



PLAYFUL
ENGINEERING-BASED
LEARNING

MAP MATS

playful adventures in math & science

A colorful pinwheel graphic with eight triangular blades in shades of blue, orange, green, pink, and white, arranged in a circular pattern around a central white circle.

GRADES

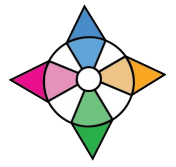
K-3

VERSION 1.1



MARYVILLE
UNIVERSITY

CENTER FOR ACCESS
AND ACHIEVEMENT



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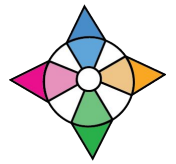
and funding provided by

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for the

Playful Engineering-Based Learning Project.

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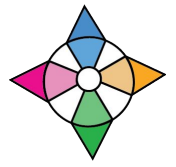
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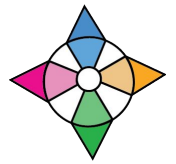
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INTRODUCTION

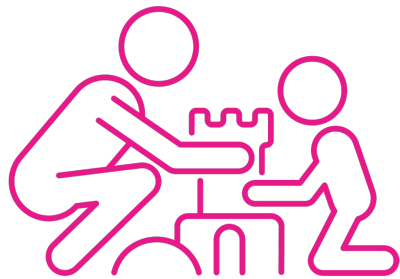




MAP MATS

playful adventures in math & science

These activities support joyful, meaningful, play-based learning using LEGO DUPLO sets and large floor MAP MATS. With these materials and this guide, you can:



ENGAGE in playful learning alongside your students.

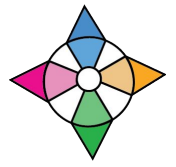


OBSERVE and do informal assessments on social skills, number sense, and letter recognition.



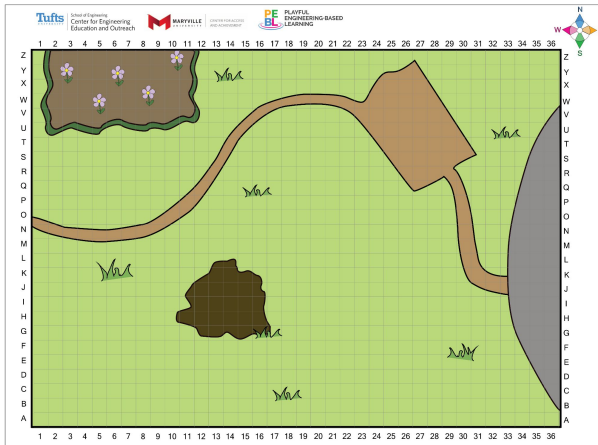
DISCOVER previously unseen abilities in your students such as spatial sense, imagination, creativity, and problem solving skills.

The Three MAP MATS

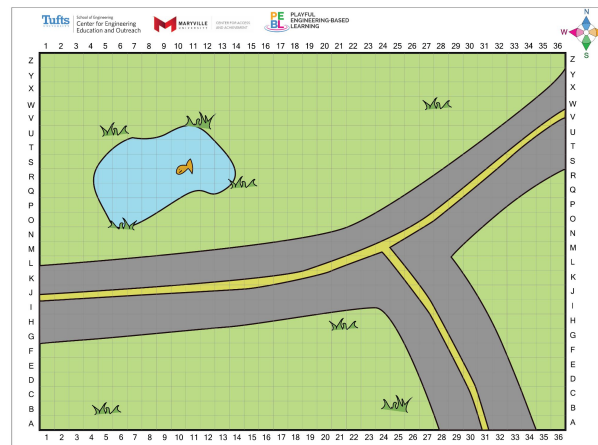


The centerpiece of MAP MATS are three vinyl mats to go on the classroom floor. They are 54" X 40" and are colorful representations of environments familiar to children.

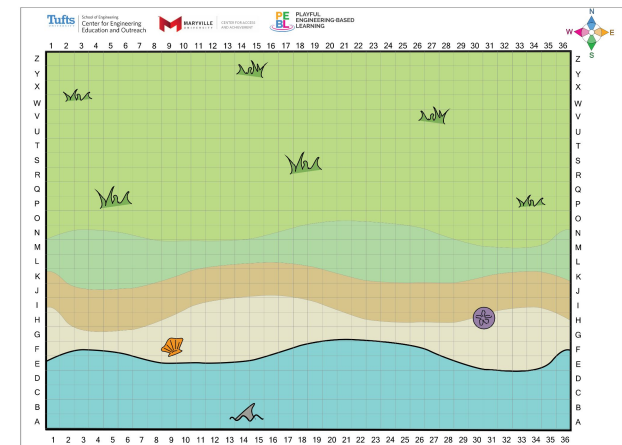
Playground



Roadway



Beach



Mats promote learning through play by...



giving context and a defined area for the children's creations that will trigger imagination.

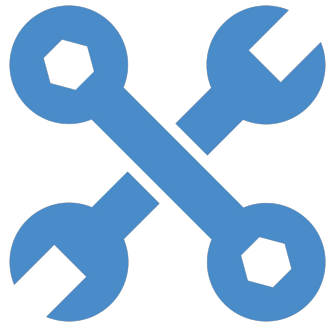
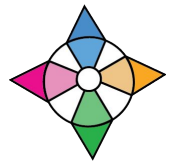


creating a shared immersive environment that supports classroom discussion and communal representations.

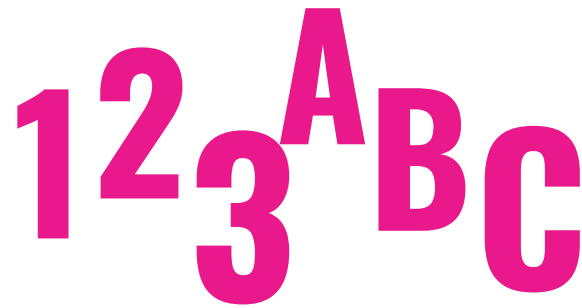


building community in the classroom through collaborative fun, imaginative storytelling, and hands-on problem solving.

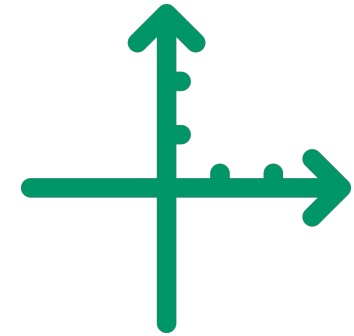
Functions of MAP MATS



MAP MATS are a **TOOL** to help students develop spatial recognition skills as they build in open ended learning spaces.



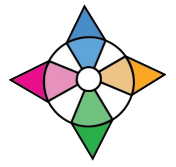
MAP MATS have features that support **NUMERACY AND LETTER** recognition.



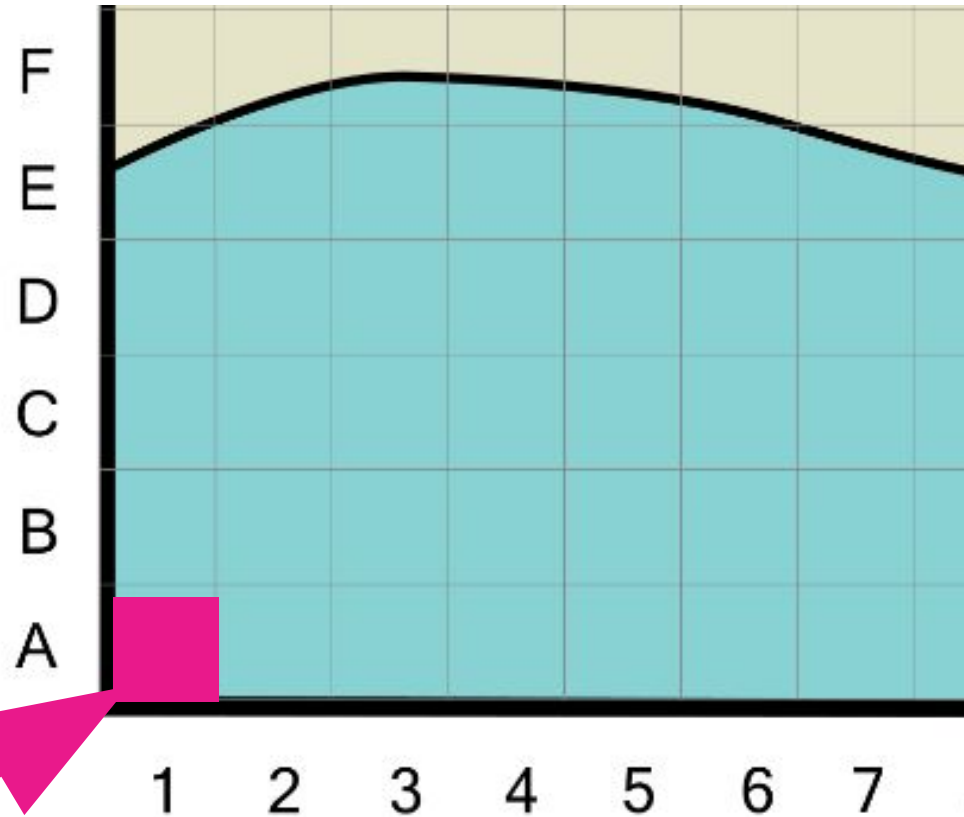
MAP MATS build conceptual understanding of the **COORDINATE MAPPING SYSTEM** and the compass rose.

MAP MATS are also a surface that can be used by students to build community, solve STEM-based challenges, and engage in cooperative playful engineering-based learning.

The **MAP** **MATS** Coordinate System



The coordinates are the intersection of the **SQUARES** not the lines. Numbers and letters are placed on the MAP MATS to visually indicate this.

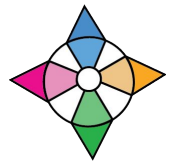


1A



Using long pieces of **yarn or ribbon**, stretched across the rows and columns of the MAP MATS will help students understand coordinates. Once students understand the concept, the yarn or ribbons are not necessary.

Choose Your LEGO Education Kit



Teachers may pair the LEGO Education People kit with a MY XL World kit or a STEAM Park kit to serve a **classroom of 18-20 students**. Tubes and Creative LEGO are fun options to add on.



People by LEGO® Education

This 44-piece set includes 26 figures, ranging from family members, like children, parents and grandparents, to occupations, such as doctor, police officer, chef, and teacher.



My XL World by LEGO® Education

Children engage in real-world role play as they build communities, modes of transportation, and fantasy worlds. The product includes 480 bricks including windows, doors, cars, and propellers.



STEAM Park by LEGO® Education

Children investigate early science, technology, engineering, art and math concepts through creative play. The product includes 295 Duplo bricks including gears, tracks, pulleys, boats and figures.

Optional add-ons:



Tubes by LEGO® Education

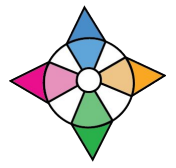
LEGO® Education Tubes lets children explore a world of fantasy animals and other creative builds – made from Tubes! Using a colorful collection of unique tube elements, LEGO® DUPLO® bricks, balls, doors and baskets, and 6 building inspiration cards, kids can create an egg-laying hen, dragon, little pooping larva and more.



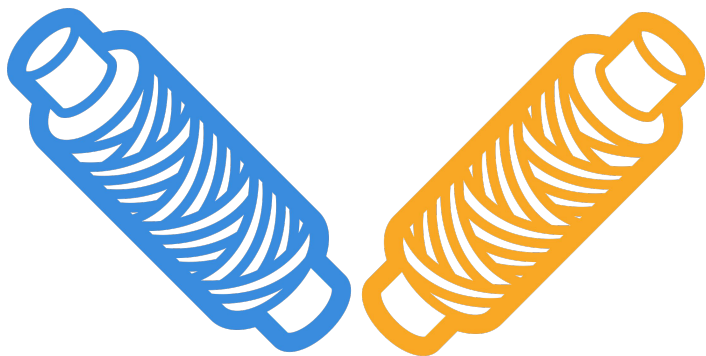
Creative LEGO® DUPLO Brick Set by LEGO® Education

Set children's creativity free with this imaginative LEGO® DUPLO® Brick Set. Not only will it inspire big ideas in young minds, it will encourage self-expression and develop fine motor skills as they build, deconstruct, and build again.

