





## Teacher Information

Design, Engineer and Build resources have been created to help middle school students engage with STEM/STEAM.

Students use their scientific /engineering), technological, mathematical skills to help problem solve and create an end product. They are then able to use their artistic skills to help create a design/look that will appeal to their targeted audience.

**Items needed to successfully complete challenge:**  
The resources used are readily available in most classrooms or can be purchased at a local store. You can negotiate with your students about additional materials if you don't have access to it (tell the students the company is currently out of supply ☺)

Tape	Glue	Paper
Cardboard	Pop sticks/ craft sticks	Straws
Cups	Scissors	String

### Time frame required:

These projects can run for as little as 30 minutes or more, depending on your lesson requirements. It generally would take a minimum of 30 minutes to complete. You can extend the students thinking and ask them to re-evaluate and improve if you have significantly longer time. On the students sheet there is a space for them to record the time frame they have been given to complete the task.

On this student sheet it also has a space for the maximum model size. You can set this depending on the size of paper/ cardboard and space you have to display the end products.

### Restrictions:

To make it more realistic the students are required to work within boundaries. They have a set budget of either \$100 or \$1,000 (allowing you to cater for all learning levels). The students can keep a tally of their expenses using the table or coupon provided. You can also decide to 'fine' your students for unsafe practices (ie. entering another construction zone - another group's work area, not using equipment properly etc).

### Links to other curriculum areas:

- Geography
- Health (group work/ social skills)
- English

Have fun with this project!

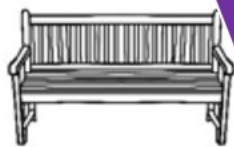


# Design, Engineer & Build!

## PLAYGROUNDS

Working with numbers up to 100

The Science teacher and local community would like to update their playground. They want to make it inviting and exciting for children aged between 5-14 years old.



**The challenge:** To design and create a model of a playground that will keep children entertained for hours. It should have a variety of equipment and structures.



What features will your playground have? How will the playground cater for the needs of the community (age range, different heights, children with disabilities, education related)?

**Your Budget: \$100**

**Material costs:**

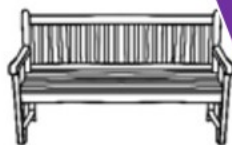
Material	Cost
Straws	\$1 each
Tape	\$1 per 5m (2 inches)
Glue	per 20 mins
Cardboard	\$15 per sheet
Paper	\$10 per sheet
Pop sticks/ craft sticks	\$1 each
Cups	\$2 each
Other	

# Design Engineer & Build!

## PLAYGROUNDS

Working with numbers & money  
\* Construction Worker costs included

### The Scenario



The school/local community would like to upgrade their playground. They want to make it inviting and exciting for children aged between 5-14 years old.

### The challenge:



To design and create a model of a playground that will keep children entertained for hours. It should have a variety of equipment and structures.

What structures will your playground have? How will your playground cater for the needs of the community (age range, different heights, children with disabilities, education related)?

**Your Budget: \$100**

**Material / Construction Worker costs:**

Material	Cost
Straws	\$1 each
Tape	\$1 per 5m (in)
Glue	\$1 per 100g
Cardboard	\$5 per sheet
Paper	\$10 per sheet
Pop sticks/raft sticks	\$1 each
Cups	\$2 each
Other	
Labour costs	\$2 per person per 15 mins

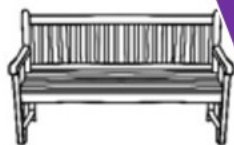


# Design, Engineer & Build!

## PLAYGROUNDS

Working with numbers up to 1,000

**The Scenario:** The local community would like to create a new playground. They want to make it interesting and exciting for children aged between 5-14 years old.



**The challenge:** To design and create a model of a playground that will keep children entertained for hours. It should have a variety of open areas and structures.



What features would your playground have? How will the playground cater for the needs of the community (age range, different heights, children with disabilities, education related)?

