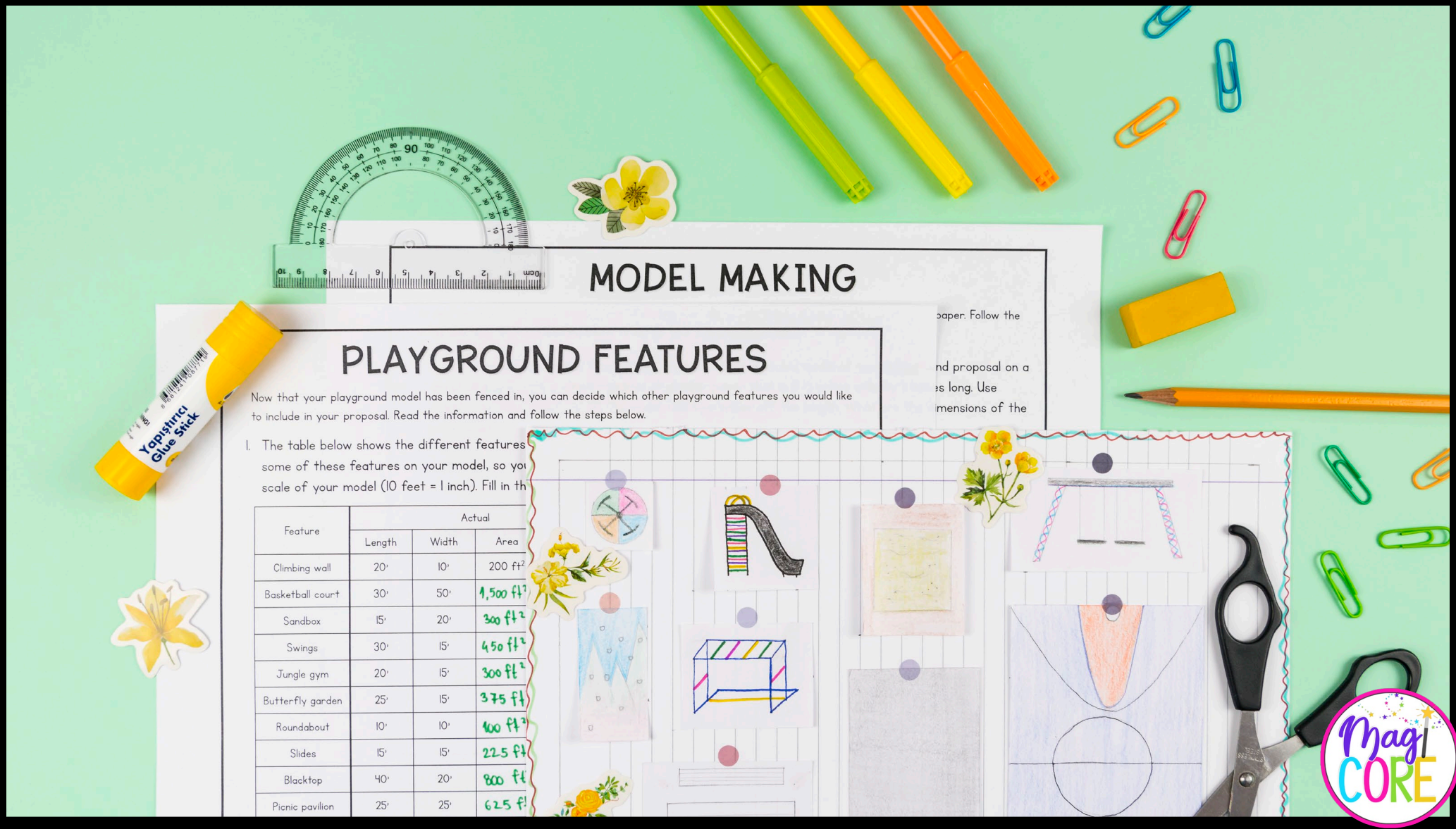
PLAYGROUND ARCHITECT

STEM Project Based Learning

5th Grade Print & Google Slides

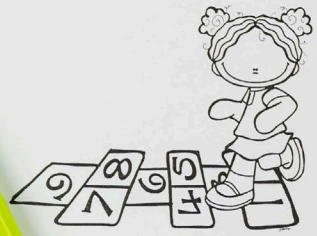


Your school is getting a new playground! Work on a plan to submit to your principal for the new playground.