Additional Materials



In addition to the LEGO products and the mats, you will need some additional materials such as:



Pieces of ribbon or yarn long enough to stretch across the MAP MATS for coordinate mapping

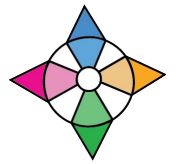


Pencil and paper for each child



Craft supplies, blocks, math manipulatives, or other makerspace materials

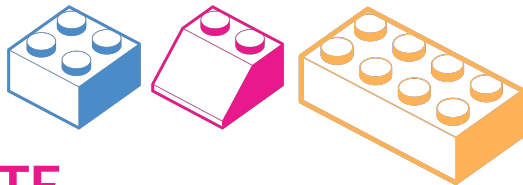
MAP MATS Vocabulary



LEGO vocabulary

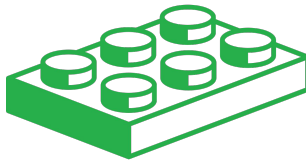
BRICK

any LEGO piece no matter its shape or color



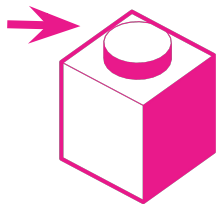
PLATE

a thin, base-like brick used as a building foundation



STUD

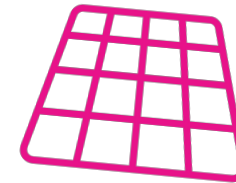
the round bumps on top of a LEGO brick



MAP MATS vocabulary

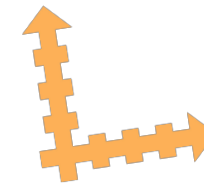
GRID

the network of lines that cross each other to make the squares



COORDINATES

a group of numbers and letters to indicate a location on the map

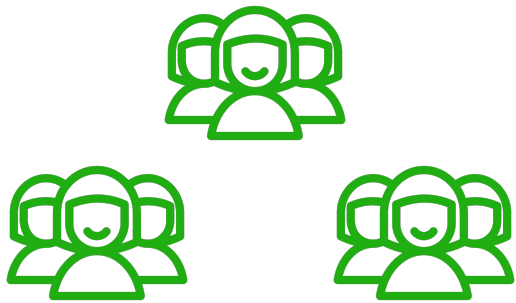
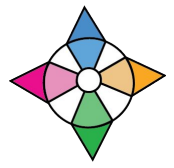


COMPASS ROSE

directional symbol in the upper right hand corner



The Basics of MAP MATS



With three mats, **divide the class into groups of three** (for example, 8 children per mat).



Allow **30 minutes to one hour** for each activity.



Use **Introduction to MAP MATS Part A & B** activities first. Do all others in any order.

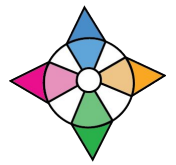


Encourage playful learning. Have children experiment, imagine, invent, try, and fail.



Keep the mat **free from any markings** from pens, crayons, pencils, or paint.

Instructional Strategies for Success



Be mindful of the
**LEARNING
OBJECTIVE**



Do a simple
activity to
**DEMONSTRATE
COOPERATION**



**ACTIVELY
ENGAGE** with
students to help
them stay focused



Ask
OPEN-ENDED
and probing
questions during
activity



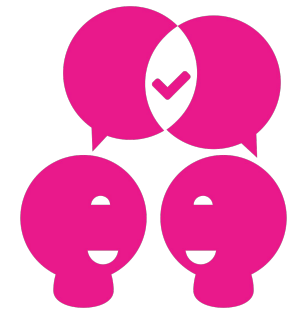
Have students
BRAINSTORM
before building



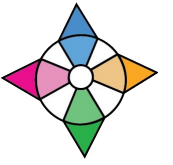
If appropriate,
have students
SKETCH their plan
before building



Have students
SHARE what they
built



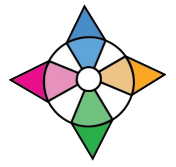
REFLECT and
DEBRIEF with
students on the
experience





ACTIVITIES

MAP MATS Activities at a Glance



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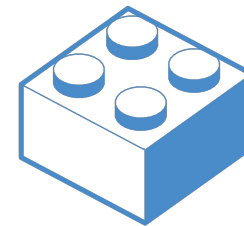
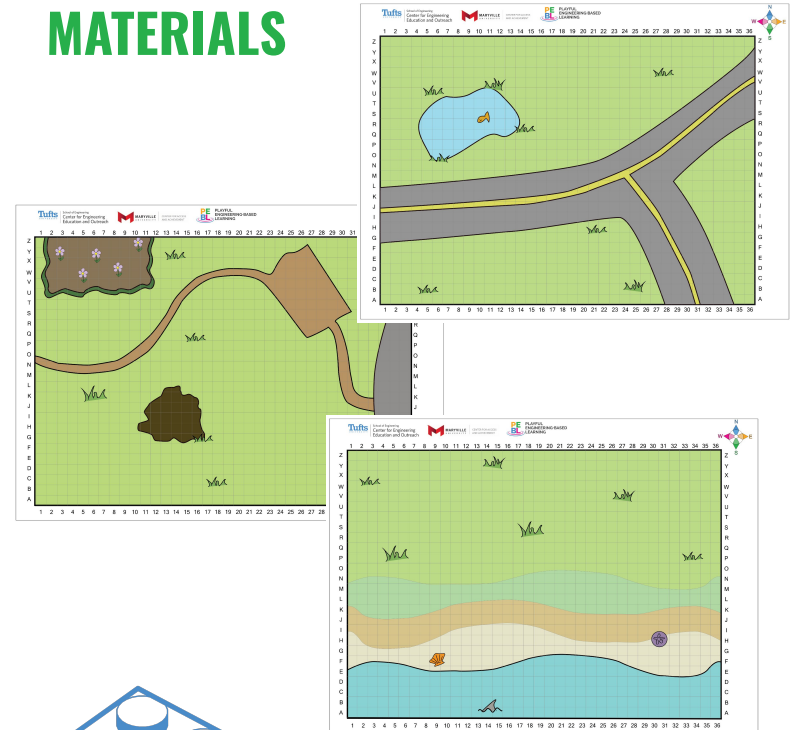
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Introduction to MAP MATS Part A

Children look at the MAP MATS for the first time. Use this opportunity to talk about what maps are, how they are used, practice observation skills, and introduce the vocabulary relating to the MAP MATS and the LEGO DUPLO bricks used in the activities

MATERIALS



One DUPLO Brick

CHILDREN WILL...

- Explore features of the mats
- Discuss the purposes of maps
- Learn MAP MATS and LEGO vocabulary

I
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T
R
O



SET UP
5 MIN

ACTIVITY
10 MIN

CLEAN UP
0 MIN

PROCEDURE



1. Choose one mat and lay it on the floor with the kids sitting around the mat in a circle.



3. Introduce the **LEGO and MAP MATS vocabulary**.



2. Talk about the mats. Ask the children what they notice, what they could do with the mats, if the mats remind them of anything



Ask the children many open ended questions. This is a great way to assess students' prior knowledge about maps and notice their observational skills. Take your time and look at each mat one at a time before doing Introduction to MAP MATS Part B.

Introduction to MAP MATS Part B

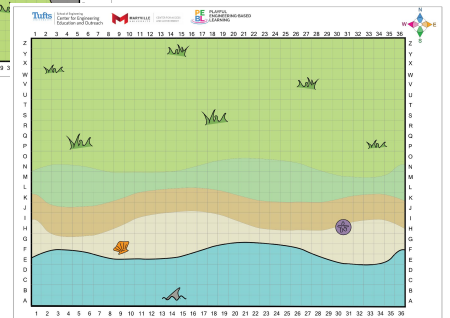
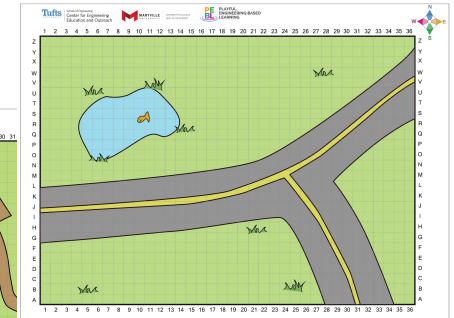
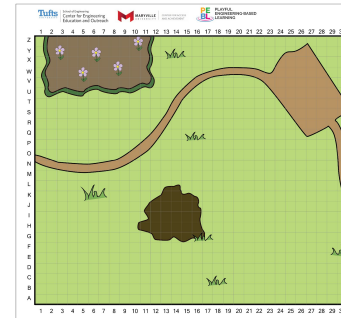
Children can explore and play freely with the people and bricks.

Observe strengths and challenges for individuals and whole class.

CHILDREN WILL...

- Engage in imaginative play
- Get familiar with the DUPLO bricks
- Practice collaborating and cooperating with classmates while building

MATERIALS



People by
LEGO
Education



My XL World
by LEGO
Education

OR



STEAM Park
by LEGO
Education

I
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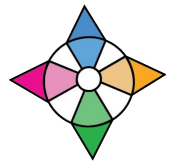


SET UP
5 MIN

ACTIVITY
20 MIN

CLEAN UP
5 MIN

PROCEDURE



Lay the mats on the floor and assign each group to a mat.

1. Set tubs of bricks on floor and divide children into three groups.



Build anything you want together with your classmates!

2. Tell children to take out some bricks and people and **build something on the MAP MATS** (anything!) together.

3. As they build, encourage children to talk to each other about what they are doing.

Share with your classmates what you are building.

Why did you decide to build it like that?



You can repeat this activity on the following day(s) assigning each group to use a different MAP MAT.

MATH

Imagine and Build!

Working in small groups children will build three dimensional environments which relate to the theme of each mat.

CHILDREN WILL...

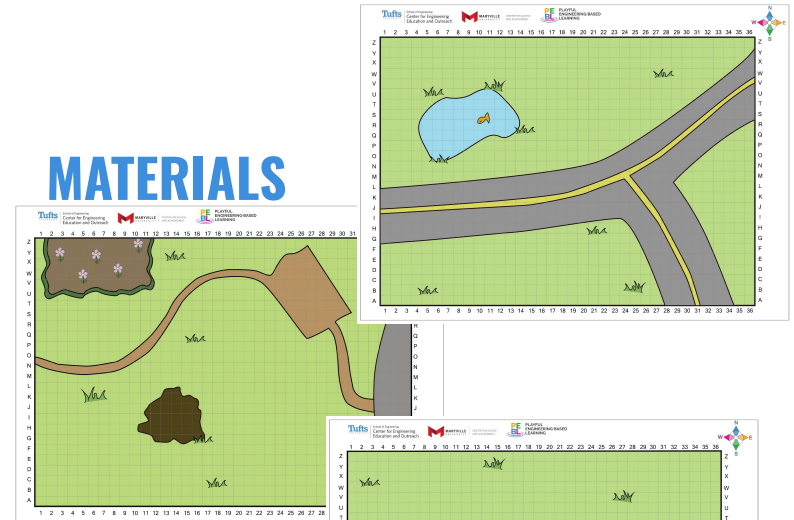
- Collaborate and communicate with a building group
- Use playful engineering to build environments which include multiple different structures
- Practice spacial and pattern recognition, numeracy, and measurement skills



SET UP
5 MIN

ACTIVITY
20 MIN

CLEAN UP
5 MIN



People by LEGO Education



My XL World by LEGO Education

OR



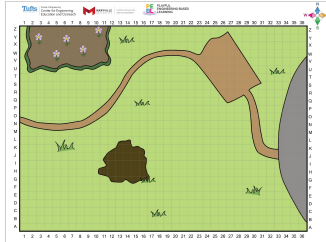
STEAM Park by LEGO Education

PROCEDURE



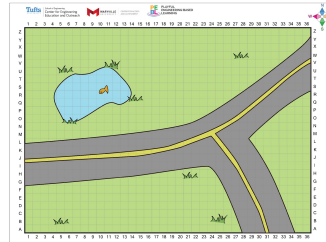
1. Divide children into three groups. Lay the mats on the floor and assign each group to a mat. Introduce the following challenges:

Playground



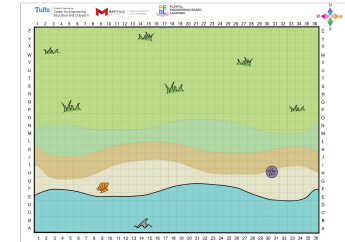
Build a playground which includes things you would like in your playground.

Roadway



Build a little town which includes things you would like to see in your community.

Beach



Build a beachside village which includes things to enjoy near the beach.

2. While the children are building, circulate and ask open ended questions such as:

How tall is your building? How many squares on the mat does your building cover?

Which structure has more bricks? Which structure has fewer bricks?

What shapes do you see in your buildings?

Why did you put that there?

What do you like best about your environment?

How did you and your friends decide what to make? What could you change to make it work better?

3. When the children have finished building their environments, have each group describe what they have built and why. Encourage positive feedback and questions from the class to the presenting group.



While circulating, use the features of the mats such as the letters and numbers to reinforce counting and letters of the alphabet.