**Your Budget: \$1,000**

**Material costs:**

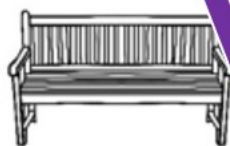
Material	Cost
Straws	\$10 each
Tape	\$1 per 5m (2 inches)
Glue	\$1 per 10 mins
Cardboard	\$150 per sheet
Paper	\$100 per sheet
Pop sticks/ craft sticks	\$2 each
Cups	\$20 each
Other	

# Design Engineer & Build!

## PLAYGROUNDS

Working with numbers 100, 1000, 10000  
\* Construction worker costs to be included

**The Scenario:** The school/ local community would like to have a new playground. They want to make it interesting and exciting for children aged between 5-14 years old.



**The challenge:**

To design and create a model of a playground that will keep children entertained for hours. It should have a variety of options and structures.



What features would your playground have? How will the playground cater for the needs of the community (age range, different heights, children with disabilities, education related)?

**Your Budget: \$1,000**

**Material / construction worker costs:**

Material	Cost
Straws	\$10 each
Tape	\$2 per 5cm in length
Glue	\$2 per 10 mins
Cardboard	\$10 per sheet
Paper	\$100 per sheet
Pop sticks/ craft sticks	\$2 each
Cups	\$20 each
Other	
Labour	\$20 per person per 15 mins



# DESIGN ENGINEER & BUILD!

## PLAYGROUNDS

### Student Worksheet

**My Budget:** \$100 or \$1000 (circle the set amount)

**My Timeframe:** 30 or 60 minutes (circle the time allocated)

**Co-workers (Team Members):** \_\_\_\_\_

#### Restrictions:

- Remember you must use a range of resources, no excessive use of one material.
- The finished product must not be bigger than:

Height: \_\_\_\_\_

Length: \_\_\_\_\_

Width: \_\_\_\_\_

#### Safety:

- Only a maximum of 4 workers are allowed on the construction site (your work area).
- You need to stay away from other group's construction sites (do not interfere with their building process).
- Use all materials with the correct safety procedures.

#### Quality Control:

























- Your playground needs to be able to withstand general weather conditions including light winds (blowing the structures).
- It needs to cater for the different needs of the community.

#### Design:

- How will you make your playground look appealing to children?
- What materials and processes will you use to ensure your design is sturdy?
- How will all of the structures go together? Will the playground be connected as one or will there be different areas to explore?
- How will your design stand out from the others?

## Purchasing Coupons: \$1,000 BUDGET


Can either be given to the teacher or glued in book as used.

<p>Tape</p>  <p>\$2 per 5cm (2 inches)</p>	<p>Tape</p>  <p>\$2 per 5cm (2 inches)</p>	<p>Tape</p>  <p>\$2 per 5cm (2 inches)</p>	<p>Tape</p>  <p>\$2 per 5cm (2 inches)</p>
<p>Tape</p>  <p>\$2 per 5cm (2 inches)</p>	<p>Tape</p>  <p>\$2 per 5cm (2 inches)</p>	<p>Tape</p>  <p>\$2 per 5cm (2 inches)</p>	<p>Tape</p>  <p>\$2 per 5cm (2 inches)</p>
<p>Paper</p>  <p>\$100 per sheet</p>	<p>Paper</p>  <p>\$100 per sheet</p>	<p>Paper</p>  <p>\$100 per sheet</p>	<p>Paper</p>  <p>\$100 per sheet</p>
<p>Paper</p>  <p>\$100 per sheet</p>	<p>Paper</p>  <p>\$100 per sheet</p>	<p>Paper</p>  <p>\$100 per sheet</p>	<p>Paper</p>  <p>\$100 per sheet</p>
<p>Glue</p>  <p>\$2 per 10 mins</p>	<p>Glue</p>  <p>\$2 per 10 mins</p>	<p>Glue</p>  <p>\$2 per 10 mins</p>	<p>Glue</p>  <p>\$2 per 10 mins</p>
<p>Glue</p>  <p>\$2 per 10 mins</p>	<p>Glue</p>  <p>\$2 per 10 mins</p>	<p>Glue</p>  <p>\$2 per 10 mins</p>	<p>Glue</p>  <p>\$2 per 10 mins</p>











## Purchasing Coupons: \$1,000 BUDGET









Can either be given to the teacher or glued in book as used.









