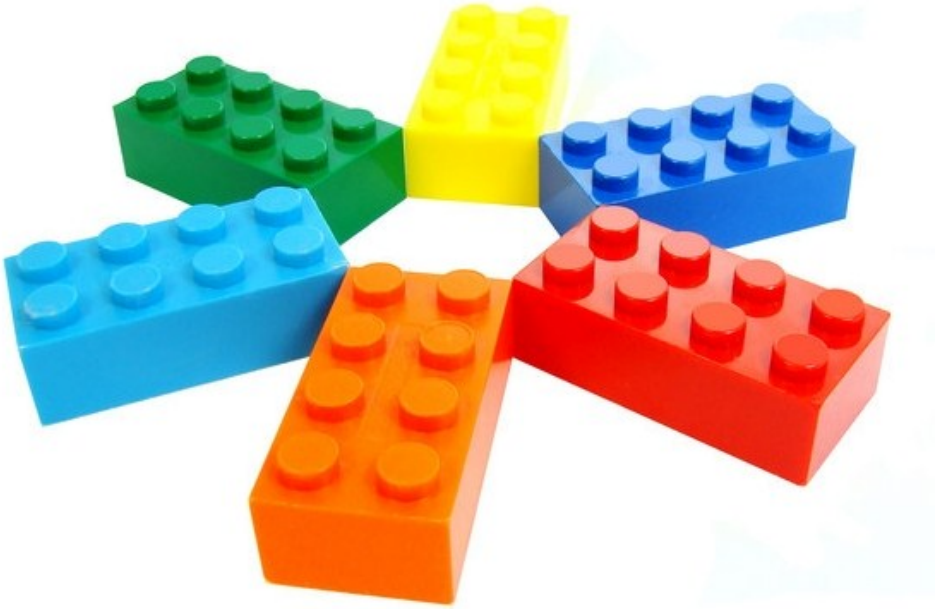
Learning with LEGO

an independent study



www.walkingbytheway.com

Day One ~ LEGO Beginnings

Copywork

"Genius is one percent inspiration and ninety-nine percent perspiration." Thomas Edison

Word of the Day

granule

Explore and Learn

1. Who invented LEGO? Read the information at this site and Complete activity #1.

2. The inventor was Danish. What country was he from? Denmark! Complete activity #2 by marking Denmark on the world map. The capital of Denmark is Copenhagen. Watch this video about Copenhagen.

3. Can you build the flag of Denmark out of LEGO bricks? Give it a try!

Building Challenge

Each day you will have a building challenge! Grab some LEGO bricks and get started on this Taxi Cab. Be sure to take a picture of your completed creation and add it to your lapbook.

Day Two ~ LEGO Business

Copywork

"What would life be like if we had no courage to attempt anything?"
Albert Einstein

Word of the Day

manufacture

Explore and Learn

1. Most companies have a mission statement or a vision. This gives the company focus and helps them plan for the future. What is LEGO Group's vision? Find out here.

2. The LEGO company makes a lot of LEGO bricks. Approximately 440 billion LEGO pieces have been made since 1949! That's a lot of LEGOs! Learn how the bricks are made by watching this video about brick making. Complete activity #3.

3. People make all kinds of things out of LEGOs. Check out this video.

Building Challenge

Today you are going to build a ship without any instructions. Watch this video for some inspiration and ideas.

Be sure to take a picture of your completed creation and add it to your lapbook.

Day Three ~ LEGO Building

Copywork

"Imagination is more important than knowledge." Albert Einstein

Word of the Day

creative

Explore and Learn

1. In order to make your LEGO creations, the bricks have to stick. Why do they stick? Read all about it here. Be sure to read through both pages. You will also need to click on the links for **interference fit** and **friction**. Complete activity #4 and activity #5.

2. There are some amazing LEGO designers and artists in the world. One of these is Sean Kenney. Take a peek at some of the creations he made for the Philadelphia Zoo.

Another incredible LEGO artist is Nathan Sawaya. Watch this video about his artwork.

3. Would you like to be a LEGO designer? What do you think it takes to work for the LEGO company? Write them an email and ask!