SET UP
5 MIN

ACTIVITY
20 MIN

CLEAN UP
5 MIN

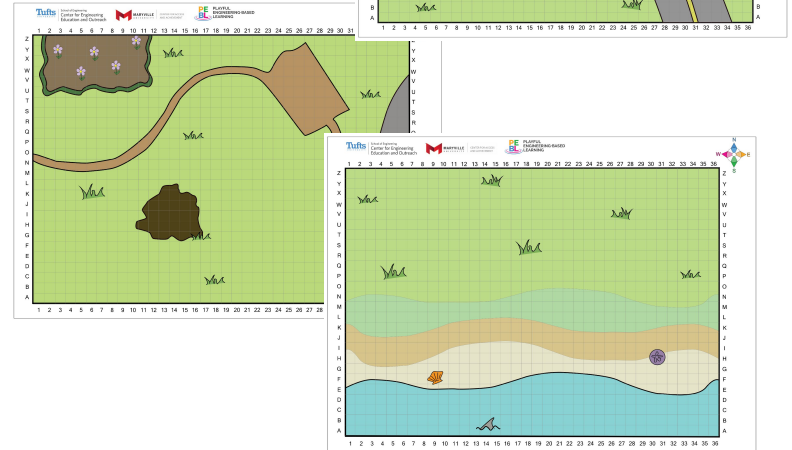
Balance with Buddies

This activity challenges student to make their own small balanced DUPLO brick creation, then combine it with the creations of other students. This is a socially interactive, creative problem solving activity.

CHILDREN WILL...

- **Actively engage as creative engineers to build a three brick model that balances on the floor or table**
- **Collaborate with a partner and then another pair of students to combine the models**
- **Cooperate with others in order to have a single final structure that balances on the floor or table**

MATERIALS

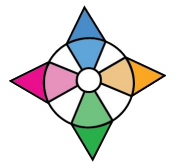


**My XL World
by LEGO
Education**

OR



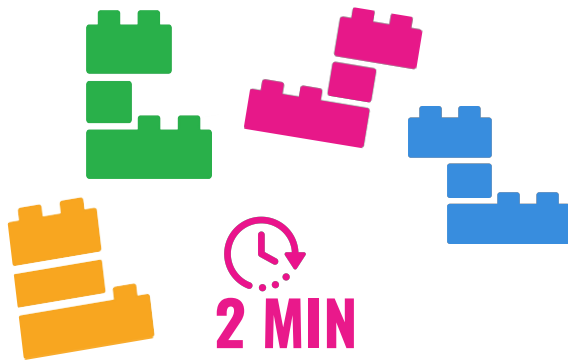
**STEAM Park by
LEGO
Education**



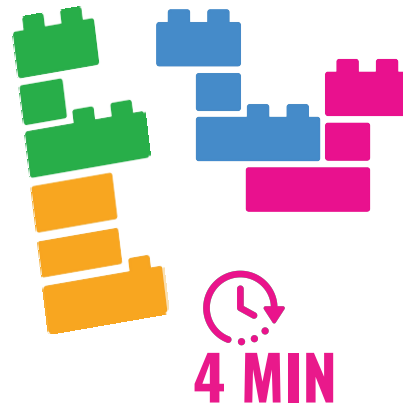
PROCEDURE

1. Lay out one MAP MAT and get out the set of DUPLO bricks. Tell the class that they are going to use the bricks to make structures that balance.
Discuss what it means to balance.

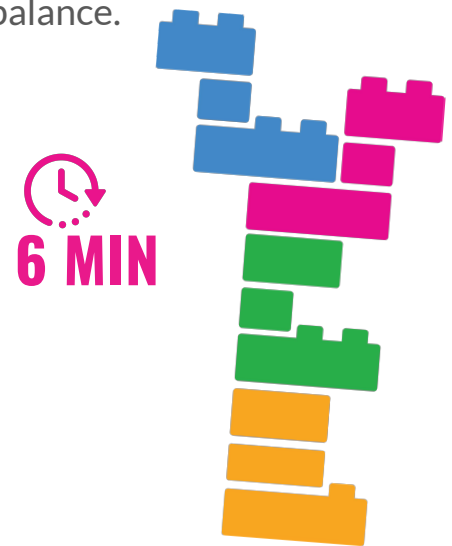
2. Have each child select 3 DUPLO bricks that can connect to each other.
Challenge them to build their own structure from the 3 bricks that can balance on the floor or table.




3. Pair the students and have the **pairs combine their builds so that they balance.** Ask that they try to find a way to combine their individual builds.



4. Next have **two pairs of students collaborate to combine their builds** into one structure that balances. Then the group will put their balanced structure on the mat. Have each each group share any challenges they had to solve to get their creations to balance.



 Be ready to help students who may struggle to cooperate with others. This challenge may bring out some frustration in students. Tell them that frustration in a challenging project is normal and they can stop for a moment to take a breath and look for a new idea.

M A T H

Introduce the Map Coordinates

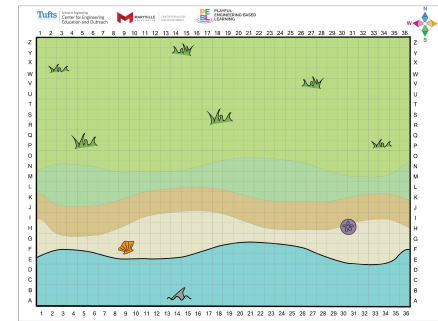
Each mat includes a representative map which uses numbers and letters together to help children locate a position on the map. Using the numbers and letters together is the coordinate system. You will introduce mapping coordinates. This is the basis of a GPS system.

This activity works best with 4 students at a time. While working with this small group, the remaining students can use the other two MAP MATS for cooperative building time.

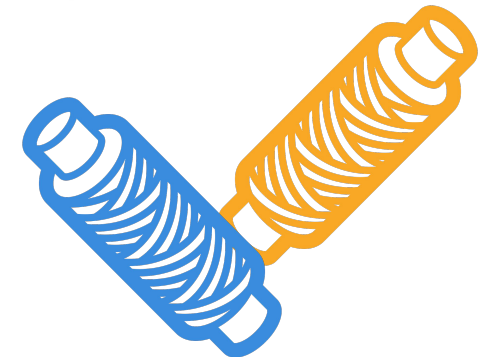
CHILDREN WILL...

- Observe the way the coordinate system works by participating in demonstrations
- Locate a specific place on the map using the coordinate system
- Demonstrate ability to count from 1-36 and to identify and name the letters of the alphabet

MATERIALS



People by
LEGO
Education



SET UP
5 MIN

ACTIVITY
15 MIN

CLEAN UP
5 MIN

PROCEDURE



1. Put the beach mat on the floor and invite the children to sit around the mat. Remind the children of the mat's features such as the **numbers**, the **alphabet**, the **compass rose**, and the **grid**.

What do you know about GPS?

Have you ever seen a map of places you visit such as the zoo or Six Flags?

What do you think the numbers and letters on the map are for?

2. Choose two children. One sits at the south side of the mat and one sits at the north side of the mat. The children should stretch a ribbon between them. **Have the children stretch the ribbon across the number 1s.** Remind them that every square from 1 to 1 is in "area one".

4. Pick a pair to **stretch the ribbon from A to A** and repeat the process with the **letters O and Z.**

3. Pick **another pair who should stretch the ribbon from 18 to 18.** Ask the children what area this is. Have the other **pair to stretch the ribbon from 36 to 36** and ask what area that is.

5. Have two children hold **a ribbon between the number 11s** and at the same time have two other children hold another **ribbon between the letter Rs.** Tell the children that where the ribbons cross is square **(11, R)**. Repeat the process.

How can we use the numbers and letters together to name the location of one single square?

Can you name the location of the orange seashell? The purple sand dollar? The shark's fin? The biggest clump of grass?



Remember to highlight that children should say the number first and then the letter.

M A T H

Come Meet Me, Friend!

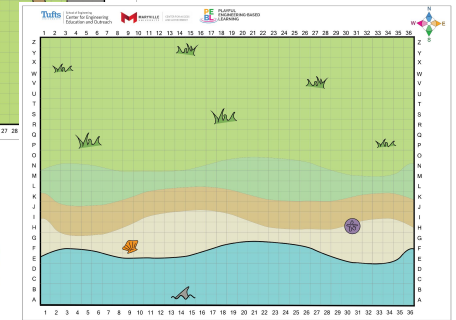
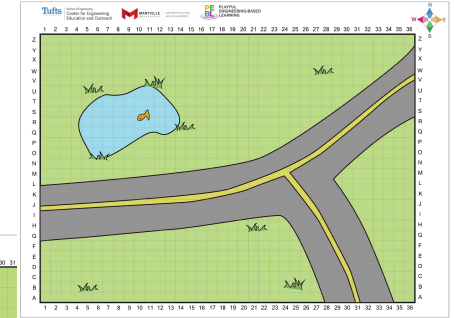
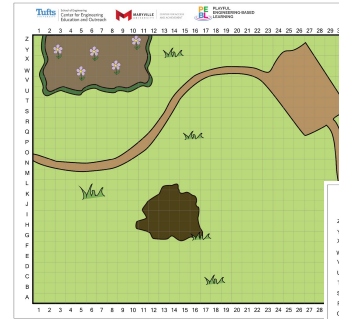
Working in pairs, children will tell their partner how to meet them at a specific location on the mat. One child will tell another child how to go from point A to point B by counting squares and using the compass rose. This activity is a playful way to reinforce counting skills in an authentic context and through social interaction.

This will work best with 3-6 students in a group with the teacher.

CHILDREN WILL...

- Enjoy and engage in the experience of using the mat as a map
- Practice giving directions through counting cardinal numbers
- Learn to use the four directions: north, south, east, and west

MATERIALS



People by LEGO Education



SET UP

5 MIN

ACTIVITY

30 MIN

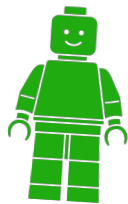
CLEAN UP

5 MIN

PROCEDURE

1. Divide children into three groups. Lay the mats on the floor and assign each group to a mat. Within each group, have children pair up.

2. Let each child choose a DUPLO person.

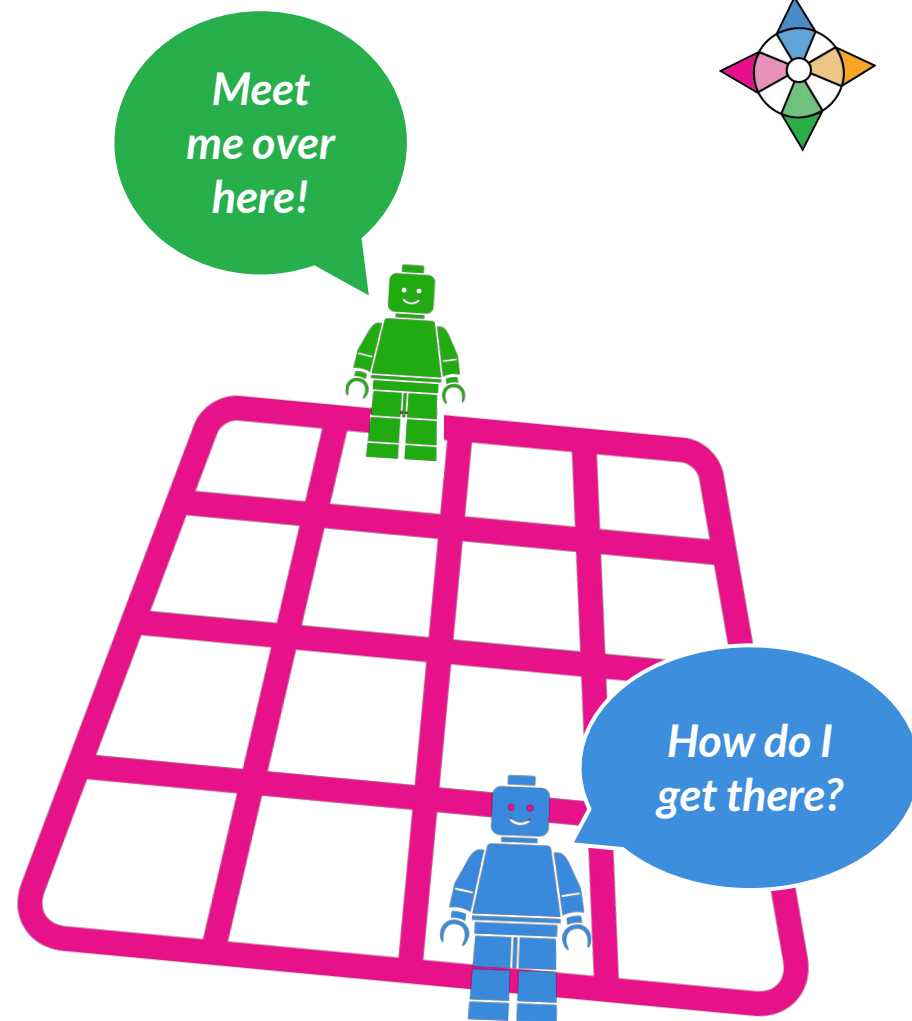


3. Child A places the character on the map. Child B places the character on the map.

4. Child A asks child B to meet them at their character's location on the map. Child B asks Child A how to get there.

5. Child A gives directions to Child B. For example, "Move 5 squares north."

6. Reverse roles.



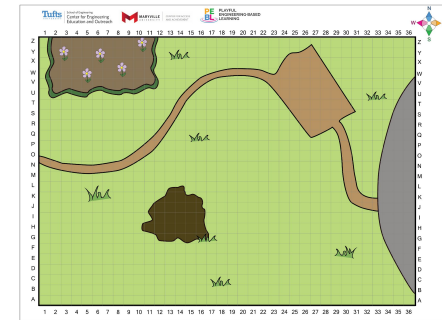
Observe carefully to note which children might need further support with counting skills. Play along if children need support or model playfully when necessary. Remember this is a joyful activity to enhance number sense.