MODELING SUPPLIES

As you brainstorm and plan out your idea for a new playground, you will be making various models.

During the course of this project, you will need the materials shown on the clipboard to make your models and answer questions about them.



- Five sheets of 8.5" x 11" printer paper
- Pencil
- Ruler
- Scissors
- Glue
- Markers, colored pencils, or crayons
- 35 toothpicks
- About 20 mini marshmallows, gumdrops, small balls of play dough, or anything you can use to stick toothpicks in that will hold up and connect the toothpicks
- Paperclip
- Protractor (if completing Challenge #1)

JUNGLE GYM

LET'S GET BUILDING

4. Each of the three fence options comes in sections. The length of each section is different depending on the type of fence. Using the total amount of fence you found in question #1, determine how many sections of each fence type you will need. Fill in your answers on the table below.

FENCE OPTION	SECTION LENGTH	# OF SECTIONS NEEDED	PRICE PER SECTION	TOTAL PRICE
Wood	10 feet	32	$85	$2,720
Metal	4 feet	80	$37	$ 2,960
PVC	8 feet	40	$56	240

5. The price per section of fence is shown in the table. Determine the [illegible]al p[illegible]e for each type of fence. Fill in your answers on the table.

6. Based on the pros and cons you listed in question #3 and the total prices [illegible]u [illegible]und, which fence do you choose for your playground? Justify your answer.

Wood. Medium price, beautiful and easy [illegible] shape

Use measurement and budgeting skills to create your design.

Google Slides Option

3. The walkway leading from the school to the playground gate is 84 feet long. Find the length of the walkway in inches and yards.

FINISHING TOUCHES

4. You want to plant tulips along the fence on the inside of the playground. You find a local garden center that sells tulip bulbs in bulk. Use the information below to determine how many of each color bulb come in one lot of tulip bulbs. Fill in the missing information in the table. Use the textbox to show your work.

Color	Red	Yellow	Pink	Orange	Purple	White	Fuchsia
Number of bulbs		36					

A. There are 8 times as many pink bulbs as yellow bulbs.
B. There are 12 times as many pink bulbs as there are white bulbs.
C. There are 5 times as many red bulbs as white bulbs.
D. There are as many purple bulbs as red and white bulbs put together.
E. The number of fuchsia bulbs is one-third of the difference between the number of pink and purple bulbs
F. The number of orange bulbs is more than the number of yellow bulbs but less than the number of fuchsia bulbs, and the sum of its digits is 5.

CHALLENGE #1: MURAL

There is a large, empty wall of the school that faces the playground. As part of the playground design contest, the principal has requested that contestants submit proposals for murals to be painted on the wall. The theme of the mural must be friendship. Use the line, shape, or scribble tools to draw your mural in the space below or sketch your idea on a piece of paper. Be sure to include all the shapes and elements listed in the table below.

Student rubric and reflection for easy assessment.