Building Challenge

Today you are going to attempt a mosaic. Do you know what a mosaic is? It's a piece of art made by decorating a surface set with small pieces of glass, tile, stone, or some other material. Some people like to make mosaics out of LEGOs! Check out this video. Read through Ed Hall's process of constructing this mosaic of Starry Night. Of course, your mosaic doesn't have to be as complex. You can make whatever you want. Maybe even Pacman!

Be sure to take a picture of your completed creation and add it to your lapbook.

Day Four ~ LEGO Brick Math

Copywork

"I have not failed. I've just found 10,000 ways that won't work."
Thomas Edison

Word of the Day

ingenuity

Explore and Learn

1. Get a cup of LEGO bricks. Make sure you have five different colors. Dump the bricks and sort them by color. Complete activity #6. For additional graphing fun, take your data to this site and make a pie graph.

2. Get another cup of LEGO bricks and complete activity #7.

3. Did you know you can practice multiplication with LEGO bricks? Grab a 2x4 brick. Look at it. You have two studs four times. How many studs are on top? 8! Complete activity #8. Ask an adult to show you how to use a calculator if the second set of problems is too difficult for you.

4. Read through the LEGO Fun Facts. Which ones are the most interesting to you?

Building Challenge

Today you are going to try out LEGO Digital Designer. Do you know what digital means? Digital is a word describing computerized technology or something electronic. What do you think LEGO Digital Designer is? That's right! It allows you to build creations on your computer! Ask an adult to help you install this program on your computer. Have fun building!

Word of the Day Mini Books

Cut on solid lines. Fold on dotted. Write a definition for the word of the day OR a sentence using the word of the day in each book.

granule	manufacture
ingenuity	creative

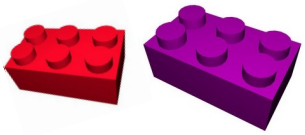
Activity #1

Cut on solid. Fold side flaps forward and top flap down using dotted lines as your guide. Write answers under each flap.

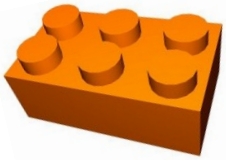
CUT AWAY

When were the first LEGO sets sold in the USA?

When were DUPLO introduced?



What does *LEGO* mean in Latin?



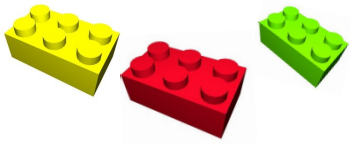
LEGO Basics

Activity #1

Glue this side to your lapbook.

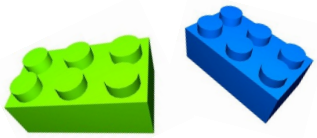
CUT AWAY

Who invented LEGOs?



What material were LEGO bricks made of at first?