MATH

Who Can Help the Squirrel First?

Using mathematical thinking and language, children will engage with a story to solve the problem.

MATERIALS



CHILDREN WILL...

- Use a DUPLO character to act out the problem
- Solve the math challenges
- Share their mathematical thinking with the group



SET UP
5 MIN

ACTIVITY
15 MIN

CLEAN UP
5 MIN



People by LEGO
Education



STEAM Park
by LEGO
Education

PROCEDURE



1. Work with one group of 3-6 students at a time and one MAP MAT. **Place the three DUPLO people and the squirrel on the mat.**

2. Read this story aloud checking the students' understanding of the problem.

Our class is out on the playground one fine spring day. Sonia is smelling a flower in the school garden at (3,X). Javion is resting in the patch of dirt at (27,S). Mr. Jones, our school custodian, is sweeping the parking lot at (35,G). Suddenly a squirrel runs through the grass and gets stuck in the mud puddle at (12,H).

3. Read the story again and have students use the people or their fingers to discover the solutions.

4. **Ask the following questions.** Have students write their answers on a piece of paper or dry erase board.

What is the fewest number of steps (squares) will each person have to take to get to the squirrel to help it?

Sonia - 25 steps, East, South

Who has the fewest number of steps? Who has the most steps? What direction must each person take to get to the squirrel?

*Fewest: Mr. Jones, 24 steps West
Most: Javion, 26 steps West, South*

5. Have students share their answers and **explain their thinking.**



This is a joyful activity to enhance number sense. Observe carefully to note which children might need further support with counting skills. Play along if children need support or model playfully when necessary.

M A T H

A Day at the Beach

Using mathematical thinking and language, children will engage with a story to solve the problem.

CHILDREN WILL...

- Use a DUPLO character to act out the problem
- Solve the math challenges
- Share their mathematical thinking with the group

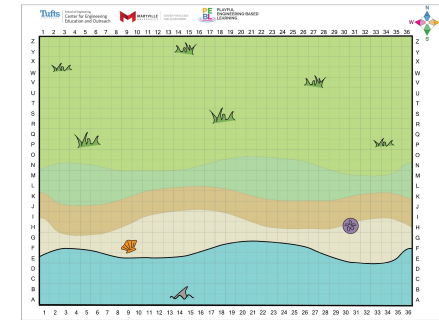


SET UP
5 MIN

ACTIVITY
15 MIN

CLEAN UP
5 MIN

MATERIALS



People by LEGO
Education



STEAM Park
by LEGO
Education

PROCEDURE



Place the beach mat on the floor and take out a **2 x 6 DUPLO brick** for the blanket, another DUPLO **brick or cone** for the umbrella and **three DUPLO people**.

Marcus and his family went to the beach. His Auntie put down a blanket in the grass that covered squares (14,Q), (14,R), and (14,S). His mom put an umbrella into the ground at (14,T).

Marcus ran from the umbrella to the water. After he played in the water awhile, he walked on the beach and found an orange shell at (9,F). Marcus kept walking until he found a purple sand dollar at (30,H).

Marcus wanted to put the sand dollar on the blanket. He walked 5 steps North, then 10 steps West. Where was he? (20,M). He was still not back to the blanket.

What shape is the blanket?

Rectangle

How many steps from the umbrella to the water?

15

How many steps from the orange shell to the purple sand dollar?

23

Did Marcus step in the water to get to the purple sand dollar?

How many more steps does he need to take to get to the blanket?

9 or 10

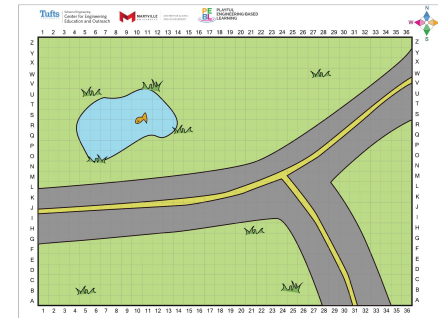


This can become a writing activity as well. What else did Marcus see at the beach? Who else was there? Where did they play? What could Marcus build on the sand? What location did he choose to build a sand castle? Add your own questions to elaborate.

The Missing Cat

Using mathematical thinking and language, children will engage with a story to solve the problem.

MATERIALS



CHILDREN WILL...

- Use a DUPLO character to act out the problem
- Solve the math challenges
- Share their mathematical thinking with the group



SET UP
5 MIN

ACTIVITY
15 MIN

CLEAN UP
5 MIN



People by LEGO
Education



STEAM Park
by LEGO
Education

PROCEDURE



Place the roadway mat on the floor and take out a **DUPLO cat (or other animal)** and **one DUPLO person**.

Amber got up on Saturday and realized that her cat, Fluffy, was missing. She was worried because her house is near a road and she hopes Fluffy does not try to cross it. Amber ran out to her grassy backyard. She stood in the clump of grass at (28,W) and looked around. Amber looked south first to make sure Fluffy was not on the other side of the road. Then she looked west and saw Fluffy by the pond at (4,Q).

Plan out a way for Amber to get to Fluffy.

Write your plan out on paper.

Example: take 10 steps west then 9 steps south, then 13 steps west then 3 steps north

Share your path with the class.

Did you get wet at the pond?



This can become a writing activity as well. What else did Amber see in her yard or on the road? Add your own questions to elaborate.

M A T H

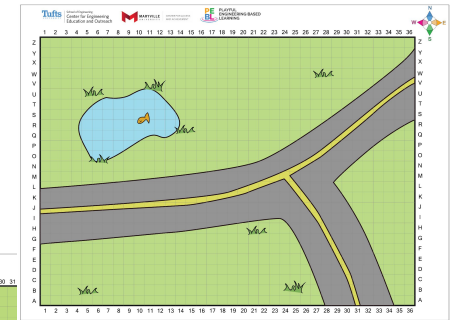
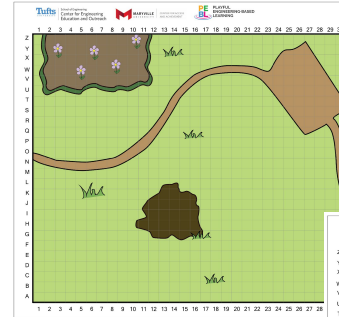
Let's Go On a Treasure Hunt #1

This treasure hunt activity uses the excitement of a treasure hunt to give students an authentic reason to practice counting skills and other basic math concepts. They will use DUPLO people to count out routes to treasure on a MAP MAT.

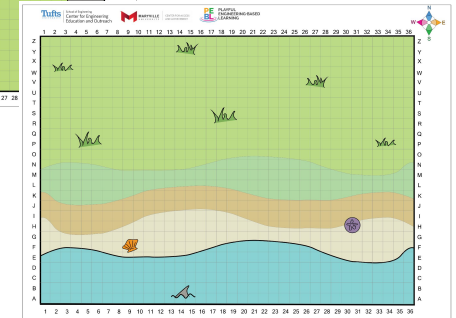
CHILDREN WILL...

- Count out a pathway to the treasure from their starting coordinates
- Practice using terms such as *least*, *greatest*, *most*, and *more*
- Use directional words to describe a route on the MAP MAT

MATERIALS



OR



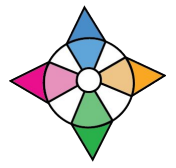
People by LEGO Education



SET UP
5 MIN

ACTIVITY
20 MIN

CLEAN UP
5 MIN



PROCEDURE

1. Set out any MAP MAT for a small group to work on. **Remind the students that 1 square= 1 step.** Practice counting steps for a minute or two.

2. **Mark the location of the "treasure" at (20,Z)** with a sticky note with an X on it (or a DUPLO Brick).



3. Have a student place a **DUPLO person on the starting point according to the table.** For example, student 1 will place the DUPLO person on (18,Y).

4. With the children, **count the number of steps and the direction to get the DUPLO person to the treasure.** For example, how many steps and what direction does it take to go from (18,Y) to (20, Z)?

5. *How many steps did you have to take to get to the treasure?*

Who is closest to the treasure?

Who is furthest from the treasure?

What compass directions did you have to move in to get to the treasure?

Student

EASY PATH		
Starting Point	How many squares away?	Compass directions?
1 (18,Y)	3	N & E
2 (24,X)	6	N & W
3 (19,S)	8	N & E
4 (30,W)	13	N & W

CHALLENGING PATH		
Starting Point	How many squares away?	Compass directions?
1 (15,S)	12	N & E
2 (35,N)	27	N & W
3 (21,G)	21	N & W
4 (9,W)	14	N & E



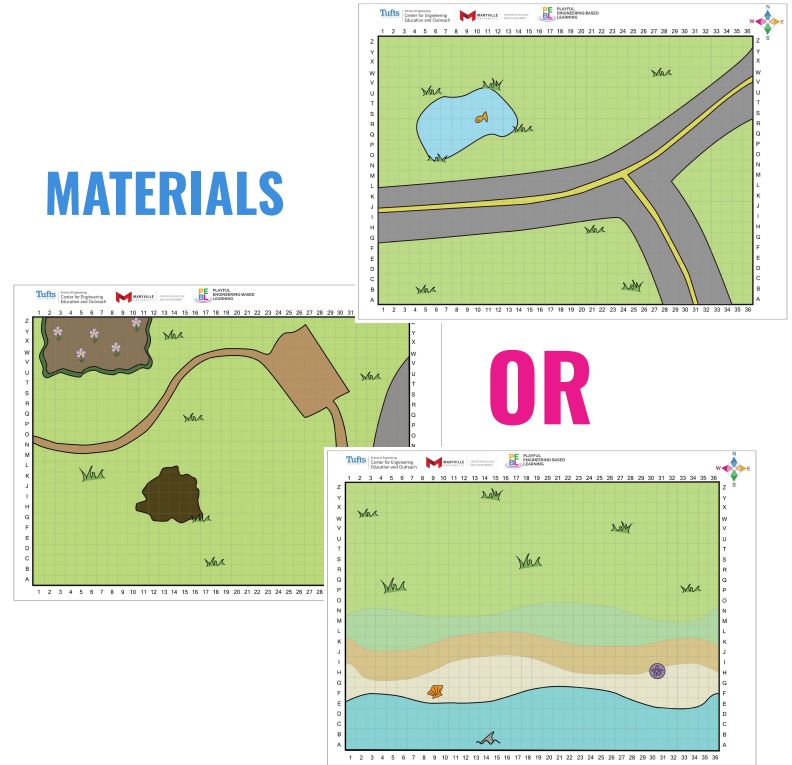
Model this activity with a small group a few times. After that, students can work individually or in small groups. For an extra challenge, have students create their own treasure hunts.

MATH

Let's Go On a Treasure Hunt #2

This treasure hunt activity uses the excitement of a treasure hunt to engage students in an authentic reason to practice counting skills and other basic math concepts. They will use DUPLO people to count out routes to a treasure placed on a MAP MAT.

MATERIALS



OR



People by LEGO Education

CHILDREN WILL...

- Count out a pathway to the treasure from their starting coordinates
- Practice using terms such as *least*, *greatest*, *most*, and *more*
- Use directional words to describe a route on the MAP MATS



SET UP
5 MIN

ACTIVITY
20 MIN

CLEAN UP
5 MIN

PROCEDURE



1. Set out any MAP MAT for a small group to work on. **Remind the students that 1 square= 1 step.** Practice counting steps for a minute or two.

2. **Mark the location of the “treasure” at (13,P)** with a sticky note with an X on it or a DUPLO Brick.



3. Have a student place a **DUPLO person on the starting point according to the table.** For example, student 1 will place the DUPLO person on (9,S).

4. With the children, **count the number of steps and the direction to get the DUPLO person to the treasure.** For example, how many steps and what direction does it take to go from (9,S) to (13,P)?

5. *How many steps did you have to take to get to the treasure?*

Who is closest to the treasure?

Who is furthest from the treasure?

What compass directions did you have to move in to get to the treasure?