TABLE OF CONTENTS

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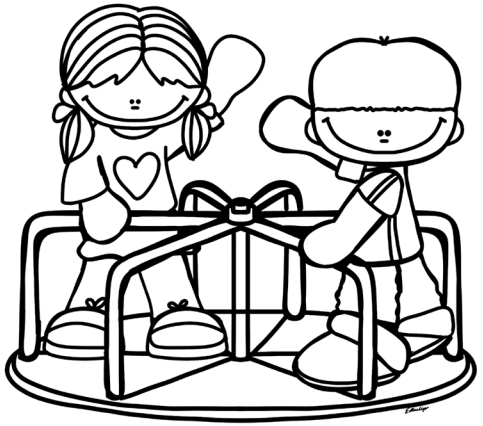
FOR THE TEACHER

PLAYGROUND ARCHITECT is a STEM project-based learning task that involves using fifth-grade math standards to build a model for a playground. It was created for students in fifth grade. The following math standards are addressed:

- 5.NBT.B.5 Fluently multiply multi-digit whole numbers using the standard algorithm.
- 5.NBT.B.6 Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors.
- 5.NF.B.4 Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.
- 5.MD.A.1 Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real-world problems.
- 5.MD.C.3 Recognize volume as an attribute of solid figures and understand concepts of volume measurement.
- 5.MD.C.5 Relate volume to the operations of multiplication and addition and solve real-world and mathematical problems involving volume.

DIRECTIONS:

1. Review the supplies needed on slide 5 to ensure students will have access to all necessary materials.
2. Assign students to work alone or in small groups.
3. Preview the activity with your students.
4. Allow students class time to complete the activity. This can span several days.
5. Allow students an opportunity to complete extra challenge activities. (Optional)
6. Allow students to complete the self-reflection and evaluation rubric.
7. Allow students an opportunity to share their completed projects.

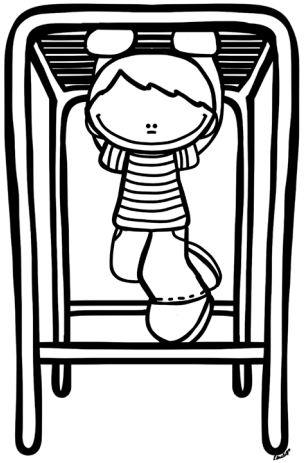


PLAYGROUND ARCHITECT

Your school is getting a new playground, and the principal has announced an exciting contest for the students. Each student in fifth grade will submit their idea for the new playground. The winner of the contest will have their proposed playground built. You are going to brainstorm your playground idea, design the important playground elements, build models of your playground, and determine the cost of your playground proposal. May the best playground win!

Here are your tasks:

- Read through the entire packet before beginning.
- Determine the type, amount, and cost of a fence to go around your playground.
- Decide which playground features you want to include in your playground proposal.
- Make a model of your playground layout on a piece of paper.
- Sketch, build, and test a model of a jungle gym for your playground.
- Solve word problems about the finishing touches for your playground including mulch, flowers, and walkways.
- Complete the challenge pages. (Optional)
- Complete the self-reflection and evaluation rubric.



MODELING SUPPLIES

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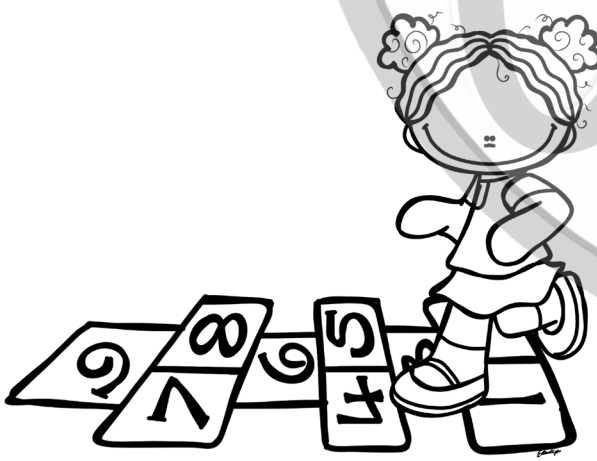