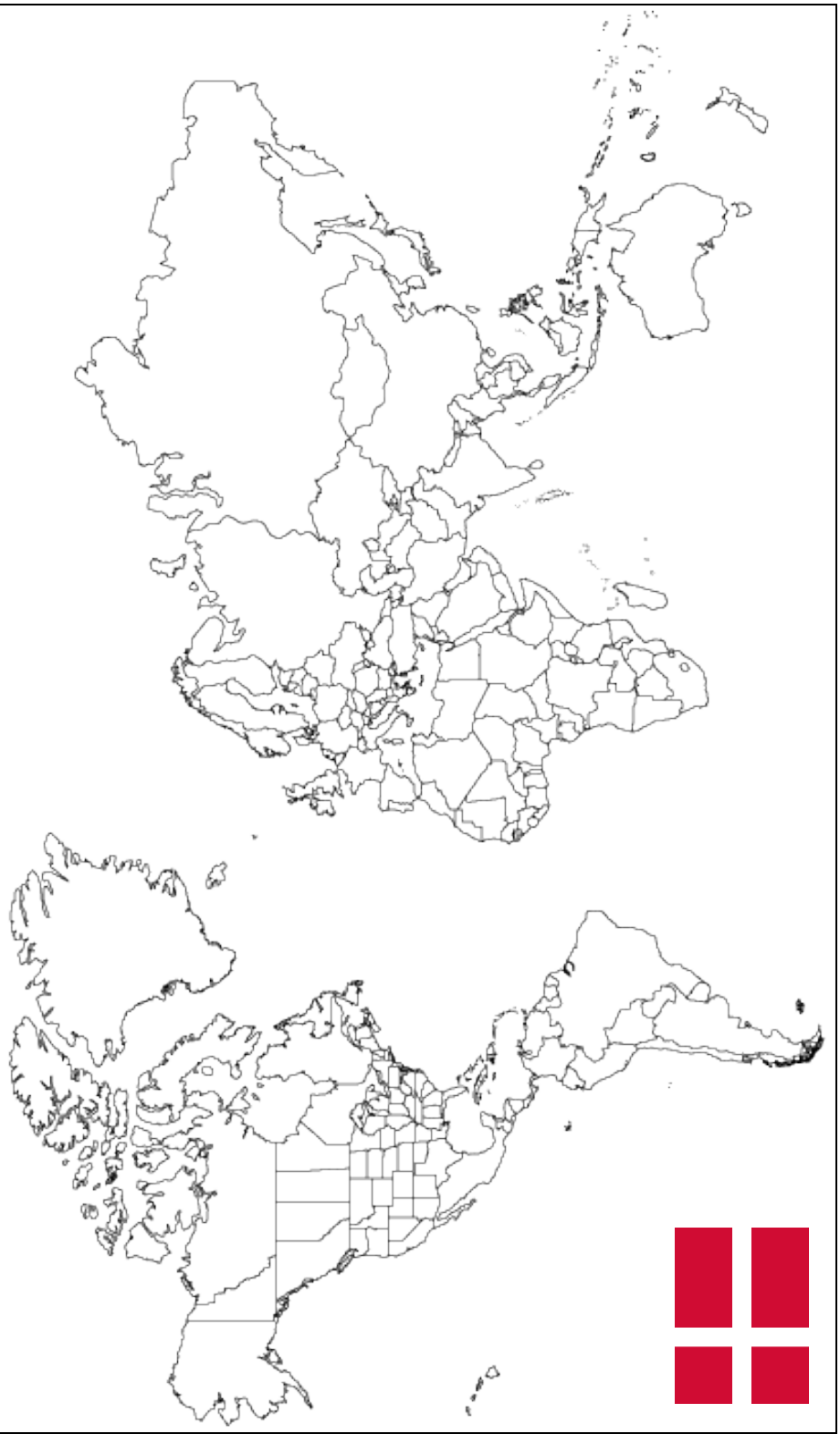
What does *LEGO* mean in Danish?



Activity #2

Denmark is on the continent of Europe. Use a map or globe to help you locate Denmark, Mark it on the world map below.

Where in the World Is Denmark?



Activity #3

Cut on solid. Fold on dotted. Paste the brick manufacturing information in the correct sequence. The manufacturing information is found on the next page.

Activity #3

Glue this side to your lapbook.

Step One: Granules

Step Two: Molding

Step Three: Transport

Step Four: Decorating and Assembly

Step Five: Packaging

Ole Kirk Christiansen a master carpenter started the LEGO Company in the village of Billund Denmark in 1932. He started out making ladders and wooden toys. The first plastic building bricks were made in 1949. Over the years, many improvements have been made to produce the LEGO bricks you find in your sets today.

It all starts with tiny plastic chunks called granules. Granules come in a bunch of different colors: blue, white, yellow, red, light gray, black, dark gray, and green. Trucks filled with granules drive up to the LEGO Factory where giant hoses suck up the granules and then dump them into three-story high metal silos. There are 14 silos and each one can hold up to 33 tons of granules. From the silos, the plastic granules are fed down pipes to the molding machines.

Part one of molding inside the molding machine: The plastic granules flow through pipes mounted on the ceiling and are fed into the molding machines. Inside the molding machines the granules are superheated to a temperature of about 450 degrees Fahrenheit. This melted plastic goo is fed into molds, little metal containers shaped like hollow LEGO bricks. Think of these as very complicated versions of the ice cube trays you keep in your own freezer. The molding machine applies hundreds of tons of pressure to make sure the bricks are shaped with perfect accuracy. Then they are cooled and ejected, which only takes about 10 seconds.

