Total number of rectangular bricks available
TABLES	**CHAIRS**	
2	1	600

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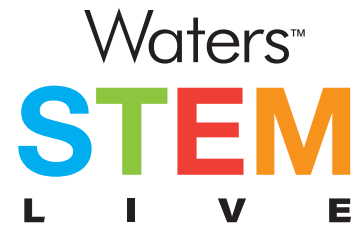
INSTRUCTIONS *(CONTINUED)*

Step 3: Dealing with Constraints *(continued)*

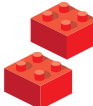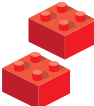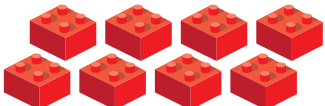Equation for square bricks constraint

S=Total used for Square Bricks

Example:

(2+2) x S=600

4xS=600

S=800/4

S=200

Number of square bricks used		Total number of square bricks available
TABLES	**CHAIRS**	
2	2	800

If we use the above example, we have exactly enough rectangles and squares to make 200 total table and chair sets.
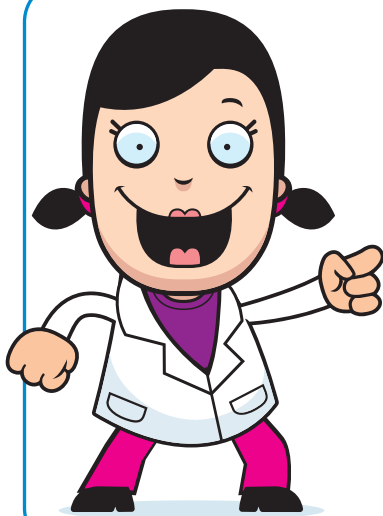
WHY IS MODELING IMPORTANT?

Modeling is the ability to experiment and make changes without impacting on the real process. Before you start building something, modeling it out provides a benefit of saving time and money (think of the waste in case you do not like your design).

Profit is a financial gain, especially the difference between the amount earned and the amount spent in buying, operating, or producing something. What it costs you to buy something, is not the entire profit because there is cost associated with making the product – which you did today. So the real question is how much profit will you make on your final design!

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