Craft Sticks  \$2 each	Craft Sticks  \$2 each	Craft Sticks  \$2 each	Craft Sticks  \$2 each
Craft Sticks  \$2 each	Craft Sticks  \$2 each	Craft Sticks  \$2 each	Craft Sticks  \$2 each
Straws  \$10 each	Straws  \$10 each	Straws  \$10 each	Straws  \$10 each
Straws  \$10 each	Straws  \$10 each	Straws  \$10 each	Straws  \$10 each
Cup  \$20 each	Cup  \$20 each	Cup  \$20 each	Cup  \$20 each
Cup  \$20 each	Cup  \$20 each	Cup  \$20 each	Cup  \$20 each

## Purchasing Coupons: \$1,000 BUDGET

Can either be given to the teacher or glued in book as used.

Cardboard  \$150 per sheet	Cardboard  \$150 per sheet	Cardboard  \$150 per sheet	Cardboard  \$150 per sheet
Cardboard  \$150 per sheet	Cardboard  \$150 per sheet	Cardboard  \$150 per sheet	Cardboard  \$150 per sheet




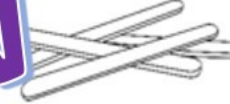
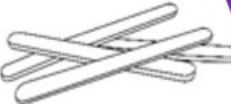

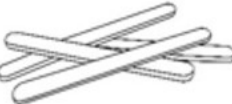
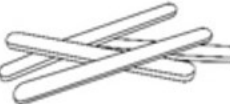












Construction  \$20 per 15 mins	Construction  \$20 per 15 mins	Construction  \$20 per 15 mins	Construction  \$20 per 15 mins
Construction  \$20 per 15 mins	Construction  \$20 per 15 mins	Construction  \$20 per 15 mins	Construction  \$20 per 15 mins

Construction  \$20 per 15 mins	Construction  \$20 per 15 mins	Construction  \$20 per 15 mins	Construction  \$20 per 15 mins
Construction  \$20 per 15 mins	Construction  \$20 per 15 mins	Construction  \$20 per 15 mins	Construction  \$20 per 15 mins



























## Purchasing Coupons: \$100 BUDGET

Can either be given to the teacher or glued in book as used.

Craft Sticks  \$1 each	Craft Sticks  \$1 each	Craft Sticks  \$1 each	Craft Sticks  \$1 each
Craft Sticks  \$1 each	Craft Sticks  \$1 each	Craft Sticks  \$1 each	Craft Sticks  \$1 each
Straws  \$1 each	Straws  \$1 each	Straws  \$1 each	Straws  \$1 each
Straws  \$1 each	Straws  \$1 each	Straws  \$1 each	Straws  \$1 each
Cup  \$2 per each	Cup  \$2 per each	Cup  \$2 per each	Cup  \$2 per each
Cup  \$2 per each	Cup  \$2 per each	Cup  \$2 per each	Cup  \$2 per each

## Purchasing Coupons: \$100 BUDGET









Can either be given to the teacher or glued in book as used.









<p>Tape</p>  <p>\$1 per 5cm (2 inches)</p>	<p>Tape</p>  <p>\$1 per 5cm (2 inches)</p>	<p>Tape</p>  <p>\$1 per 5cm (2 inches)</p>	<p>Tape</p>  <p>\$1 per 5cm (2 inches)</p>
<p>Tape</p>  <p>\$1 per 5cm (2 inches)</p>	<p>Tape</p>  <p>\$1 per 5cm (2 inches)</p>	<p>Tape</p>  <p>\$1 per 5cm (2 inches)</p>	<p>Tape</p>  <p>\$1 per 5cm (2 inches)</p>
<p>Paper</p>  <p>\$10 per sheet</p>	<p>Paper</p>  <p>\$10 per sheet</p>	<p>Paper</p>  <p>\$10 per sheet</p>	<p>Paper</p>  <p>\$10 per sheet</p>
<p>Paper</p>  <p>\$10 per sheet</p>	<p>Paper</p>  <p>\$10 per sheet</p>	<p>Paper</p>  <p>\$10 per sheet</p>	<p>Paper</p>  <p>\$10 per sheet</p>
<p>Glue</p>  <p>\$1 per 10 mins</p>	<p>Glue</p>  <p>\$1 per 10 mins</p>	<p>Glue</p>  <p>\$1 per 10 mins</p>	<p>Glue</p>  <p>\$1 per 10 mins</p>
<p>Glue</p>  <p>\$1 per 10 mins</p>	<p>Glue</p>  <p>\$1 per 10 mins</p>	<p>Glue</p>  <p>\$1 per 10 mins</p>	<p>Glue</p>  <p>\$1 per 10 mins</p>