Because of the dangerous conditions and high precision required, the molding process is almost completely automated. Finished pieces roll down conveyor belts into boxes. When a box is full the molding machine sends a radio signal to one of the robot trucks that patrol the hall. The robot trucks are guided by grooves in the factory floor. They pick up full boxes and dump them onto another conveyor belt that takes them onto the next step of the manufacturing process.

What would LEGO bricks be without lots of cool details and decorations? The next stop in the manufacturing process is the assembly halls where details are printed on and multi-part pieces are put together. Faces, control panels, numbers, words and other decorative details are stamped onto bricks by a giant printer. Some LEGO pieces, like mini figures, are made up of several pieces that fit together. These complex pieces are snapped together by machines that apply pressure with great precision.

The final step is putting all the right pieces together to make complete LEGO kits. Kits can have hundreds of different pieces, so the packaging process has to be fast and accurate. Boxes, called cassettes, roll on conveyor belts underneath the bins that hold each type of piece. The bins open and close to release the right number of pieces into each cassette. Finally, packing operators fold the boxes, add additional pieces, and watch out for any machine-made mistakes.

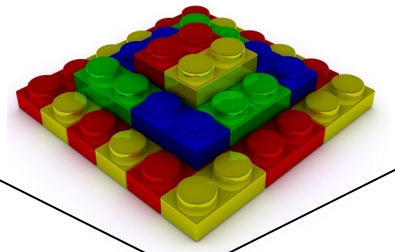
Activity #3

Finished bricks roll down conveyor belts into boxes. Once a box is full, a robot picks it up and dumps it on to another conveyor belt.	Once in the molding machines, the granules are heated to 450 degrees F. The melted plastic is then put into metal molds. After the bricks are made and cooled, they are ejected from the molds.	Lego kits are put together.
Trucks filled with granules drive up to the factory. Giant hoses suck them out of the trucks and they are fed down pipes to the molding machines.	Details are printed on the LEGOs by a giant printer and multi-piece parts like mini-figures are put together by a machine.	

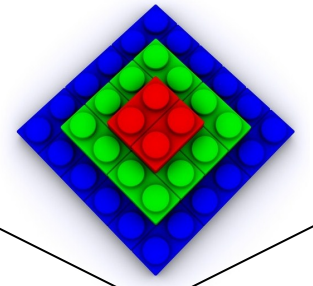
Activity #4

Cut out book on solid lines. Fold on dotted. Paste the correct information under each flap.

What Is Interference Fit?



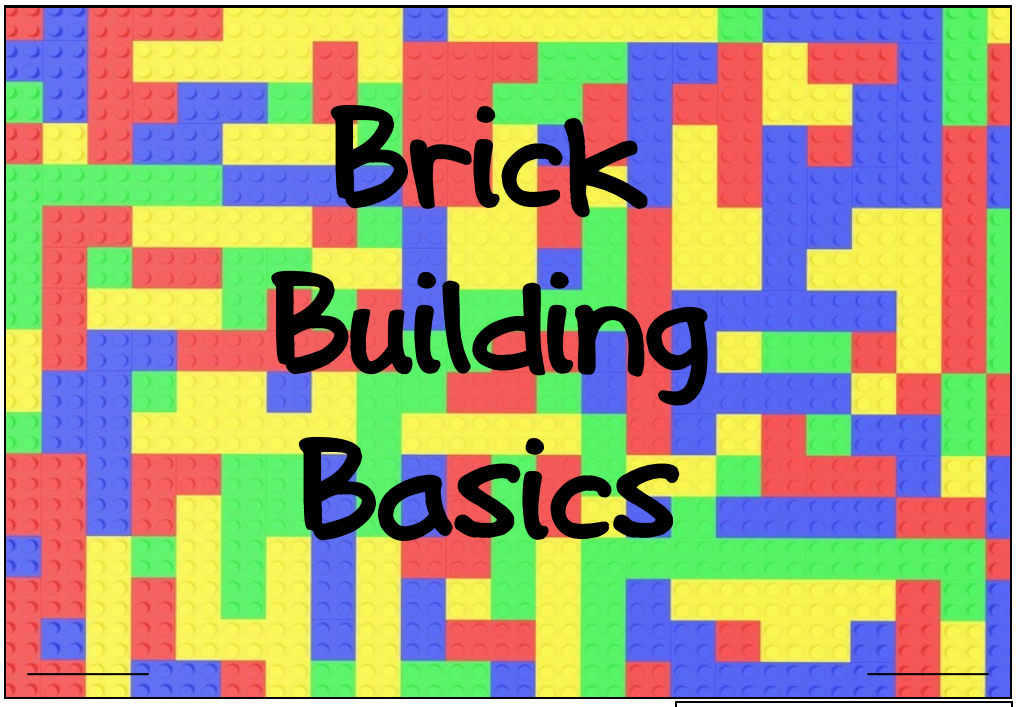
What Is Friction?