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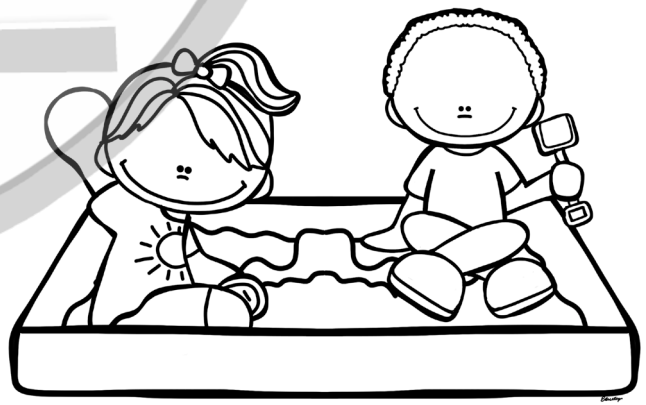
MODEL MAKING

To help you with brainstorming, you want to make a model of the playground to scale on a piece of paper. Follow the steps and answer the questions below to set up your playground model.

1. To get your creative juices flowing, you want to create a scaled model of your playground proposal on a sheet of paper. Find a standard piece of printer paper that is 8 ½ inches wide by 11 inches long. Use scissors to trim 1 ½ inches off the width and two inches off the length. What are the dimensions of the paper now?

2. What is the perimeter of the paper?

3. What is the area of the paper?



LET'S GET BUILDING

4. Each of the three fence options comes in sections. The length of each section is different depending on the type of fence. Using the total amount of fence you found in question #1, determine how many sections of each fence type you will need. Fill in your answers on the table below.

FENCE OPTION	SECTION LENGTH	# OF SECTIONS NEEDED	PRICE PER SECTION	TOTAL PRICE
Wood	10 feet		$85.15	
Metal	4 feet		$37.82	
PVC	8 feet		$56.46	

5. The price per section of fence is shown in the table. Determine the total price for each type of fence. Fill in your answers on the table.

6. Based on the pros and cons you listed in question #3 and the total prices you found, which fence do you choose for your playground? Justify your answer.

PLAYGROUND FEATURES

Now that your playground model has been fenced in, you can decide which other playground features you would like to include in your proposal. Read the information and follow the steps below.

1. The table below shows the different features you can include in your playground. You want to draw some of these features on your model, so you need to determine their dimensions according to the scale of your model (10 feet = 1 inch). Fill in the missing dimensions. Find the areas and perimeters.

Feature	Actual				Model			
	Length	Width	Area	Perimeter	Length	Width	Area	Perimeter
Climbing wall	20'	10'	200 ft^2	60'	2"	1"	2 in^2	6"
Basketball court	30'	50'						
Sandbox	15'	20'						
Swings	30'	15'						
Jungle gym	20'	15'						
Butterfly garden	25'	15'						
Roundabout	10'	10'						
Slides	15'	15'						
Blacktop	40'	20'						
Picnic pavilion	25'	25'						

JUNGLE GYM

You want to create your own design for your jungle gym. Follow the instructions below.

1. First, brainstorm what your jungle gym might look like. Create a sketch in the space below.

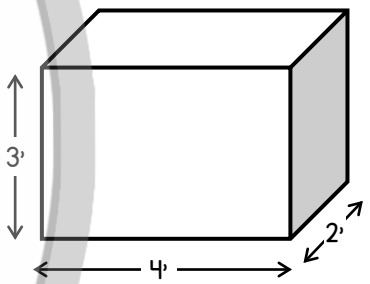
2. Explain your design for your jungle gym. What shapes did you use (triangles, squares, rectangles, etc.)? Why did you choose these shapes? Is your jungle gym symmetrical? Can you identify any weak points in your structure? Is there any part you think will be particularly difficult to build?

FINISHING TOUCHES

Your playground proposal is almost complete! You just need to make a few more decisions about the finishing touches. Answer the questions below.

1. You want to put down mulch in the playground. You estimate you will need 350 kilograms of mulch to cover the whole playground. How many grams of mulch is this?

2. The mulch comes in bins such as the one shown here. What is the volume of each bin of mulch?



3. Each bin contains 42 kilograms of mulch. How many bins will you need?

4. How many kilograms of mulch will there be in total? What is the volume of all the mulch in cubic inches?

CHALLENGE #1: MURAL

1. Label the 3 acute and 3 obtuse angles in your mural with the letters in the table below. Use a protractor to measure each angle. Record your measurements.