EASY PATH			
Group	Starting Point	How many squares away?	Compass directions?
1	(9,S)	7	N & E
2	(15,M)	5	N & W
3	(7,Q)	7	N & E
4	(16,0)	4	N & W

CHALLENGING PATH			
Group	Starting Point	How many squares away?	Compass directions?
1	(27,S)	17	S & W
2	(8,H)	13	N & E
3	(32,R)	21	S & W
4	(15,C)	15	N & W



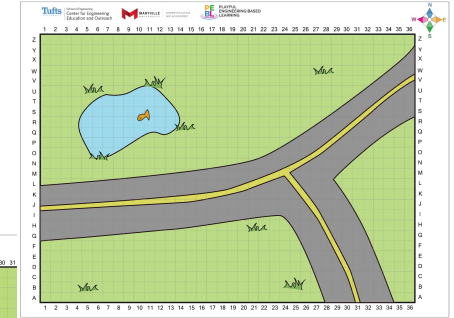
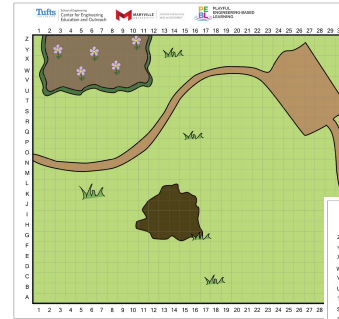
Model this activity with a small group a few times. After that, students can work individually or in small groups. For an extra challenge, have students create their own treasure hunts.

MATH

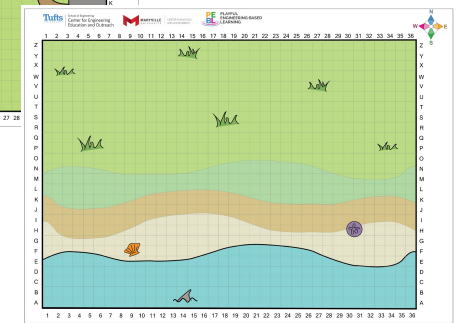
Let's Go On a Treasure Hunt #3

This treasure hunt activity uses the excitement of a treasure hunt to engage students in an authentic reason to practice counting skills and other basic math concepts. They will use DUPLO people to count out routes to a treasure placed on a MAP MAT.

MATERIALS



OR



CHILDREN WILL...

- Count out a pathway to the treasure from their starting coordinates.
- Practice using terms such as *least*, *greatest*, *most*, and *more*
- Use directional words to describe a route on the MAP MATS



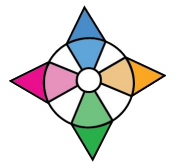
People by LEGO Education



SET UP
5 MIN

ACTIVITY
20 MIN

CLEAN UP
5 MIN



PROCEDURE

1. Set out any MAP MAT for a small group to work on. **Remind the students that 1 square= 1 step.** Practice counting steps for a minute or two.

2. Mark the location of the “treasure” at (9,F) with a sticky note with an X on it or a DUPLO Brick.



3. Have a student place a **DUPLO person on the starting point according to the table.** For example, student 1 will place the DUPLO person on (12,C).

4. With the children, **count the number of steps and the direction to get the DUPLO person to the treasure.** For example, how many steps and what direction does it take to go from (12,C) to (9,F)?

5. *How many steps did you have to take to get to the treasure?*

Who is closest to the treasure?

Who is furthest from the treasure?

What compass directions did you have to move in to get to the treasure?

EASY PATH			
Student	Starting Point	How many squares away?	Compass directions?
1	(12,C)	6	N & W
2	(4,H)	7	S & E
3	(13,M)	11	S & W
4	(2,A)	13	N & E

CHALLENGING PATH			
Student	Starting Point	How many squares away?	Compass directions?
1	(27,M)	18	S & W
2	(25,B)	20	N & W
3	(6,Q)	15	S & E
4	(1,D)	10	N & E



Model this activity with a small group a few times. After that, students can work individually or in small groups. For an extra challenge, have students create their own treasure hunts.

Let's Go On a Treasure Hunt #4

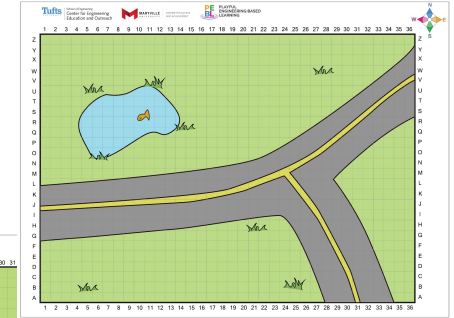
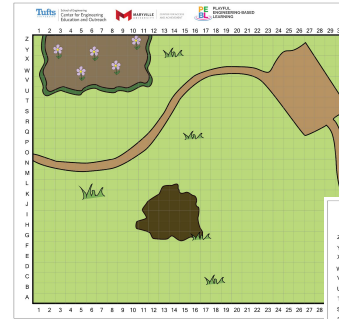
MATH

This treasure hunt activity uses the excitement of a treasure hunt to engage students in an authentic reason to practice counting skills and other basic math concepts. They will use DUPLO people to count out routes to a treasure placed on a MAP MAT.

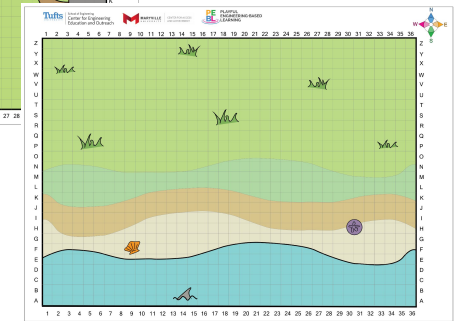
CHILDREN WILL...

- Count out a pathway to the treasure from their starting coordinates.
- Practice using terms such as least, greatest, most, and more
- Use directional words to describe a route on the MAP MAT

MATERIALS



OR



People by LEGO Education



SET UP
5 MIN

ACTIVITY
20 MIN

CLEAN UP
5 MIN



PROCEDURE

1. Set out any MAP MAT for a small group to work on. **Remind the students that 1 square= 1 step.** Practice counting steps for a minute or two.

2. Mark the location of the “treasure” at (33,L) with a sticky note with an X on it or a DUPLO Brick.



3. Have a student place a **DUPLO person on the starting point according to the table.** For example, student 1 will place the DUPLO person on (20,P).

4. With the children, **count the number of steps and the direction to get the DUPLO person to the treasure.** For example, how many steps and what direction does it take to go from (20,P) to (33,L)?

5. *How many steps did you have to take to get to the treasure?*

Who is closest to the treasure?

Who is furthest from the treasure?

What compass directions did you have to move in to get to the treasure?

EASY PATH			
Student	Starting Point	How many squares away?	Compass directions?
1	(20,P)	7	S & E
2	(25,L)	8	E
3	(32,T)	9	S & W
4	(36,W)	14	S & W

CHALLENGING PATH			
Student	Starting Point	How many squares away?	Compass directions?
1	(17,D)	24	N & E
2	(36,A)	14	N & W
3	(15,Q)	23	E & S
4	(7,T)	34	S & E



Model this activity with a small group a few times. After that, students can work individually or in small groups. For an extra challenge, have students create their own treasure hunts.

M A T H

Introduction to Coding with Color

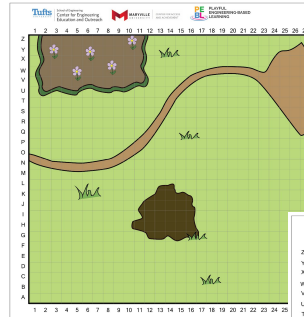
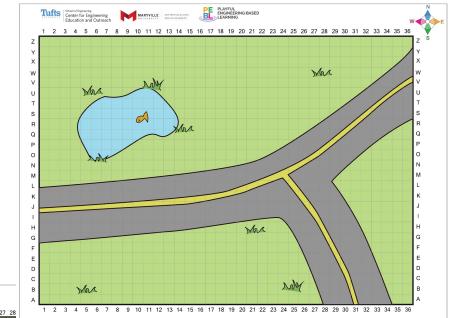
Throughout time humans have used codes to communicate. Think of Morse Code, hieroglyphics, and secret codes. Coding is way to give directions, information, or instructions, often substituting symbols for words.

To create simple codes with MAP MATS, children will substitute the colors of the compass rose for the directional words and learn to give directions for a route on the map.

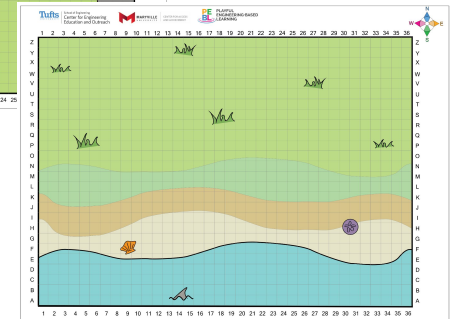
CHILDREN WILL...

- Use basic coding skills to give directions and create routes on the MAP MATS
- Substitute the compass rose colors for directional words
- Try to use code to move around on the MAP MATS

MATERIALS



OR



People by LEGO Education



SET UP

5 MIN

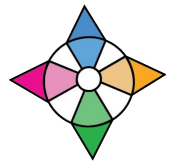
ACTIVITY

30 MIN

CLEAN UP

5 MIN

PROCEDURE



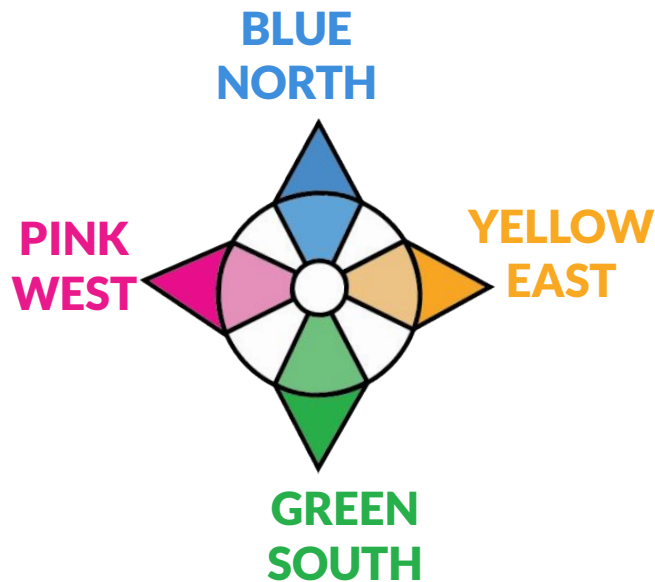
1. Ask students if they know what a code is.

Codes can contain symbols or colors.

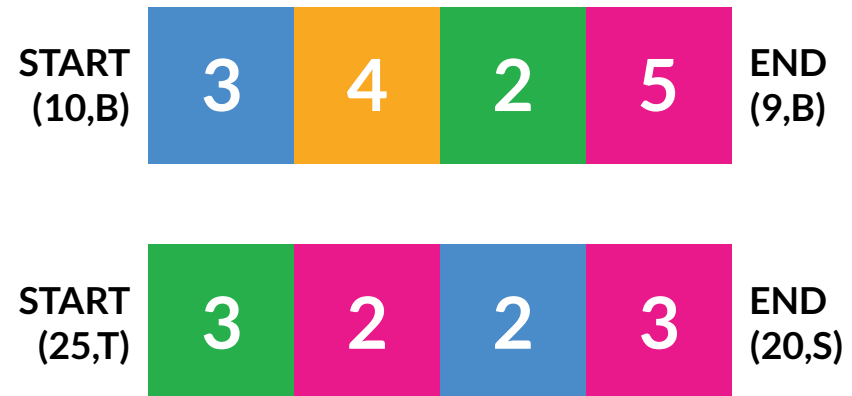
Codes are like recipes you use if you are cooking or baking.

Codes are a way to give directions using something other than just words.

2. Show the students how the colors of the compass rose can substitute for the directional words.



3. Show the students this example of a code using the colors instead of the directional words. Have the children move a brick, person, or figure from start to finish following the code.



To make it more challenging use the letter (B for blue, Y for yellow, P for pink, and G for green) and add more steps!

START (1,A) → 5B → 5Y → 6B → 4Y → 2M → 1G → 8B → END (9,R)

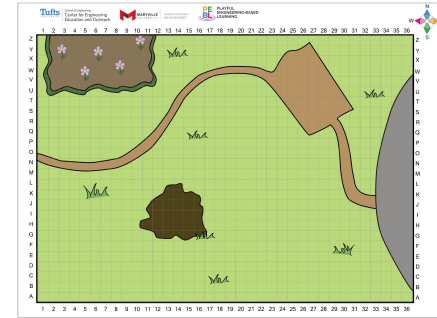
START (20,K) → 4M → 7G → 6B → 3Y → 2B → 4Y → 4M → END (20,K)



Coding with Color on the Playground

To create simple codes with MAP MATS, children will substitute the colors of the compass rose for the directional words and learn to give directions for a route on the map.

MATERIALS



People by LEGO Education

CHILDREN WILL...