refers to the match between the size and shape of two parts where one is slightly larger than the other and so force is required to assemble the parts	the resistance of two surfaces to slide past each other; it's what makes your computer stay on the table and what allows you to walk across the room without sliding

Activity #5

Cut pages out. Stack together with cover on top and staple on the bottom. Write definitions for the words on the pages.



Studs

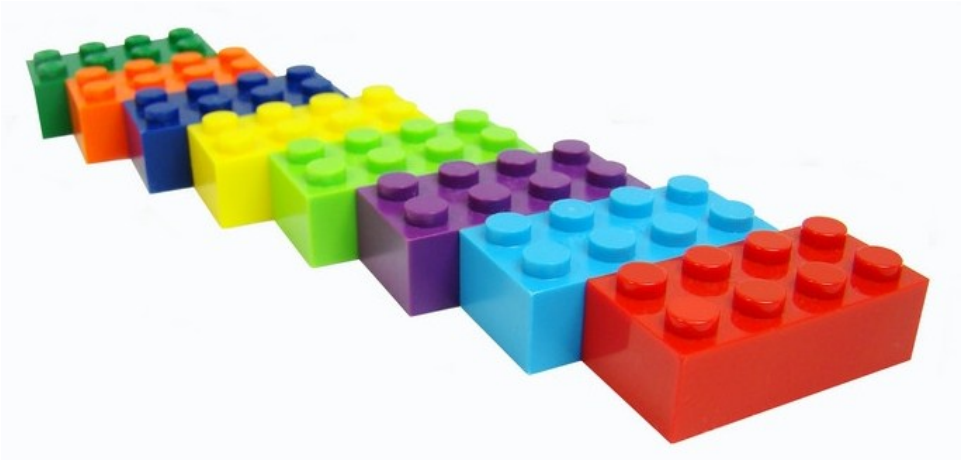
Tubes

Walls

Activity #6

Cut out title piece below. Fold graph in half and paste title piece to the front. Complete the questions.

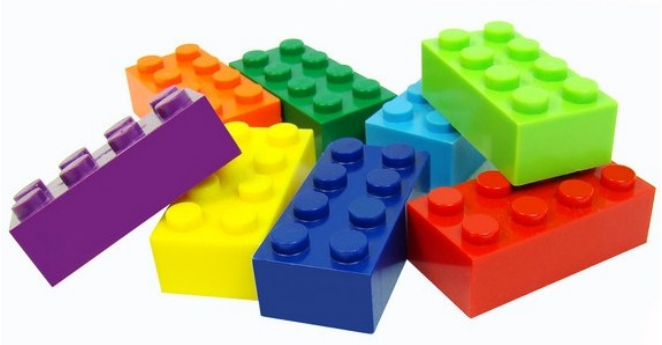
Lego Graph



Look at your graph and answer the following questions.

How many bricks do you have of each color?

1. _____
2. _____
3. _____
4. _____
5. _____



How many bricks do you have total? _____

Which color has the most? _____

Which color has the least? _____

Choose five colors of bricks to use for your graph.
Write the names of the colors at the bottom of the page.