## Purchasing Coupons: \$100 BUDGET

Can either be given to the teacher or glued in book as used.

Cardboard  \$15 per sheet	Cardboard  \$15 per sheet	Cardboard  \$15 per sheet	Cardboard  \$15 per sheet
Cardboard  \$15 per sheet	Cardboard  \$15 per sheet	Cardboard  \$15 per sheet	Cardboard  \$15 per sheet

Construction  \$2 per 15 mins	Construction  \$2 per 15 mins	Construction  \$2 per 15 mins	Construction  \$2 per 15 mins
Construction  \$2 per 15 mins	Construction  \$2 per 15 mins	Construction  \$2 per 15 mins	Construction  \$2 per 15 mins

Construction  \$2 per 15 mins	Construction  \$2 per 15 mins	Construction  \$2 per 15 mins	Construction  \$2 per 15 mins
Construction  \$2 per 15 mins	Construction  \$2 per 15 mins	Construction  \$2 per 15 mins	Construction  \$2 per 15 mins



Student Working out Paper:



PREVIEW

PREVIEW

PREVIEW









**DESIGN IT!**

**TITLE:**

**PREVIEW**

**PREVIEW**

**PREVIEW**

Remember to label:

- \* Where each material is used.
- \* Measurements

**TITLE:**

**DESIGN IT!**

PREVIEW

PREVIEW



**Explain it!**

Why did you chose your design?: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

PREVIEW

What was your total cost, why?: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_



**TITLE:**

Materials Used:

**DRAW IT!**

PREVIEW

PREVIEW

The Process:

Step 1: \_\_\_\_\_

PREVIEW

**TITLE:**

**DESIGN IT!**

Materials Used:

**PREVIEW**

**PREVIEW**

**The Process:**

Step 1: \_\_\_\_\_

**PREVIEW**



# Reflection

## Team work

I would rate my groups cooperative skills as 1 2 3 4 5  
Give reasons for your choice.

How did you share the roles and jobs?

How did you handle any differences of opinion/ issues?

PREVIEW

## New Learning

What mathematics/ technology concepts have you used?

How do you think your design could assist others/ be used in society?

What data did you use?



## Challenges

What challenges did you come across?

How did you work to fix them?

If you were to do this task again, what would you change and why?

PREVIEW

# Reflection

## Team work

I would rate my groups cooperative skills as 1 2 3 4 5.  
Give reasons for your choice.

How did you share the roles and jobs?

How did you handle differences of opinion/ issues?

PREVIEW

## Challenges

What challenges did you come across?

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PREVIEW

## New Learning

What mathematical/technology concepts have you used?

How do you think your design could assist others/ be used in society?

What data did you use?

PREVIEW





## PLAYGROUND

On task learning	/5
Working out	/5
Correct calculations	/5
Team work	/5
	/20

## PLAYGROUND

On task learning	/5
Working out	/5
Correct calculations	/5
Team work	/5
	/20

## PLAYGROUND

On task learning	/5
Working out	/5
Correct calculations	/5
Team work	/5
	/20

## PLAYGROUND

On task learning	/5
Working out	/5
Correct calculations	/5
Team work	/5
	/20

## PLAYGROUND

On task learning	/5
Working out	/5
Correct calculations	/5
Team work	/5
	/20

## PLAYGROUND

On task learning	/5
Working out	/5
Correct calculations	/5
Team work	/5
	/20



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