- Use basic coding skills to give directions and create routes on the MAP MATS
- Substitute the compass rose colors for directional words
- Try out each others codes on the MAP MATS



SET UP

5 MIN

ACTIVITY

30 MIN

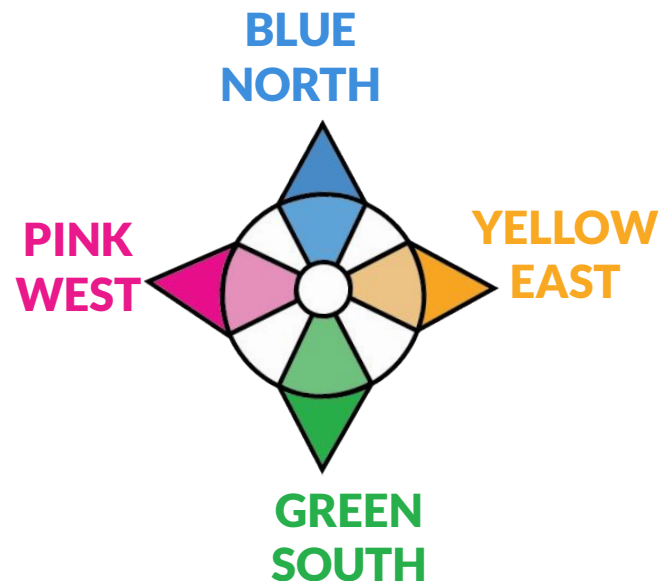
CLEAN UP

5 MIN

PROCEDURE



1. Remind the students how the colors of the compass rose can substitute for the directional words.
2. Give each student a **blue**, **yellow**, **pink**, and **green** crayon or marker and paper.
3. Give the students one of the two **challenges** and have them write down their own code.
4. Have students **test each other's code**.



CHALLENGE 1

Write a code to direct a person to get from the parking lot at (34,J) to any flower in the garden.

CHALLENGE 2

Start at (9,H). Walk all around the mud puddle without getting dirty. End at (11,G).

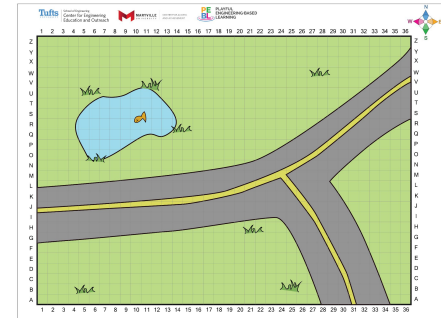


Create more challenges and have the students create new challenges too. They can also write stories to go along with the code. Incorporate math by counting the squares traveled and making equations from the code.

Coding with Color on the Roadway

To create simple codes with MAP MATS, children will substitute the colors of the compass rose for the directional words and learn to give directions for a route on the map.

MATERIALS



CHILDREN WILL...

- Use basic coding skills to give directions and create routes on the MAP MATS
- Substitute the compass rose colors for directional words
- Try out each others codes on the MAP MATS



People by LEGO Education



SET UP

5 MIN

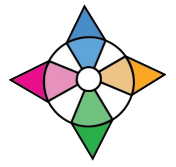
ACTIVITY

30 MIN

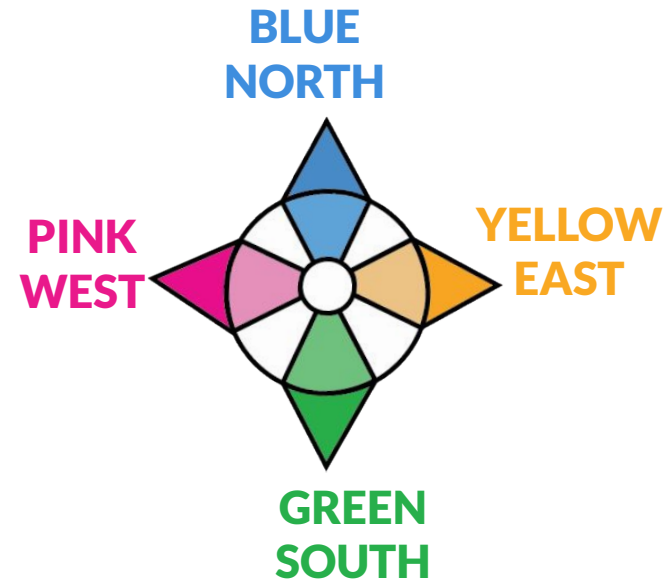
CLEAN UP

5 MIN

PROCEDURE



1. Remind the students how the colors of the compass rose can substitute for the directional words.
2. Give each student a **blue**, **yellow**, **pink**, and **green** crayon or marker and paper.
3. Give the students one of the two **challenges** and have them write down their own code.
4. Have students **test each other's code**.



CHALLENGE 1

Start at (9,V). Go around the pond without getting wet or going through a clump of grass. End at (8,W).

CHALLENGE 2

Go from (35,O) to (10,D). Count the number of times you have to cross a road.



Create more challenges and have the students create new challenges too. They can also write stories to go along with the code. Incorporate math by counting the squares traveled and making equations from the code.

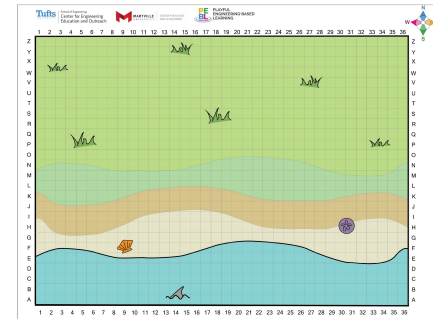
Coding with Color on the Beach

To create simple codes with MAP MATS, children will substitute the colors of the compass rose for the directional words and learn to give directions for a route on the map.

CHILDREN WILL...

- Use basic coding skills to give directions and create routes on the MAP MATS
- Substitute the compass rose colors for directional words
- Try out each others codes on the MAP MATS

MATERIALS



People by LEGO Education



SET UP

5 MIN

ACTIVITY

30 MIN

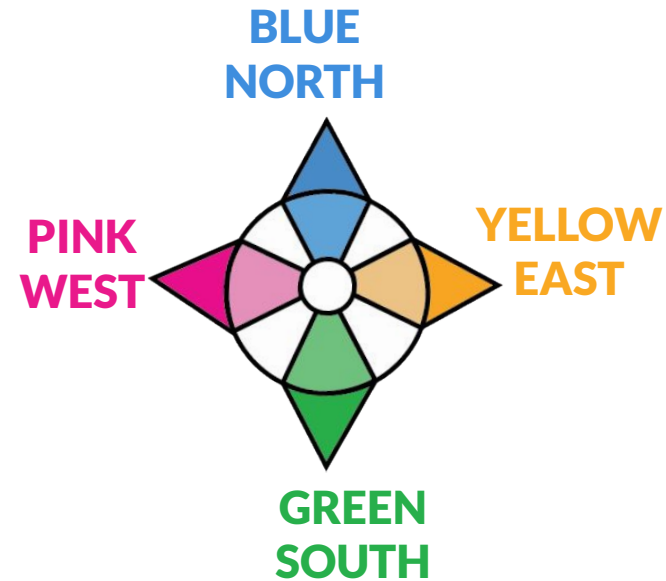
CLEAN UP

5 MIN

PROCEDURE



1. Remind the students how the colors of the compass rose can substitute for the directional words.
2. Give each student a **blue**, **yellow**, **pink**, and **green** crayon or marker and paper.
3. Give the students one of the two **challenges** and have them write down their own code.
4. Have students **test each other's code**.



CHALLENGE 1

Start at (1,G). Create a code to get to (36,J) staying only on the light and dark sand squares. Don't trip on a shell!

CHALLENGE 2

Write a code to get from (7,X) to the water at (21,D).



Create more challenges and have the students create new challenges too. They can also write stories to go along with the code. Incorporate math by counting the squares traveled and making equations from the code.

Let's Measure with MAP MATS

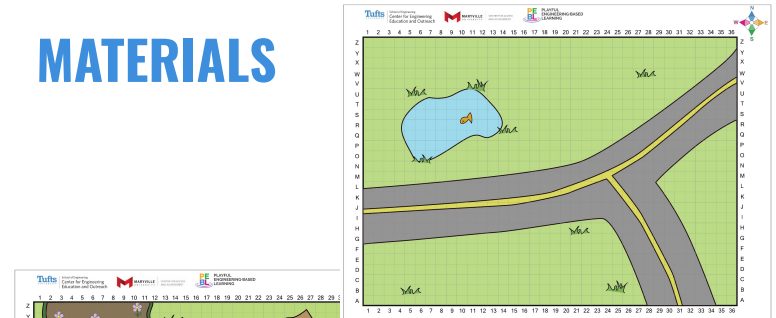
M A T H

Measuring lengths with non-standard units is a basic concept to develop with young learners. The squares on the MAP MATS are a visually interesting way to practice measuring objects in non-standard units. In addition, the numerical part of the coordinate system, can function as a measuring tool.

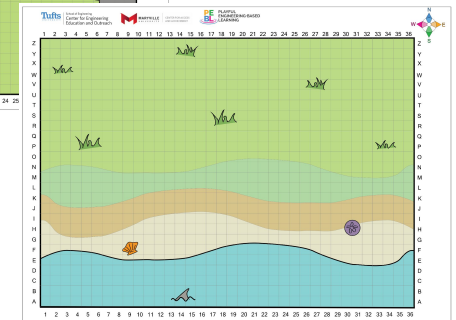
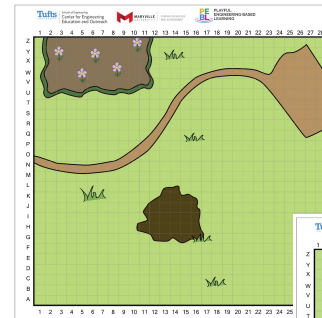
CHILDREN WILL...

- Measure the lengths of objects using the squares of the MAP MATS as non-standard units
- Compare the lengths of different objects
- Find the difference in lengths between objects
- Record the data collected from measuring

MATERIALS



OR



SET UP

5 MIN

ACTIVITY

30 MIN

CLEAN UP

5 MIN

PROCEDURE



The number scales on the north and south sides of the MAP MATS can be used as non-standard or alternative units of measure with each square representing one unit.

1. Lay one MAP MAT on the floor. Ask the students if the map could help them measure things.

Is there anything on the mat that can measure things?

Do you think the squares could help?

2. Ask students to **pick an object in the room** that they would like to measure with the squares on the MAP MAT.

3. When students have their objects in hand, they can **guess how many squares long they think it is**. Students record their guesses.

How many squares long do you think it is?

4. Students **take turns measuring their own objects** by laying them down with one end at either (1,A) or (1,Z) and then record the result.

5. Students **compare the measured length of their objects with their guesses**.



Additional Measuring Challenges:

- Students can build a tower with the DUPLO bricks, lay it on its side and measure in squares.
- Challenge students to build something that is 5 squares long.
- Have 2 or 3 students build a tower with DUPLO and measure. Have them predict how long the 2 or 3 towers are together based on the measurement of the individual towers. Then check their prediction by putting them together to measure.

MATH

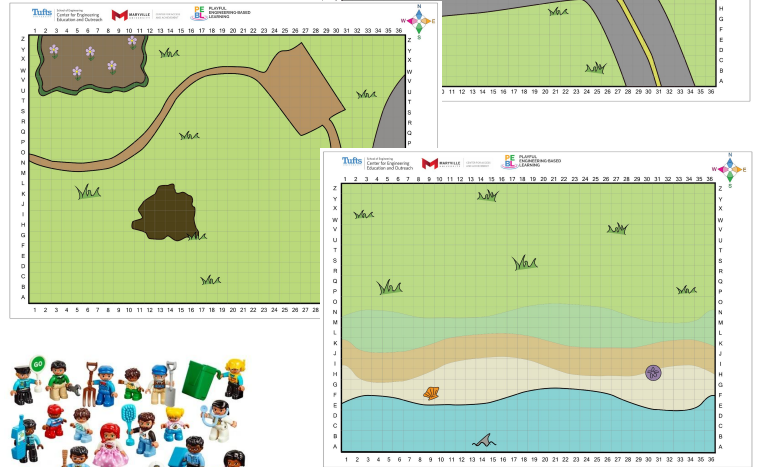
Towers of Patterns

This activity builds the concept of pattern as something that repeats. Students can create patterns involving colors of bricks, shapes of bricks, and/or sizes of bricks.

CHILDREN WILL...

- Build towers that have a pattern from DUPLO bricks
- Give the towers imaginative names that go with the pattern
- Guess each other's patterns

MATERIALS



People by LEGO Education



My XL World by LEGO Education

OR



STEAM Park by LEGO Education

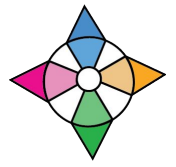


SET UP
5 MIN

ACTIVITY
15 MIN

CLEAN UP
5 MIN

PROCEDURE



- 1.** Reinforce the concept with students that a pattern repeats and is predictable.

What patterns do you see in the classroom?