20					
19					
18					
17					
16					
15					
14					
13					
12					
11					
10					
9					
8					
7					
6					
5					
4					
3					
2					
1					

Activity #7

Do you know what estimation is? To estimate is to judge the approximate value, size, or cost of something. Can you guess how many bricks you have in your cup? Complete this exercise twice using the forms below.

How many bricks do you THINK you have? _____

Dump them out and count them.

How many bricks do you actually have? _____

What's the difference?

_____

How many bricks do you THINK you have? _____

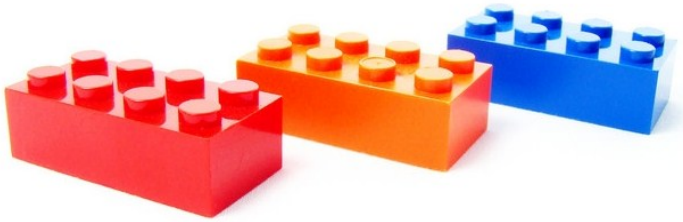
Dump them out and count them.

How many bricks do you actually have? _____

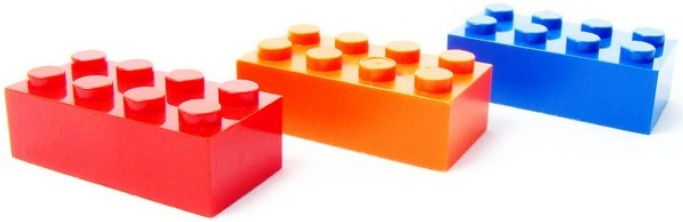
What's the difference?

_____

Cut on solid. Fold on dotted. Glue forms inside book.



LEGO Estimation



Activity #8

Complete the multiplication facts.
Use your LEGO bricks if you need hints!

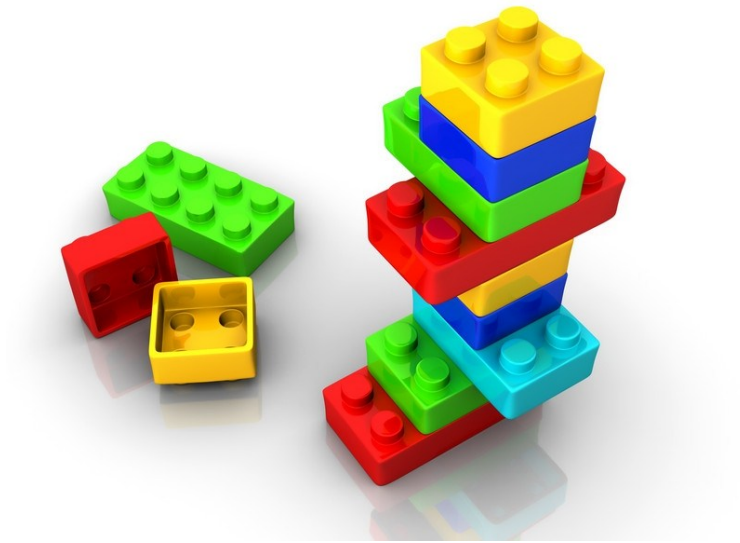
How many studs are on each kind of brick?

1x1 =	1x6 =	2x3 =
1x2 =	1x8 =	2x4 =
1x3 =	2x1 =	2x6 =
1x4 =	2x2 =	2x8 =

How many studs are on these building plates?

4x4 =	4x12 =	6x14 =
4x6 =	6x6 =	8x8 =
4x8 =	6x10 =	10x10 =
4x10 =	6x12 =	32x32 =

Cut out the multiplication pages and cut out this cover. Stack together and staple.



Multiplication

LEGO Fun Facts

- If you built a column of 40,000,000,000 LEGO bricks, it would reach the moon!
- Laid end to end, the number of LEGO bricks sold in one year would reach more than five times around the world!
- The world's children spend 5 billion hours each year playing with LEGO bricks!
- On average there are 62 LEGO bricks for every person on earth!
- Approximately seven LEGO sets are sold every second!
- You can buy LEGO products in 130 different countries!