Acute angles	Measurement	Obtuse angles	Measurement
A		D	
B		E	
C		F	

2. To keep costs of the mural down, the principal asks that it be completed only using paint that is already in the art room. You go to the art room to see how much of each color paint is there. The table below shows the quantity of paint in both liters and milliliters. Fill in the missing amounts. Remember that 1 liter = 1,000 milliliters.

Color	Amount in L	Amount in mL	Color	Amount in L	Amount in mL
red	2.45		green		2,670
blue		1,098	yellow	3.756	
black		3,221	white	0.382	

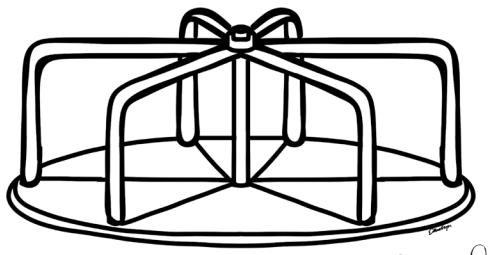
CHALLENGE #2: MORE MODELS

In this challenge, you will have the opportunity to plan and build another model. Answer the questions and follow the instructions below.

1. Choose another feature that you included in your playground other than the jungle gym. If you were to make a model of this feature, what materials might you use that you could find easily in your home or classroom?

2. What process would you follow to create your model? Explain the steps you would take.

3. You performed three tests on your jungle gym model to test its stability and strength. What are two tests that you could perform on this model? What qualities would these tests assess?



SELF-REFLECTION

Write a reflection of your experience with this project. How did you feel about the math problems and activities? Explain what you found easy to do and any difficulties you had while working on this project. Did you enjoy this activity? Why or why not?

RATE THIS PROJECT

Circle the statement you most agree with.

I am ready for something harder. This was just right. I found this very challenging.

SELF-EVALUATION

Circle one box per row on the rubric that expresses how you rate yourself on this Project Based Learning Activity.

+	✓	−
I felt very confident about the math in this project.	I felt pretty good about my ability to complete the math in this project.	I felt a lot of the math in this project was too hard for me to do alone.
I understood all of the math and did not need help to complete the problems.	I understood most of the math but needed a little help to solve some of the problems.	I understood some of the math but needed help to complete most of the problems.
I easily used many strategies to solve the math problems efficiently.	I needed some help to use the best strategies for solving the math problems.	I had trouble understanding the best way to solve many of the math problems.
I feel I am ready for a harder math project.	I feel I would like to spend more time practicing similar math problems.	I feel I need assistance to work on similar math problems.

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Good to Go

Not O.K.

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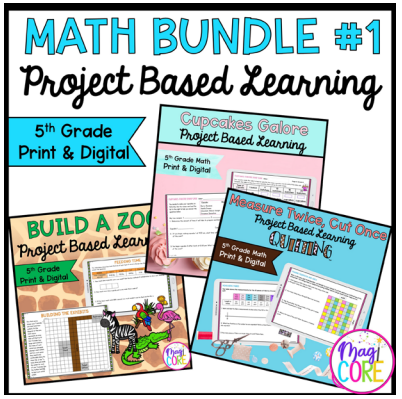

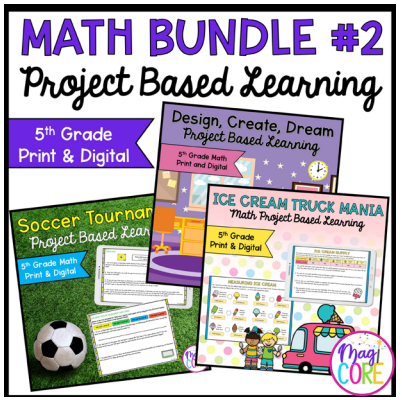

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