- 2.** Prepare the mats on the floor with sets of DUPLO bricks. Children can work alone or in pairs.

Use your imagination and engineering thinking to build a tower that has a pattern.

- 3.** Students place finished towers on one of the mats.

Can anyone guess the pattern of that tower?

Think of a creative name for your tower that goes with the pattern?

Share the name of your tower.



This activity can be repeated many times and the builds can get more complex as children develop their understanding of pattern. For students that need more challenge, encourage them to make patterns that have more than one attribute (i.e. shape and color). Be prepared to scaffold students who are struggling with the concept of pattern.

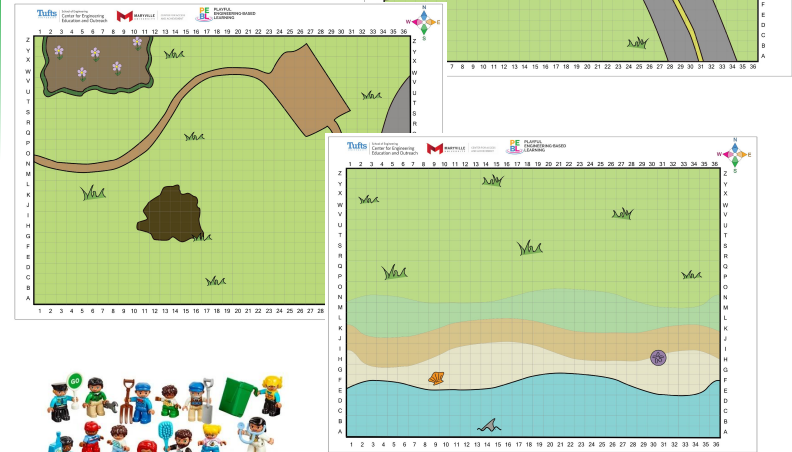
Oops! We are Stuck!

Each child will be part of a team with a specific design problem to solve using playful, engineering-based thinking. Each MAP MAT has a different design challenge.

CHILDREN WILL...

- Use creative and problem solving skills to solve an environmental problem
- Try out models to see if they work, and if not, iterate until they have a workable solution
- Explain how a model works to solve the problem

MATERIALS



People by LEGO Education



My XL World by LEGO Education

OR



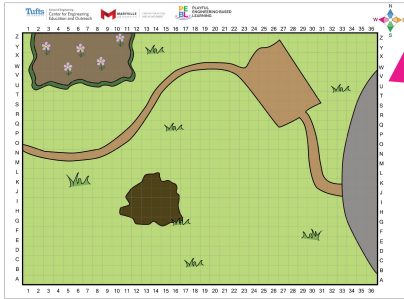
STEAM Park by LEGO Education

PROCEDURE



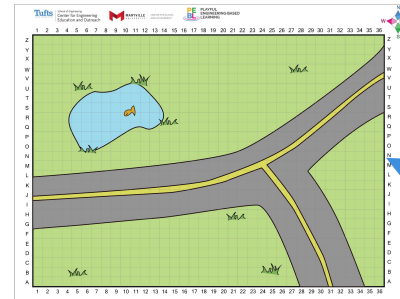
1. Divide children into three groups, one for each mat. Within each group, put children in teams of two or three. Use the following challenges for each mat:

Playground



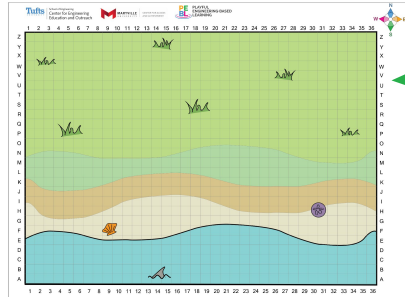
Everytime it rains a mud puddle forms on our playground and you can't play in that area. Can you design a structure that goes over the mud puddle so you can play in that area?

Roadway



Many people want to cross from the south to the north but the road has too much traffic. Can you build a way for people to safely cross the road to reach the pond?

Beach



You are at the beach with your family. You are eating lunch in the grass and now you want to go into the water but the sand is way too hot! What can you build to help you get to the water so your feet don't touch the sand?

2. Have each team of builders explain their solution to the class. Encourage children to give positive feedback and ask questions of the builders.



You can repeat this activity using other materials besides LEGO bricks such as cardboard, construction paper, and tape. Invent some other problems or ask children to come up with their own challenges.



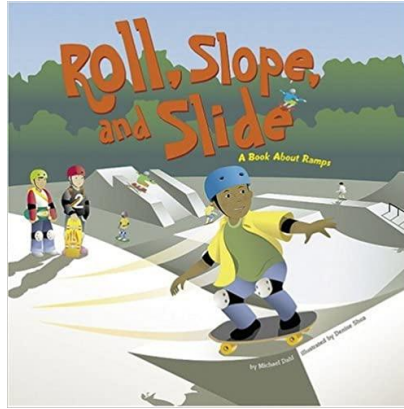
SET UP
5 MIN

ACTIVITY
30 MIN

CLEAN UP
5 MIN

Slopes, Slides, and Ramps

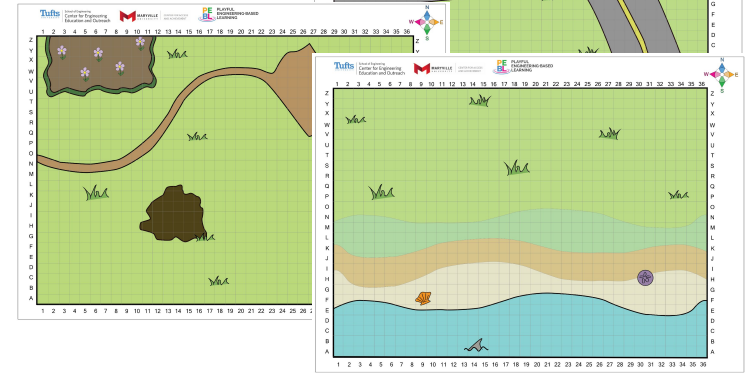
Inspire your children to learn about slopes, slides, and ramps by reading aloud a [Roll, Slope and Slide: A Book about Ramps](#). Using DUPLO bricks, children will build their own slopes, slides, and ramps at various locations on the mats.



CHILDREN WILL...

- Use imagination and prior knowledge to design slopes, slides, and ramps
- Iterate designs to see different outcomes
- Begin to gain awareness of the way the design of a slope, slide, or ramp affects speed, direction, distance, and motion of an object

MATERIALS



My XL World by LEGO Education



People by LEGO Education

OR



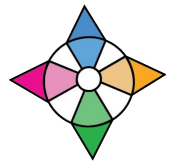
STEAM Park by LEGO Education

optional:



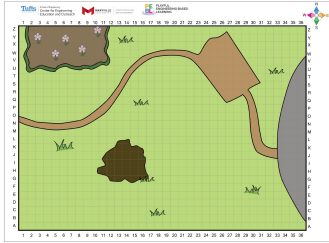
Tubes by LEGO Education

PROCEDURE

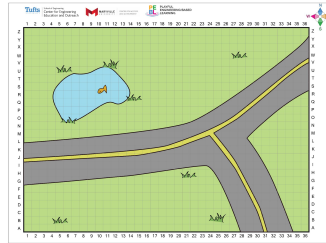


1. The book, [Roll, Slope and Slide: A Book about Ramps](#), is a non-fiction book which introduces and reinforces concepts of force, motion, and stability. Skim through the book and choose one chapter to inspire the children to build.

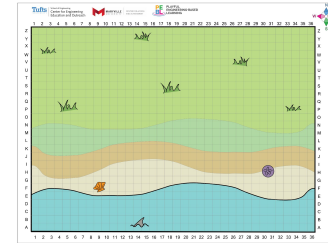
2.



Playground
Build a variety of slides.



Roadway
Build a variety of roadways.



Beach
Build a variety of ramps.

3.

Circulate to each group, asking open ended questions.

How could you make the moving objects go faster, slower?

How could you change the direction of the moving object (ball, car, people, animals)?

4.

Bring groups together and discuss what each group has built.

What did you notice about your builds?

What would you do differently next time?

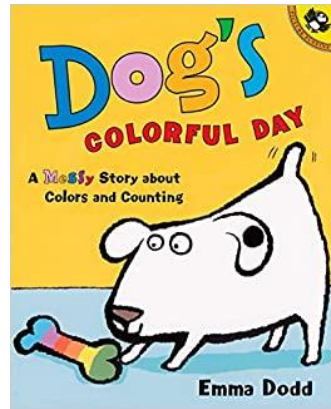
Did you have any problems building? How did you solve them?



Remember to ask questions which reinforce quantitative numeracy to connect counting to cardinality such as how many, how long, how short, and how tall. Children will describe ways to change the motions of an object (how to cause an object to go slower, faster, farther, change direction, or stop).

Colors of Our World

Engage students by reading aloud [Dog's Colorful Day](#), which is centered around colors. Children will build constructions using a single color brick. Working with color constraints will encourage creative problem-solving and collaborative group work in order to create novel combinations.



CHILDREN WILL...

- Work within constraints to meet a specific goal
- Practice counting and comparing numbers
- Observe and state similarities and differences among an array of objects

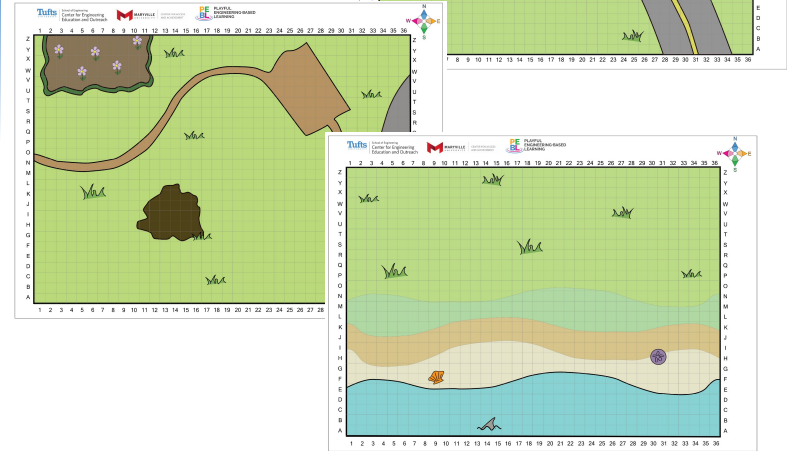


SET UP
5 MIN

ACTIVITY
30 MIN

CLEAN UP
5 MIN

MATERIALS



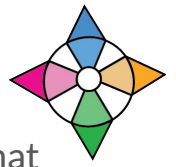
My XL World
by LEGO
Education

OR



STEAM Park by
LEGO
Education

PROCEDURE



1. Read [Dog's Colorful Day](#) aloud and ask a few questions about the story.
2. Divide the class into seven groups. Assign each group one of the following colors: **yellow**, **pink/purple**, **blue**, **green**, **red**, **orange/brown**, **black/white/grey**. DO NOT include road pieces.
3. Have each group find pieces of their assigned color and **work together to build a structure that can stand**. Set a timer for 7 minutes.
4. After 7 minutes, invite each group to bring their build to set on the mat.

5. Gather the whole class around the mat and ask:

Do any structures have the same number of pieces?

*Which is the tallest?
The shortest?*

What do you think about the world of many colors you built? What would you like to change about the world? Why? How would you describe this world to your family?

Did you have any challenges in doing this? What and why?

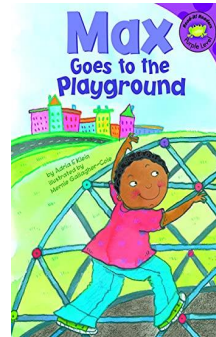
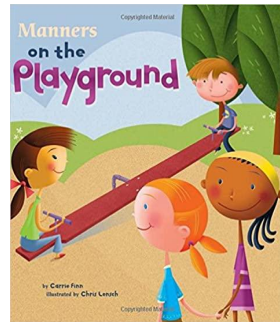
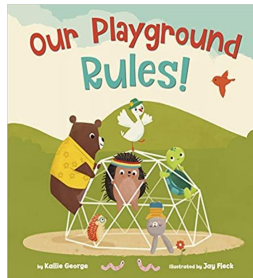
*Which structure has the least number of pieces?
How do you know?*



This constraint may cause frustration and disappointment among some children who may not like their color or may feel they don't have enough bricks to build. This creates an opportunity for children to practice social-emotional regulation in dealing with issues of fairness, disappointment, and frustration. Be sure to acknowledge and provide strategies for coping with issues if they emerge.

What Can We Do On Our Playground?

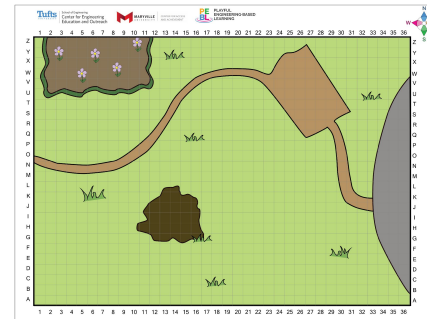
The school playground is rich with opportunities for autonomous play for children, a place to observe movement and shapes. Use the suggested book list as a springboard for class discussions and imaginative playful building experiences for the students.



CHILDREN WILL...

- Engage in socially meaningful play using DUPLO people
- Talk about the need to make sure that things on a playground are accessible to all children
- Express ideas about other things that can be on a playground - such as a bench for those who want to rest
- Tell what they know about different types of movement and shapes that might be found on a playground

MATERIALS



People by LEGO Education



My XL World by LEGO Education

OR



STEAM Park by LEGO Education

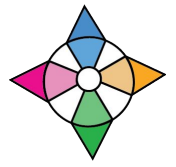


SET UP
5 MIN

ACTIVITY
30 MIN

CLEAN UP
5 MIN

PROCEDURE



1.

Set out the materials and gather the class into a reading circle and **read aloud one of the books on the list.**



2.

Facilitate a short discussion to go with the book. Point out **shapes** in the pictures, talk about types of **movement**, and briefly talk about planning for **safety** when designing playground equipment.

3.

Put the students into small groups and ask to **build playground equipment.**

4.

Ask open ended questions such as:

Does a piece of playground equipment have to be big to be fun?

What kind of movement do you like when you are on the playground?

What shapes are you using in your equipment?

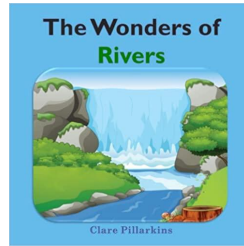
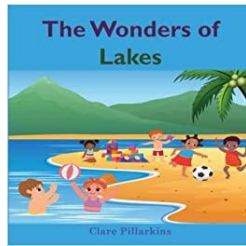
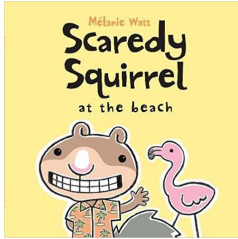
How can you know if something will be safe for children?



This is an activity that can be repeated many times with variations. For instance, constraints could be this playground only has things that will rock back and forth, or this playground can't have anything round (or blue, or square, etc). You might also have the children write a short story about something that happens on a playground.

What Will We Find at the Shore?

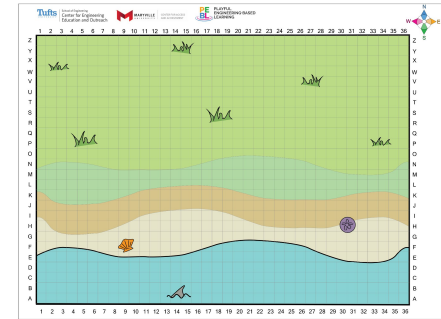
Read a book about an environment that has a shore or beach. Lead a class discussion about the concepts in the book. Using the beach map, encourage students to use DUPLO to build things that might be found at the beach.



CHILDREN WILL...

- Actively engage in building things they might find at a beach, such as buildings, creatures in the water, boat docks, and sand castles
- Use their imaginations to play with other children creating an adventure story
- Practice using the coordinate system as they build and collaborate with their classmates

MATERIALS



My XL World
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OR



STEAM Park
by LEGO
Education



People by LEGO
Education

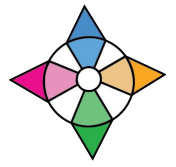


SET UP
5 MIN

ACTIVITY
30 MIN

CLEAN UP
5 MIN

PROCEDURE



1.

Set out the materials and gather the class into a reading circle and **read aloud one of the books on the list.**



2.

Facilitate a short discussion to go with the book.

*Who has been to a beach?
What did you find there?*

Do you know any stories about animals that live in water?

Do you know that there are amusement parks at some beaches?

Do you know that beaches can be at rivers or lakes or oceans?

3.

Let the children work alone or in small groups **to build things that would be fun at the beach.**

4.

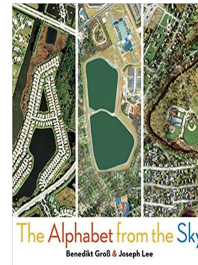
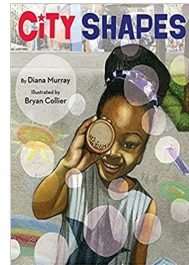
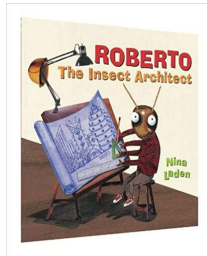
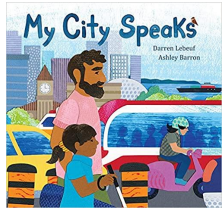
Allow time for social interaction and imaginative play. **Reference the coordinate system** as the children play.



This is an activity that can be repeated with many variations. One time you could prompt student to build imaginary creatures that live in the water. Another time you could build a little town on the shore. Boat docks can be constructed.

What Makes Our Community Special?

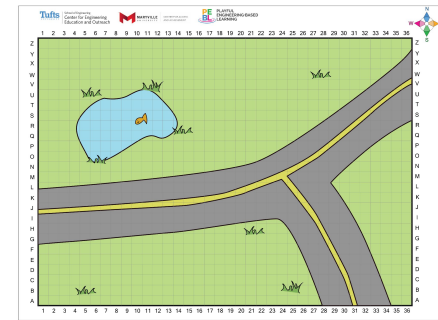
Building the concept of community is a keystone concept in the early grades. Read a book about cities or smaller communities. Using the roadway map, have students plan and build their own communities.



CHILDREN WILL...

- Collaborate to create a meaningful community
- Practice different building techniques to make buildings that represent their vision and ideas of community

MATERIALS



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Education

OR



STEAM Park by
LEGO
Education



People by LEGO
Education

PROCEDURE



1. Set out the materials. Sit in a reading circle and **read aloud one of the books about towns and cities** on the list or another of your choosing.



2. Facilitate a short discussion to go with the book.

What makes a community?

What places will you find there?

What shapes make up the building?

What buildings do you want most in your community?

3. Let the children work alone or in small **groups to build things that can go in their community.**

4. Allow time for social interaction and imaginative play. **Reference the coordinate system** as the children play.



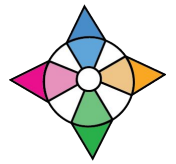
This is an activity that can be repeated with many variations. You can adjust the building prompts to go with a book that you read about community, cities, or neighborhoods.



APPENDIX

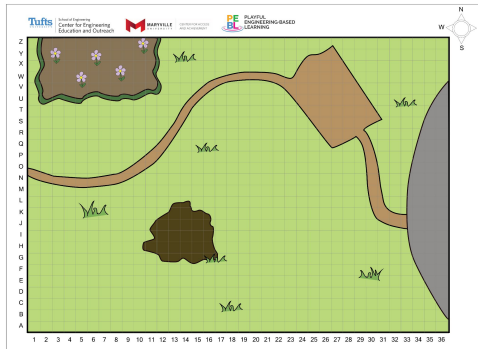


Suggested Books to Use with MAP MATS



[Roll, Slope & Slide](#) by Michael Dahl and Denise Shea

[Dog's Colorful Day: A Messy Story About Colors and Counting](#) by Emma Dodd



Books for Playground MAP MAT:

[Our Playground Rules](#) by Kallie George, Illustrator, Jay Fleck

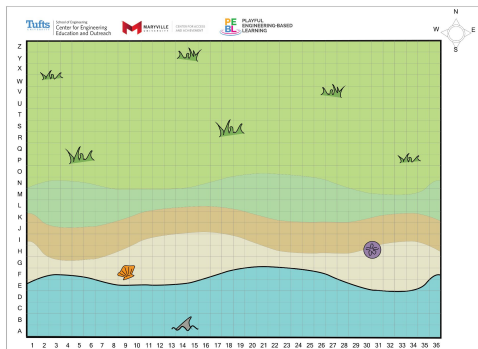
[Manners on the Playground](#) by Carrie Finn, Illustrator, Chris Lensch

[Max Goes to the Playground](#) by Adria F. Klein, Illustrator, Mernie Gallagher-Cole

[Let's Build a Playground](#) by Robert Pizzo

[Melvin & Muffin - Physics on the Playground \(Exploring Newton's 3rd Law\)](#) by Dr.

Kathleen J. Tate, Illustrator, Josh Vierela



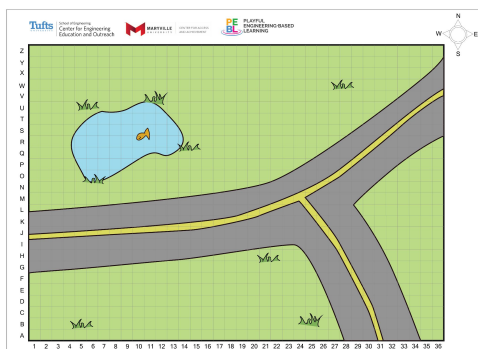
Books for Beach MAP MAT:

[Scaredy Squirrel at the Beach](#) by Melanie Watt

[The Wonders of Rivers: An Informative and Fun Book of Nature for Kids](#) by Clare

Pillarkins

[The Wonder of Lakes: An Informative and Fun Book of Nature for Kids](#) by Clare Pillarkins



Books for Roadway MAP MAT:

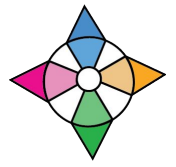
[Wonders of the Environment: A Fun and Educational Book for Kids](#) by Clare Pillarkins

[My City Speaks](#) by Darren Lebeuf, Illustrator, Ashley Barron

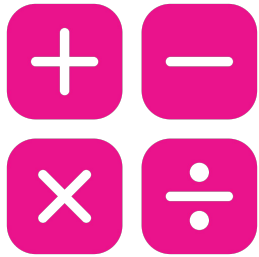
[Roberto: The Insect Architect](#) by Nina Laden

[City Shapes](#) by Diana Murray, Illustrator, Bryan Collier

[ABC: The Alphabet from the Sky](#) by Benedikt Gross and Joey Lee

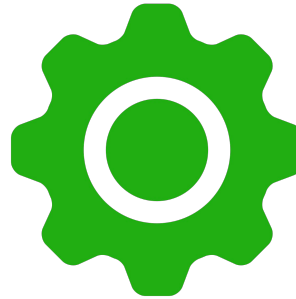


MATH



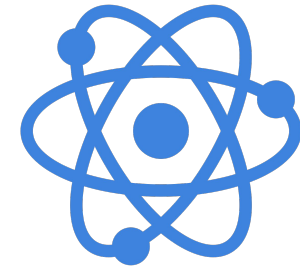
Counting and Cardinality
Operations and Algebraic Thinking
Number and Operations in Base 10
Measurement and Data
Geometry

ENGINEERING

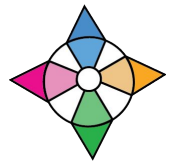


Defining and Delimiting Engineering Problems
Developing Possible Solutions
Optimizing the Solution Process

SCIENCE



Structure and Properties of Matter
Natural Resources
Natural Hazards



SOCIAL STUDIES

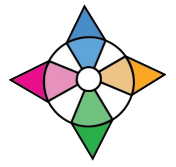
- Reading and constructing maps
- Understanding the concept of location to make predictions and solve problems
- Understanding the concept of place
- Relationships within places/human-environment interactions
- Understanding relationships between and among places
- Use visual tools to communicate information and ideas



ENGLISH LANGUAGE

- Writing
- Print awareness
- Speaking/listening
 - Listen for a purpose
 - Listen for entertainment
 - Speak effectively in collaborative discussions
 - Speak effectively when presenting

Additional Learning through Play Resources



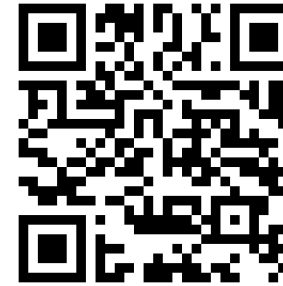
LEGO FOUNDATION



Learning Through Play

learningthroughplay.com

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Learning Through Play

<http://tiny.cc/unicef-play>

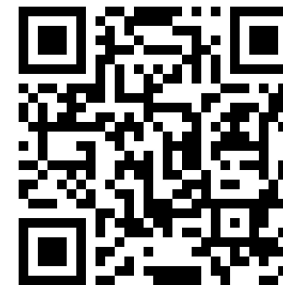
INTERNATIONAL SCHOOL OF BILLUND



Pedagogy of Play

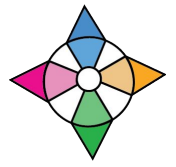
isbillund.com/academics/pedagogy-of-play

HARVARD PROJECT ZERO



Pedagogy of Play

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maryville.edu/mapmats



TRAINING VIDEOS
Demos of selected MAP
MATS activities



DOWNLOADS
Printable MAP MATS
Activity Guide

